ank=20240703:08462

Årsredovisning
Aprea Therapeutics AB

Org.nr 556631-2285

Räkenskapsår 2023-01-01 - 2023-12-31

Fastställelseintyg
Undertecknad styrelseledamot intygar att resultaträkningen och balansräkningen i årsredovisningen
har fastställts på årsstämma den 13 Juni 2024
Årsstämman beslöt att godkänna styrelsens förslag till resultatdisposition.

Jag intygar också att innehållet i årsredovisningen och revisionsberättelsen stämmer överens med originalen.

Märsta den 13/6-2024

Lars Abrahmsén

Aprea Therapeutics AB
556631-2285

ink2_20240702;20240703084463

Årsredovisning

för räkenskapsåret 2023-01-01 - 2023-12-31

Styrelsen för Aprea Therapeutics AB avger härmed följande årsredovisning.

Innehåll	Sida
Förvaltningsberättelse	2
Resultaträkning	3
Balansräkning	4
Rapport över förändringar i eget kapital	6
Kassaflödesanalys	7
Tilläggsupplysningar	
Redovisningsprinciper m.m.	8
Noter	9

Styrelsens säte: Märsta
Företagets redovisningsvaluta: Svenska kronor (SEK).
Alla belopp redovisas, om inte annat anges, i kronor.

ank=20240702-20240703083454

Förvaltningsberättelse

Information om verksamheten

Aprea Therapeutics AB är ett Sverige baserat biofarmaceutiskt företag fokuserat på upptäckt och utveckling av nya substanser mot cancer, vilka reaktiverar tumörsuppressorproteinet p53.

Väsentliga händelser under räkenskapsåret

Bolaget har erhållit ett aktieägartillskott via kapitaltäckningsgaranti från moderbolaget med SEK 6 557 908 kr.

För mer information, besök www.aprea.com

Forskning och utveckling

Bolaget bedriver för närvarande ingen aktiv läkemedelsutveckling.

Ägarförhållanden

Bolaget är ett helägt dotterbolag till Aprea Therapeutics Inc. (84-2246769) med säte i Doylestown PA, USA.

Flerårsöversikt	**2023**	**2022**	**2021**	**2020**
Nettoomsättning (tkr)	0	191	165	159
Resultat efter finansiella poster (tkr)	-5 392	-61 926	-111 581	-202 861
Balansomslutning (tkr)	17 503	17 860	60 714	167 645
Soliditet (%)	54,4%	46,8%	27,6%	45,5%

Förslag till resultatdisposition

Styrelsen föreslår att till förfogande stående medel

Överkursfond	1 129 475 241
Balanserat resultat	-1 134 312 332
Årets resultat	-5 391 894
	-10 228 986
disponeras så att	
i ny räkning överföres	-10 228 986
	-10 228 986

sm=20240702-20240703084435

Resultaträkning

	Not	2023-01-01 -2023-12-31	2022-01-01 -2022-12-31
Nettoomsättning		0	190 545
Övriga rörelseintäkter		1 367 680	8 107 645
		1 367 680	**8 298 190**
Rörelsens kostnader			
Handelsvaror		-793 884	-2 282 597
Övriga externa kostnader	2,3,4	-1 578 686	-51 862 314
Personalkostnader	5	-2 875 869	-10 888 744
Avskrivningar av materiella och immateriella anläggningstillgångar	8,9,10	0	-45 075
Övriga rörelsekostnader		-1 780 798	-5 167 443
		-7 029 237	**-70 246 173**
Rörelseresultat		**-5 661 557**	**-61 947 983**
Resultat från finansiella poster			
Övriga ränteintäkter och liknande resultatposter	6	269 674	22 184
Räntekostnader och liknande resultatposter	7	-11	-102
		269 663	**22 082**
Resultat efter finansiella poster		**-5 391 894**	**-61 925 901**
Resultat före skatt		**-5 391 894**	**-61 925 901**
Årets resultat		**-5 391 894**	**-61 925 901**

20240703084402 ank=2023

Balansräkning

	Not	2023-12-31	2022-12-31
TILLGÅNGAR			
Anläggningstillgångar			
Immateriella anläggningstillgångar			
Balanserade utgifter för forsknings- och utvecklingsarbeten och liknande arbeten	8	0	0
Koncessioner, patent, licenser, varumärken samt liknande	9	0	0
		0	**0**
Materiella anläggningstillgångar			
Maskiner och andra tekniska anläggningar	10	0	0
		0	**0**
Finansiella anläggningstillgångar			
Andelar i koncernföretag	11,12	105 897	105 897
Andra långfristiga värdepappersinnehav		0	0
		105 897	**105 897**
Summa anläggningstillgångar		**105 897**	**105 897**
Omsättningstillgångar			
Kortfristiga fordringar			
Kundfordringar		0	3 500
Fordringar hos koncernföretag		6 557 908	0
Aktuell skattefordran		133 419	1 190 119
Övriga fordringar		103 598	58 280
Förutbetalda kostnader och upplupna intäkter		26 854	11 770
		6 821 779	**1 263 669**
Kassa och bank		10 575 547	16 490 015
Summa omsättningstillgångar		**17 397 326**	**17 753 684**
SUMMA TILLGÅNGAR		**17 503 223**	**17 859 581**

ink=20240702-20240703094457

Balansräkning

	Not	2023-12-31	2022-12-31
EGET KAPITAL OCH SKULDER			
Eget kapital	13		
Bundet eget kapital			
Aktiekapital		9 517 723	9 517 723
Reservfond		10 228 986	10 228 986
		19 746 709	**19 746 709**
Fritt eget kapital			
Överkursfond		1 129 475 241	1 129 475 241
Balanserat resultat		-1 134 312 333	-1 078 944 340
Årets resultat		-5 391 894	-61 925 901
		-10 228 986	**-11 395 000**
Summa eget kapital		**9 517 723**	**8 351 709**
Avsättningar	14		
Övriga avsättningar		0	0
		0	**0**
Kortfristiga skulder			
Leverantörsskulder		452 446	1 433 131
Skulder till koncernföretag		6 264	6 264
Övriga skulder		64 599	61 994
Upplupna kostnader och förutbetalda intäkter	15	7 462 192	8 006 483
		7 985 500	**9 507 872**
SUMMA EGET KAPITAL OCH SKULDER		**17 503 223**	**17 859 581**

Aprea Therapeutics AB
556631-2285

Rapport över förändringar i eget kapital

	Bundet eget kapital		*Fritt eget kapital*		
	Aktie-kapital	Reservfond	Överkursfond	Balanserat resultat	Årets resultat
Ingående balans 2022-01-01	9 517 723	10 228 986	1 129 475 241	-1 020 896 682	-111 580 695
Omföring resultat föregående år	0	0	0	-111 580 695	111 580 695
Erhållna aktieägartillskott	0	0	0	53 533 037	0
Årets resultat	0	0	0	0	-61 925 901
Utgående balans 2022-12-31	**9 517 723**	**10 228 986**	**1 129 475 241**	**-1 078 944 340**	**-61 925 901**
Omföring resultat föregående år	0	0	0	-61 925 901	61 925 901
Erhållna aktieägartillskott*	0	0	0	6 557 908	0
Årets resultat	0	0	0	0	-5 391 894
Utgående balans 2023-12-31	**9 517 723**	**10 228 986**	**1 129 475 241**	**-1 134 312 333**	**-5 391 894**

* Erhållna ackumulerade villkorade aktieägartillskott ingående i balanserats resultat till 112 180 120 (105 622 212) kr.

ank=20240702\20240702-2024070308469

Kassaflödesanalys

	Not	2023-01-01 -2023-12-31	2022-01-01 -2022-12-31
Den löpande verksamheten			
Rörelseresultat		-5 661 557	-61 947 983
Justeringar för poster som inte ingår i kassaflödet m.m.			
Avskrivningar och nedskrivningar		0	45 075
Avsättningar		0	-1 087 124
Övrigt		0	0
Erhållen/erlagd ränta och liknande poster		269 663	22 082
Betald inkomstskatt		1 056 700	-621 903
Kassaflöde från den löpande verksamheten före förändringar av rörelsekapital		**-4 335 194**	**-63 589 853**
Förändringar i rörelsekapital			
Förändring av rörelsefordringar		-6 614 810	3 412 932
Förändring av rörelseskulder		-1 522 372	-33 374 684
Erhållna aktieägartillskott		6 557 908	0
Kassaflöde från den löpande verksamheten		**-5 914 468**	**-93 551 605**
Investeringsverksamheten			
Försäljning av anläggningstillgångar		0	72 831
Kassaflöde från investeringsverksamheten		**0**	**72 831**
Finansieringsverksamheten			
Erhållna aktieägartillskott		0	53 533 037
Kassaflöde från finansieringsverksamheten		**0**	**53 533 037**
Årets kassaflöde		**-5 914 468**	**-39 945 737**
Likvida medel vid årets början		**16 490 015**	**56 435 752**
Likvida medel vid årets slut		**10 575 547**	**16 490 015**

ank=20240702-20240703#47

Immateriella anläggningstillgångar
Utgifter för utvecklingsprojekt redovisas som immateriella anläggningstillgångar om företaget kan visa att det är tekniskt möjligt att fullfölja och lönsamt att kommersialisera resultatet och endast om utgifterna för detta projekt kan mätas på ett tillförlitligt sätt. Detta innebär i praktiken att utgifterna inte aktiveras innan amerikanska läkemedelsmyndigheten FDA eller Europeiska kommissionen gett sitt godkännande vilket hittills inte varit fallet. Avskrivningar görs för att fördela kostnaden för utvecklingsprojektet över deras bedömda nyttjandeperiod och påbörjas när projektet börjar generera intäkter. Övriga forsknings- och utvecklingsutgifter redovisas enligt kostnadsföringsmodellen, vilken innebär att utgifter för framtagande av en internt upparbetad immateriell tillgång redovisas som kostnad när de uppkommer.

Likvida medel
Likvida medel inkluderar kassamedel och disponibla tillgodohavanden hos banker och andra kreditinstitut samt andra kortfristiga likvida placeringar som lätt kan omvandlas till kontanter och är föremål för en obetydlig risk för värdefluktationer. För att klassificeras som likvida medel får löptiden inte överskrida tre månader från tidpunkten för förvärvet.
Likvida medel består av banktillgodohavanden.

Eget kapital
Transaktionskostnader som direkt kan hänföras till emission av nya aktier redovisas, netto efter skatt, i eget kapital som avdrag från emissionslikviden.

Ersättningar till anställda
Ersättningar till anställda avser alla typer av ersättningar som företaget lämnar till de anställda. Företagets ersättningar innefattar bland annat löner, betald semester, betald frånvaro, bonus och ersättningar efter avslutad anställning. Redovisning sker i takt med intjänandet.
Ersättningar till anställda efter avslutad anställning avser premiebestämda pensionsplaner. Som premiebestämda planer klassificeras planer där fastställda avgifter betalas och det inte finns förpliktelser, vare sig legala eller informella, att betala något ytterligare, utöver dessa avgifter. Företaget har inga övriga långfristiga ersättningar till anställda.

Fordringar, skulder och avsättningar
Om inget annat anges ovan värderas kortfristiga fordringar till det lägsta av dess anskaffningsvärde och det belopp varmed de beräknas bli reglerade. Långfristiga fordringar och långfristiga skulder värderas efter första värderingstillfället till upplupet anskaffningsvärde. Övriga skulder och avsättningar värderas till de belopp varmed de beräknas bli reglerade. Övriga tillgångar redovisas till anskaffningsvärde om inget annat anges.

Övriga avsättningar
Avsättningar redovisas när bolaget har en formell eller informell förpliktelse som en följd av tidigare händelser och det är sannolikt att ett utflöde av resurser kommer att krävas för att reglera förpliktelsen. Avsättningar värderas till den bästa uppskattningen av det belopp som krävs för att reglera förpliktelsen. Om effekten av tid när betalning sker är väsentlig nuvärdesberäknas förpliktelsen.

Aktier i dotterbolag
Aktier i dotterbolag redovisas till anskaffningsvärde, efter avdrag för eventuella nedskrivningar, i enlighet med årsredovisningslagen.

Not 2 Övriga externa kostnader

	2023	2022
Kliniska studier	-89 776	-42 811 244
Konsultkostnader	0	-4 342 890
Övrigt	-1 488 908	-4 708 180
	-1 578 684	**-51 862 314**

Not 3 Arvode till revisorer

	2023	2022
Ernst & Young		
Revisionsuppdraget	80 000	100 000
Annan revisionsverksamhet	0	0
Skatterådgivning	0	0
Övriga tjänster	0	0
	80 000	**100 000**

ank=20240702-20240702#2

Not 4 Leasingavtal - leasetagare

Operationell leasing

	2023	2022
Kostnadsförda leasingavgifter avseende operationella leasingavtal	0	1 364 766

Framtida minimileaseavgifter avseende ej uppsägningsbara operationella leasingavtal

Ska betalas inom 1 år	0	0
Ska betalas inom 1-5 år	0	0
Ska betalas senare än 5 år	0	0
	0	**0**

Not 5 Anställda och personalkostnader

Medelantalet anställda

	2023	2022
Män	1	4
Kvinnor	0	2
	1	**6**

	2023	2022
Löner och andra ersättningar		
Styrelse och verkställande direktör	0	0
Övriga anställda	1 447 295	8 518 393
	1 447 295	**8 518 393**

Pensions- och övriga sociala kostnader		
Pensionskostnader för övriga anställda	779 700	1 957 377
Övriga sociala kostnader enligt lag och avtal	643 286	1 438 547
	1 422 986	**3 395 924**

	2023-12-31	2022-12-31
Könsfördelning bland ledande befattningshavare		
Andel kvinnor i styrelsen	0%	0%
Andel män i styrelsen	100%	100%
Andel kvinnor bland övriga ledande befattningshavare	0%	0%
Andel män bland övriga ledande befattningshavare	100%	100%

Styrelsen
Till styrelsens ordförande och ledamöter utgår arvoden enligt bolagsstämmans beslut.

Not 6 Övriga ränteintäkter och liknande resultatposter

	2023	2022
Övriga ränteintäkter	269 674	22 184
	269 674	**22 184**

Not 7 Räntekostnader och liknande resultatposter

	2023	2022
Övriga räntekostnader	11	102
	11	**102**

20240702-20240703084773
årsk=20240

Not 8 Balanserade utgifter för forsknings- och utvecklingsarbeten och liknande arbeten

	2023-12-31	2022-12-31
Ingående anskaffningsvärden	12 654 783	12 654 783
Utgående ackumulerade anskaffningsvärden	**12 654 783**	**12 654 783**
Ingående avskrivningar	-12 654 783	-12 654 783
Utgående ackumulerade avskrivningar	**-12 654 783**	**-12 654 783**
Utgående redovisat värde	**0**	**0**

Not 9 Patent

	2023-12-31	2022-12-31
Ingående anskaffningsvärden	1 472 809	1 472 809
Utgående ackumulerade anskaffningsvärden	**1 472 809**	**1 472 809**
Ingående avskrivningar	-1 472 809	-1 472 809
Årets avskrivningar	0	0
Utgående ackumulerade avskrivningar	**-1 472 809**	**-1 472 809**
Utgående redovisat värde	**0**	**0**

Not 10 Maskiner och andra tekniska anläggningar

	2023-12-31	2022-12-31
Ingående anskaffningsvärden	0	1 032 081
Försäljningar/utrangeringar	0	-1 032 081
Utgående ackumulerade anskaffningsvärden	**0**	**0**
Ingående avskrivningar	0	-908 174
Försäljningar/utrangeringar	0	953 249
Årets avskrivningar	0	-45 075
Utgående ackumulerade avskrivningar	**0**	**0**
Utgående redovisat värde	**0**	**0**

Not 11 Andelar i koncernföretag

	2023-12-31	2022-12-31
Ingående anskaffningsvärden	105 897	105 897
Utgående redovisat värde	**105 897**	**105 897**

Not 12 Specifikation av andelar i koncernföretag

Namn	Kapital-andel	Rösträtts-andel	Antal andelar	Bokfört värde
Aprea US Inc	100%	100%	500 100	105 897
				105 897

ank=20240702-20240707030809#74

Not 13 Eget kapital
Per den 31 december 2023 hade aktiekapitalet följande sammansättning:

	2023-12-31 *Kvotvärde*	2022-12-31 *Kvotvärde*	2023-12-31 Antal	2022-12-31 Antal
Stamaktier	1	1	9 517 723	9 517 723
			9 517 723	**9 517 723**

Not 14 Avsättningar

	2023-12-31	2022-12-31
Sociala avgifter avseende aktierelaterade ersättningar		
Belopp vid årets ingång	0	1 087 124
Under året ianspråktagna belopp	0	-1 087 124
	0	**0**

Not 15 Upplupna kostnader och förutbetalda intäkter

	2023-12-31	2022-12-31
Upplupna löner	237 790	272 745
Upplupna semesterlöner	429 574	360 940
Upplupna sociala avgifter	398 836	1 294 613
Upplupna kliniska studiekostnader	2 503 079	2 490 823
Övriga upplupna kostnader	3 892 913	3 587 362
	7 462 192	**8 006 483**

Not 16 Ställda säkerheter och eventualförpliktelser

Inga ställda säkerheter eller eventualförpliktelser finns för moderbolag eller koncern.

Not 17 Disposition av vinst eller förlust

Förslag till resultatdisposition	2023-12-31	2022-12-31
Styrelsen föreslår att till förfogande stående medel		
Överkursfond	1 129 475 241	1 129 475 241
Balanserat resultat	-1 134 312 332	-1 078 944 339
Årets resultat	-5 391 894	-61 925 901
	-10 228 986	**-11 395 000**
disponeras så att		
I ny räkning överföres	-10 228 986	-11 395 000
	-10 228 986	**-11 395 000**

Aprea Therapeutics AB
556631-2285

Märsta den 13 juni 2024

Oren Gilad
Ordförande

Lars Abrahmsén

Vår revisionsberättelse har lämnats den 13 juni 2024

Ernst & Young AB

Linn Haslum Lindgren
Auktoriserad Revisor

ami=20240702-20240703084173

ak=20240703084775

Building a better working world

Revisionsberättelse

Till bolagsstämman i Aprea Therapeutics AB, org.nr 556631-2285

Rapport om årsredovisningen

Uttalanden

Vi har utfört en revision av årsredovisningen för Aprea Therapeutics AB för år 2023.

Enligt vår uppfattning har årsredovisningen upprättats i enlighet med årsredovisningslagen och ger en i alla väsentliga avseenden rättvisande bild av Aprea Therapeutics ABs finansiella ställning per den 31 december 2023 och av dess finansiella resultat och kassaflöde för året enligt årsredovisningslagen. Förvaltningsberättelsen är förenlig med årsredovisningens övriga delar.

Vi tillstyrker därför att bolagsstämman fastställer resultaträkningen och balansräkningen.

Grund för uttalanden

Vi har utfört revisionen enligt International Standards on Auditing (ISA) och god revisionssed i Sverige. Vårt ansvar enligt dessa standarder beskrivs närmare i avsnittet *Revisorns ansvar*. Vi är oberoende i förhållande till Aprea Therapeutics AB enligt god revisorssed i Sverige och har i övrigt fullgjort vårt yrkesetiska ansvar enligt dessa krav.

Vi anser att de revisionsbevis vi har inhämtat är tillräckliga och ändamålsenliga som grund för våra uttalanden.

Styrelsens ansvar

Det är styrelsen som har ansvaret för att årsredovisningen upprättas och att den ger en rättvisande bild enligt årsredovisningslagen. Styrelsen ansvarar även för den interna kontroll som den bedömer är nödvändig för att upprätta en årsredovisning som inte innehåller några väsentliga felaktigheter, vare sig dessa beror på oegentligheter eller misstag.

Vid upprättandet av årsredovisningen ansvarar styrelsen för bedömningen av bolagets förmåga att fortsätta verksamheten. Den upplyser, när så är tillämpligt, om förhållanden som kan påverka förmågan att fortsätta verksamheten och att använda antagandet om fortsatt drift. Antagandet om fortsatt drift tillämpas dock inte om styrelsen avser att likvidera bolaget, upphöra med verksamheten eller inte har något realistiskt alternativ till att göra något av detta.

Revisorns ansvar

Våra mål är att uppnå en rimlig grad av säkerhet om att årsredovisningen som helhet inte innehåller några väsentliga felaktigheter, vare sig dessa beror på oegentligheter eller misstag, och att lämna en revisionsberättelse som innehåller våra uttalanden. Rimlig säkerhet är en hög grad av säkerhet, men är ingen garanti för att en revision som utförs enligt ISA och god revisionssed i Sverige alltid kommer att upptäcka en väsentlig felaktighet om en sådan finns. Felaktigheter kan uppstå på grund av oegentligheter eller misstag och anses vara väsentliga om de enskilt eller tillsammans rimligen kan förväntas påverka de ekonomiska beslut som användare fattar med grund i årsredovisningen.

Som del av en revision enligt ISA använder vi professionellt omdöme och har en professionellt skeptisk inställning under hela revisionen. Dessutom:

- identifierar och bedömer vi riskerna för väsentliga felaktigheter i årsredovisningen, vare sig dessa beror på oegentligheter eller misstag, utformar och utför granskningsåtgärder bland annat utifrån dessa risker och inhämtar revisionsbevis som är tillräckliga och ändamålsenliga för att utgöra en grund för våra uttalanden. Risken för att inte upptäcka en väsentlig felaktighet till följd av oegentligheter är högre än för en väsentlig felaktighet som beror på misstag, eftersom oegentligheter kan innefatta agerande i maskopi, förfalskning, avsiktliga utelämnanden, felaktig information eller åsidosättande av intern kontroll.
- skaffar vi oss en förståelse av den del av bolagets interna kontroll som har betydelse för vår revision för att utforma granskningsåtgärder som är lämpliga med hänsyn till omständigheterna, men inte för att uttala oss om effektiviteten i den interna kontrollen.
- utvärderar vi lämpligheten i de redovisningsprinciper som används och rimligheten i styrelsens uppskattningar i redovisningen och tillhörande upplysningar.
- drar vi en slutsats om lämpligheten i att styrelsen använder antagandet om fortsatt drift vid upprättandet av årsredovisningen. Vi drar också en slutsats, med grund i de inhämtade revisionsbevisen, om det finns någon väsentlig osäkerhetsfaktor som avser sådana händelser eller förhållanden som kan leda till betydande tvivel om bolagets förmåga att fortsätta verksamheten. Om vi drar slutsatsen att det finns en väsentlig osäkerhetsfaktor, måste vi i revisionsberättelsen fästa uppmärksamheten på upplysningarna i årsredovisningen om den väsentliga osäkerhetsfaktorn eller, om sådana upplysningar är otillräckliga, modifiera uttalandet om årsredovisningen. Våra slutsatser baseras på de revisionsbevis som inhämtas fram till datumet för revisionsberättelsen. Dock kan framtida händelser eller förhållanden göra att ett bolag inte längre kan fortsätta verksamheten.
- utvärderar vi den övergripande presentationen, strukturen och innehållet i årsredovisningen, däribland upplysningarna, och om årsredovisningen återger de underliggande transaktionerna och händelserna på ett sätt som ger en rättvisande bild.

Vi måste informera styrelsen om bland annat revisionens planerade omfattning och inriktning samt tidpunkten för den. Vi måste också informera om betydelsefulla iakttagelser under revisionen, däribland de eventuella betydande brister i den interna kontrollen som vi identifierat.

ank=20240702-20240703#A77

Building a better working world

Rapport om andra krav enligt lagar och andra författningar

Utfalanden

Utöver vår revision av årsredovisningen har vi även utfört en revision av styrelsens förvaltning av Aprea Therapeutics AB för år 2023 samt av förslaget till dispositioner beträffande bolagets vinst eller förlust.

Vi tillstyrker att bolagsstämman behandlar förlusten enligt förslaget i förvaltningsberättelsen och beviljar styrelsens ledamöter ansvarsfrihet för räkenskapsåret.

Grund för uttalanden

Vi har utfört revisionen enligt god revisionssed i Sverige. Vårt ansvar enligt denna beskrivs närmare i avsnittet *Revisorns ansvar*. Vi är oberoende i förhållande till Aprea Therapeutics AB enligt god revisorssed i Sverige och har i övrigt fullgjort vårt yrkesetiska ansvar enligt dessa krav.

Vi anser att de revisionsbevis vi har inhämtat är tillräckliga och ändamålsenliga som grund för våra uttalanden.

Styrelsens ansvar

Det är styrelsen som har ansvaret för förslaget till dispositioner beträffande bolagets vinst eller förlust. Vid förslag till utdelning innefattar detta bland annat en bedömning av om utdelningen är försvarlig med hänsyn till de krav som bolagets verksamhetsart, omfattning och risker ställer på storleken av bolagets egna kapital, konsolideringsbehov, likviditet och ställning i övrigt.

Styrelsen ansvarar för bolagets organisation och förvaltningen av bolagets angelägenheter. Detta innefattar bland annat att fortlöpande bedöma bolagets ekonomiska situation och att tillse att bolagets organisation är utformad så att bokföringen, medelsförvaltningen och bolagets ekonomiska angelägenheter i övrigt kontrolleras på ett betryggande sätt.

Revisorns ansvar

Vårt mål beträffande revisionen av förvaltningen, och därmed vårt uttalande om ansvarsfrihet, är att inhämta revisionsbevis för att med en rimlig grad av säkerhet kunna bedöma om någon styrelseledamot i något väsentligt avseende:

- företagit någon åtgärd eller gjort sig skyldig till någon försummelse som kan föranleda ersättningsskyldighet mot bolaget, eller
- på något annat sätt handlat i strid med aktiebolagslagen, årsredovisningslagen eller bolagsordningen.

Vårt mål beträffande revisionen av förslaget till dispositioner av bolagets vinst eller förlust, och därmed vårt uttalande om detta, är att med rimlig grad av säkerhet bedöma om förslaget är förenligt med aktiebolagslagen.

Rimlig säkerhet är en hög grad av säkerhet, men ingen garanti för att en revision som utförs enligt god revisionssed i Sverige alltid kommer att upptäcka åtgärder eller försummelser som kan föranleda ersättningsskyldighet mot bolaget, eller att ett förslag till dispositioner av bolagets vinst eller förlust inte är förenligt med aktiebolagslagen.

Som en del av en revision enligt god revisionssed i Sverige använder vi professionellt omdöme och har en professionellt skeptisk inställning under hela revisionen. Granskningen av förvaltningen och förslaget till dispositioner av bolagets vinst eller förlust grundar sig främst på revisionen av räkenskaperna. Vilka tillkommande granskningsåtgärder som utförs baseras på vår professionella bedömning med utgångspunkt i risk och väsentlighet. Det innebär att vi fokuserar granskningen på sådana åtgärder, områden och förhållanden som är väsentliga för verksamheten och där avsteg och överträdelser skulle ha särskild betydelse för bolagets situation. Vi går igenom och prövar fattade beslut, beslutsunderlag, vidtagna åtgärder och andra förhållanden som är relevanta för vårt uttalande om ansvarsfrihet. Som underlag för vårt uttalande om styrelsens förslag till dispositioner beträffande bolagets vinst eller förlust har vi granskat förslaget är förenligt med aktiebolagslagen.

Stockholm den 13 juni 2024

Ernst & Young AB

Linn Haslum Lindgren
Auktoriserad revisor

A member firm of Ernst & Young Global Limited

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

☒ ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the year ended December 31, 2023

OR

☐ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from to
Commission File Number 001-39069

Aprea Therapeutics, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**84-2246769**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
3805 Old Easton Road **Doylestown, Pennsylvania** (Address of principal executive offices)	**18902** (Zip code)

(617) 463-9385
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol**	**Name of exchange on which registered:**
Common stock, par value $0.001 per share	APRE	The NASDAQ Stock Market LLC

Securities registered pursuant to Section 12(g) of the Act: **None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☐	Accelerated filer ☐
Non-accelerated filer ☒	Smaller reporting company ☒
	Emerging growth company ☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☒

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant as of June 30, 2023 was approximately $10.0 million.

There were 5,430,215 shares of the registrant's common stock, $0.001 par value, outstanding as of March 26, 2024.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement for its 2024 Annual Meeting of Stockholders (the "Proxy Statement"), to be filed within 120 days of the registrant's fiscal year ended December 31, 2023, are incorporated by reference in Part III of this Annual Report on Form 10-K. Except with respect to information specifically incorporated by reference in this Annual Report on Form 10-K, the Proxy Statement is not deemed to be filed as part of this Annual Report on Form 10-K.

Aprea Therapeutics, Inc.
Annual Report on Form 10-K
For the Year Ended December 31, 2023

Table of Contents

	Page
PART I	
Item 1. Business	6
Item 1A. Risk Factors	45
Item 1B. Unresolved Staff Comments	104
Item 1C. Cybersecurity	104
Item 2. Properties	105
Item 3. Legal Proceedings	105
Item 4. Mine Safety Disclosures	105
PART II	
Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities	106
Item 6. [Reserved]	107
Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations	108
Item 7A. Quantitative and Qualitative Disclosures About Market Risk	124
Item 8. Financial Statements and Supplementary Data	F-1
Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	125
Item 9A. Controls and Procedures	125
Item 9B. Other Information	126
Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections	126
PART III	
Item 10. Directors, Executive Officers and Corporate Governance	126
Item 11. Executive Compensation	126
Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters	126
Item 13. Certain Relationships and Related Transactions and Director Independence	126
Item 14. Principal Accounting Fees and Services	126
PART IV	
Item 15. Exhibits, Financial Statement Schedules	126
Item 16. Form 10-K Summary	129

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K includes statements that are, or may be deemed, "forward-looking statements." In some cases, these forward-looking statements can be identified by the use of forward-looking terminology, including the terms "believes," "estimates," "anticipates," "expects," "plans," "intends," "may," "designed," "would," "could," "might," "will," "should," "approximately" or, in each case, their negative or other variations thereon or comparable terminology, although not all forward-looking statements contain these words. They appear in a number of places throughout this Annual Report on Form 10-K and include statements regarding our current intentions, beliefs, projections, outlook, analyses or current expectations concerning, among other things, our ongoing and planned clinical trials, including for ATRN-119, our ongoing and planned studies, including for APR-1051, our ongoing and planned development, prospects for commercialization, and market uptake of our potential product candidates, the strength and breadth of our intellectual property, the timing of and our ability to make regulatory filings and obtain and maintain regulatory approvals for our product candidates, the legal and regulatory landscape impacting our business, the degree of clinical utility of our product candidates, particularly in specific patient populations, expectations regarding clinical trial data, our development and validation of manufacturing capabilities, our results of operations, financial condition, liquidity, prospects, growth and strategies, the length of time that we will be able to continue to fund our operating expenses and capital expenditures, our expected financing needs and sources of financing, the industry in which we operate and the trends that may affect the industry or us.

By their nature, forward-looking statements involve risks and uncertainties because they relate to future events, competitive dynamics, and healthcare, regulatory and scientific developments and depend on economic circumstances that may or may not occur in the future or may occur on longer or shorter timelines than anticipated. We caution you that forward-looking statements are not guarantees, or predictive, of future performance and that our actual results of operations, financial condition and liquidity, and the development of the industry in which we operate may differ materially from the forward-looking statements contained in this Annual Report on Form 10-K.

Some of the factors that we believe could cause actual results to differ from those anticipated or predicted include

- our ability to continue to operate as an integrated company subsequent to our acquisition of Atrin Pharmaceuticals Inc.;
- estimates of our expenses, capital requirements and our needs for additional financing;
- business interruptions, including delays in enrollment, patient follow-up and data collection of clinical trials, resulting from a public health emergency or pandemic;
- the prospects of our product candidates, all of which are still in development;
- outcomes and results of ongoing or future preclinical studies and clinical trials of our product candidates;
- our expectations regarding our ability to identify, discover or acquire additional suitable product candidates;
- the design of our ongoing and planned clinical trials, including the sample size, trial duration, endpoint definition, event rate assumptions and eligibility criteria;
- our ability to enroll patients in clinical trials, to timely and successfully complete those trials and to receive necessary regulatory approvals;
- our expectations regarding the timing of initiation of data readout from our clinical trials;

- market acceptance or commercial success of any product candidate we develop and the degree of acceptance among physicians, patients, patient advocacy groups, health care payors and the medical community;

- our expectations regarding competition, potential market size, the size of the patient populations for our product candidates, if approved for commercial use, and market acceptance;

- our ability to obtain regulatory approval of our product candidates, and any restrictions, limitations and/or warnings in their labels, if approved;

- the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates;

- potential claims relating to our intellectual property and third-party intellectual property;

- the duration of our intellectual property estate that will provide protection for our product candidates;

- developments relating to our competitors and our industry;

- our sales, marketing or distribution capabilities and our ability to commercialize our product candidates, if we obtain regulatory approval;

- current and future agreements with third parties in connection with conducting clinical trials, as well as the manufacturing of our product candidates;

- our expectations regarding the ability of our current contract manufacturing partners to produce our product candidates in the quantities and timeframe that we will require;

- our expectations regarding our future costs of goods;

- our ability to attract, retain and motivate key personnel and increase the size of our organization;

- our ability to establish collaborations in lieu of obtaining additional financing;

- the impact of government laws and regulations;

- our financial performance; and

- our expectations regarding the time during which we will be an emerging growth company under the JOBS Act or a smaller reporting company under the Exchange Act.

Any forward-looking statements that we make in this Annual Report on Form 10-K speak only as of the date of such statement, and we undertake no obligation to update such statements to reflect events or circumstances after the date of this Annual Report on Form 10-K. You should also read carefully the factors described in the "Risk Factors" included in Part I, Item 1A of this Annual Report to better understand significant risks and uncertainties inherent in our business and underlying any forward-looking statements. As a result of these factors, we cannot assure you that the forward-looking statements in this Annual Report on Form 10-K will prove to be accurate. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, you should not regard these statements as a representation or warranty by us or any other person that we will achieve our objectives and plans in any specified timeframe, or at all.

This Annual Report on Form 10-K includes statistical and other industry and market data that we obtained from industry publications and research, surveys and studies conducted by third parties. Industry publications and third-party research, surveys and studies generally indicate that their information has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. While we believe these industry publications and third-party research, surveys and studies are reliable, we have not independently verified such data.

We qualify all of our forward-looking statements by these cautionary statements. In addition, with respect to all of our forward-looking statements, we claim the protection of the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995.

This Form 10-K may include trademarks, tradenames, and service marks that are the property of other organizations. Solely for convenience, our trademarks and tradenames referred to in this Form 10-K may appear without the ® and ™ symbols, but those references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights, or the right of the applicable licensor to these trademarks and tradenames.

PART I

Item 1. Business

Overview

We are a clinical-stage biopharmaceutical company focused on developing novel synthetic lethality-based cancer therapeutics that target DNA damage response ("DDR") pathways. Our approach is built upon a platform of integrated discovery technologies to enrich our pipeline with novel targets in synthetic lethality and cancer treatment. Together with our expertise in small molecule drug discovery, we are applying the capabilities of our discovery platform to the development of new precision oncology therapies and the identification of patient populations most likely to benefit.

Aprea Therapeutics AB was originally incorporated in 2002 and commenced principal operations in 2006. On September 20, 2019, we consummated a reorganization, pursuant to which all of the issued and outstanding stock and options of Aprea Therapeutics AB were exchanged for common stock, preferred stock or options, as applicable, of Aprea Therapeutics, Inc. As a result, Aprea Therapeutics AB became a wholly-owned subsidiary of Aprea Therapeutics, Inc.

On May 16, 2022, we acquired Atrin Pharmaceuticals Inc. ("Atrin"), in accordance with the terms of the Agreement and Plan of Merger dated May 16, 2022 (the "Merger Agreement"), by and among us, ATR Merger Sub I Inc., a Delaware corporation and our wholly owned subsidiary ("First Merger Sub"), ATR Merger Sub II LLC, a Delaware limited liability company and wholly owned subsidiary of Aprea ("Second Merger Sub") and Atrin. Pursuant to the Merger Agreement, First Merger Sub merged with and into Atrin, pursuant to which Atrin was the surviving corporation and became a wholly owned subsidiary of Aprea (the "First Merger"). Immediately following the First Merger, Atrin merged with and into the second Merger Sub, pursuant to which Second Merger Sub was the surviving entity. The former Atrin business is now our business.

We believe that synthetic lethality has the potential to impact patients' lives and treatment strategies for a wide range of cancer types. When a gene in the DDR pathway is damaged or fails, related genes make up for its loss of function. Our approach is to inhibit these genes, thereby specifically killing cancer cells with specific mutations. This approach is called synthetic lethality. Using synthetic lethality, our product candidates are designed to selectively kill cancer cells while minimizing the effect on normal, unmutated cells, decreasing the toxicity normally associated with cancer treatment. We aspire to become a leader in this emerging field and are establishing a pipeline of clinical and preclinical programs that we believe may have broad applications to cancer treatment.

Our most advanced synthetic lethality product candidate is ATRN-119, a clinical-stage small molecule inhibitor of ataxia telangiectasia and Rad3-related, or ATR, a kinase that plays a critical role in DDR. ATR is one of several key regulators of the response to defective DNA replication and DNA damage, which occurs more commonly in cancer cells than in normal cells. We are enrolling patients into a Phase 1/2a clinical trial to evaluate ATRN-119 under an investigational new drug application, or IND. Patients with advanced solid tumors having mutations in defined DDR-related genes are currently being enrolled into the Phase 1 dose escalation part of the trial. The primary endpoint of this Phase 1 part is to evaluate the tolerability and pharmacokinetics of ATRN-119 when administered orally on a continuous, once-daily schedule. The secondary endpoint of this Phase 1 is to evaluate the initial efficacy of ATRN-119. We anticipate ATRN-119 Phase 1 readout to be available in the first quarter of 2025. We anticipate initiating Phase 2a expansion stage during the first quarter of 2025 and expect additional efficacy data from Phase 2a in the third quarter of 2025.

We have several additional, wholly-owned synthetic lethality programs. We are targeting WEE1, a kinase that is a key regulator of multiple phases of the cell cycle. Our lead WEE1 inhibitor product candidate is APR-1051. In March 2024, the U.S. Food and Drug Administration, or FDA, cleared our IND application for APR-1051. We anticipate enrollment of first patient into Phase 1 dose-escalation in the first half of 2024, and expect an update from the clinical study in the

fourth quarter of 2024. We expect open-label safety/efficacy data in the second quarter of 2025 and recommended phase 2 dose in the second half of 2025.

Finally, we also have an early-stage program, currently in the lead optimization stage, for an undisclosed DDR target. In addition to development of these drugs as single agents, we are evaluating potential combination opportunities within our pipeline, including research on the combination of ATRN-119 and APR-1051 that is supported by a Phase II SBIR grant from the National Cancer Institute.

Prior to the acquisition of Atrin, we were engaged in the clinical development of cancer therapeutics that reactivate the mutant p53 tumor suppressor protein. Our lead product candidate was APR-246, or eprenetapopt. Following our failed pivotal Phase 3 trial in December 2020, we engaged in a thorough evaluation of strategic options leading to the acquisition of Atrin and shifting our focus to the Atrin assets. We do not currently have any ongoing or planned preclinical studies or clinical trials involving our reactivators of mutant p53 and our primary focus is on the discovery and development of molecules targeting DDR pathways in oncology through synthetic lethality.

We have assembled a team with extensive experience in the discovery, development, and commercialization of oncology drugs to support our mission of developing novel synthetic lethality-based cancer therapeutics.

Our Pipeline

We are applying our discovery platform and drug development capabilities to build a robust pipeline of synthetic lethality-based cancer therapeutics. Our current programs are summarized below. We retain global development and commercialization rights to all of our product candidates.

Molecule	Target	Indication	Biomarker	Preclinical	IND-Enabling	Phase 1	Anticipated Milestones	
ATRN-119	ATR	Advanced Solid Tumors	RepliBiom[1] Profiling				Complete P 1/2a dose escalation Initiate dose expansion	1Q 2025 1Q 2025
ATRN-1051	WEE1	Ovarian Cancer, Others	CCNE Amplification, Others				Initiate P 1/2a dose escalation Open-label safety/efficacy data	1H 2024 2Q 2025
APRE-DDRi	DDR Target	Advanced Solid Tumors	Undisclosed				Identify lead candidate	Q2 2024

[1] RepliBiom - a synthetic lethality discovery platform

Our pipeline includes the clinical-stage asset ATRN-119, an ATR inhibitor that is being evaluated in a Phase 1/2a clinical trial in patients with advanced solid tumors having mutations in defined DDR-related genes. Our DDR-focused synthetic lethality pipeline also includes a WEE1 inhibitor for which we received IND clearance in March 2024, as well as a preclinical program of a novel DDR inhibitor for an undisclosed target.

Our strategy

We aspire to be a leader in the emerging field of synthetic lethality-based precision oncology therapeutics. The key elements of our strategy are to:

- ***Continue to efficiently develop our clinical-stage product candidate, ATRN-119, an orally bioavailable small molecule inhibitor of ATR.*** We are currently conducting a Phase 1/2a clinical trial evaluating ATRN-119 in patients with advanced solid tumors having mutations in defined DDR-related genes. We are enrolling patients into the Phase 1 part of this clinical trial. The primary endpoint of this Phase 1 part is to evaluate the tolerability and pharmacokinetics of ATRN-119 when administered orally on a continuous, once-daily schedule. The secondary endpoint of this Phase 1 is to evaluate the potential initial efficacy of

ATRN-119. Once we have selected a dose of ATRN-119 from the Phase 1 part we plan to enroll additional patients into a Phase 2a part of the clinical trial to assess preliminary efficacy.

- ***Advance our preclinical pipeline of small molecule product candidates, including APR-1051, an orally bioavailable small molecule inhibitor of WEE1, into clinical development.*** Our synthetic lethality pipeline includes several research programs. We received IND clearance from the FDA for APR-1051 in March 2024. We anticipate enrollment of the first patient into out Phase I dose-escalation in the first half of 2024. We continue to invest in our early preclinical research efforts to identify novel inhibitors of other DDR-related targets.

- ***Expand our precision oncology pipeline, leveraging the capabilities of our discovery platform to identify synthetic lethality targets, associated biomarkers and opportunities for combination therapy regimens.*** Utilizing our discovery platforms, we are continuing our target and biomarker identification activities to both expand our pipeline of synthetic lethality-based product candidates as well as to focus future clinical development in patient populations most likely to benefit. We are also researching opportunities to combine product candidates in our pipeline with other therapies that may enhance synthetic lethality and potentially increase benefit to genetically defined populations of cancer patients.

- ***Maximize the commercial opportunity of our product candidates across global markets.*** We currently retain worldwide development and commercialization rights to all our product candidates. We may elect to selectively evaluate strategic partnership opportunities for our product candidates with partners whose development and commercial capabilities complement our own.

Our Approach

Our approach to the development of novel cancer therapies is based on a powerful biological phenomenon known as synthetic lethality. Synthetic lethality represents an emerging strategy to treat a broad spectrum of cancers that currently lack effective treatments. Our focus is the application of synthetic lethality in the DDR pathway to effect selective killing of cancer cells while sparing normal cells.

Background on Synthetic Lethality

First described in 1922, the concept of synthetic lethality describes biological observations wherein mutations in a pair of genes result in cell death, but mutations in either gene alone do not. Cancer is a genetically driven collection of diseases in which mutations in the genome allow cells to bypass the normal checks and balances that control cell replication. Frequently, these mutations occur in genes that have critical roles in metabolism and DNA repair. While mutations in such genes may permit cells to survive, it is possible that mutation in a second gene, or loss of function resulting from pharmacologic inhibition, may trigger cancer cell death if the two genes are synthetically lethal.

The first clinical validation of synthetic lethality for cancer treatment was with BRCA1/2 mutations and PARP inhibition. BRCA1 and BRCA2 are proteins with key roles in the repair of DNA double-strand breaks (DSBs), one of the most lethal DNA lesions. BRCA1/2 mediate homologous recombination (HR), the major mechanism of DSB repair. When there is a loss of function in BRCA1/2 due to mutation, then cells become more dependent on PARP1 to prevent the formation of DSBs. If in this context PARP1 function is inhibited, then BRCA1/2 mutated cancer cells die. In other words, BRCA1/2 mutation and PARP1 inhibition are synthetically lethal. In contrast, normal cells with functional BRCA1/2 are spared. There are currently four PARP inhibitors approved by FDA for the treatment of breast, ovarian, pancreatic, and castration-resistant prostate cancers with BRCA1/2 mutations and other DNA damage repair dysfunction.

Background on DDR

Cells are continuously exposed to endogenous and exogenous stress that can lead to DNA damage. To counter this lethal threat, cells have mechanisms to detect DNA damage, activate the appropriate repair pathway or, if irreparable, induce cell cycle arrest or apoptosis. These DDR processes are vital for cell survival.

Cancer cells rely on various alternative pathways to repair and resist DNA damage and replication stress. Many of these DDR-related genes are mutated across cancers, as loss of the DDR pathway allows cancer cells to rapidly evolve and grow out of control. Notably, functional loss of these pathways also creates a vulnerability in these cancers because mutation or loss of some DDR genes increases reliance on other DDR genes to support continued cancer cell growth. When mutation or loss of function of two DDR genes leads to cell death, the interplay between these genes is synthetic lethality. Importantly, selective targeting of specific members of the DDR pathway represents an attractive potential therapeutic approach for the treatment of cancer. Furthermore, because genes that are mutated in cancers continue to function normally in healthy tissues, this treatment approach can potentially reduce drug-induced toxicity while maintaining anti-cancer activity.

Our Focus on Synthetic Lethality in DDR

ATR Inhibitors in Advanced Solid Tumors

Our most advanced synthetic lethality product candidate is ATRN-119, a clinical stage ATR inhibitor for patients with solid tumors having defined genetic mutations in DDR-related genes.

Ataxia Telangiectasia and Rad3-related (ATR) and Checkpoint Kinase 1 (CHK1) are critical DNA damage response kinases that prevent the collapse of replication forks into DSBs. ATR is one of several key regulators of the response to defective DNA replication and DNA damage, which occurs more commonly in cancer cells than in normal cells.

In response to these cancer-associated genomic insults, ATR is activated to inhibit progression to cellular division and prevent the assembly of the SLX1-SLX4, MUS81-EME1 and XPF-ERCC1 (SMX) endonuclease (DNA cutting) complex. When ATR is inhibited, the SMX complex is inappropriately activated, promoting the cutting of replication forks into DSBs. In association with ATR's fundamental roles in these replication responses, cells with increased oncogenic stress, p53 mutations and deficiencies in DDR pathways are predicted to have increased sensitivity to ATR inhibition. Accordingly, ATR inhibition is also predicted to sensitize cells to DNA-damaging chemotherapy, radiotherapy, and PARP inhibitor treatments, making ATR inhibitors particularly attractive for the development of novel combination therapies.

We have developed a highly potent and selective macrocyclic inhibitor of ATR, ATRN-119, that has the potential to have less toxicity to normal tissues while continuing to capitalize on cancer vulnerabilities due to oncogenic stress and DDR pathway defects. ATRN-119 has received FDA IND approval (IND #141317) for a first-in-human clinical trial for cancer patients. Enrollment in this clinical trial was initiated in the first quarter of 2023. We anticipate ATRN-119 Phase 1 readout to be available in the first quarter of 2025. We anticipate initiating the Phase 2a expansion stage during the first quarter of 2025 and expect additional efficacy data from Phase 2a in the third quarter of 2025.

ATRN-119 Potential Differentiation and Preclinical Data

Several ATR inhibitors in development by third parties have been or are currently being evaluated in clinical trials either as monotherapy or in combination regimens. We believe that ATRN-119 is potentially differentiated from other ATR inhibitors in its molecular structure and selectivity for ATR versus other members of the phosphatidylinositol 3-kinase-related kinase, or PIKK, family of kinases. In addition, we believe that ATRN-119 may potentially cause less hematologic toxicity compared to other ATR inhibitors.

ATRN-119 is a macrocycle and is structurally dissimilar to three oral ATR inhibitors for which chemical structures have been disclosed: AZD-6738 (AstraZeneca), BAY1895344 (Bayer), and RP-3500 (Repare/Roche). The macrocyclic structure of ATRN-119 was designed to restrict the conformational freedom of the molecule, or ability to rotate freely around certain chemical bonds, which may reduce its ability to bind off-target proteins, resulting in potentially increased tolerability, hence permitting higher efficacious drug dosing. Consistent with this hypothesis, ATRN-119 has demonstrated increased selectivity for ATR versus related members of the phosphatidylinositol 3-kinase-related kinase, or PIKK, family of kinases, including ataxia-telangiectasia mutated (ATM), DNA-dependent protein kinase (DNA-PK) and mammalian target of rapamycin (mTOR). In preclinical studies, we have observed a high potency of ATRN-119 for inhibition of ATR, with an IC50 of approximately 4 nM, whereas the IC50 of ATRN-119 is significantly higher for off-

target inhibition of ATM (>600-fold), DNA-PK (>2000-fold) and mTOR (>2000-fold). Selectivity for ATR over other kinases, including PIKKs, may potentially limit toxicity from off-target inhibition. Comprehensive in-vitro head-to-head studies of ATRN-119 versus the oral ATR inhibitors AZD-6738, BAY1895344, and RP-3500 have not been conducted, but data for these other ATR inhibitors have been reported in peer-reviewed scientific publications.

ATRN-119 Displays High Selectivity for ATR Versus Related PIKK Kinases

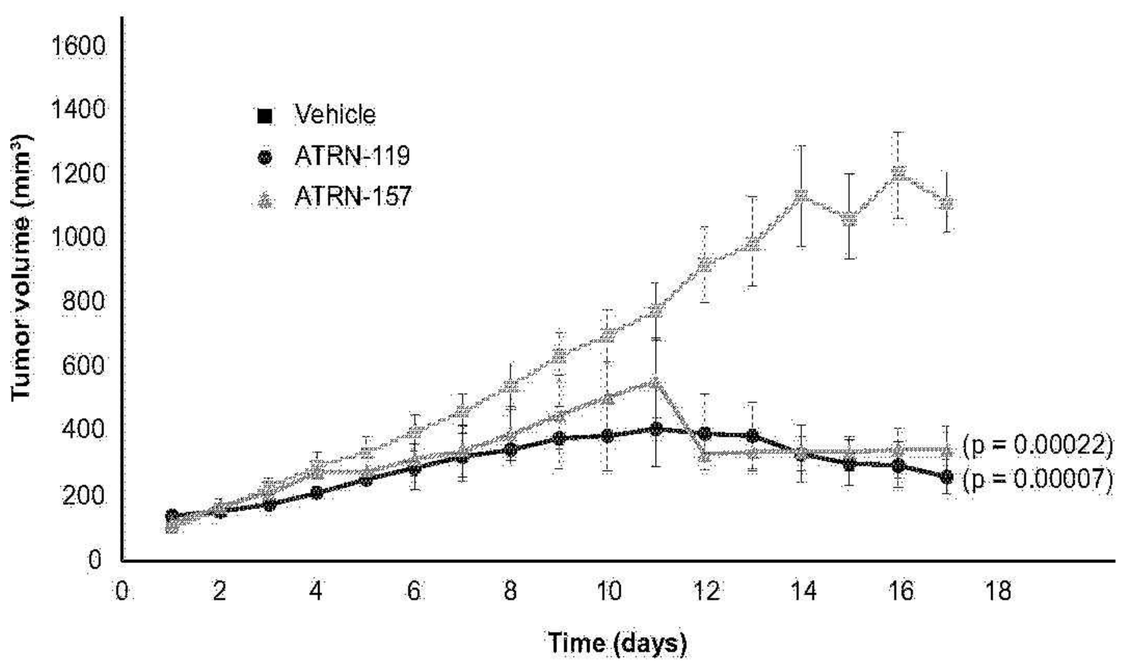
	On Target Cellular IC_{50} (nM)	Fold Difference in IC_{50} for Off-Target PIKK Inhibition		
	ATR	ATM	DNA-PK	mTOR
Aprea: ATRN-119[1]	4	> 600x	> 2000x	> 2000x
AstraZeneca: AZD-6738[2]	74	> 400x	> 400x	70 – 310x
Bayer: BAY1895344[3]	36	39x	9x	61x
Repare/Roche: RP-3500[4]	0.33	> 20000x	> 20000x	30x

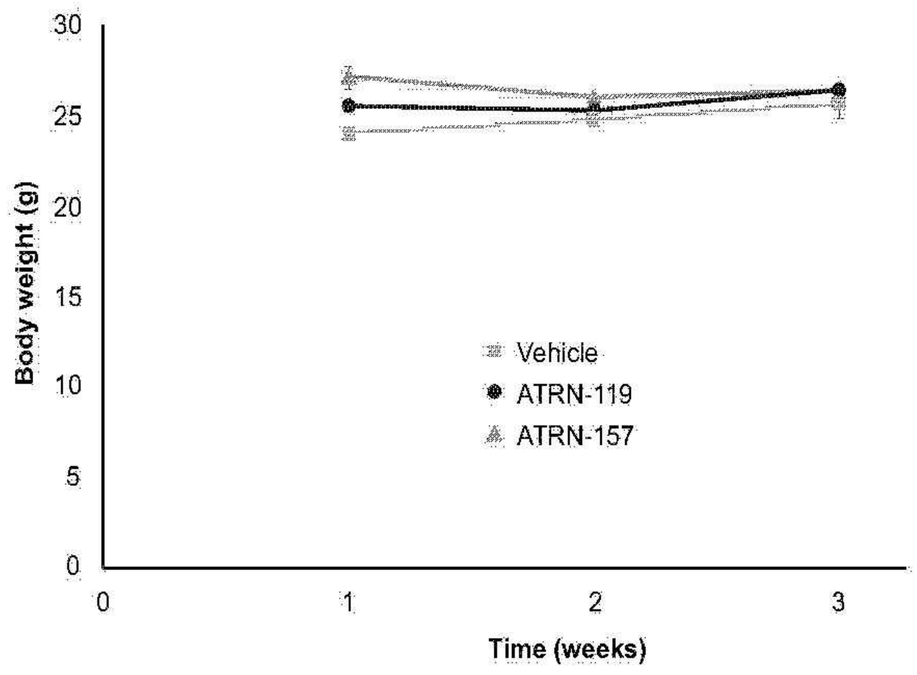
1) ATRN-119 data from HCT116 – Bcl/XL cell line
2) Foote et al (2018), *J Med Chem*
3) Lücking et al (2020), *J Med Chem*
4) Roulston et al (2022), *Mol Cancer Ther*

Preclinical studies identified an active metabolite, ATRN-157, in dogs receiving oral administration of ATRN-119. Notably, further characterization demonstrated that potency and selectivity of ATRN-157 was comparable to ATRN-119. The presence and abundance of ATRN-157 is assessed in parallel with ATRN-119 in our ongoing Phase 1 clinical trial in order to characterize the overall pharmacokinetic profile.

We observed ATRN-119 to have a potentially favorable tolerability profile across our preclinical studies and animal models. As part of our preclinical studies with ATRN-119, we conducted cell line-derived xenograft, or CDX, mouse model studies, using the colon cancer cell line HCT-116 (mutated KRAS, p53 null). In this study we injected female mice (N=4 per group) with tumor cells and waited for tumor volume to reach approximately 150 mm^3 before initiating daily administration over a period of 17 days with vehicle administered orally; ATRN-119 administered orally at 100 mg/kg/day; ATRN-157 administered subcutaneously at 20 mg/kg/day; or a competitor ATR inhibitor administered orally at 25 mg/kg/day. In this study, both ATRN-119 and ATRN-157 demonstrated statistically significant tumor growth inhibition as compared to vehicle control and smaller tumor volume than measured in mice receiving the competitor ATR inhibitor. Body weight loss, as a measurement of tolerability, was negligible across all groups of mice in this study.

ATRN-119 Halts Tumor Progression and Causes No Obvious Toxicity in KRAS-Mutant, p53-Null CDX Model





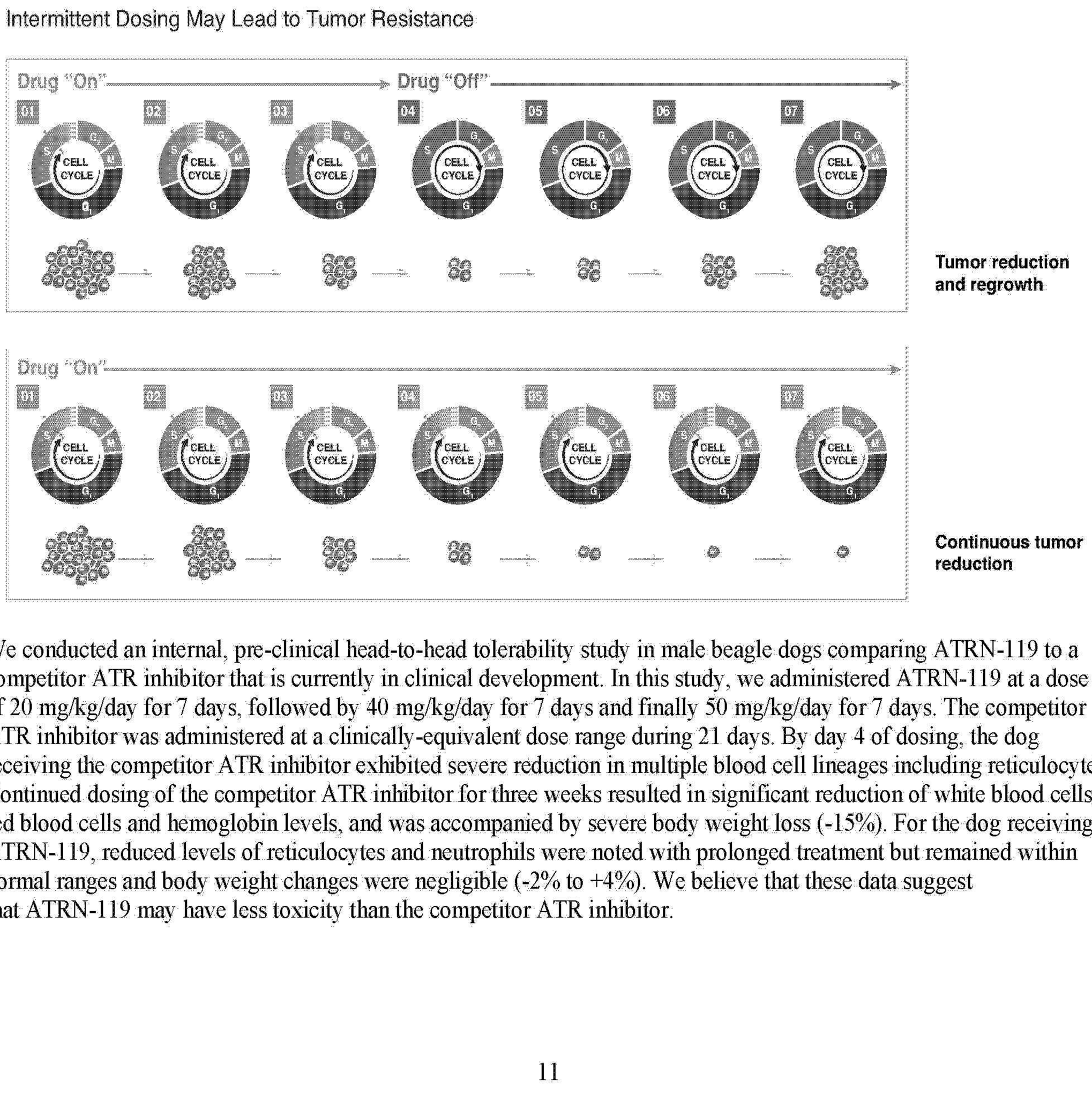
Data from clinical trials testing the oral ATR inhibitors AZD-6738, BAY1895344 and RP-3500 have been presented and support preclinical observation of synthetic lethality between ATR inhibitors and ATM- and ARID1A-deficient cancers. Additional data from patients with normal ATM expression but who still responded to treatment with AZD-6738 suggest that other mutations may also be synthetic lethal with ATR inhibition. In addition, clinical trial data for RP-3500

demonstrated responses in patients with tumors having mutations in CDK12, RAD51C and BRCA1/2. We believe these data are encouraging and indicate that many additional DDR-related mutations may be synthetic lethal with ATR inhibitors.

Although these early clinical results are encouraging, we believe that improvements in the tolerability of ATR inhibitors could provide opportunities to expand the therapeutic window and administer higher doses on a continuous daily dosing schedule to potentially improve response rates and response duration. Hematologic toxicities, specifically all-grade and higher-grade (grade ≥ 3) adverse events of anemia, neutropenia and thrombocytopenia, have been reported with other ATR inhibitors in clinical development. In order to reduce the frequency of these hematologic adverse events, some other ATR inhibitors are currently being tested using intermittent dosing schedules, such as a repeated schedule of 3 days on treatment followed by 4 days off treatment.

We believe that intermittent dosing might be less favorable in decreasing cancer cells rate of proliferation by allowing cell cycles to proceed in the absence of drug target inhibition and that such conditions may contribute to the development of drug resistance. For these reasons, we believe that a continuous ATR inhibitor dosing paradigm may be preferable to intermittent dosing provided the tolerability of the regimen remains acceptable.

ATRN-119 Continuous Daily Dosing Schedule Can Potentially Provide Greater Tumor Growth Inhibition



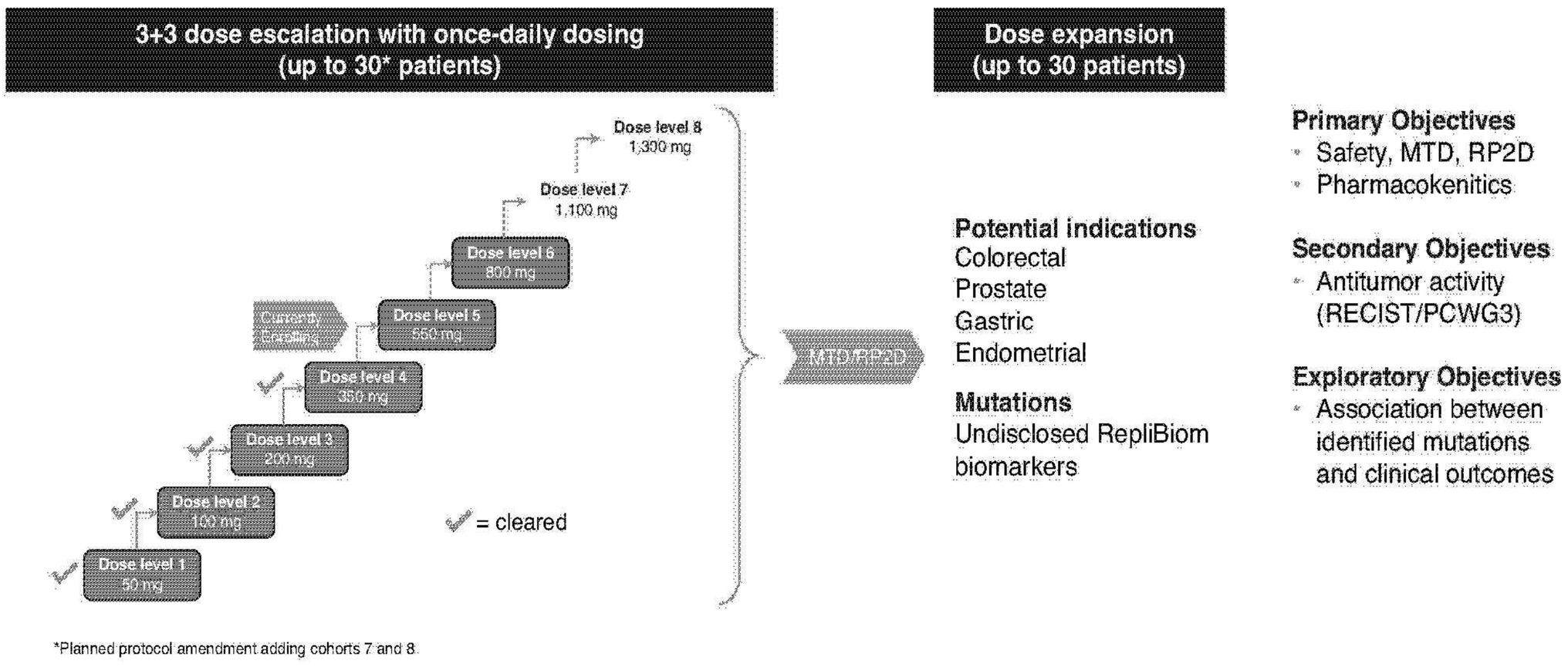
We conducted an internal, pre-clinical head-to-head tolerability study in male beagle dogs comparing ATRN-119 to a competitor ATR inhibitor that is currently in clinical development. In this study, we administered ATRN-119 at a dose of 20 mg/kg/day for 7 days, followed by 40 mg/kg/day for 7 days and finally 50 mg/kg/day for 7 days. The competitor ATR inhibitor was administered at a clinically-equivalent dose range during 21 days. By day 4 of dosing, the dog receiving the competitor ATR inhibitor exhibited severe reduction in multiple blood cell lineages including reticulocytes. Continued dosing of the competitor ATR inhibitor for three weeks resulted in significant reduction of white blood cells, red blood cells and hemoglobin levels, and was accompanied by severe body weight loss (-15%). For the dog receiving ATRN-119, reduced levels of reticulocytes and neutrophils were noted with prolonged treatment but remained within normal ranges and body weight changes were negligible (-2% to +4%). We believe that these data suggest that ATRN-119 may have less toxicity than the competitor ATR inhibitor.

These data are also consistent with observations in our 28-day GLP toxicology study of ATRN-119 in dogs, in which hematologic changes were of small magnitude and reversible. We believe that the results of our preclinical studies support the testing of daily oral dosing of ATRN-119 in clinical trials.

ATRN-119 Clinical Trial

In January 2023, we enrolled the first patient into our open-label Phase 1/2a clinical trial of ATRN-119 as monotherapy in patients with advanced solid tumors having at least one mutation in a defined panel of DDR-related genes. This panel is a proprietary collection of DDR genes that, when mutated, we believe may be synthetically lethal with ATR inhibition by ATRN-119. In the ongoing monotherapy dose escalation phase (Part 1) of our trial, the primary endpoint is evaluating the tolerability and pharmacokinetics of continuous daily oral dosing of ATRN-119 using a 3+3 trial design in up to approximately 30 patients. A secondary endpoint is evaluating potential initial efficacy. At completion of Part 1 we anticipate identification of a recommended Phase 2 dose that will be used in a Phase 2a cohort expansion (Part 2) to test the tolerability and potential efficacy of ATRN-119 monotherapy in approximately 30 additional patients. An efficacy evaluation is performed every eight weeks. As of March 26, 2024 we have activated four clinical sites in the United States. We anticipate completing the dose escalation for ATRN-119 in the fourth quarter of 2024 and recommended phase 2 dose to be determined in the first quarter of 2025. For Phase 2a cohort expansion (Part 2), we anticipate enrollment of the first patient in the first quarter of 2025 and additional efficacy data in the third quarter of 2025.

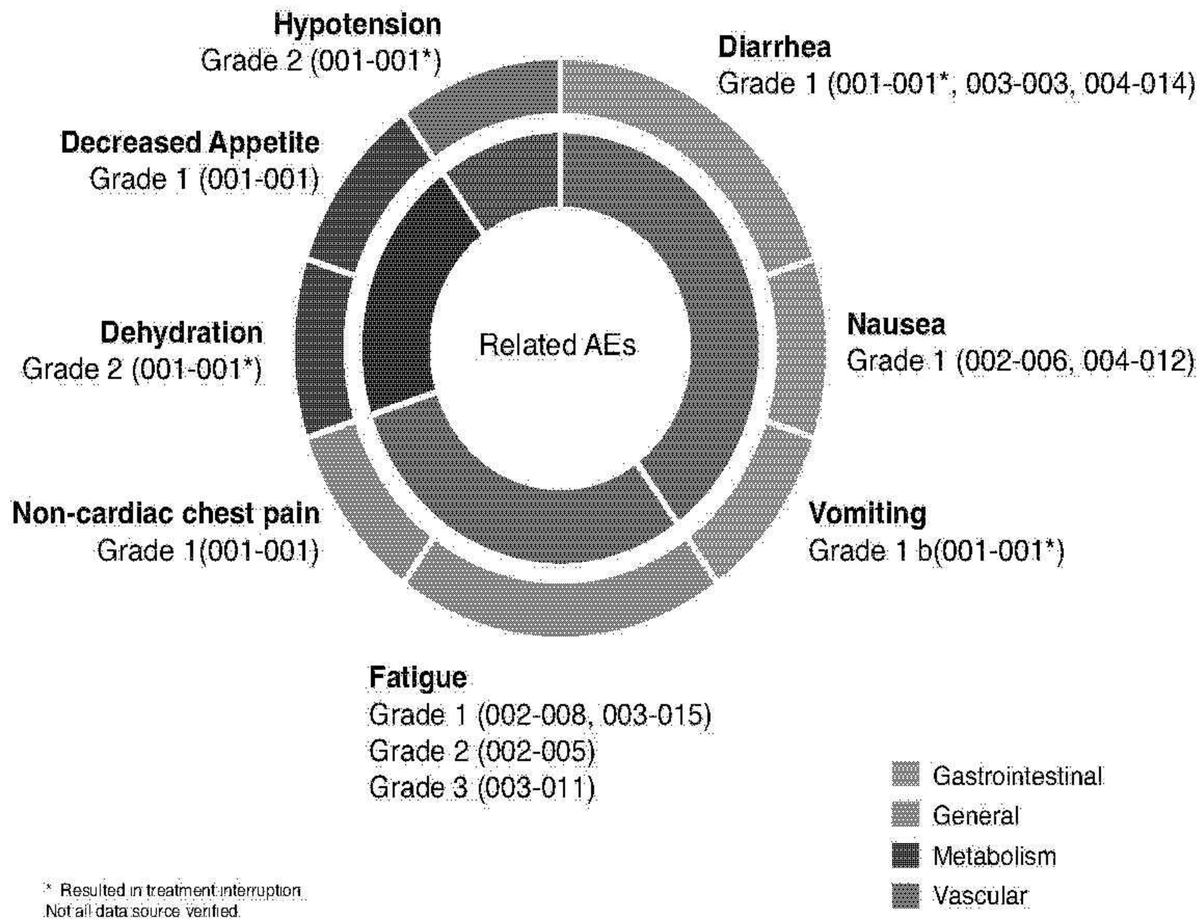
Design of Phase 1/2a Clinical Trial Testing ATRN-119 as Monotherapy and Trial Status as of February 28, 2024



As of February 23, 2024, 16 patients were enrolled to the first five cohorts of the Phase 1 escalation stage (50mg/day, 100mg/daily, 200mg/daily, 350mg/daily and 550mg/daily). The first four cohorts were cleared, and ATRN-119 was found to be safe and well tolerated in all four cohorts, with no related adverse effects ≥ grade 4.

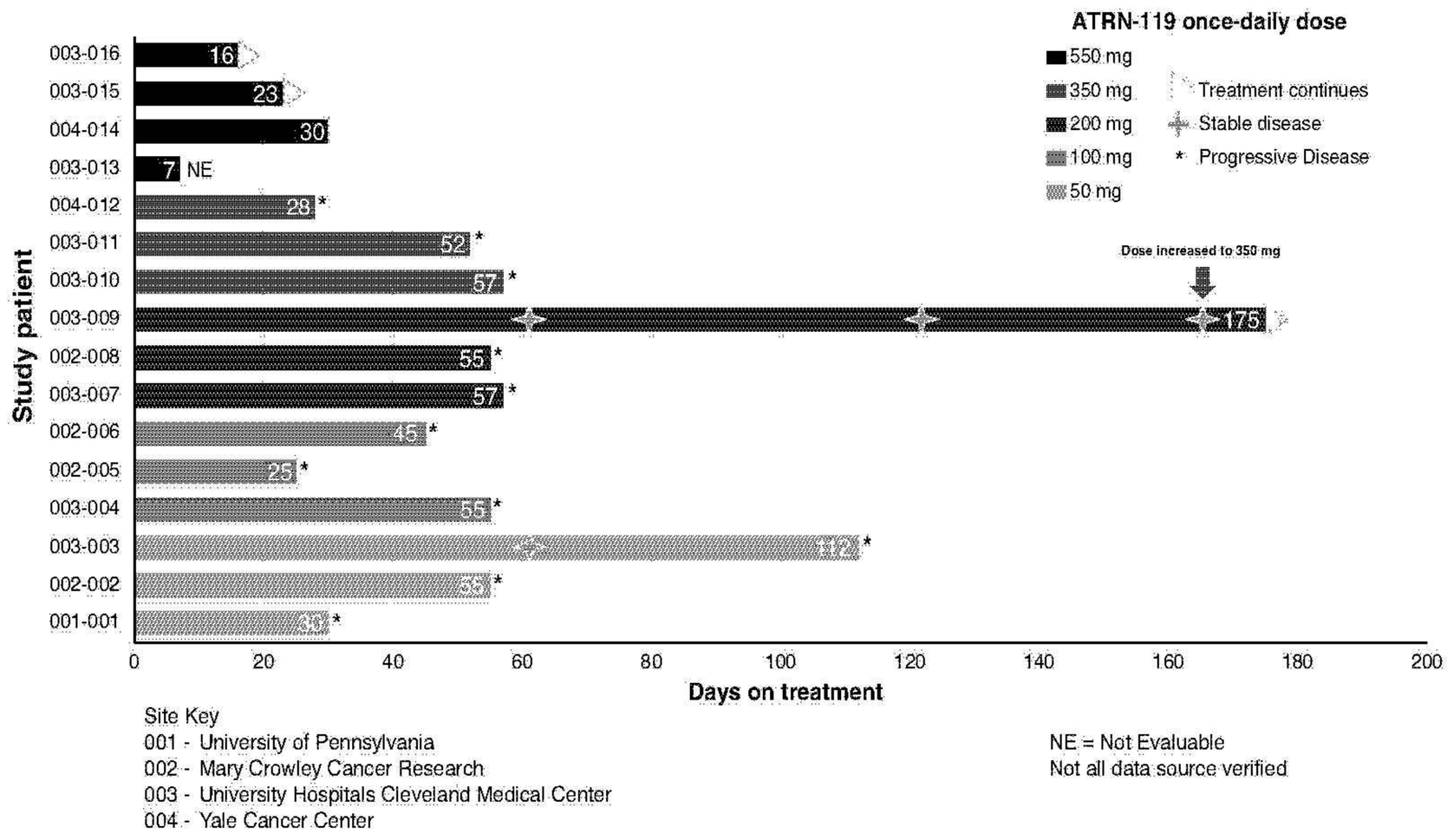
ATRN-119, Phase 1/2a Clinical Trial, First Five Cohorts, Safety Results

As of February 23, 2024, seven of fifteen patients experienced adverse effects that are possibly/probably related to ATRN-119.



ATRN-119, Phase 1/2a Clinical Trial, First Five Cohorts, Summary of Duration of Treatment

As of February 28, 2024, two stable disease patients were observed in the five first cohorts of the dose escalation Phase 1 trial:



We anticipate completing the dose-escalation in the fourth quarter of 2024 and to initiate the expansion stage, Phase 2a, during the first quarter of 2025. We anticipate obtaining additional efficacy data from Phase 2a in the third quarter of 2025.

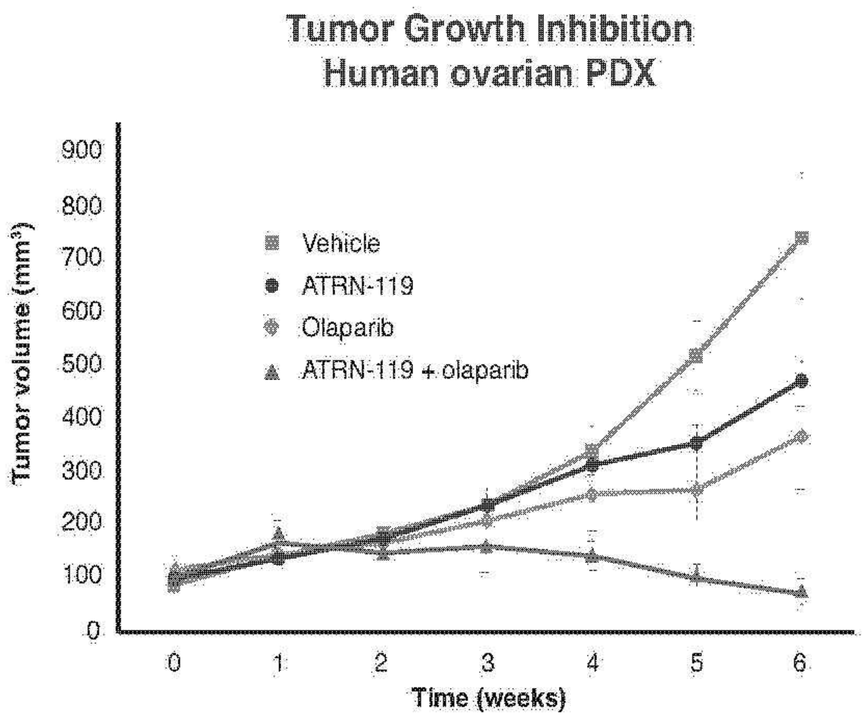
Opportunities for Combination of ATRN-119 with Other Therapies

Combinations of anti-cancer agents have the potential to interact synergistically. This synergy can potentially augment efficacy over monotherapy regimens and reduce the risk of drug resistance. We believe that our ATRN-119 could potentially interact synergistically with various anti-cancer agents, including PARP inhibitors, WEE1 inhibitors, radiopharmaceuticals, chemotherapies, antibody-drug conjugates (ADCs) and immunotherapies. In a preclinical study,

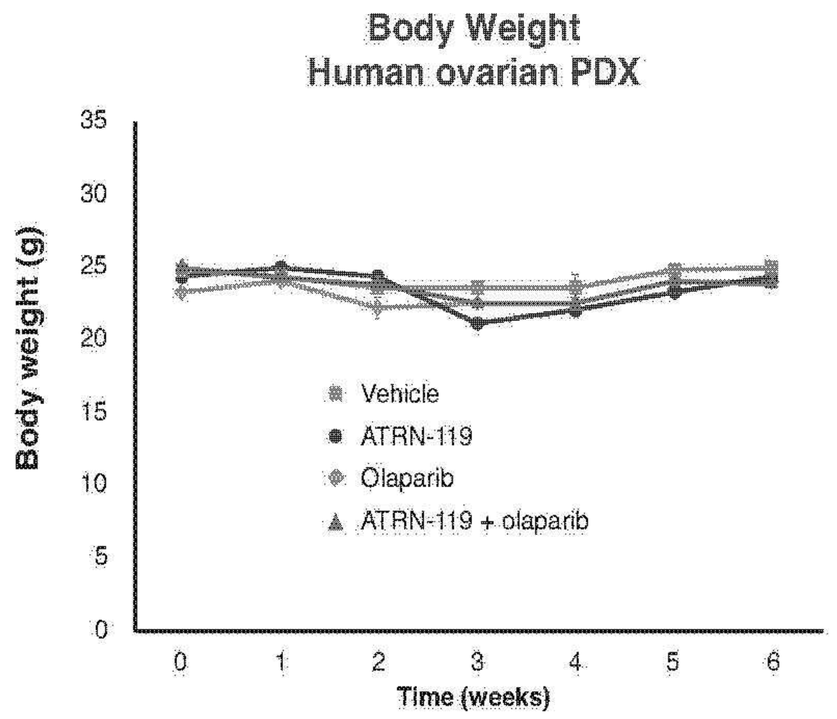
we evaluated ATRN-119 and the PARP inhibitor olaparib as both monotherapies and a combination therapy in a patient-derived xenograft, or PDX, ovarian cancer mouse model. Mice were first transplanted with patient-derived BRCA2 deficient ovarian cancer tumor material. When tumors grew to approximately 100 mm^3 the mice were dosed (N=6-8 per group) with vehicle, olaparib at 50 mg/kg/day, ATRN-119 at 90 mg/kg twice daily, or the combination of the two agents at the same doses and schedules. In this study, ATRN-119 and olaparib monotherapies demonstrated comparable tumor growth inhibition. However, the combination of ATRN-119 + olaparib demonstrated statistically significant tumor growth inhibition compared to either single agent or vehicle control. Body weight loss, as a measurement of tolerability, was negligible in the mice receiving any of these regimens.

ATRN-119 + Olaparib Combination Drives Regression and No Serious Toxicity in BRCA2-deficient PDX Model

ATRN-119 + Olaparib Inhibits Ovarian Tumor Growth Over Time



ATRN-119 + Olaparib Shows Negligible Weight Loss Over Time



Pre-clinical studies with ATRN-119.
Data on file

We believe that these data are supportive of future clinical trials to evaluate the combination of a PARP inhibitor and ATNR-119.

WEE1 Inhibitors in Advanced Solid Tumors

We are advancing research of our WEE1 inhibitor, APR-1051, for patients having tumors with increased expression of Cyclin E1 (CCNE1), and potentially other genetic and/or molecular signatures.

WEE1 kinase is a key regulator of multiple phases of the cell cycle, most prominently in progression from G1 to S phase and from S/G2 to M phase through inhibitory phosphorylation of CDK2 and CDK1, respectively. Thus, when WEE1 is inhibited, both G1-S and G2-M checkpoints are abrogated, leading to premature S-phase and M-phase entry. Notably, the replication stress caused by CCNE1 overexpression is transformed into toxic levels of DSBs and cancer cell death when WEE1 is inhibited. These findings suggest CCNE1 overexpression is a cancer-associated vulnerability that may be used to sensitize these cancers to WEE1 inhibitors.

Several WEE1 inhibitors in development by third parties have been or are currently being evaluated in clinical trials either as a monotherapy or in combination regimens. We believe that APR-1051 is potentially differentiated from other WEE1 inhibitors in its: 1) molecular structure; 2) selectivity for WEE1 versus off-target inhibition of the polo-like kinase, or PLK, family of kinases; 3) potentially superior pharmacokinetic properties; and 4) Potential absence of QT prolongation at doses that significantly inhibit WEE1. Of the WEE1 inhibitors developed by other companies, the structures of ZN-c3 (Zentalis) and AZD-1775 (AstraZeneca) are similar, differing only in one region of the molecules. In contrast, the structure of APR-1051 is not similar to either of these two product candidates.

In preclinical biochemical studies, we have observed high potency of APR-1051 for inhibition of WEE1, with an IC50 of approximately 2.2 nM; however, even when tested at a very high relative concentration of 1 μM, APR-1051 did not appreciably inhibit PLK1 (17%), PLK2 (33%) or PLK3 (12%). We believe that this high selectivity for WEE1 over PLK1/2/3 is an important differentiating attribute of APR-1051 versus some of the other WEE1 inhibitors in development. Head-to-head studies of APR-1051 versus the oral WEE1 inhibitors ZN-c3 and AZD-1775 have not been conducted; however, data for the ZN-c3 and AZD-1775 have been previously published and indicate similar levels of PLK inhibition that are higher than that caused by APR-1051. This distinguishing feature is observed despite an apparently higher potency of APR-1051 for WEE1 inhibition.

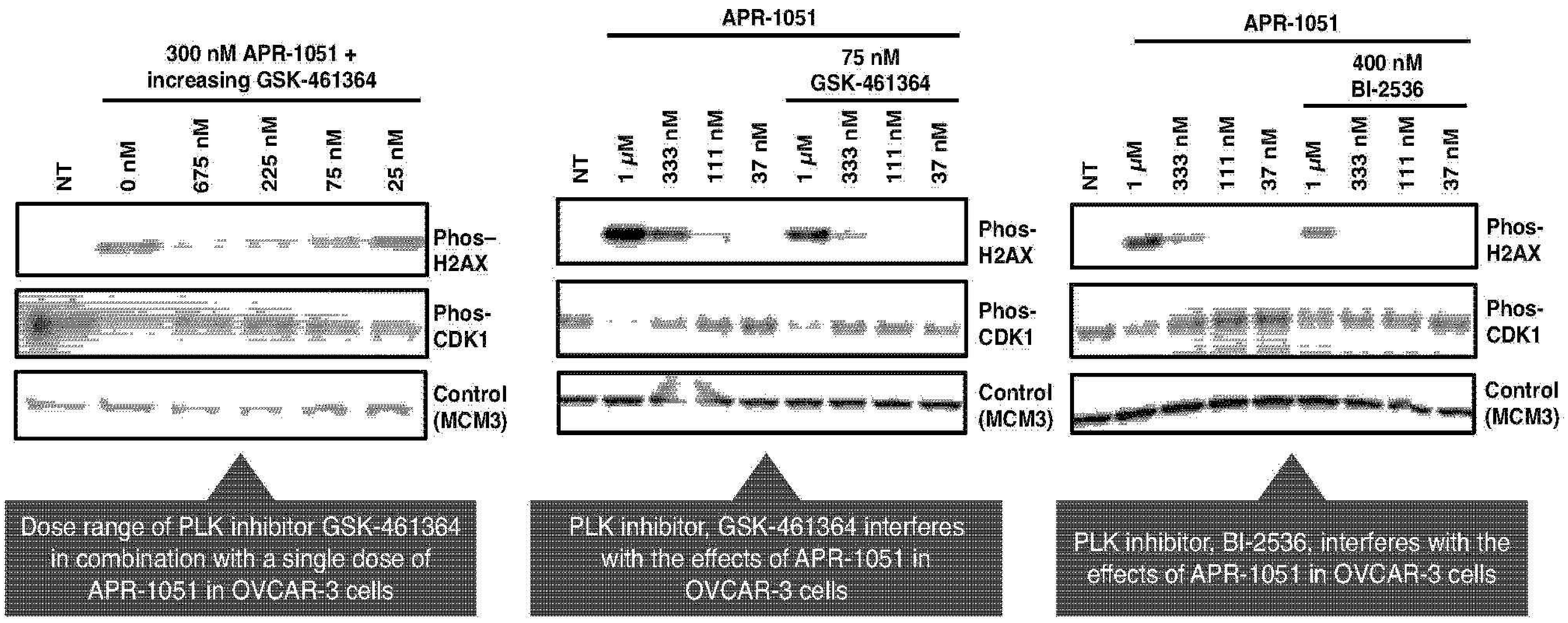
APR-1051 Displays High Selectivity for WEE1 Versus PLK Kinases

	On Target IC_{50} (nM)	Off-Target Inhibition of PLKs at 1 μM (%)		
	WEE1	PLK1	PLK2	PLK3
Aprea: APR-1051	2.2	17	33	12
Zentalis: ZN-c3(1)	3.8	79	96	92
AstraZeneca: AZD-1775(1)(2)	3.9	70	101	91

1) Huang et al, (2021) J Med Chem
2) AstraZeneca announced in July 2022 the discontinuation of development of AZD-1775

In an in-vitro study we showed that PLK1 inhibition reduces the expected molecular effects of WEE1 inhibitor on phos-H2AX and phos-CDK1, hence we believe that minimal PLK1 co-inhibition enables full therapeutic potential of APR-1051.

PLK1 Inhibition Reduces the Molecular Effects of WEE1 Inhibitors in Cells [1]

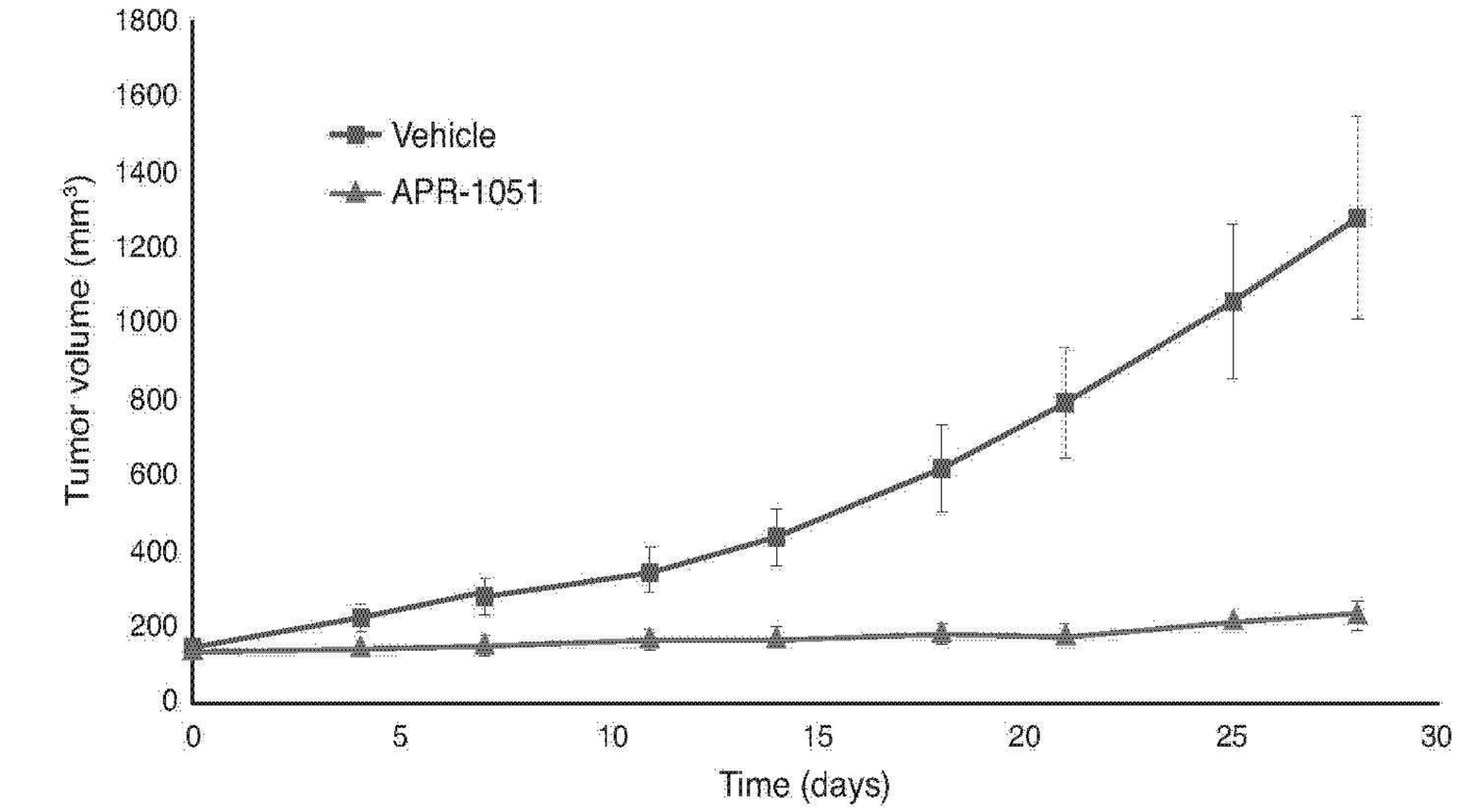


[1] AACR-NCI-EORTC Meeting, Poster C147, 2023

We believe that CCNE1 gene amplification or high Cyclin E protein expression is a potential biomarker for our WEE1 inhibitor. Overexpression of Cyclin E protein can drive cells into S-phase prematurely, resulting in replicative stress that may be synthetically lethal with WEE1 inhibition. We are conducting research to expand our list of proprietary potential biomarkers for WEE1 inhibition that could increase potential market opportunities for APR-1051, if approved.

As part of our preclinical studies with APR-1051, we conducted a CDX mouse model study using the CCNE1-amplified ovarian cancer cell line OVCAR3. In this study we injected female mice (N=7 per group) with tumor cells and waited for tumor volume to reach approximately 150 mm^3 before initiating daily administration over a period of 28 days with vehicle administered orally or an exploratory formulation of APR-1051 administered orally at 30 mg/kg/day. In this model we observed nearly complete tumor growth inhibition when APR-1051 was administered at 30 mg/kg/day.

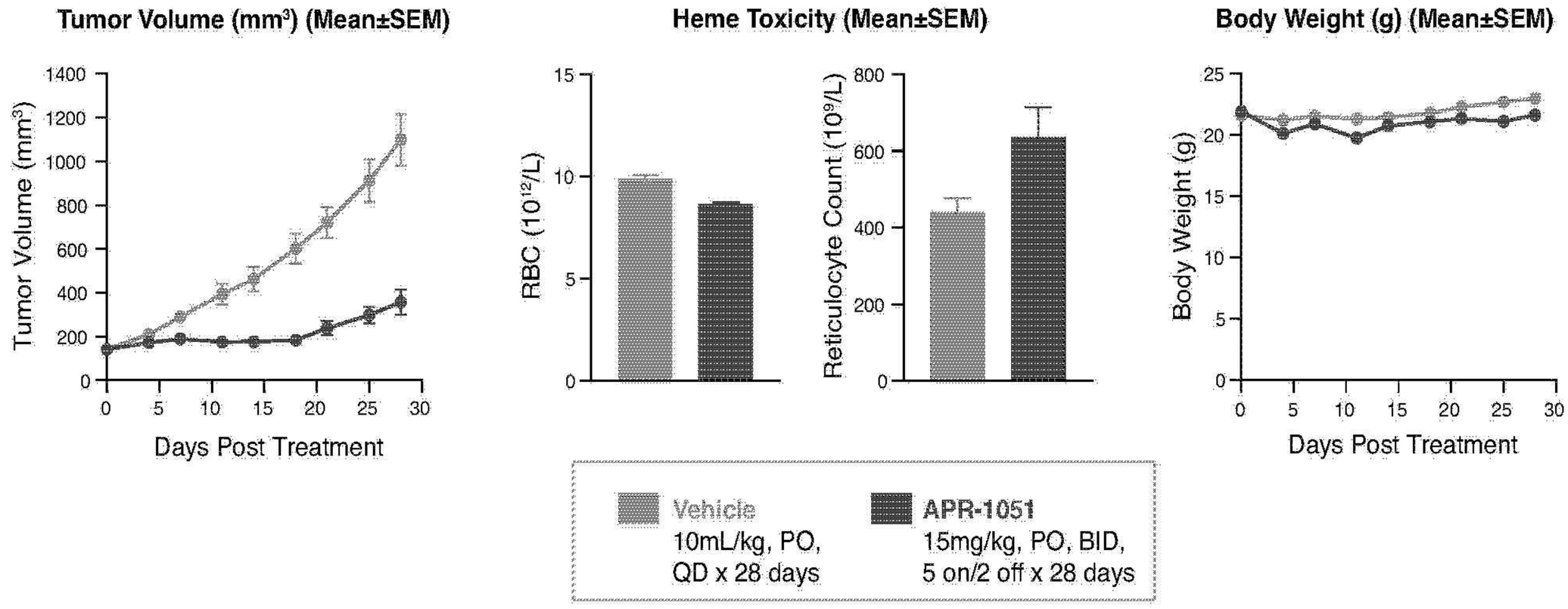
APR-1051 Exhibits Strong Tumor Control in CCNE1-Overexpressing CDX Model



Pre-clinical studies with APR-1051
Data on file

In another preclinical study with APR-1051 in a CDX mouse model bearing OVCAR3-derived tumors, a significant antitumor activity was shown in female mice (N=10) treated with 15 mg/kg on a 5-on/2-off BID schedule.

APR-1051 Suppresses Tumor Growth While Causing Little Effect on RBCs and Body Weight [1]



[1] AACR-NCI-EORTC Meeting, Poster C147, 2023

In preclinical studies conducted in mice, APR-1051 has also demonstrated potentially favorable pharmacokinetic properties as assessed by the area under the curve, or AUC, a commonly used measure of drug exposure. Head-to-head studies of APR-1051 versus the oral ZN-c3 and AZD-1775 have not been conducted; however, data for the ZN-c3 and

AZD-1775 have been previously disclosed by Zentalis and suggest APR-1051 may have potentially advantageous drug exposure.

APR-1051 Pre-Clinical Data Highlight Potentially Favorable Pharmacokinetic Properties

	APR-1051[1]	Azenosertib (ZN-c3)[2]			Adavosertib (AZD-1775)[2]		
Dose (mg/kg/d)	10	20	40	80	20	40	80
C_{max} ng/ml	1,460	1,167	1,997	5,100	635	2,460	4,703
T_{max} hr	3	1	1	1	1	1	1
AUC_{0-24}, ng*hr/ml	16,739	4,863	17,088	39,722	1,494	6,313	13,408

Note: Head-to-head studies have not been conducted
1 Data from an exploratory formulation of APR-1051 administered to fasted Balb/c mice
2 Data from study in A-427 NSCLC xenograft model as reported in Zentalis Corporate Overview, March 2022

AACR-NCI-EORTC Meeting, Poster C147, 2023

In addition, QT prolongation adverse effects were reported with several competitor WEE1 inhibitors being developed by other companies, whereas APR-1051 showed negligible inhibition of hERG channels, which could potentially indicate that APR-1051 will not cause QT prolongation at doses that significantly inhibit WEE1.

APR-1051 Exhibits Substantially Lower Inhibition of hERG than WEE1 [1]

In vitro kinase assays IC50		Average WEE1 kinase IC50	hERG inhibition IC50		Average hERG IC50	Fold difference between kinase IC50 and hERG IC50
LanthaScreen (Thermo)	Hotspot (Reaction Biology)		HEK293 cells (Medicilon)	CHO cells (WuXi)		hERG inhibition over WEE1 kinase inhibition
2.2 nM	41.4 nM	**21.8 nM**	8,840 nM	660 nM	**4,750 nM**	**218-fold (range 16- to 3,946-fold)**

[1] AACR-NCI-EORTC Meeting, Poster C147, 2023

In March 2024, the U.S. FDA cleared our IND application for APR-1051 (IND 169359). We plan to initiate a Phase 1 ACESOT-1051 (A Multi-Center Evaluation of WEE1 Inhibitor in Patients with Advanced Solid Tumors, APR-1051) clinical trial in the first half of 2024, evaluating APR-1051 for monotherapy treatment of Cyclin E overexpressing cancers including breast and ovarian cancers. We expect an update from the clinical study in the fourth quarter of 2024, an open-label efficacy data in the second quarter of 2025 and recommended phase 2 dose in the second half of 2025.

Inhibitors of Other DDR Targets

In addition, we also have an early preclinical program, currently in a lead optimization stage, for an undisclosed DDR target. Lead candidate selection is expected in the second quarter of 2024.

Platform of Integrated Discovery Technologies for Synthetic Lethality and Biomarker Discovery

Our development pipeline is based on our discovery platforms and a rationally designed series of molecules. We have developed highly selective small molecule regulators of DDR proteins that may play fundamental roles in these response pathways.

Our drug discovery and development processes integrate three unique platforms: RepliBiom, ATRIZE™ and SCET™. These integrated technologies provide us with the opportunity to enrich our pipeline with potentially novel targets in synthetic lethality and cancer treatment. In addition, by utilizing our integrated technologies we have identified cancer-associated gene alterations that may lead to increased sensitivity to our DDR inhibitors and may provide future opportunities for improved efficacy and tolerability in cancer treatment.

RepliBiom

RepliBiom is designed to identify proteins that cancer cells use to resist the effects of drug treatment. This integrated proteomic, genomic and machine learning approach is designed to identify response factors that both participate in the molecular response to drug treatment and are highly mutated in cancers.

Absence of these resistance factors predicts sensitivity to drug treatment, thus potentially promoting durable drug responses. In addition, this approach is being used to identify combination therapy approaches and new drug targets to advance our drug development programs. Thus, we believe that RepliBiom has the potential to identify candidate biomarkers of therapeutic benefit to our product candidates as well as novel synthetic lethality targets.

ATRIZE

ATRIZE is an innovative, high-throughput system designed to detect disruption of DNA synthesis and DDR activation, and thus is potentially ideal for screening DDR inhibitors. ATRIZE may reduce the time required to discover active drug candidates and optimize their design for precision cancer therapy.

SCET

SCET is a medicinal chemistry cyclization approach to generate highly potent and selective enzyme inhibitors. The SCET approach enables the design and synthesis of novel conformationally constrained drug candidates with potentially higher affinity and specificity for the target enzyme. By utilizing this approach, we believe that we have developed highly potent and specific anticancer drug candidates with decreased off-target activities.

Manufacturing

We currently contract with third parties for the manufacture of our product candidates for certain preclinical studies and clinical trial materials, including raw materials and consumables necessary for their manufacture, consistent with applicable cGMP requirements. We intend to continue to contract production of these materials and services in the future, including commercial manufacture if our product candidates receive marketing approval. We do not own or operate cGMP manufacturing facilities, nor do we currently plan to build our own cGMP manufacturing capabilities for production of our product candidates for clinical or commercial use.

Although we rely upon contract manufacturers for the manufacture of our product candidates for pre-clinical trials and clinical trials, we have personnel and consultants who oversee our contract manufacturers. In the future, we may also rely upon collaboration partners, in addition to contract manufacturers, for the manufacture of our product candidates or any products for which we obtain marketing approval.

Currently, we have agreements with manufacturers for the production of ATRN-119 active pharmaceutical ingredient, or API, and drug product. We currently have agreements with one manufacturer for APR-1051 API. We believe that these third parties have sufficient capacity to meet our current demand and, in the event they fail to meet our demand, we believe that adequate alternative sources for the supply of materials for our product candidates exist.

We expect that one or more of our current contract manufacturers will have capacity to support commercial scale production but we do not have any formal agreements in place at this time given our early stage of development. If needed, we believe we can identify and establish agreements with additional contract manufacturers to provide API as well as drug product. We intend to identify and qualify additional manufacturers to provide the API, drug product and other services pertaining to our clinical and potential future supply chains prior to seeking marketing approval for any of our product candidates.

All of our product candidates are small molecules and are manufactured synthetically from readily available starting materials. The chemistry underlying our product candidates appears amenable to scale-up and does not currently require unusual equipment in the manufacturing process. We expect to continue to develop product candidates that can be produced cost-effectively at contract manufacturing facilities.

Manufacturing clinical products is subject to extensive regulations that impose various procedural and documentation requirements, which govern record keeping, manufacturing processes and controls, personnel, quality control and quality assurance. Our contract manufacturers are required to comply with current good manufacturing practice (cGMP) regulations, which are regulatory requirements for the production of pharmaceuticals for use in humans.

Competition

The pharmaceutical and biotechnology industries generally, and the cancer drug sector specifically, are highly competitive and characterized by rapidly advancing technologies, evolving understanding of disease etiology and a strong emphasis on proprietary drugs. While we believe that our product candidates, development capabilities, experience and scientific knowledge provide us with competitive advantages, we face significant potential competition from many different sources, including major pharmaceutical, specialty pharmaceutical and biotechnology companies, academic institutions, governmental agencies and public and private research institutions. Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future.

There are a large number of companies developing or marketing treatments for cancer, including the indications for which we may develop product candidates. Many of the companies that we compete against or may compete against in the future have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved drugs than we do. Small or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or that may be necessary for, our programs.

Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize drugs that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any drugs that we may develop. Our competitors also may obtain FDA or other regulatory approval for their drugs more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. The key competitive factors affecting the success of all of our product candidates, if approved, are likely to be their efficacy, safety, convenience and price, in guiding the use of related therapeutics, the level of generic competition and the availability of reimbursement from government and other third-party payors.

The most common methods of treating patients with cancer are surgery, radiation and therapy with drugs or biologics. There are a variety of available drug therapies marketed for cancer. In many cases, these drugs are administered in combination to enhance efficacy. Some of the currently-approved drug therapies are branded and subject to patent protection and may be established as standard of care for the treatment of indications for which we may choose to seek regulatory approvals. Many of these approved drugs are well-established therapies and are widely accepted by physicians, patients and third-party payors, and even if our drug candidates were to be approved, there can be no assurance that our drugs would displace existing treatments.

In addition to currently marketed therapies, there are also a number of drugs in late-stage clinical development to treat cancer, including for the treatment of the indications for which we are developing product candidates. These clinical-stage drug candidates may provide efficacy, safety, convenience and other benefits that are not provided by currently-marketed therapies. As a result, they may provide significant competition for any of our product candidates for which we obtain regulatory approval.

With respect to our lead product candidate, ATRN-119, several companies are developing ATR inhibitors, including Antengene, Artios Pharma, AstraZeneca, IMPACT Therapeutics, Merck KGaA and Repare Therapeutics. Several of these companies are conducting clinical trials with their ATR inhibitors as monotherapy and/or in combination with other chemotherapies and targeted agents.

With respect to our WEE1 inhibitor product candidate, APR-1051, several companies are developing WEE1 inhibitors, including Debiopharm, IMPACT Therapeutics, Schrodinger and Zentalis Pharmaceuticals. Several of these companies are conducting clinical trials with their WEE1 inhibitors as monotherapy and/or in combination with other chemotherapies and targeted agents. AstraZeneca was previously developing a clinical-stage WEE1 inhibitor, AZD-1775, but reported discontinuation of further development in July 2022.

Intellectual Property

We strive to protect the proprietary technologies that we believe are important to our business, including seeking and maintaining patent protection intended to cover claims directed to composition of matter, methods-of-use, formulations, and manufacturing processes for our product candidates, as well as other inventions that are important to our business.

Our success will depend significantly on our ability to obtain and maintain patent and other proprietary protection for commercially important technology, inventions, and know-how related to our business, defend and enforce our patents, preserve the confidentiality of our trade secrets, and operate without infringing the valid and enforceable patents and other proprietary rights of third parties.

A third party may hold intellectual property, including patent rights, which are important or necessary to the development or commercialization of our product candidates. If it becomes necessary for us to use patented or proprietary technology of third parties to develop or commercialize our product candidates, we may need to seek a license from such third parties. Our business could be harmed, possibly materially, if we are unable to obtain such a license on terms that are commercially reasonable, or at all.

We may seek to expand our intellectual property estate by filing patent applications directed to dosage forms, methods of treatment, diagnostics, and additional compounds and their derivatives. Specifically, we have sought and will continue to seek patent protection in the United States and internationally for novel compositions of matter covering the compounds of our product candidates, the chemistries and processes for manufacturing these compounds, and the use of these compounds in a variety of therapies. The chemical structure of eprenetapopt is in the public domain. Accordingly, we do not own or license any composition of matter patents claiming the compound of eprenetapopt and will not in the future own or license any composition of matter patents claiming the chemical structure of eprenetapopt as described in the public domain.

The patent positions of biopharmaceutical companies like us are generally uncertain and involve complex legal, scientific and factual questions. In addition, the coverage claimed in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted after issuance. Consequently, we do not know whether any of our product candidates will be protectable or remain protected by enforceable patents. We cannot predict whether the patent applications we are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide sufficient proprietary protection from competitors. Any patents that we hold may be challenged, circumvented or invalidated by third parties.

Because patent applications in the United States and certain other jurisdictions are maintained in secrecy for 18 months, and since publication of discoveries in the scientific or patent literature often lags actual discoveries, we cannot be certain of whether inventions covered by pending patent applications represent the first priority filings of those

inventions. Moreover, we may have to participate in proceedings declared by the United States Patent and Trademark Office, or USPTO, in post-grant challenge proceedings at the USPTO or at a foreign patent office, such as inter partes review and post grant review proceedings at the USPTO and opposition proceedings at the European Patent Office, that challenge priority of invention or other features of patentability. Such proceedings could result in substantial cost, even if the eventual outcome is favorable to us. For more information regarding the risks related to our intellectual property, see "Risk Factors—Risks Related to Our Intellectual Property."

Patent portfolio

As of December 31, 2023, our exclusively owned patent portfolio is directed toward various aspects of our product candidates and research programs.

As of December 31, 2023, the portion of our portfolio for DDR inhibitors, including our ATR and WEE1 programs, consists of 4 issued U.S. patents, 2 U.S. patent applications, 13 pending non-U.S. patent applications, and 18 non-U.S. patents. The claims of these owned patents and patent applications are directed toward composition of matter, pharmaceutical compositions and methods of use. The granted patents and pending applications, if issued, in this family are expected to expire between 2035 and 2044, not giving effect to any potential patent term extensions and patent term adjustments and assuming payment of all appropriate maintenance, renewal, annuity, or other governmental fees.

As of December 31, 2023, the portion of our portfolio for p53 reactivators, including eprenetapopt, consists of 3 issued U.S. patents, 1 pending U.S. application, approximately 90 foreign issued patents and approximately 2 pending foreign patent applications. The claims of these owned patents and patent applications are directed toward drug product formulations and methods of use. The granted patents and pending applications, if issued, in this family are expected to expire between 2024 and 2040, not giving effect to any potential patent term extensions and patent term adjustments and assuming payment of all appropriate maintenance, renewal, annuity, or other governmental fees.

Intellectual property protection

The term of individual patents depends upon the legal term of the patents in the countries in which they are obtained. In most countries in which we file, the patent term is 20 years from the earliest date of filing a non-provisional patent application.

In the United States, the Hatch-Waxman Act permits a patent holder to apply for patent term extension of a patent that covers an FDA-approved drug, which, if granted, can extend the patent term of such patent to compensate for part of the patent term lost during the FDA regulatory review process. This extension can be for up to five years beyond the original expiration date of the patent. The length of the patent term extension is related to the length of time the drug is under regulatory review. Patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, only one patent applicable to an approved drug may be extended and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended.

Similar provisions are available in Europe and other non-United States jurisdictions to extend the term of a patent that covers an approved drug. In the future, if and when our product candidates receive FDA approval, we expect to apply for patent term extensions on patents covering those product candidates. While we intend to seek patent term extensions to any of our patents in any jurisdiction where such extensions are available, there is no guarantee that the applicable authorities, including the FDA and the USPTO in the United States, will agree with our assessment of whether such extensions should be granted, and even if granted, the length of such extensions.

In addition to our reliance on patent protection for our inventions, product candidates and research programs, we also rely on trade secrets and confidentiality agreements to protect our technology, know-how and other aspects our business that are not amenable to, or that we do not consider appropriate for, patent protection. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets or disclose our technology. Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers and

other advisors to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed or made known to the individual or entity during the course of the party's relationship with us is to be kept confidential and not disclosed to third parties except in specific circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and which are related to our current or planned business or research and development or made during normal working hours, on our premises or using our equipment or proprietary information, are our exclusive property. However, such confidentiality agreements and invention assignment agreements can be breached and we may not have adequate remedies for any such breach. For more information regarding the risks related to our intellectual property, see "Risk Factors—Risks Related to Our Intellectual Property."

Government Regulation

Government regulation and product approvals

Government authorities in the United States, at the federal, state and local level, and in other countries and jurisdictions, including the EU, extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting, and import and export of drug products. The processes for obtaining marketing approvals in the United States and in foreign countries and jurisdictions, along with subsequent compliance with applicable statutes and regulations and other regulatory authorities, require the expenditure of substantial time and financial resources.

Review and approval of drugs in the United States

In the United States, the FDA approves drug products under the Federal Food, Drug, and Cosmetic Act, or FDCA, and implementing regulations. The failure to comply with applicable requirements under the FDCA and other applicable laws at any time during the product development process, approval process or after approval may subject an applicant and/or sponsor to a variety of administrative or judicial sanctions, including refusal by the FDA to approve pending applications, withdrawal of an approval, debarment, imposition of a clinical hold, issuance of warning letters and other types of letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement of profits, or civil or criminal investigations and penalties brought by the FDA and the Department of Justice or other governmental entities.

An applicant seeking approval to market and distribute a new drug product in the United States must typically undertake the following:

- completion of preclinical laboratory tests, animal studies and formulation studies in compliance with applicable FDA good laboratory practice, or GLP, regulations;
- submission to the FDA of an IND, which must take effect before human clinical trials begin;
- approval by an independent institutional review board, or IRB, representing each clinical site before each clinical trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practices, or GCP, and other applicable regulations to establish the safety and efficacy of the proposed drug product for each proposed indication;
- preparation and submission to the FDA of an NDA requesting marketing for one or more proposed indications;
- review by an FDA advisory committee, where appropriate or if applicable;

- satisfactory completion of one or more FDA inspections of the manufacturing facility or facilities at which the product, or components thereof, are produced to assess compliance with current Good Manufacturing Practices, or cGMP, requirements and to assure that the facilities, methods and controls are adequate to preserve the product's identity, strength, quality and purity;

- satisfactory completion of FDA audits of clinical trial sites to assure compliance with GCPs and the integrity of the clinical data;

- payment of user fees and securing FDA approval of the NDA; and

- compliance with any post-approval requirements, including the potential requirement to implement a Risk Evaluation and Mitigation Strategy, or REMS, and the potential requirement to conduct post-approval studies.

Satisfaction of FDA pre-market approval requirements typically takes many years and the actual time required may vary substantially based upon the type, complexity, and novelty of the product candidate or disease. A clinical hold may occur at any time during the life of an IND and may affect one or more specific trials or all trials conducted under the IND. The testing and approval process requires substantial time, effort, and financial resources.

Preclinical studies

Before an applicant begins testing a compound with potential therapeutic value in humans, the drug candidate enters the preclinical testing stage. Preclinical studies include laboratory evaluation of product chemistry, toxicity and formulation, as well as *in vitro* and animal studies to assess the potential safety and activity of the drug for initial testing in humans and to establish a rationale for therapeutic use. The conduct of preclinical studies is subject to federal regulations and requirements, including GLP regulations. The results of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and plans for clinical trials, among other things, are submitted to the FDA as part of an IND. Some long-term preclinical testing, such as animal tests of reproductive adverse events and carcinogenicity, may continue after the IND is submitted.

The IND and IRB processes

An IND is an exemption from the FDCA that allows an unapproved drug to be shipped in interstate commerce for use in an investigational clinical trial and a request for FDA authorization to administer an investigational drug to humans. Such authorization must be secured prior to interstate shipment and administration of any new drug that is not the subject of an approved NDA. In support of a request for an IND, a sponsor must submit, among other things, a protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND. The sponsor may be a company seeking to develop the drug or, as in the case of an investigator-initiated trial, the sponsor may be an investigator who is conducting the trial. In addition, the results of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and plans for clinical trials, among other things, are submitted to the FDA as part of an IND. The FDA requires a 30-day waiting period after the filing of each IND before clinical trials may begin. This waiting period is designed to allow the FDA to review the IND to determine whether human research subjects will be exposed to unreasonable health risks. At any time during this 30-day period, the FDA may raise concerns or questions about the conduct of the trials as outlined in the IND and impose a clinical hold. In this case, the IND sponsor and the FDA must resolve any outstanding concerns before clinical trials can begin. If the FDA has neither commented on nor questioned the IND within this 30-day period, the clinical trial proposed in the IND may begin.

Following commencement of a clinical trial under an IND, the FDA may also place a clinical hold or partial clinical hold on that trial. A clinical hold is an order issued by the FDA to the sponsor to delay a proposed clinical investigation or to suspend an ongoing investigation. A partial clinical hold is a delay or suspension of only part of the clinical work requested under the IND. For example, a specific protocol or part of a protocol is not allowed to proceed, while other protocols may do so. No more than 30 days after imposition of a clinical hold or partial clinical hold, the FDA will provide the sponsor a written explanation of the basis for the hold. Following issuance of a clinical hold or partial

clinical hold, an investigation may only resume after the FDA has notified the sponsor that the investigation may proceed. The FDA will base that determination on information provided by the sponsor correcting the deficiencies previously cited or otherwise satisfying the FDA that the investigation can proceed.

A sponsor may choose, but is not required, to conduct a foreign clinical study under an IND. When a foreign clinical study is conducted under an IND, all IND requirements must be met unless waived. When the foreign clinical study is not conducted under an IND, the sponsor must ensure that the study complies with certain FDA regulatory requirements in order to use the study as support for an IND or application for marketing approval. Specifically, FDA has promulgated regulations governing the acceptance of foreign clinical trials not conducted under an IND, establishing that such studies will be accepted as support for an IND or application for marketing approval if the study was conducted in accordance with GCP, including review and approval by an independent ethics committee, or IEC, and use of proper procedures for obtaining informed consent from subjects, and the FDA is able to validate the data from the study through an on-site inspection if FDA deems such inspection necessary. The GCP requirements encompass both ethical and data integrity standards for clinical studies. The FDA's regulations are intended to help ensure the protection of human subjects enrolled in non-IND foreign clinical trials, as well as the quality and integrity of the resulting data. They further help ensure that non-IND foreign studies are conducted in a manner comparable to that required for IND studies. If a marketing application is based solely on foreign clinical data, the FDA requires that the foreign data be applicable to the U.S. population and U.S. medical practice; the studies must have been performed by clinical investigators of recognized competence; and the FDA must be able to validate the data through an on-site inspection or other appropriate means, if the FDA deems such an inspection to be necessary.

In addition to the foregoing IND requirements, an IRB representing each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution, and the IRB must conduct continuing review and reapprove the study at least annually. The IRB must review and approve, among other things, the study protocol and informed consent information to be provided to study subjects. An IRB must operate in compliance with FDA regulations. An IRB can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, if the clinical trial is not being conducted in accordance with the IRB's requirements or if the product candidate has been associated with unexpected serious harm to patients. A separate submission to the existing IND must be made for each successive clinical trial conducted during product development, as well as amendments to previously submitted clinical trials. Further, an independent IRB for each institution participating in the clinical trial must review and approve the plan for any clinical trial, its informed consent form, and other communications to study subjects before the clinical trial commences at that site. The IRB must continue to oversee the clinical trial while it is being conducted, including any changes to the study plans.

Additionally, some trials are overseen by an independent group of qualified experts organized by the trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated check points based on access that only the group maintains to available data from the study. Suspension or termination of development during any phase of clinical trials can occur if it is determined that the participants or patients are being exposed to an unacceptable health risk. Other reasons for suspension or termination may be made by us based on evolving business objectives and/or competitive climate.

Information about certain clinical trials must be submitted within specific timeframes to the National Institutes of Health, or NIH, for public dissemination on its ClinicalTrials.gov website.

Human clinical trials in support of an NDA

Clinical trials involve the administration of the investigational product to human subjects under the supervision of qualified investigators in accordance with GCP requirements, which include, among other things, the requirement that all research subjects provide their informed consent in writing before their participation in any clinical trial. Clinical trials are conducted under written study protocols detailing, among other things, the inclusion and exclusion criteria, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated.

Human clinical trials are typically conducted in the following sequential phases, which may overlap or be combined:

Phase 1: . . The drug is initially introduced into healthy human subjects or, in certain indications such as cancer, patients with the target disease or condition and tested for safety, dosage tolerance, absorption, metabolism, distribution, excretion and, if possible, to gain an early indication of its effectiveness and to determine optimal dosage.

Phase 2: . . The drug is administered to a limited patient population to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted diseases and to determine dosage tolerance and optimal dosage.

Phase 3: . . The drug is administered to an expanded patient population, generally at geographically dispersed clinical trial sites, in well-controlled clinical trials to generate enough data to statistically evaluate the efficacy and safety of the product for approval, to establish the overall risk-benefit profile of the product, and to provide adequate information for the labeling of the product.

Phase 4: . . Post-approval studies, which are conducted following initial approval, are typically conducted to gain additional experience and data from treatment of patients in the intended therapeutic indication.

Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA and more frequently if serious AEs occur. In addition, IND safety reports must be submitted to the FDA for any of the following: serious and unexpected suspected adverse reactions for which there is evidence to suggest a causal relationship between the drug and the AE; findings from other studies or animal or *in vitro* testing that suggest a significant risk in humans exposed to the drug; and any clinically important increase in the case of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, or at all. Furthermore, the FDA or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, if the clinical trial is not being conducted in accordance with the IRB's requirements or if the drug has been associated with unexpected serious harm to patients. The FDA will typically inspect one or more clinical sites to assure compliance with GCP and the integrity of the clinical data submitted.

Regulatory authorities, an IRB or the sponsor may suspend or discontinue a clinical trial at any time on various grounds, including a finding that the subjects are being exposed to an unacceptable health risk, the clinical trial is not being conducted in accordance with the FDA's or the IRB's requirements, or if the drug has been associated with unexpected serious harm to subjects. Some studies also include a data safety monitoring board, which receives special access to unblinded data during the clinical trial and may advise the sponsor to halt the clinical trial if it determines that there is an unacceptable safety risk for subjects or other grounds, such as no demonstration of efficacy.

Concurrent with clinical trials, companies often complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the drug as well as finalize a process for manufacturing the product in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the drug candidate and, among other things, must develop methods for testing the identity, strength, quality, and purity of the final drug. Additionally, appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the drug candidate does not undergo unacceptable deterioration over its shelf life.

Submission of an NDA to the FDA

Assuming successful completion of required clinical testing and other requirements, the results of the preclinical studies and clinical trials, together with detailed information relating to the product's chemistry, manufacture, controls and

proposed labeling, among other things, are submitted to the FDA as part of an NDA requesting approval to market the drug product for one or more indications. Data can come from company-sponsored clinical trials intended to test the safety and effectiveness of a use of a product, or from several alternative sources, including investigator-initiated trials that are not sponsored by company. Under federal law, the submission of NDAs requiring clinical data is additionally subject to an application user fee, which for federal fiscal year 2024 is $4,048,695. The sponsor of an approved NDA is also subject to annual program fees, which for fiscal year 2024 are $416,734 per eligible product.

The FDA conducts a preliminary review of an NDA within 60 days of its receipt and informs the sponsor whether the application is sufficiently complete to permit substantive review. The FDA may request additional information rather than accept an NDA for filing. In this event, the application must be resubmitted with the additional information. The resubmitted application is also subject to review before the FDA accepts it for filing. Once the submission is accepted for filing, the FDA begins an in-depth substantive review. The FDA has agreed to specified performance goals in the review process of NDAs. Most such applications are meant to be reviewed within ten months from the filing date, and most applications for "priority review" products are meant to be reviewed within six months of the filing date. The review process and the Prescription Drug User Fee Act goal date may be extended by the FDA for three additional months to consider new information or clarification provided by the applicant to address an outstanding deficiency identified by the FDA following the original submission.

Before approving an NDA, the FDA typically will inspect the facility or facilities where the product is or will be manufactured. These pre-approval inspections may cover all facilities associated with an NDA submission, including drug component manufacturing (such as APIs), finished drug product manufacturing, and control testing laboratories. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving an NDA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP.

In addition, as a condition of approval, the FDA may require an applicant to develop a REMS. REMS use risk minimization strategies beyond the professional labeling to ensure that the benefits of the product outweigh the potential risks. To determine whether a REMS is needed, the FDA will consider the size of the population likely to use the product, seriousness of the disease, expected benefit of the product, expected duration of treatment, seriousness of known or potential adverse events, and whether the product is a new molecular entity. REMS can include medication guides, physician communication plans for healthcare professionals, and elements to assure safe use, or ETASU. ETASU may include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring, and the use of patient registries. The FDA may require a REMS before approval or post-approval if it becomes aware of a serious risk associated with use of the product. The requirement for a REMS can materially affect the potential market and profitability of a product.

The FDA is required to refer an application for a novel drug to an advisory committee or explain why such referral was not made. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

Fast track, breakthrough therapy and priority review designations

The FDA is authorized to designate certain products for expedited review if they are intended to address an unmet medical need in the treatment of a serious or life-threatening disease or condition. These programs are referred to as fast track designation, breakthrough therapy designation and priority review designation. In May 2014, the FDA published a final Guidance for Industry titled "Expedited Programs for Serious Conditions-Drugs and Biologics," which provides guidance on the FDA programs that are intended to facilitate and expedite development and review of new product candidates as well as threshold criteria generally applicable to concluding that a product candidate is a candidate for these expedited development and review programs.

Specifically, the FDA may designate a product for Fast Track review if it is intended, whether alone or in combination with one or more other products, for the treatment of a serious or life-threatening disease or condition, and it demonstrates the potential to address unmet medical needs for such a disease or condition. For Fast Track products, sponsors may have greater interactions with the FDA and the FDA may initiate review of sections of a Fast Track product's application before the application is complete. This rolling review may be available if the FDA determines, after preliminary evaluation of clinical data submitted by the sponsor, that a Fast Track product may be effective. The sponsor must also provide, and the FDA must approve, a schedule for the submission of the remaining information and the sponsor must pay applicable user fees. However, the FDA's time period goal for reviewing a Fast Track application does not begin until the last section of the application is submitted. In addition, the Fast Track designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Second, a product may be designated as a Breakthrough Therapy if it is intended, either alone or in combination with one or more other products, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The FDA may take certain actions with respect to Breakthrough Therapies, including holding meetings with the sponsor throughout the development process; providing timely advice to the product sponsor regarding development and approval; involving more senior staff in the review process; assigning a cross-disciplinary project lead for the review team; and taking other steps to design the clinical trials in an efficient manner.

Third, the FDA may designate a product for priority review if it is a product that treats a serious condition and, if approved, would provide a significant improvement in safety or effectiveness. The FDA determines, on a case-by-case basis, whether the proposed product represents a significant improvement when compared with other available therapies. Significant improvement may be illustrated by evidence of increased effectiveness in the treatment of a condition, elimination or substantial reduction of a treatment-limiting product reaction, documented enhancement of patient compliance that may lead to improvement in serious outcomes, and evidence of safety and effectiveness in a new subpopulation. A priority designation is intended to direct overall attention and resources to the evaluation of such applications, and to shorten the FDA's goal for taking action on a marketing application from ten months to six months.

Accelerated approval pathway

The FDA may grant accelerated approval to a drug for a serious or life-threatening condition that provides meaningful therapeutic advantage to patients over existing treatments based upon a determination that the drug has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit. The FDA may also grant accelerated approval for such a condition when the product has an effect on an intermediate clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality, or IMM, and that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity or prevalence of the condition and the availability or lack of alternative treatments. Drugs granted accelerated approval must meet the same statutory standards for safety and effectiveness as those granted traditional approval.

For the purposes of accelerated approval, a surrogate endpoint is a marker, such as a laboratory measurement, radiographic image, physical sign or other measure that is thought to predict clinical benefit, but is not itself a measure of clinical benefit. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. An intermediate clinical endpoint is a measurement of a therapeutic effect that is considered reasonably likely to predict the clinical benefit of a drug, such as an effect on IMM. The FDA has limited experience with accelerated approvals based on intermediate clinical endpoints, but has indicated that such endpoints generally may support accelerated approval where the therapeutic effect measured by the endpoint is not itself a clinical benefit and basis for traditional approval, if there is a basis for concluding that the therapeutic effect is reasonably likely to predict the ultimate clinical benefit of a drug.

The accelerated approval pathway is most often used in settings in which the course of a disease is long and an extended period of time is required to measure the intended clinical benefit of a drug, even if the effect on the surrogate or intermediate clinical endpoint occurs rapidly. Thus, accelerated approval has been used extensively in the development

and approval of drugs for treatment of a variety of cancers in which the goal of therapy is generally to improve survival or decrease morbidity and the duration of the typical disease course requires lengthy and sometimes large trials to demonstrate a clinical or survival benefit.

The accelerated approval pathway is contingent on a sponsor's agreement to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the drug's clinical benefit. As a result, a drug candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or confirm a clinical benefit during post-marketing studies, would allow the FDA to withdraw the drug from the market on an expedited basis. All promotional materials for drug candidates approved under accelerated regulations are subject to prior review by the FDA.

Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened. In addition, the manufacturer of an investigational drug for a serious or life-threatening disease is required to make available, such as by posting on its website, its policy on responding to requests for expanded access. Furthermore, fast track designation, breakthrough therapy designation, accelerated approval and priority review do not change the standards for approval and may not ultimately expedite the development or approval process.

The FDA's decision on an NDA

The FDA reviews applications to determine, among other things, whether a product is safe and effective for its intended use and whether the manufacturing controls are adequate to assure and preserve the product's identity, strength, quality and purity. Before approving an NDA, the FDA will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities, including contract manufacturers and subcontracts, are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving an NDA, the FDA will typically inspect one or more clinical trial sites to assure compliance with GCPs.

Once the FDA receives an application, it has 60 days to review the NDA to determine if it is substantially complete to permit a substantive review, before it accepts the application for filing. Once the submission is accepted for filing, the FDA begins an in-depth review of the NDA. Under the goals and policies agreed to by the FDA under Prescription Drug User Fee Act, or PDUFA, the FDA has set the review goal of 10 months from the 60-day filing date to complete its initial review of a standard NDA for a new molecular entity, or NME, and make a decision on the application. For priority review applications, the FDA has set the review goal of reviewing NME NDAs within six months of the 60-day filing date. Such deadlines are referred to as the PDUFA date. The PDUFA date is only a goal and the FDA does not always meet its PDUFA dates. The review process and the PDUFA date may also be extended if the FDA requests or the NDA sponsor otherwise provides additional information or clarification regarding the submission during the review period that amends the original application.

On the basis of the FDA's evaluation of the NDA and accompanying information, including the results of the inspection of the manufacturing facilities, the FDA may issue an approval letter or a complete response letter. An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. If and when those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the NDA, the FDA will issue an approval letter. The FDA has committed to reviewing such resubmissions in two or six months depending on the type of information included. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

If the FDA approves a product, it may limit the approved indications for use for the product, require that contraindications, warnings or precautions be included in the product labeling, require that post-approval studies, including Phase 4 clinical trials, be conducted to further assess the drug's safety after approval, require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution

restrictions or other risk management mechanisms, including REMS, which can materially affect the potential market and profitability of the product. The FDA may prevent or limit further marketing of a product based on the results of post-market studies or surveillance programs. After approval, many types of changes to the approved product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

In addition, under the Pediatric Research Equity Act, an NDA or supplement to an NDA for a new active ingredient, indication, dosage form, dosage regimen or route of administration must contain data that are adequate to assess the safety and efficacy of the drug for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults or full or partial waivers from the pediatric data requirements.

Post-approval requirements

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims, are subject to prior FDA review and approval. There also are continuing, annual user fee requirements for any marketed products and the establishments at which such products are manufactured, as well as new application fees for supplemental applications with clinical data.

In addition, drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are required to register their establishments with the FDA and state agencies, and are subject to periodic unannounced inspections by the FDA and these state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated and often require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon the sponsor and any third-party manufacturers that the NDA holder may decide to use. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP compliance.

Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including AEs of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical trials to assess new safety risks; or imposition of distribution or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, including total or partial suspension of production, complete withdrawal of the product from the market or product recalls;
- fines, warning or untitled letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending NDAs or supplements to approved NDAs, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Drugs may be promoted only for the approved indications and in a manner and for uses consistent with the approved

labeling. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability.

In addition, the distribution of prescription drug products is subject to the Prescription Drug Marketing Act, or PDMA, which regulates the distribution of drugs and drug samples at the federal level, and sets minimum standards for the registration and regulation of drug distributors by the states. Both the PDMA and state laws limit the distribution of prescription drug product samples and impose requirements to ensure accountability in distribution.

Failure to comply with any of the FDA's requirements could result in significant adverse enforcement actions. These include a variety of administrative or judicial sanctions, such as refusal to approve pending applications, license suspension or revocation, withdrawal of an approval, imposition of a clinical hold or termination of clinical trials, warning letters, untitled letters, modification of promotional materials or labeling, product recalls, product seizures or detentions, refusal to allow imports or exports, total or partial suspension of production or distribution, debarment, injunctions, fines, consent decrees, corporate integrity agreements, refusals of government contracts and new orders under existing contracts, exclusion from participation in federal and state healthcare programs, restitution, disgorgement or civil or criminal penalties, including fines and imprisonment. It is also possible that failure to comply with the FDA's requirements relating to the promotion of prescription drugs may lead to investigations alleging violations of federal and state healthcare fraud and abuse and other laws, as well as state consumer protection laws. Any of these sanctions could result in adverse publicity, among other adverse consequences.

U.S. Marketing Exclusivity

In 1984, with passage of the Hatch-Waxman Amendments to the FDCA, Congress established an abbreviated regulatory scheme allowing the FDA to approve generic drugs that are shown to contain the same active ingredients as, and to be bioequivalent to, drugs previously approved by the FDA pursuant to NDAs. To obtain approval of a generic drug, an applicant must submit an abbreviated new drug application, or ANDA, to the agency. An ANDA is a comprehensive submission that contains, among other things, data and information pertaining to the API, bioequivalence, drug product formulation, specifications and stability of the generic drug, as well as analytical methods, manufacturing process validation data and quality control procedures. ANDAs are "abbreviated" because they generally do not include preclinical and clinical data to demonstrate safety and effectiveness. Instead, in support of such applications, a generic manufacturer may rely on the preclinical and clinical testing previously conducted for a drug product previously approved under an NDA, known as the reference-listed drug, or RLD.

Specifically, in order for an ANDA to be approved, the FDA must find that the generic version is identical to the RLD with respect to the active ingredients, the route of administration, the dosage form, and the strength of the drug. An applicant may submit an ANDA suitability petition to request the FDA's prior permission to submit an abbreviated application for a drug that differs from the RLD in route of administration, dosage form, or strength, or for a drug that has one different active ingredient in a fixed-combination drug product (i.e., a drug product with multiple active ingredients). At the same time, the FDA must also determine that the generic drug is "bioequivalent" to the innovator drug. Under the statute, a generic drug is bioequivalent to a RLD if "the rate and extent of absorption of the drug do not show a significant difference from the rate and extent of absorption of the listed drug." Upon approval of an ANDA, the FDA indicates whether the generic product is "therapeutically equivalent" to the RLD in its publication "Approved Drug Products with Therapeutic Equivalence Evaluations," also referred to as the "Orange Book." Physicians and pharmacists may consider a therapeutic equivalent generic drug to be fully substitutable for the RLD. In addition, by operation of certain state laws and numerous health insurance programs, the FDA's designation of therapeutic equivalence often results in substitution of the generic drug without the knowledge or consent of either the prescribing physician or patient.

Under the Hatch-Waxman Amendments, the FDA may not approve an ANDA until any applicable period of non-patent exclusivity for the RLD has expired. The FDCA provides a period of five years of non-patent data exclusivity for a new drug containing a new chemical entity. For the purposes of this provision, an NCE is a drug that contains no active moiety that has previously been approved by the FDA in any other NDA. An active moiety is the molecule or ion responsible for the physiological or pharmacological action of the drug substance. In cases where such NCE exclusivity has been granted, an ANDA may not be submitted to the FDA until the expiration of five years from the date the NDA is approved, unless the submission is accompanied by a Paragraph IV certification that a listed patent for the RLD is

invalid or will not be infringed by the drug that is the subject of the ANDA, in which case the applicant may submit its application four years following the original product approval.

The FDCA also provides for a period of three years of exclusivity if the NDA includes reports of one or more new clinical investigations, other than bioavailability or bioequivalence studies, that were conducted by or for the applicant and are essential to the approval of the application. This three-year exclusivity period often protects changes to a previously approved drug product, such as a new dosage form, route of administration, combination or indication. Three-year exclusivity would only be available for a drug product that contains a previously approved active moiety, provided the statutory requirement for a new clinical investigation is satisfied. Unlike five-year NCE exclusivity, an award of three-year exclusivity does not block the FDA from accepting ANDAs seeking approval for generic versions of the drug as of the date of approval of the original drug product; it does, however, block the FDA from approving ANDAs during the period of exclusivity. The FDA typically makes decisions about awards of data exclusivity shortly before a product is approved.

505(b)(2) NDAs

As an alternative path to FDA approval for modifications to formulations or uses of products previously approved by the FDA pursuant to an NDA, an applicant may submit an NDA under Section 505(b)(2) of the FDCA. Section 505(b)(2) was enacted as part of the Hatch-Waxman Amendments and permits the filing of an NDA where at least some of the information required for approval comes from studies not conducted by, or for, the applicant, and for which the applicant has not obtained a right of reference. If the 505(b)(2) applicant can establish that reliance on FDA's previous findings of safety and effectiveness is scientifically and legally appropriate, it may eliminate the need to conduct certain preclinical studies or clinical trials of the new product. The FDA may also require companies to perform additional bridging studies or measurements, including clinical trials, to support the change from the previously approved reference drug. The FDA may then approve the new product candidate for all, or some, of the label indications for which the reference drug has been approved, as well as for any new indication sought by the 505(b)(2) applicant. An RLD's unexpired non-patent exclusivities would also block FDA from accepting or approving 505(b)(2) NDAs in the same way as they apply to ANDAs.

Hatch-Waxman patent certification and the 30-Month Stay

Upon approval of an NDA or a supplement thereto, NDA sponsors are required to list with the FDA each patent with claims that cover the applicant's product or an approved method of using the product. Each of the patents listed by the NDA sponsor is published in the Orange Book. When an ANDA applicant files its application with the FDA, the applicant is required to certify to the FDA concerning any patents listed for the reference product in the Orange Book, except for patents covering methods-of-use for which the ANDA applicant is not seeking approval. To the extent that the Section 505(b)(2) applicant is relying on studies conducted for an already approved product, the applicant is required to certify to the FDA concerning any patents listed for the approved product in the Orange Book to the same extent that an ANDA applicant would.

Specifically, the applicant must certify with respect to each patent that:

- the required patent information has not been filed;
- the listed patent has expired;
- the listed patent has not expired, but will expire on a particular date and approval is sought after patent expiration; or
- the listed patent is invalid, unenforceable or will not be infringed by the new product.

A certification that the new product will not infringe the already approved product's listed patents or that such patents are invalid or unenforceable is called a Paragraph IV certification. If the applicant does not challenge the listed patents or indicates that it is not seeking approval of a patented method of use, the application will not be approved until all the

listed patents claiming the referenced product have expired (other than method of use patents involving indications for which the applicant is not seeking approval).

If the ANDA or 505(b)(2) applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA or 505(b)(2) application has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the Paragraph IV certification. The filing of a patent infringement lawsuit within 45 days after the receipt of a Paragraph IV certification automatically prevents the FDA from granting final approval of the application until the earlier of 30 months after the receipt of the Paragraph IV notice, expiration of the patent, or a decision in the infringement case that is favorable to the applicant. The ANDA or 505(b)(2) application also will not be approved until any applicable non-patent exclusivity listed in the Orange Book for the branded reference drug has expired.

Pediatric studies and exclusivity

Under the Pediatric Research Equity Act of 2003, an NDA or supplement thereto must contain data that are adequate to assess the safety and effectiveness of the drug product for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. With enactment of the Food and Drug Administration Safety and Innovation Act of 2012, sponsors must also submit pediatric study plans prior to the assessment data.

Those plans must contain an outline of the proposed pediatric study or studies the applicant plans to conduct, including study objectives and design, any deferral or waiver requests, and other information required by regulation. The applicant, the FDA, and the FDA's internal review committee must then review the information submitted, consult with each other, and agree upon a final plan. The FDA or the applicant may request an amendment to the plan at any time.

The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements. Additional requirements and procedures relating to deferral requests and requests for extension of deferrals are contained in FDASIA. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan designation.

Pediatric exclusivity is another type of non-patent marketing exclusivity in the United States and, if granted, provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity, including the non-patent and orphan exclusivity. This six-month exclusivity may be granted if an NDA sponsor submits pediatric data that fairly respond to a written request from the FDA for such data. The data do not need to show the product to be effective in the pediatric population studied; rather, if the clinical trial is deemed to fairly respond to the FDA's request, the additional protection is granted. If reports of requested pediatric studies are submitted to and accepted by the FDA within the statutory time limits, whatever statutory or regulatory periods of exclusivity or patent protection cover the product are extended by six months. This is not a patent term extension, but it effectively extends the regulatory period during which the FDA cannot approve another application. FDA may only grant pediatric exclusivity if existing patent or exclusivity protections for the drug would otherwise expire at least 9 months after the grant of the pediatric exclusivity; FDA has 180 days to make a pediatric exclusivity determination once the NDA sponsor submits study reports required under the written request.

Orphan drug designation and exclusivity

Under the Orphan Drug Act, the FDA may designate a drug product as an "orphan drug" if it is intended to treat a rare disease or condition (generally meaning that it affects fewer than 200,000 individuals in the United States, or more in cases in which there is no reasonable expectation that the cost of developing and making a drug product available in the United States for treatment of the disease or condition will be recovered from sales of the product). A company must request orphan product designation before submitting an NDA. If the request is granted, the FDA will disclose the identity of the therapeutic agent and its potential use. Orphan product designation does not convey any advantage in or shorten the duration of the regulatory review and approval process. Among the other benefits of orphan drug designation

are tax credits for certain research and an exemption from the NDA or BLA application fee. The FDA may revoke orphan drug designation, and if it does, it will publicize that the drug is no longer designated as an orphan drug.

If the sponsor of a product with orphan designation receives the first FDA approval for that drug for the disease or condition for which it has such designation or for a select indication or use within the rare disease or condition for which it was designated, the product generally will receive orphan product exclusivity. Orphan product exclusivity means that the FDA may not approve any other applications for the same product for the same indication for seven years, except in certain limited circumstances. If a drug or drug product designated as an orphan product ultimately receives marketing approval for an indication broader than what was designated in its orphan product application, it may not be entitled to exclusivity. Orphan drug exclusivity, however, could also block the approval of one of our therapeutic candidates for seven years if a competitor obtains orphan drug designation and FDA approval of the same therapeutic candidate for the same condition or disease as our orphan-designated drug.

Orphan exclusivity will not bar approval of another product under certain circumstances, including if a subsequent product with the same active ingredient for the same indication is shown to be clinically superior to the approved product on the basis of greater efficacy or safety, or providing a major contribution to patient care, or if the company with orphan drug exclusivity is not able to meet market demand. Further, the FDA may approve more than one product for the same orphan indication or disease as long as the products contain different active ingredients. Moreover, competitors may receive approval of different products for the indication for which the orphan product has exclusivity or obtain approval for the same product but for a different indication for which the orphan product has exclusivity.

In addition, as the FDA has interpreted the Orphan Drug Act, even if a previously approved same drug does not have unexpired orphan exclusivity, a demonstration of clinical superiority is required for a subsequent marketing application for the same orphan-designated drug for the same disease or condition to be awarded a 7-year period of orphan exclusivity upon marketing approval. In recent years, there have been multiple legal challenges to this FDA interpretation, and in August 2017, Congress amended the orphan drug provisions of the FDCA through enactment of the FDA Reauthorization Act of 2017 to codify FDA's longstanding interpretation. Section 527 of the FDCA now expressly provides that if a sponsor of an orphan-designated drug that is otherwise the same as an already approved drug for the same rare disease or condition is seeking orphan exclusivity, FDA shall require such sponsor, to demonstrate that such drug is clinically superior to any already approved or licensed drug that is the same drug in order to obtain orphan drug exclusivity.

In September 2021, the United States Court of Appeals for the Eleventh Circuit decided in *Catalyst Pharmaceuticals, Inc. v. FDA* that the FDA's interpretation of orphan drug exclusivity "for the same drug for the same disease or condition" as meaning the same "use or indication" was inappropriately narrow. This decision had the potential to significantly broaden the scope of orphan drug exclusivity for drugs that receive marketing approval for orphan indications that are narrower than their orphan-designated conditions in the United States. On January 24, 2023, the FDA issued a statement to address the uncertainty created by the circuit court's decision in *Catalyst*. This notification announced that, at this time, in matters beyond the scope of that court order (i.e., ordering the FDA to set aside its approval of the specific drug at issue), the FDA intends to continue to apply its existing regulations tying orphan-drug exclusivity to the uses or indications for which the orphan drug was approved. We cannot guarantee which rules and interpretations will be governing going forward in different situations, that the FDA will maintain this current position, or that other judicial actions will not impact the FDA's application of the Orphan Drug Act.

Patent term restoration and extension

A patent claiming a new drug product may be eligible for a limited patent term extension under the Hatch-Waxman Act, which permits a patent restoration of up to five years for patent term lost during product development and the FDA regulatory review. The restoration period granted is typically one-half the time between the effective date of an IND and the submission date of an NDA less any time the applicant did not act with due diligence during the period, plus the time between the submission date of an NDA and the ultimate approval date less any time the applicant did not act with due diligence during the period. Patent term restoration cannot be used to extend the remaining term of a patent past a total of 14 years from the product's approval date. Only one patent applicable to an approved drug product is eligible for the extension, only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be

extended, and the application for the extension must be submitted prior to the expiration of the patent in question. A patent that covers multiple drugs for which approval is sought can only be extended in connection with one of the approvals. The USPTO reviews and approves the application for any patent term extension or restoration in consultation with the FDA. Similar provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug. In the future, if and when our products receive FDA approval, we expect to apply for patent term extensions on patents covering those products. We plan to seek patent term extensions to any of our issued patents in any jurisdiction where these are available, however there is no guarantee that the applicable authorities, including the FDA in the United States, will agree with our assessment of whether such extensions should be granted, and if granted, the length of such extensions. For more information regarding the risks related to our intellectual property, see "Risk Factors—Risks Related to Our Intellectual Property."

Regulations outside the United States

We will be subject to similar foreign laws and regulations concerning the development of our product candidates outside of the United States in the future.

Coverage and reimbursement

Our ability to commercialize any products successfully will also depend in part on the extent to which coverage and adequate reimbursement for the procedures utilizing our product candidates, performed by health care providers, once approved, will be available from government health administration authorities, private health insurers and other organizations. Government authorities and other third-party payors, such as private health insurers and health maintenance organizations, determine which procedures, and the products utilized in such procedures, they will cover and establish reimbursement levels. Assuming coverage is obtained for procedures utilizing a given product by a third-party payor, the resulting reimbursement payment rates may not be adequate or may require co-payments that patients find unacceptably high. Patients who undergo procedures for the treatment of their conditions, and their treating physicians, generally rely on third-party payors to reimburse all or part of the costs associated with the procedures which utilize our products. Treating physicians are unlikely to use and order our products unless coverage is provided and the reimbursement is adequate to cover all or a significant portion of the cost of the procedures which utilize our products. Therefore, coverage and adequate reimbursement for procedures which utilize new products is critical to the acceptance of such new products. Coverage decisions may depend upon clinical and economic standards that disfavor new products when more established or lower cost therapeutic alternatives are already available or subsequently become available.

Government authorities and other third-party payors are developing increasingly sophisticated methods of cost containment, such as including price controls, restrictions on coverage and reimbursement and requirements for substitution of less expensive products and procedures. Government and other third-party payors are increasingly challenging the prices charged for health care products and procedures, examining the cost effectiveness of procedures, and the products used in such procedures, in addition to their safety and efficacy, and limiting or attempting to limit both coverage and the level of reimbursement. Further, no uniform policy requirement for coverage and reimbursement exists among third-party payors in the United States, which causes significant uncertainty related to the insurance coverage and reimbursement of newly approved products, and the procedures which may utilize such newly approved products. Therefore, coverage and reimbursement can differ significantly from payor to payor and health care provider to health care provider. As a result, the coverage determination process is often a time-consuming and costly process that requires the provision of scientific and clinical support for the use of new products to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance.

There may be significant delays in obtaining coverage and reimbursement for newly approved products, and coverage may be more limited than the purposes for which the product is approved by the FDA. Moreover, eligibility for coverage and reimbursement does not imply that a product, or the procedures which utilize such product, will be paid for in all cases or at a rate which the health care providers who purchase those products will find cost effective. Additionally, we expect pricing pressures in connection with the sale of any of our product candidates due to the trend toward managed healthcare, the increasing influence of health maintenance organizations, and additional legislative changes.

We cannot be sure that coverage and reimbursement will be available for any product that we commercialize, or the procedures which utilize such product, and, if reimbursement is available, what the level of reimbursement will be. Coverage and reimbursement may impact the demand for, or the price of, any product candidate for which we obtain marketing approval. If coverage and reimbursement are not available or reimbursement is available only to limited levels, we may not successfully commercialize any product candidate for which we obtain marketing approval.

Healthcare law and regulation

In the United States, our activities are potentially subject to regulation by various federal, state, and local authorities in addition to the FDA, including but not limited to, CMS, other divisions of the U.S. Department of Health and Human Services (such as the Office of Inspector General, or OIG, and the Health Resources and Service Administration), the U.S. Department of Justice, and individual U.S. Attorney offices, and state and local governments. For example, sales, marketing, and scientific/educational grant programs are subject to the federal Anti-Kickback Statute and the federal False Claims Act, may have to comply with the privacy and security provisions of HIPAA (defined below), and may be subject to similar state laws, each as amended, as applicable. Healthcare providers and third-party payors play a primary role in the recommendation and prescription of drug products that are granted marketing approval. Arrangements with providers, consultants, third-party payors and customers are subject to these broadly applicable healthcare laws and regulations that may constrain our business and/or financial arrangements.

The applicable federal and state healthcare laws and regulations, include, without limitation, the following:

- *The Federal Anti-Kickback Statute*—An intent-based federal criminal statute that prohibits, among other things, any person from knowingly and willfully soliciting, offering, receiving or paying remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation or arranging of, any good or service, for which payment may be made, in whole or in part, by a federal health care program, such as Medicare and Medicaid. The term "remuneration" has been broadly interpreted to include anything of value. The PPACA (as defined below), among other things, amended the intent requirement of the federal Anti-Kickback Statute, to clarify that a person or entity need not have actual knowledge of this statute or specific intent to violate it. The Anti-Kickback Statute applies to arrangements between pharmaceutical manufacturers on the one hand and individuals, such as prescribers, patients, purchasers, and formulary managers on the other hand, including, for example, consulting/speaking arrangements, discount and rebate offers, grants, charitable contributions, and patient support offerings, among others. A conviction for violation of the Anti-Kickback Statute can result in criminal fines and/or imprisonment and requires mandatory exclusion from participation in federal health care programs. Exclusion may also be imposed if the government determines that an entity has committed acts that are prohibited by the Anti-Kickback Statute. Although there are a number of statutory exceptions and regulatory safe harbors to the federal Anti-Kickback Statute that protect certain common industry practices from prosecution, the exceptions and safe harbors are narrowly drawn, and arrangements may be subject to scrutiny or penalty if they do not fully satisfy all elements of an available exception or safe harbor. The Anti-Kickback Statute safe harbors have been the subject of recent regulatory reforms. As a general matter, however, any changes to the safe harbors may impact our future contractual and other arrangements with pharmacy benefit managers, group purchasing organizations, third-party payors, wholesalers and distributors, healthcare providers and prescribers, and other entities, as well as our future pricing strategies.

- *The Federal Civil False Claims Act*—Imposes civil penalties, including through civil whistleblower or *qui tam* actions, against individuals or entities for, among other things, knowingly presenting, or causing to be presented, false or fraudulent claims for payment to a federal health care program or knowingly making using or causing to be made or used a false statement or record material to payment of a false claim or avoiding, decreasing or concealing an obligation to pay money to the federal government, with potential liability including mandatory treble damages and significant per-claim penalties, currently set at $11,803 to $23,607 per false claim or statement for penalties assessed after December 13, 2021, with respect to violations occurring after November 2, 2015. Pharmaceutical companies have been investigated and/or subject to government enforcement actions asserting liability under the federal civil False Claims Act in

connection with their alleged off-label promotion of drugs, purportedly concealing price concessions in the pricing information submitted to the government for government price reporting purposes (e.g., under the Medicaid Drug Rebate Program), and allegedly providing free product to customers with the expectation that the customers would bill federal health care programs for the product. In addition, the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal False Claims Act. As a result of a modification made by the Fraud Enforcement and Recovery Act of 2009, a claim includes "any request or demand" for money or property presented to the U.S. government. In addition, manufacturers can be held liable under the federal False Claims Act even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent claims. There is also the federal criminal False Claims Act, which is similar to the federal civil False Claims Act and imposes criminal liability on those that make or present a false, fictitious, or fraudulent claim to the federal government.

- *The Federal Criminal Statute on False Statements Relating to Health Care Matters*—Makes it a crime to knowingly and willfully falsify, conceal, or cover up a material fact, make any materially false, fictitious, or fraudulent statements or representations, or make or use any materially false writing or document knowing the same to contain any materially false, fictitious, or fraudulent statement or entry in connection with the delivery of or payment for healthcare benefits, items, or services.

- *HIPAA Criminal Federal Health Care Fraud Statute*—Enacted as part of the Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), makes it a crime to knowingly and willfully execute, or attempt to execute, a scheme or artifice to defraud any health care benefit program or to obtain, by means of false or fraudulent pretenses, representations, or promises, any of the money or property owned by, or under the custody or control of any health care benefit program in connection with the delivery of or payment for healthcare benefits, items, or services. A violation of this statute is a felony and may result in fines, imprisonment or exclusion from government sponsored programs, or integrity oversight and reporting obligations to resolve allegations of non-compliance.

- *The Federal Civil Monetary Penalties Law*—Authorizes the imposition of substantial civil monetary penalties against an entity, such as a pharmaceutical manufacturer, that engages in activities including, among others (1) knowingly presenting, or causing to be presented, a claim for services not provided as claimed or that is otherwise false or fraudulent in any way; (2) arranging for or contracting with an individual or entity that is excluded from participation in federal healthcare programs to provide items or services reimbursable by a federal healthcare program; (3) violations of the federal Anti-Kickback Statute; or (4) failing to report and return a known overpayment.

- *HIPAA Health Information Privacy and Security*—Numerous federal and state laws, rules and regulations govern the collection, dissemination, use, privacy, security and confidentiality of personal information. HIPAA, as amended by the federal Health Information Technology for Economic and Clinical Health Act ("HITECH"), in addition to the criminal powers described above, HIPAA requires covered entities, including health plans and most health care providers, to implement administrative, physical, and technical safeguards to protect the privacy and security of covered information (known as "protected health information") and sets limits and conditions on the uses and disclosures that may be made of such information without the authorization of the relevant individual. HIPAA's Security Rule and certain provisions of the HIPAA Privacy Rule and Breach Notification Rule apply to business associates of covered entities (i.e., entities that provide services to covered entities that may require access and use of handle protected health information on behalf of covered entities), and business associates are subject to direct liability for violation of these Rules. In addition, a covered entity may be subject to criminal and civil penalties as a result of a business associate violating HIPAA, if the business associate is found to be an agent of the covered entity. Covered entities must report breaches of unsecured protected health information to affected individuals without unreasonable delay and notification must also be made to the U.S. Department of Health & Human Services, Office for Civil Rights (OCR) and, in certain situations involving large breaches, to the media. HITECH also created tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state

attorneys general new authority to file civil actions for damages or injunctions in U.S. federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions. OCR enforces the HIPAA Rules and performs compliance audits and investigations. In addition to enforcement by OCR, HIPAA authorizes state attorneys general to bring civil actions seeking either injunction or damages in response to HIPAA violations that impact state residents. On December 1, 2022, OCR issued a bulletin on the requirements under HIPAA for online tracking technologies (e.g., cookies, pixels) to protect the privacy and security of health information. This bulletin outlined OCR's position on the use of online tracking technology vendors, when certain information received by such vendors constitutes protected health information under HIPAA, and accordingly, when business associate agreements must be executed between covered entities and such vendors. The HIPAA Rules impose and will continue to impose significant costs on us in order to comply with these standards.

- *Other Privacy Laws*—HIPAA establishes a federal "floor" with respect to privacy, security, and breach notification requirements and does not supersede any state laws insofar as they are broader or more stringent than HIPAA. There are numerous other laws, regulations and legislative and regulatory initiatives at the federal and state levels addressing privacy and security of personal data. Depending on the data we receive, we may be subject to federal and state privacy-related laws that may be more restrictive or contain different requirements than the privacy regulations issued under HIPAA. These laws vary and could impose additional penalties and requirements related to such data. For example, the Federal Trade Commission (FTC) uses its consumer protection authority to initiate enforcement actions against companies relating to their use and disclosure of personally identifiable information. Specifically, FTC has asserted authority and issued enforcement actions in response to actual or perceived unfair or deceptive practices by a company in the handling of consumer information. The FTC has also pursued enforcement actions against companies for violations of its Health Breach Notification Rule and the Children's Online Privacy Protection Act. Further, certain states have proposed or enacted legislation that will create new data privacy and security obligations for certain entities. These new laws include the California Consumer Privacy Act, or CCPA, which came into effect January 1, 2020 and was amended and expanded by the California Privacy Rights Act, or CPRA, passed on November 3, 2020, and effective as of January 1, 2023; the Virginia Consumer Data Protection Act, effective as of January 1, 2023; the Colorado Privacy Act and the Connecticut Data Privacy Act, both effective as of July 1, 2023; the Utah Consumer Privacy Act, effective as of December 31, 2023, and the Washington My Health My Data Act ("MHMDA"), with certain provisions effective as of July 1, 2023 and other provisions effective March 31, 2024. Among other things, these state-specific laws create new data privacy obligations for covered companies and provide new privacy rights to state residents, including the right to opt out of certain disclosures of their information. The CCPA also created a private right of action with statutory damages for certain data breaches, thereby potentially increasing risks associated with a data breach. The MHMDA also contains a private right of actions. Draft regulations implementing the state statutes have been published, but many questions remain as to how all of the new statutes will be interpreted. The effects of state data protection laws are significant and have required us to modify our data processing practices and may cause us to incur substantial costs and expenses to ensure ongoing compliance, particularly given our base of operations in California. Various U.S. state laws and regulations may also require us to notify affected individuals and state agencies in the event of a data breach involving individually identifiable information. In addition to the laws discussed above, we may see more stringent state and federal privacy legislation passed in 2024 and beyond, as the increased cyber-attacks during the ongoing COVID-19 pandemic have once again put a spotlight on data privacy and security in the U.S. and other jurisdictions. We cannot predict where new legislation might arise, the scope of such legislation, or the potential impact to our business and operations. We expect to incur additional costs to ensure that our data privacy and security policies, procedures, and activities comply with applicable and evolving legal requirements.

- *The Federal Physician Payments Sunshine Act*—Requires "applicable manufacturers" of drugs, devices, biologics, and medical supplies for which payment is available under Medicare, Medicaid or the State Children's Health Insurance Program, among others, to track and report annually to the federal government (for disclosure to the public) certain payments and other transfers of value they make to "covered recipients." The term covered recipients includes U.S.-licensed physicians, teaching hospitals, physician

assistants, nurse practitioners, clinical nurse specialists, anesthesiologist assistants, certified nurse anesthetists, and certified nurse midwives. If we become an applicable manufacturer, reimbursable by federal healthcare programs, then we will be subject to this law, which would require us to track and annually report certain direct or indirect payments and other transfers of value to such covered recipients. We are also required to report certain ownership or investment interests held by physicians and their immediate family members. CMS has the potential to impose penalties of up to $1.36 million per year for violations of the Physician Payment Sunshine Act, depending on the circumstances, and reported payments also have the potential to draw scrutiny to our relationships with health care practitioners and academic medical institutions, which may have implications under the Anti-Kickback Statute and other healthcare laws.

- *The Federal Food, Drug and Cosmetic Act*—A set of laws, which prohibits, among other things, the adulteration or misbranding of drugs, biologics and medical devices.

- *Analogous State and Foreign Laws*—There are state and foreign law equivalents of the above federal laws, such as the Anti-Kickback Statute and the False Claims Act, which may apply to items or services reimbursed by any third-party payor, including commercial insurers (i.e., so-called "all-payor anti-kickback laws"), as well as state and foreign laws that govern the privacy and security of health information or personally identifiable information in certain circumstances, including state health information privacy and data breach notification laws which govern the collection, use, disclosure, and protection of health-related and other personal information, many of which differ from each other in significant ways and, with respect to state laws, are often not pre-empted by HIPAA, thus requiring additional compliance efforts.

- *State and Foreign Laws Regulating Pharmaceutical Manufacturer Compliance Programs, Drug Price Transparency, and Other Practices*—Some state and foreign laws require pharmaceutical companies to implement compliance programs, comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government, or to track and report gifts, compensation, or other remuneration to physicians and other healthcare providers. Several U.S. states and localities have enacted legislation requiring pharmaceutical companies to establish marketing compliance programs, file periodic reports, and/or make periodic public disclosures on sales, marketing, pricing, clinical trials, and other activities. Other state laws prohibit certain marketing-related activities including the provision of gifts, meals or other items to certain healthcare providers, and restrict the ability of manufacturers to offer co-pay support to patients for certain prescription drugs. In addition, several recently passed state laws require disclosures related to state agencies and/or commercial purchasers with respect to certain price increases that exceed a certain level as identified in the relevant statutes. Some of these laws and regulations contain ambiguous requirements that government officials have not yet clarified. Given the lack of clarity in the laws and their implementation, our reporting actions could be subject to the penalty provisions of the pertinent federal and state laws and regulations.

- *FCPA and Other Anti-Bribery and Anti-Corruption Laws*—The U.S. Foreign Corrupt Practices Act, or FCPA, prohibits U.S. corporations and their representatives from offering, promising, authorizing or making payments to any foreign government official, government staff member, political party or political candidate in an attempt to obtain or retain business abroad. The scope of the FCPA would include interactions with certain healthcare professionals in many countries, either directly or through our contracted distributors. Our present and future business has been and will continue to be subject to various other U.S. and foreign laws, rules and/or regulations.

We expect that one or more of our products, if approved, may be eligible for coverage under Medicare, the federal health care program that provides health care benefits to the aged and disabled, including coverage for outpatient services and supplies, such as certain drug products, that are medically necessary to treat a beneficiary's health condition. In addition, one or more of our products, if approved, may be covered and reimbursed under other federal health care programs, such as Medicaid and the 340B Drug Pricing Program. The Medicaid Drug Rebate Program requires pharmaceutical manufacturers to enter into and have in effect a national drug rebate agreement with the Secretary of the Department of Health and Human Services in exchange for state Medicaid coverage of most of the manufacturer's drugs and pay

quarterly rebates based on utilization of a manufacturer's covered outpatient drugs under the program as a condition for states to receive federal matching funds for a manufacturer's covered outpatient drugs furnished to Medicaid patients and in order for payment to be available for a manufacturer's drugs under Medicare Part B. When a manufacturer markets a new covered outpatient drug (COD), it must also submit product and pricing data concerning the drug to CMS via the Medicaid Drug Programs (MDP) system. Pharmaceutical manufacturers are also required to participate in the 340B Drug Pricing Program, administered by the Health Resources and Services Administration (HRSA) in order for payment to be available for a manufacturer's drugs under Medicaid and Medicare Part B. Under the 340B Drug Pricing Program, a manufacturer must charge no more than the 340B "ceiling price" for its covered outpatient drugs purchased by statutorily defined covered entities that participate in the program.

In addition, federal law requires that, in order for payment to be available for a manufacturer's drugs under Medicaid and Medicare Part B, as well as to be purchased by certain federal agencies and grantees, it must also participate in the Department of Veterans Affairs ("VA") Federal Supply Schedule ("FSS") pricing program. To participate, manufacturers are required to enter into an FSS contract and other agreements with the VA for their covered drugs. Under these agreements, manufacturers must make their covered drugs available to the "Big Four" federal agencies—the VA, the Department of Defense ("DoD"), the Public Health Service (including the Indian Health Service), and the Coast Guard—at pricing that is capped pursuant to a statutory federal ceiling price, or FCP, formula. The FCP is based on a weighted average non-federal average manufacturer price, which manufacturers are required to report on a quarterly and annual basis to the VA. Further, pursuant to regulations issued by the DoD to implement Section 703 of the National Defense Authorization Act for Fiscal Year 2008, manufacturers may enter into an agreement with the Defense Health Agency (DHA) under which they agree to honor "Big Four" pricing for their covered drugs when they are dispensed to TRICARE beneficiaries by TRICARE retail network pharmacies.

As part of the requirements to participate in these government programs, many pharmaceutical manufacturers must calculate and report certain price reporting metrics to the government, such as average manufacturer price, best price, average sales price, and non-federal average manufacturer price. The calculations can be complex and are often subject to interpretation by manufacturers, governmental or regulatory agencies and the courts. Governmental agencies may also make changes in program interpretations, requirements, or conditions of participation, some of which may have implications for amounts previously estimated or paid. Any failure to comply with these price reporting and rebate payment obligations, when applicable, could negatively impact our financial results. Civil monetary penalties can be applied if a manufacturer is found to have knowingly submitted any false price information to the government, if a manufacturer is found to have made a misrepresentation in the reporting of its average sales price, or if a manufacturer fails to submit the required price data on a timely basis. Such conduct also could be grounds for CMS to terminate a manufacturer's Medicaid drug rebate agreement, in which case federal payments may not be available under Medicaid or Medicare Part B for a manufacturer's covered outpatient drugs and may provide a basis for other potential liability under other federal laws such as the False Claims Act.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations, guidance, case law or other applicable law. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, individual imprisonment, exclusion from participation in federal health care programs, such as Medicare and Medicaid, disgorgement, reputational harm, additional oversight and reporting obligations pursuant to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with applicable laws and regulations, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to market our products, if approved, and adversely impact our financial results. Although effective compliance programs can mitigate the risk of investigation and prosecution for violations of these laws and regulations, these risks cannot be eliminated entirely. Any action against us for an alleged or suspected violation could cause us to incur significant legal expenses and could divert our management's attention from the operation of our business, even if our defense is successful. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found not to be in compliance with applicable laws, it may be costly to us in terms of money, time and resources, and they may be subject to criminal, civil or administrative sanctions, including exclusion from government-funded healthcare programs.

U.S. healthcare reform

In the United States and some foreign jurisdictions, there have been and continue to be a number of legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of our product candidates, restrict or regulate post-approval activities and affect our ability, or the ability of our future collaborators, to effectively sell any drugs for which we, or they, obtain marketing approval. We expect that current laws, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and additional downward pressure on the price that we, or our future collaborators, may receive for any approved drugs. For example, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (collectively, "PPACA") has substantially changed and continues to impact healthcare financing and delivery by both government payors and private insurers. Among the PPACA provisions of importance to the pharmaceutical industry, in addition to those otherwise described above, are the following:

- an annual, nondeductible fee on any entity that manufactures or imports specified branded prescription drugs and biologic agents, apportioned among these entities according to their market share in certain federal programs identified in the PPACA;

- expansion of beneficiary eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to certain individuals with income at or below 138% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability;

- expansion of manufacturers' rebate liability under the Medicaid Drug Rebate Program by increasing the minimum rebate for both branded and generic drugs and revising the definition of "average manufacturer price" for calculating and reporting Medicaid drug rebates on outpatient prescription drug prices;

- extension of manufacturers' Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations;

- a separate methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected;

- expansion of the types of entities eligible for the 340B drug discount program;

- establishment of the Medicare Part D coverage gap discount program that, as a condition for the manufacturers outpatient drugs to be covered under Medicare Part D, requires manufacturers to provide a now 70% point-of-sale-discount off the negotiated price of applicable brand drugs to eligible beneficiaries during their coverage gap period;

- establishment of the Center for Medicare and Medicaid Innovation within the Centers for Medicare and Medicaid Services to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending;

- creation of the Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research;

- reporting of certain financial arrangements between manufacturers of drugs, biologics, devices, and medical supplies and physicians and teaching hospitals under the Physician Payments Sunshine Act; and

- annual reporting of certain information regarding drug samples that manufacturers and distributors provide to licensed practitioners.

The framework of the PPACA continues to evolve as a result of executive, legislative, regulatory, and administrative developments that have challenged the law and contribute to legal uncertainty that could affect the profitability of our

products. While Congress has not enacted legislation to comprehensively repeal the PPACA, legislation affecting the PPACA has been signed into law, including the elimination, effective January 1, 2019, of the tax-based shared responsibility payment imposed by the PPACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year, which is commonly referred to as the "individual mandate." In December 2018, a federal district court in Texas ruled that the PPACA's individual mandate, without the penalty that was eliminated effective January 1, 2019, was unconstitutional and could not be severed from the PPACA. As a result, the court ruled the remaining provisions of the PPACA were also invalid. The Fifth Circuit Court of Appeals affirmed the district court's ruling that the individual mandate was unconstitutional, but it remanded the case back to the district court for further analysis of whether the mandate could be severed from the PPACA (i.e., whether the entire PPACA was therefore also unconstitutional). On June 17, 2021, the U.S. Supreme Court dismissed this challenge without specifically ruling on the constitutionality of the PPACA.

Effective January 1, 2019, the Bipartisan Budget Act of 2018, among other things, further amended portions of the Social Security Act implemented as part of the PPACA to increase from 50% to 70% the point-of-sale discount that pharmaceutical manufacturers participating in the Coverage Gap Discount Program must provide to eligible Medicare Part D beneficiaries during the coverage gap phase of the Part D benefit, commonly referred to as the "donut hole," and to reduce standard beneficiary cost sharing in the coverage gap from 30% to 25% in most Medicare Part D plans. In addition, the Further Consolidated Appropriations Act of 2020, signed into law December 20, 2019, fully repealed the PPACA's "Cadillac Tax" on certain high-cost employer-sponsored insurance plans (for tax years beginning after December 31, 2019), the annual fee imposed on certain health insurance providers based on market share (for calendar year 2021), and the medical device excise tax on non-exempt medical devices (for sales after December 31, 2019). In the future, there may be additional challenges and/or amendments to the PPACA. It remains to be seen precisely what any new legislation will provide, when or if it will be enacted, and what impact it will have on the availability and cost of healthcare items and services, including drug products.

Most recently, on August 16, 2022 the Inflation Reduction Act of 2022, or IRA was signed into law. Among other things, the IRA requires manufacturers of certain drugs to engage in price negotiations with Medicare (beginning in 2026), with prices that can be negotiated subject to a cap; imposes rebates under Medicare Part B and Medicare Part D to penalize price increases that outpace inflation (first due in 2023); and replaces the Part D coverage gap discount program with a new discounting program (beginning in 2025). The IRA permits the Secretary of the Department of Health and Human Services (HHS) to implement many of these provisions through guidance, as opposed to regulation, for the initial years. For that and other reasons, it is currently unclear how the IRA will be effectuated, and the impact of the IRA on the pharmaceutical industry cannot yet be fully determined. On December 14, 2023, President Biden announced that, through the IRA, dozens of pharmaceutical companies are required to pay rebates to Medicare for price hikes on prescription drugs.

In addition, other legislative changes have been proposed and adopted since the PPACA was enacted. For example, the Budget Control Act of 2011, among other things, resulted in reductions in payments to Medicare providers of 2% per fiscal year, which went into effect on April 1, 2013 and, due to subsequent legislation, will remain in effect through 2031, with the exception of a temporary suspension of the payment reduction from May 1, 2020 through March 31, 2022 due to the coronavirus pandemic. Sequestration will start again on April 1, 2022. From April 1, 2022 to June 30, 2022, payment for Medicare fee-for-service claims will be adjusted downwards by 1%; beginning on July 1, 2022, the payment will be adjusted downwards by 2%. In addition, on March 11, 2021, President Biden signed the American Rescue Plan Act of 2021 into law, which eliminates the statutory Medicaid drug rebate cap, currently set at 100% of a drug's average manufacturer price, for single source and innovator multiple source drugs, beginning January 1, 2024. These legislative changes may result in additional reductions in Medicare and other healthcare funding and otherwise affect the prices we may obtain for any of our product candidates for which we may obtain regulatory approval or the frequency with which any such product candidate is prescribed or used.

Recently, the cost of prescription pharmaceuticals has been the subject of considerable discussion in the United States. Congress considered and passed legislation, and the former Trump administration pursued several regulatory reforms to further increase transparency around prices and price increases, lower out-of-pocket costs for consumers, and decrease spending on prescription drugs by government programs. Congress also continued to conduct inquiries into the prescription drug industry's pricing practices. While several proposed reform measures will require Congress to pass

legislation to become effective, Congress and the Biden administration have each indicated that it will continue to seek new legislative and/or administrative measures to address prescription drug costs. The Biden administration has taken several recent executive actions that signal changes in policy from the prior administration. For example, on July 9, 2021, President Biden signed an executive order to promote competition in the US economy that included several initiatives addressing prescription drugs. Among other provisions, the executive order directed the Secretary of HHS to issue a report to the White House within 45 days that includes a plan to, among other things, reduce prices for prescription drugs, including prices paid by the federal government for such drugs. In response to the Executive Order, on September 9, 2021, HHS issued a Comprehensive Plan for Addressing High Drug Prices that identified potential legislative policies and administrative tools that Congress and the agency can pursue in order to make drug prices more affordable and equitable, improve and promote competition throughout the prescription drug industry, and foster scientific innovation. Additionally, on February 2, 2022, the Biden Administration signaled its continued commitment to the Cancer Moonshot initiative, which was initially launched in 2016. In its recent announcement, the administration noted that its new goals under the initiative include addressing inequities in order to ensure broader access to cutting-edge cancer therapeutics and investing in a robust pipeline for new treatments. At the state level, legislatures are increasingly passing legislation and states are implementing regulations designed to control spending on and patient out-of-pocket costs for drug products. Implementation of cost containment measures or other healthcare reforms that affect the pricing and/or availability of drug products may impact our ability to generate revenue, attain or maintain profitability, or commercialize products for which we may receive regulatory approval in the future.

We expect that these and other healthcare reform measures that may be adopted in the future may result in more rigorous coverage criteria and/or new payment methodologies, and place additional downward pressure on the price that we receive for any approved product and/or the level of reimbursement physicians and other healthcare providers receive for administering any approved product we might bring to market. Reductions in reimbursement levels and imposition of more rigorous coverage criteria or new payment methodologies may negatively impact the prices we receive or the frequency with which our products are prescribed or administered. Any coverage or reimbursement policies instituted by Medicare or other federal health care programs may result in similar policies from private payors. The implementation of cost containment measures or other healthcare reforms may affect our ability to generate revenue, attain or maintain profitability, or commercialize our drug candidates. We expect that additional state and federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our drug candidates or additional pricing pressures.

Human Capital Resources and Employees

As of December 31, 2023, we had 7 full-time employees, of which 4 employees are directly engaged in research and development with the rest providing administrative, business and operations support. We also utilize outside consultants and independent contractors to supplement our full-time workforce. None of our employees are represented by a labor union or covered by collective bargaining agreements. We consider the relationship with our employees to be good.

Our human capital resource objectives include, identifying, recruiting, retaining, incentivizing, and integrating our existing and new employees. The principal purpose of our equity incentive plan is to attract, retain and motivate employees and directors through the granting of stock-based compensation awards. Our future performance depends significantly upon the continued service of our key scientific, technical and senior management personnel and our continued ability to attract and retain highly skilled employees. We provide our employees with competitive salaries and bonuses, opportunities for equity ownership, development programs that enable continued learning and growth and a robust employment package that promotes well-being across all aspects of their lives. In addition to salaries, these programs include potential annual discretionary bonuses, stock awards, healthcare and insurance benefits, health savings and flexible spending accounts, paid time off, family leave, and flexible work schedules, among other benefits.

Information about Our Executive Officers

The following table sets forth certain information about our executive officers as of December 31, 2023.

Name	*Age*	*Position*
Oren Gilad, Ph.D.	56	President and Chief Executive officer
John P. Hamill.	60	Senior Vice President, Chief Financial Officer and Secretary

Oren Gilad, Ph.D. has served as our Chief Executive Officer since July 2022. He has served as our President and a member of our Board since May 2022, when he was appointed in connection with our acquisition of Atrin Pharmaceuticals, Inc., a privately held oncology discovery company. Dr. Gilad has more than twenty years of academic, private and public biotechnology industry experience, as well as extensive leadership experience across all phases of drug development. Prior to joining Aprea, from 2011 to 2022, he was the Chief Executive Officer of Atrin Pharmaceuticals, Inc. Prior to founding Atrin Pharmaceuticals. Inc. in 2011, Dr. Gilad had a 13-year academic career, where he authored numerous high impact scientific articles, including one that demonstrated the importance of the ATR pathway in cancer development and prevention. This breakthrough research was conducted at the University of Pennsylvania. Dr. Gilad holds a B.Sc from the Hebrew University, a Ph.D. and post-doctorate from the University of California at Davis, and a post-doctorate from the University of Pennsylvania.

John P. Hamill has served as our Senior Vice President, Chief Financial Officer and Secretary since January 2023. From June 2020 to January 2023, Mr. Hamill served as Senior Vice President and Chief Financial Officer of Windtree Therapeutics, Inc., a biopharmaceutical company focused on the development of novel therapeutics intended to address significant unmet medical needs in important acute care markets. Mr. Hamill maintained a consulting practice offering financial and chief financial officer services from September 2019 to June 2020. From August 2018 to August 2019, he served as the Vice President of Finance and Chief Financial Officer of Trevena, Inc., a biopharmaceutical company focused on the development and commercialization of novel medicines for patients with central nervous system disorders. From June 2017 through July 2018, Mr. Hamill maintained a consulting practice offering chief financial officer services such as, amongst other things, raising capital and budgeting. From January 2014 through March 2016, Mr. Hamill was Chief Financial Officer and from April 2016 through May 2017 Chief Executive Officer and Chief Financial Officer for NephroGenex, Inc. Mr. Hamill earned his B.S. with a dual major in Accounting/Business and Computer Science from DeSales University. Mr. Hamill is a Certified Public Accountant and is a member of the Pennsylvania Institute of Certified Public Accountants and the American Institute of Certified Public Accountants.

Environmental Regulations

We believe we are compliant in all material respects with applicable environmental laws. Presently, we do not anticipate such compliance will have a material effect on capital expenditures, earnings, or our competitive position with respect to any of our operations.

Corporate Information

We were incorporated in Delaware in May 2019. Our corporate headquarters are located at 3805 Old Easton Road, Doylestown, Pennsylvania 18902, and our telephone number is (617) 463-9385.

Available Information

Our corporate website address is www.aprea.com. Information contained on or accessible through our website are not part of this Annual Report on Form 10-K, and inclusion of our website address in this annual report is an inactive textual reference only. We make our Annual Report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and all amendments to those reports available free of charge on our website as soon as reasonably practicable after we file such reports with, or furnish such reports to, the Securities and Exchange Commission, or SEC.

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012 ("JOBS Act"). We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth anniversary of the completion of our initial public offering, which is December 31, 2024, (b) in which we have total

annual gross revenue of at least $1.235 billion, or (c) in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeded $700 million as of the prior March 31st, and (2) the date on which we have issued more than $1.0 billion in non-convertible debt during the prior three-year period.

We are also a "smaller reporting company," as such term is defined in Rule 12b-2 of the Exchange Act, meaning that the market value of our common stock held by non-affiliates is less than $700 million and our annual revenue is less than $100 million during the most recently completed fiscal year. We may continue to be a smaller reporting company if either (i) the market value of our common stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our common stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

Item 1A. Risk Factors

Our business is subject to substantial risks and uncertainties. Investing in our common stock involves a high degree of risk. You should carefully consider the risk factors below together with the information contained elsewhere in this Annual Report on Form 10-K, including Part II, Item 8 "Financial Statements and Supplementary Data" and Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," and in our other public filings in evaluating our business. Any of the risks and uncertainties described below and in our other filings with the SEC, either alone or taken together, could materially and adversely affect our business, financial condition, results of operations, prospects for growth, and the value of an investment in our common stock. In addition, these risks and uncertainties could cause actual results to differ materially from those expressed or implied by forward looking statements contained in this Form 10-K (please read the Cautionary Note Regarding Forward-Looking Statements in this Form 10-K).

Risk Factor Summary

An investment in our securities is subject to various risks, these risks include, among others, the brief bulleted list of our principal risk factors set forth below that make an investment in our company speculative or risky.

Risks related to our financial position and the need for additional capital

- We have incurred significant losses in each year since inception. We expect to incur losses for the foreseeable future and may never achieve or maintain profitability.
- Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability. We have never generated commercial revenues and may never be profitable.
- We will need substantial additional funding, which may not be available to us on acceptable terms or at all. If we are unable to raise capital when needed, we may be forced to delay, reduce and/or eliminate our research and drug development programs or future commercialization efforts.
- Adverse developments affecting the financial services industry, such as actual events or concerns involving liquidity, defaults or non-performance by financial institutions or transactional counterparties, could adversely affect our current and projected business operations and our financial condition and results of operations.

Risks related to the discovery, development and commercialization of our product candidates

- We are substantially dependent on the success of our lead product candidates, ATRN-119, which is currently in clinical development. Our clinical trials of ATRN-119 may not be successful. If we are unable to obtain approval for and commercialize ATRN-119 or experience significant delays in doing so, our business will be materially harmed.
- We are in the early stages of testing ATRN-119 in clinical trials and we have not tested APR-1051 in clinical trials. The results of preclinical studies and early-stage clinical trials may not be predictive of future results in later studies or trials. Initial success in clinical trials may not be indicative of results obtained when these trials are completed or in later-stage clinical trials.
- We may not be able to file INDs or IND amendments to commence additional clinical trials on the timelines we expect, and even if we are able to, the FDA may not permit us to proceed.
- We have limited experience as a company conducting clinical trials and may be unable to complete clinical trials for any product candidates we may develop.
- We may find it difficult to enroll patients in our clinical trials. If we experience delays or difficulties in the enrollment of patients in clinical trials, our receipt of necessary marketing approvals could be delayed or prevented.

- If serious adverse or unacceptable side effects are identified during the development of our product candidates or we observe limited efficacy of our product candidates, we may need to abandon or limit the development of one or more of our product candidates.
- The outcome of preclinical testing and early clinical trials may not be predictive of the success of later clinical trials, interim results of a clinical trial do not necessarily predict final results, and the results of our clinical trials may not satisfy the requirements of the FDA or comparable foreign regulatory authorities.
- We may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.
- If, in the future, we are unable to establish sales and marketing capabilities or enter into agreements with third parties to sell and market our product candidates, we may not be successful in commercializing our product candidates if and when they are approved.

Risks related to our dependence on third parties

- We rely on third parties to conduct our clinical trials and some aspects of our research and preclinical studies, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials, research and studies.

Risks related to our intellectual property

- If we are unable to obtain and maintain intellectual property protection for our product candidates or for our technology, our competitors could develop and commercialize products or technology similar or identical to ours, and our ability to successfully commercialize any product candidates we may develop, and our technology may be adversely affected.
- Issued patents covering our product candidates and other technologies could be narrowed or found invalid or unenforceable if challenged in court or before administrative bodies in the United States or abroad.
- We may be subject to other claims challenging the inventorship of our patents and other intellectual property.

Risks related to regulatory and marketing approval and other legal compliance matters

- We have never obtained marketing approval for a product candidate and we may be unable to obtain, or may be delayed in obtaining, marketing approval for any of our product candidates.
- Even if we complete the necessary preclinical studies and clinical trials, the marketing approval process is expensive, time-consuming and uncertain and may prevent us, or any future collaborators, from obtaining approvals for the commercialization of some or all of our product candidates. As a result, we cannot predict when or if, and in which territories, we, or any future collaborators, will obtain marketing approval to commercialize a product candidate.
- Failure to obtain marketing approval in foreign jurisdictions would prevent our product candidates from being marketed abroad. Any approval we are granted for our product candidates in the United States would not assure approval of our product candidates in foreign jurisdictions.
- The FDA's and other comparable regulatory authorities' policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates, which would impact our ability to generate commercial revenue.
- Recently enacted and future legislation, and any change in existing government regulations and policies, may increase the difficulty and cost for us and our future collaborators to obtain marketing approval of and commercialize our product candidates and affect the prices we, or they, may obtain.

Risks related to our common stock

- Our executive officers, directors and principal stockholders may have substantial influence over matters submitted to stockholders for approval.
- Our certificate of incorporation designates the state courts in the State of Delaware or, if no state court located within the State of Delaware has jurisdiction, the federal court for the District of Delaware, as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could discourage lawsuits against the company and our directors, officers and employees.
- We are required to meet the Nasdaq Stock Market, or Nasdaq, continued listing requirements and other Nasdaq rules, and if we fail to meet such rules and requirements, we may be subject to delisting.

The summary risk factors described above should be read together with the text of the full risk factors below in this section entitled "*Risk Factors*" and the other information set forth in this Annual Report on Form 10-K. The risks summarized above or described in full below are not the only risks that we face. Additional risks and uncertainties not precisely known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial condition, results of operations and future growth prospects.

Risks related to our financial position and need for additional capital

We have incurred significant losses in each year since inception. We expect to incur losses for the foreseeable future and may never achieve or maintain profitability.

Since our inception, we have incurred significant losses on an aggregate basis. Our net loss was $14.3 million, $112.7 million and $37.1 million for the years ended December 31, 2023, 2022 and 2021, respectively. Our accumulated deficit was $308.1 million as of December 31, 2023. We have not generated any commercial revenue to date from sales of any drugs and have financed our operations principally through private placements of our preferred stock and the net proceeds received from the initial public offering (IPO) of our common stock. We have devoted substantially all of our efforts to research and development. We expect that our lead product candidate, ATRN-119, which we acquired in connection with the acquisition of Atrin Pharmaceuticals, Inc. is currently in clinical development. We expect that it will be several years, if ever, before we have any product candidates ready for commercialization. We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future. The net losses we incur may fluctuate significantly from quarter to quarter.

To become and remain profitable, we must develop, obtain approval for and eventually commercialize a drug or drugs with significant market potential, either on our own or with a collaborator. This will require us to be successful in a range of challenging activities, including completing preclinical studies and clinical trials of our product candidates, obtaining marketing approval for these product candidates, manufacturing, marketing and selling those drugs for which we may obtain marketing approval and establishing and managing any collaborations for the development, marketing and/or commercialization of our product candidates. We may never succeed in these activities and, even if we do, may never generate revenues that are significant or large enough to achieve profitability. If we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would decrease the value of our company and could impair our ability to raise capital, maintain our research and development efforts, expand our business and/or continue our operations. A decline in the value of our company could also cause our stockholders to lose all or part of their investment.

Even if we succeed in commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to develop and market additional product candidates. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

Our product candidates, if approved, may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of drugs that we do not expect to be commercially available for many years, if at all. If we are unable to obtain product approvals or generate significant commercial revenues, our business will be materially harmed.

Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability. We have never generated commercial revenues and may never be profitable.

We are an early-stage company. Our operations to date have been limited to organizing and staffing our company, business planning, raising capital, developing our product candidates, identifying potential product candidates, conducting preclinical studies of our product candidates and conducting clinical trials of our product candidates. Our lead product candidate, ATRN-119 is in clinical development, and our other product candidates are in preclinical development. We have not yet demonstrated our ability to successfully complete large-scale, pivotal clinical trials, obtain marketing approvals, manufacture commercial-scale drug products, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful drug commercialization. Typically, it takes about six to ten years to develop a new drug from the time it is in Phase 1 clinical trials to when it is approved for treating patients, but in many cases it may take longer. Consequently, any predictions you make about our future success or viability may not be as accurate as they could be if we had a longer operating history.

In addition, as a business with a limited operating history, we may encounter unforeseen expenses, difficulties, complications, delays and other known and unknown factors. We may need to transition from a company with a research focus to a company capable of supporting commercial activities. We may not be successful in such a transition.

As we continue to build our business, we expect our financial condition and operating results may fluctuate significantly from quarter to quarter and year to year due to a variety of factors, many of which are beyond our control. Accordingly, you should not rely upon the results of any particular quarterly or annual periods as indications of future operating performance.

We will need substantial additional funding, which may not be available to us on acceptable terms or at all. If we are unable to raise capital when needed, we may be forced to delay, reduce and/or eliminate our research and drug development programs or future commercialization efforts.

Developing drug products, including conducting preclinical studies and clinical trials, is a very time-consuming, expensive and uncertain process that takes years to complete. We expect our expenses to increase in connection with our ongoing activities, particularly as we conduct clinical trials of, and seek marketing approval for our product candidates. In addition, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to drug sales, marketing, manufacturing and distribution to the extent that such sales, marketing, manufacturing and distribution are not the responsibility of any collaborator that we may have at such time for any such product candidate. Furthermore, since the completion of our IPO, we have incurred and expect to incur additional costs associated with operating as a public company. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. The recent uncertainty and volatility in financial markets which in turn may make raising additional funds even more difficult or impossible for us. If we are unable to raise capital when needed or on attractive terms, we may be forced to delay, reduce and/or eliminate our research and drug development programs or future commercialization efforts.

We believe that our existing cash and cash equivalents as of December 31, 2023 and the upfront gross proceeds of approximately $16.0 million received from our private placement of our common stock and warrants in March 2024, before deducting placement agent fees and offering costs of approximately $1.4 million, will be sufficient to meet our currently projected operating expenses and capital expenditure requirements into the third quarter of 2025. Our estimate as to how long we expect our existing cash and cash equivalents to be able to continue to fund our operations is based on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Further, changing circumstances, some of which may be beyond our control, could cause us to consume capital

significantly faster than we currently anticipate, and we may need to seek additional funds sooner than planned. Our future capital requirements will depend on many factors, including:

- the scope, progress, results and costs of our current and future clinical trials of ATRN-119 and our other product candidates for our current targeted indications;

- the scope, progress, results and costs of drug discovery, preclinical research and clinical trials for ATRN-119 and our other product candidates;

- the number of future product candidates that we pursue and their development requirements;

- the costs, timing and outcome of regulatory review of our product candidates;

- the extent to which we acquire or invest in businesses, products and technologies, including entering into or maintaining licensing or collaboration arrangements for product candidates on favorable terms, although we currently have no commitments or agreements to complete any such transactions;

- the costs and timing of future commercialization activities, including drug sales, marketing, manufacturing and distribution, for any of our product candidates for which we receive marketing approval, to the extent that such sales, marketing, manufacturing and distribution are not the responsibility of any collaborator that we may have at such time;

- the amount of revenue, if any, received from commercial sales of our product candidates, should any of our product candidates receive marketing approval;

- the costs of preparing, filing and prosecuting patent applications, maintaining, defending and enforcing our intellectual property rights and defending intellectual property-related claims;

- our headcount growth and associated costs as we expand our business operations and our research and development activities; and

- the costs of operating as a public company.

Raising additional capital may cause dilution to our stockholders and restrict our operations or require us to relinquish rights to our product candidates.

We expect our expenses to increase in connection with our planned operations. Until such time, if ever, as we can generate substantial revenues from the sale of drugs, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, strategic alliances and/or licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, ownership interests in our securities may be diluted, and the terms of these securities could include liquidation or other preferences and anti-dilution protections that could adversely affect the rights of our common stockholders. In addition, debt financing, if available, would result in fixed payment obligations and may involve agreements that include restrictive covenants that limit our ability to take specific actions, such as incurring additional debt, making capital expenditures, creating liens, redeeming stock or declaring dividends, that could adversely impact our ability to conduct our business. In addition, securing financing could require a substantial amount of time and attention from our management and may divert a disproportionate amount of their attention away from day-to-day activities, which may adversely affect our management's ability to oversee the development of our product candidates.

If we raise additional funds through collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technology, future revenue streams or product candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds when needed, we may be required to

delay, reduce and/or eliminate our product candidate development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

We are currently operating in a period of economic uncertainty and capital markets disruption, which has been significantly impacted by geopolitical instability, an ongoing military conflict between Russia and Ukraine, Israel and Hamas and record inflation. Our business, financial condition and results of operations could be materially adversely affected by any negative impact on the global economy and capital markets resulting from the conflict in Ukraine, the Middle East, geopolitical tensions or record inflation.

U.S. and global markets are experiencing volatility and disruption following the escalation of geopolitical tensions and the start of the military conflict between Russia and Ukraine. On February 24, 2022, a full-scale military invasion of Ukraine by Russian troops was reported. Although the length and impact of the ongoing military conflict is highly unpredictable, the conflict in Ukraine could lead to market disruptions, including significant volatility in commodity prices, credit and capital markets, as well as supply chain interruptions, which has led to record inflation globally. We are continuing to monitor inflation, the situation in Ukraine and global capital markets and assessing the potential impacts on our business.

The global economy has been, and may continue to be, negatively impacted by Russia's invasion of Ukraine. As a result of Russia's invasion of Ukraine, the U.S., the European Union, the United Kingdom, and other G7 countries, among other countries, have imposed substantial financial and economic sanctions on certain industry sectors and parties in Russia. Broad restrictions on exports to Russia have also been imposed. These measures include: (i) comprehensive financial sanctions against major Russian banks; (ii) additional designations of Russian individuals with significant business interests and government connections; (iii) designations of individuals and entities involved in Russian military activities; and (iv) enhanced export controls and trade sanctions limiting Russia's ability to import various goods. Russian military actions and the resulting sanctions could continue to adversely affect the global economy and financial markets and lead to instability and lack of liquidity in capital markets, potentially making it more difficult for us to obtain additional funds.

There are current geopolitical tensions with China. Recently, the Biden administration has signed multiple executive orders regarding China. One particular executive order titled Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy signed on September 12, 2022 will likely impact the pharmaceutical industry to encourage U.S. domestic manufacturing of pharmaceutical products. Any additional executive orders or potential sanctions with China could materially impact our current manufacturing partners.

In addition, on October 7, 2023, Hamas militants and members of other terrorist organizations infiltrated Israel's southern border from the Gaza Strip and conducted a series of terror attacks on civilian and military targets. Thereafter, Hamas launched extensive rocket attacks on Israeli population and industrial centers located along the Israeli border with the Gaza Strip. Shortly following the attack, Israel's security cabinet declared war against Hamas and launched an aerial bombardment of various targets within the Gaza Strip. It is possible that other terrorist organizations will join the hostilities as well, including Hezbollah in Lebanon, the Houthi in Yemen and Palestinian military organizations in the West Bank, resulting in a widening of the conflict. The intensity and duration of Israel's current war against Hamas is difficult to predict as are such war's economic implications on the global economy.

Although our business has not been materially impacted by the ongoing military conflict between Russian and Ukraine, Israel and Hamas, geopolitical tensions, or record inflation to date, it is impossible to predict the extent to which our operations, or those of our suppliers and manufacturers, will be impacted in the short and long term, or the ways in which the conflict may impact our business. The extent and duration of the conflict in Ukraine, the Middle East, geopolitical tensions, record inflation, sanctions and resulting market disruptions are impossible to predict, but could be substantial. Any such disruptions may also magnify the impact of other risks described herein.

Adverse developments affecting the financial services industry, such as actual events or concerns involving liquidity, defaults or non-performance by financial institutions or transactional counterparties, could adversely affect our current and projected business operations and our financial condition and results of operations.

Actual events involving limited liquidity, defaults, non-performance or other adverse developments that affect financial institutions, transactional counterparties or other companies in the financial services industry or the financial services industry generally, or concerns or rumors about any events of these kinds or other similar risks, have in the past and may in the future lead to market-wide liquidity problems. For example, on March 10, 2023, Silicon Valley Bank, or SVB, was closed by the California Department of Financial Protection and Innovation, which appointed the Federal Deposit Insurance Corporation, or the FDIC, as receiver. Similarly, on March 12, 2023, Signature Bank and Silvergate Capital Corp. were each swept into receivership. Although a statement by the Department of the Treasury, the Federal Reserve and the FDIC stated that all depositors of SVB would have access to all of their money after only one business day of closure, including funds held in uninsured deposit accounts, borrowers under credit agreements, letters of credit and certain other financial instruments with SVB, Signature Bank or any other financial institution that is placed into receivership by the FDIC may be unable to access undrawn amounts thereunder. If any of our counterparties to any such instruments were to be placed into receivership, we may be unable to access such funds. In addition, if any parties with whom we conduct business are unable to access funds pursuant to such instruments or lending arrangements with such a financial institution, such parties' ability to pay their obligations to us or to enter into new commercial arrangements requiring additional payments to us could be adversely affected. In this regard, counterparties to SVB credit agreements and arrangements, and third parties such as beneficiaries of letters of credit (among others), may experience direct impacts from the closure of SVB and uncertainty remains over liquidity concerns in the broader financial services industry. Similar impacts have occurred in the past, such as during the 2008-2010 financial crisis. We held all of our cash, cash equivalents, restricted cash and available for sale investments with SVB.

Inflation and rapid increases in interest rates have led to a decline in the trading value of previously issued government securities with interest rates below current market interest rates. Although the U.S. Department of Treasury, FDIC and Federal Reserve Board have announced a program to provide up to $25 billion of loans to financial institutions secured by certain of such government securities held by financial institutions to mitigate the risk of potential losses on the sale of such instruments, widespread demands for customer withdrawals or other liquidity needs of financial institutions for immediately liquidity may exceed the capacity of such program. There is no guarantee that the U.S. Department of Treasury, FDIC and Federal Reserve Board will provide access to uninsured funds in the future in the event of the closure of other banks or financial institutions, or that they would do so in a timely fashion.

Although we assess our banking relationships as we believe necessary or appropriate, our access to funding sources and other credit arrangements in amounts adequate to finance or capitalize our current and projected future business operations could be significantly impaired by factors that affect us, the financial institutions with which we have arrangements directly, or the financial services industry or economy in general. These factors could include, among others, events such as liquidity constraints or failures, the ability to perform obligations under various types of financial, credit or liquidity agreements or arrangements, disruptions or instability in the financial services industry or financial markets, or concerns or negative expectations about the prospects for companies in the financial services industry. These factors could involve financial institutions or financial services industry companies with which we have financial or business relationships, but could also include factors involving financial markets or the financial services industry generally.

In addition, investor concerns regarding the U.S. or international financial systems could result in less favorable commercial financing terms, including higher interest rates or costs and tighter financial and operating covenants, or systemic limitations on access to credit and liquidity sources, thereby making it more difficult for us to acquire financing on acceptable terms or at all. Any decline in available funding or access to our cash and liquidity resources could, among other risks, adversely impact our ability to meet our operating expenses, financial obligations or fulfill our other obligations, result in breaches of our financial and/or contractual obligations or result in violations of federal or state wage and hour laws. Any of these impacts, or any other impacts resulting from the factors described above or other related or similar factors not described above, could have material adverse impacts on our liquidity and our current and/or projected business operations and financial condition and results of operations.

In addition, any further deterioration in the macroeconomic economy or financial services industry could lead to losses or defaults by parties with whom we conduct business, which in turn, could have a material adverse effect on our current and/or projected business operations and results of operations and financial condition. For example, a party with whom we conduct business may fail to make payments when due, default under their agreements with us, become insolvent or

declare bankruptcy. Any bankruptcy or insolvency, or the failure to make payments when due, of any counterparty of ours, or the loss of any significant relationships, could result in material losses to us and may material adverse impacts on our business.

Risks related to the discovery, development and commercialization of our product candidates

We are substantially dependent on the success of our lead product candidate, ATRN-119, which is in clinical development. Our clinical trials of ATRN-119 may not be successful. If we are unable to obtain approval for and commercialize ATRN-119 or experience significant delays in doing so, our business will be materially harmed.

We have no products approved for sale. Our future success is substantially dependent on our ability to timely obtain marketing approval for, and then successfully commercialize, ATRN-119, our lead product candidate. We are investing a majority of our efforts and financial resources in the research and development of ATRN-119. Our business depends entirely on the successful development and commercialization of our product candidates. We currently have no drugs approved for sale and generate no revenues from sales of any products, and we may never be able to develop a marketable product.

Our product candidates will require additional clinical development, evaluation of clinical, preclinical and manufacturing activities, marketing approval in multiple jurisdictions, substantial investment and significant marketing efforts before we generate any revenues from product sales. We are not permitted to market or promote any of our product candidates before we receive marketing approval from the FDA and comparable foreign regulatory authorities, and we may never receive such marketing approvals.

The success of ATRN-119 will depend on several factors, including the following:

- successful initiation, successful patient enrollment and timely completion of clinical trials of ATRN-119;
- successful initiation and successful patient enrollment and completion of additional clinical trials, for ATRN-119 or our other product candidates;
- our ability to demonstrate ATRN-119's safety, tolerability and efficacy to the FDA or any comparable foreign regulatory authority for marketing approval;
- timely receipt of marketing approvals for ATRN-119;
- obtaining and maintaining patent protection, trade secret protection and regulatory exclusivity, both in the United States and internationally;
- successfully defending and enforcing our rights in our intellectual property portfolio;
- avoiding and successfully defending against any claims that we have infringed, misappropriated or otherwise violated any intellectual property of any third party;
- the performance of our future collaborators, if any;
- the extent of, and our ability to timely complete, any required post-marketing approval commitments imposed by FDA or other applicable regulatory authorities;
- successfully developing a companion diagnostic test on a timely and cost effective basis;
- establishment of supply arrangements with third-party raw materials and drug product suppliers and manufacturers who are able to manufacture clinical trial and commercial quantities of ATRN-119 drug substance and drug product and to develop, validate and maintain a commercially viable manufacturing process that is compliant with current

good manufacturing practices, or cGMP, at a scale sufficient to meet anticipated demand and over time enable us to reduce our cost of manufacturing;

- establishment of scaled production arrangements with third-party manufacturers to obtain finished products that are compliant with cGMP and appropriately packaged for sale;
- successful launch of commercial sales following any marketing approval;
- a continued acceptable safety profile following any marketing approval;
- commercial acceptance by patients, the medical community and third-party payors;
- the availability of coverage and adequate reimbursement and pricing by third-party payors and government authorities;
- the availability, perceived advantages, relative cost, relative safety and relative efficacy of alternative and competing treatments; and
- our ability to compete with other therapies.

We do not have complete control over many of these factors, including certain aspects of clinical development and the regulatory submission process, potential threats to our intellectual property rights and the manufacturing, marketing, distribution and sales efforts of any future collaborator. Accordingly, we cannot assure you that we will ever be able to generate revenue through the sale of our product candidates. If we are not successful in commercializing ATRN-119, or are significantly delayed in doing so, our business will be materially harmed.

We are in the early stages of testing ATRN-119 in clinical trials and we have not tested APR-1051 in clinical trials. The results of preclinical studies and early-stage clinical trials may not be predictive of future results in later studies or trials. Initial success in clinical trials may not be indicative of results obtained when these trials are completed or in later-stage clinical trials.

We are in the early stages of testing ATRN-119 in clinical trials and we have not tested APR-1051 in clinical trials. The results of preclinical studies, whether or not conducted by us, may not be predictive of the results of clinical trials, and the results of any early-stage clinical trials that we are conducting today and that we may commence in the future may not be predictive of the results of the later-stage clinical trials. For example, even if successful, the results of our Phase 1 clinical trials of our product candidates ATRN-119 and APR-1051 and other product candidates may not be predictive of the results of further clinical trials of these product candidates or any of our other product candidates. In addition, initial success in clinical trials may not be indicative of results obtained when such trials are completed on in later stage clinical trials. In particular, the small number of patients in our current and planned early clinical trials may make the results of these trials less predictive of the outcome of later clinical trials. Moreover, preclinical and clinical data often are susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials nonetheless have failed to obtain marketing licensure of their product candidates. Our current clinical trials for ATRN-119 and future clinical trials for APR-1051 may not ultimately be successful or support further clinical development. There is a high failure rate for product candidates proceeding through clinical trials. Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in clinical development even after achieving encouraging results in earlier studies. Any such setbacks in our clinical development could materially harm our business, results of operations, financial condition and prospects.

We may not be able to file INDs or IND amendments to commence additional clinical trials on the timelines we expect, and even if we are able to, the FDA may not permit us to proceed.

We have filed IND's for ATRN-119 and APR-1051, but we may not be able to file INDs for our other product candidates on the timelines we expect. For example, we may experience manufacturing delays or other delays with IND-enabling studies. Moreover, we cannot be sure that submission of an IND will result in the FDA allowing further clinical trials to begin, or that, once begun, issues will not arise that lead FDA, IRBs, or other authorities to suspend, terminate, or require changes to our clinical trials. Additionally, even if such regulatory and other authorities agree with the design and implementation of the clinical trials set forth in an IND, we cannot guarantee that such regulatory authorities will not change their requirements in the future. These considerations also apply to new clinical trials or changes to existing clinical trials we may submit as amendments to existing INDs or to a new IND. Any failure to file INDs on the timelines we expect or to obtain regulatory clearance or approvals for our trials may prevent us from completing our clinical trials or commercializing our products on a timely basis, if at all.

We have limited experience as a company conducting clinical trials and may be unable to complete pivotal clinical trials for any product candidates we may develop.

Our success is dependent upon our ability to initiate and successfully complete clinical trials and obtain regulatory approval for and commercialization of our product candidates. We have not demonstrated an ability to perform the functions necessary for the approval or successful commercialization of any product candidate. The successful commercialization of any product candidate may require us to perform a variety of functions, including:

- continuing to undertake preclinical development;
- obtaining approval to commence clinical trials;
- successfully planning and enrolling subjects in clinical trials;
- participating in regulatory approval processes;
- formulating and manufacturing products; and
- conducting sales and marketing activities

We have limited experience designing, conducting and enrolling subjects in clinical trials. While certain members of our management and staff have significant experience in conducting clinical trials, to date, we have not completed any clinical trials as a company. Our operations to date provide a limited basis to assess our ability to develop and commercialize our product candidates.

Because of this lack of experience, any future clinical trials we may conduct may not be completed on time, if at all. Large-scale trials require significant additional financial and management resources, monitoring and oversight, and reliance on third-party clinical investigators, consultants or contract research organizations, or CROs. Relying on third-party clinical investigators, CROs and manufacturers, which are all also subject to governmental oversight and regulations, may also cause us to encounter delays that are outside of our control. Failure to commence or complete, or delays in, clinical trials, could prevent us from or delay us in commercializing our product candidates.

We may find it difficult to enroll patients in our clinical trials. If we experience delays or difficulties in the enrollment of patients in clinical trials, our receipt of necessary marketing approvals could be delayed or prevented.

We may not be able to initiate or continue clinical trials for our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA or comparable foreign regulatory authorities. Patient enrollment is a significant factor in the timing of clinical trials and our ability to enroll eligible patients may be limited or may result in slower enrollment than we anticipate.

Patient enrollment may be affected if our competitors have ongoing clinical trials for product candidates that are under development for the same indications as our product candidates, and patients who would otherwise be eligible for our

clinical trials instead enroll in clinical trials of our competitors' product candidates. Patient enrollment may also be affected by other factors, including:

- size and nature of the patient population;
- severity of the disease under investigation;
- availability and efficacy of approved drugs for the disease under investigation;
- patient eligibility criteria for the trial in question;
- patients' and clinicians' perceived risks and benefits of the product candidate under study;
- competing clinical trials;
- efforts to facilitate timely enrollment in clinical trials;
- physicians' attitudes and practices with respect to clinical trial enrollment;
- the ability to monitor patients adequately during and after treatment;
- proximity and availability of clinical trial sites for prospective patients; and
- continued enrollment of prospective patients by clinical trial sites.

Our inability to enroll a sufficient number of patients for our clinical trials would result in significant delays or may require us to abandon one or more clinical trials altogether. Enrollment delays in our clinical trials may result in increased development costs for our product candidates, which would cause the value of our company to decline and limit our ability to obtain additional financing.

Leveraging synthetic lethality in therapeutic targeting of DDR represents an emerging strategy to treat a broad spectrum of cancers, and negative perceptions of the efficacy, safety, or tolerability of this class of targets, including any that we develop, could adversely affect our ability to conduct our business, advance our product candidates or obtain regulatory approvals.

Aside from PARP inhibitors, such as Lynparza, Rubraca, Zejula and Talzenna, no synthetic lethality small molecule inhibitor therapeutics have been approved to date by the FDA. Pamiparib, a PARP inhibitor developed by Beigene, was approved in 2021 in China. Adverse events in future clinical trials of our product candidates or in clinical trials of other similar products and the resulting publicity, as well as any other adverse events in the field of synthetic lethality and DDR, or any adverse events involving other products that are perceived to be similar to DDR, such as those related to gene therapy or gene editing, could result in a decrease in the perceived benefit of one or more of our programs, increased regulatory scrutiny, decreased confidence by healthcare professionals, patients and CROs in our product candidates, difficulties and delays in regulatory clearance or approval for, enrollment of patients in, and conduct of, our clinical trials, and less demand for any product that we may develop. Our pipeline of product candidates could result in a greater quantity of reportable adverse events or other reportable negative clinical outcomes, manufacturing reportable events or material clinical events that could lead to clinical delays or holds by the FDA or applicable regulatory authority or other clinical delays, any of which could negatively impact the perception of one or more of our product development programs, as well as our business as a whole.

In addition, responses by U.S. federal or foreign governments to adverse events or negative public perception may result in new legislation or regulations that could limit our ability to develop any product candidates or commercialize any approved products, obtain or maintain regulatory approval, or otherwise achieve profitability. More restrictive statutory regimes, government regulations, or negative public opinion would have an adverse effect on our business, financial

condition, results of operations, and prospects, and may delay or impair the development of our product candidates and commercialization of any approved products or demand for any products we may develop.

If serious adverse or unacceptable side effects are identified during the development of our product candidates or we observe limited efficacy of our product candidates, we may need to abandon or limit the development of one or more of our product candidates.

Adverse events or unacceptable side effects caused by, or other unexpected properties of, our product candidates could cause us, any future collaborators, an institutional review board, or IRB, or regulatory authorities to interrupt, delay or halt clinical trials of one or more of our product candidates and could result in the (i) delay or denial of marketing approval by the FDA or comparable foreign regulatory authorities, (ii) approval with significant restrictions on distribution or use or (iii) required labeling information regarding safety concerns, if approved.

In general, our clinical trials of ATRN-119 will include cancer patients who are very sick and whose health is deteriorating. We expect that patients may experience adverse events, serious adverse events or may die during their participation in our future clinical trials for ATRN-119 or other product candidates. We cannot predict with certainty what adverse events may occur in our clinical trials. Any adverse events, serious adverse events, or deaths occurring in our clinical trials, whether related to our product candidates or not, could affect perceptions relating to our product candidates. In addition, our previous clinical trials of eprenetapopt include cancer patients who were very sick and whose health is deteriorating, and we expect that additional clinical trials of eprenetapopt and our other product candidates will include similar patients with deteriorating health. Multiple patients in these trials have experienced adverse events. The most commonly reported adverse events include nausea, vomiting, constipation, dizziness, fatigue, and neutropenia. Some patients in these trials have experienced serious adverse events. The most common serious adverse events include febrile neutropenia, pneumonia, sepsis, and pyrexia.

In addition, if any of our product candidates are associated with adverse events or undesirable side effects or have properties that are unexpected, our trials could be suspended or terminated and the FDA or comparable foreign regulatory authorities could order us to cease further development of or deny approval of our product candidates for any or all targeted indications. We, or any future collaborators, may abandon development or limit development of that product candidate to certain uses or subpopulations in which the undesirable side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective. Drug-related side effects could affect patient recruitment or the ability of enrolled patients to complete the trial or result in potential product liability claims. Any of these occurrences may harm our business, results of operations, financial condition and prospects significantly.

The outcome of preclinical testing and early clinical trials may not be predictive of the success of later clinical trials, interim results of a clinical trial do not necessarily predict final results, and the results of our clinical trials may not satisfy the requirements of the FDA or comparable foreign regulatory authorities.

We currently have no drugs approved for sale and we cannot guarantee that we will ever have marketable drugs. Clinical failure can occur at any stage of clinical development. Clinical trials may produce negative or inconclusive results, and we or any future collaborators may decide, or regulators may require us, to conduct additional clinical trials or preclinical studies. We will be required to demonstrate with substantial evidence through adequate and well-controlled clinical trials that our product candidates are safe and effective for use in treating specific conditions in order to obtain marketing approvals for their commercial sale. Success in preclinical studies and early-stage clinical trials does not mean that future larger registration clinical trials will be successful because product candidates in later-stage clinical trials may fail to demonstrate safety and efficacy to the satisfaction of the FDA and non-U.S. regulatory authorities despite having progressed through preclinical studies and early-stage clinical trials. Product candidates that have shown promising results in preclinical studies and early-stage clinical trials may still suffer significant setbacks in subsequent registration clinical trials. Additionally, the outcome of preclinical studies and early-stage clinical trials may not be predictive of the success of later-stage clinical trials.

From time to time, we may publish or report interim or preliminary data from our clinical trials. Interim or preliminary data from clinical trials that we may conduct may not be indicative of the final results of the trial and are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient

data become available. Interim or preliminary data also remain subject to audit and verification procedures that may result in the final data being materially different from the interim or preliminary data. As a result, interim or preliminary data should be viewed with caution until the final data are available.

In addition, the design of a clinical trial can determine whether its results will support approval of a drug and flaws in the design of a clinical trial may not become apparent until the clinical trial is well advanced. We have limited experience in designing clinical trials and may be unable to design and conduct a clinical trial to support marketing approval. Further, if our product candidates are found to be unsafe or lack efficacy, we will not be able to obtain marketing approval for them and our business would be harmed. A number of companies in the pharmaceutical industry, including those with greater resources and experience than us, have suffered significant setbacks in advanced clinical trials, even after obtaining promising results in preclinical studies and earlier clinical trials.

In some instances, there can be significant variability in safety and efficacy results between different clinical trials of the same product candidate due to numerous factors, including changes in trial protocols, differences in size and type of the patient populations, differences in and adherence to the dosing regimen and other trial protocols and the rate of dropout among clinical trial participants. We do not know whether any clinical trials we may conduct will demonstrate consistent or adequate efficacy and safety sufficient to obtain marketing approval to market our product candidates.

In addition, in the event that an adverse safety issue, clinical hold, or other adverse finding occurs in one of our clinical trials, that event could adversely affect any other clinical trials for the same product candidate. Moreover, there is a relatively limited safety data set for product candidates with the same mechanism of action as ATRN-119 or our other product candidates. An adverse safety issue or other adverse finding in a clinical trial conducted by a third party with a similar mechanism of action could adversely affect clinical trials involving ATRN-119 or our other product candidates.

Further, our product candidates may not be approved even if they achieve their primary endpoints in clinical trials, including registration trials. The FDA or comparable foreign regulatory authorities may disagree with our trial design and our interpretation of data from preclinical studies and clinical trials. In addition, any of these regulatory authorities may change requirements for the approval of a product candidate even after reviewing and providing comments or advice on a protocol for a pivotal clinical trial that has the potential to result in approval by the FDA or comparable foreign regulatory authorities. In addition, any of these regulatory authorities may also approve a product candidate for fewer or more limited indications than we request or may grant approval contingent on the performance of costly post-marketing clinical trials. In addition, the FDA or other comparable foreign regulatory authorities may not approve the labeling claims that we believe would be necessary or desirable for the successful commercialization of our product candidates.

Before obtaining marketing approvals for the commercial sale of any product candidate for a target indication, we must demonstrate with substantial evidence gathered in preclinical studies and adequate and well-controlled clinical trials, and, with respect to approval in the United States, to the satisfaction of the FDA and elsewhere to the satisfaction of other comparable foreign regulatory authorities, that the product candidate is safe and effective for use for that target indication. There is no assurance that the FDA or other comparable foreign regulatory authorities will consider our future clinical trials to be sufficient to serve as the basis for approval of one of our product candidates for any indication. The FDA and other comparable foreign regulatory authorities retain broad discretion in evaluating the results of our clinical trials and in determining whether the results demonstrate that a product candidate is safe and effective. If we are required to conduct additional clinical trials of a product candidate than we expect prior to its approval, we will need substantial additional funds and there is no assurance that the results of any such additional clinical trials will be sufficient for approval.

Clinical drug development is a lengthy and expensive process, with an uncertain outcome. If clinical trials of our product candidates fail to demonstrate safety and efficacy to the satisfaction of regulatory authorities or do not otherwise produce positive results, we may incur additional costs, experience delays in completing, or ultimately be unable to complete, the development of our product candidates or be unable to obtain marketing approval.

Before obtaining marketing approval from regulatory authorities for the sale of our product candidates, we must complete preclinical development and then conduct extensive clinical trials to demonstrate the safety and efficacy of our

product candidates. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is uncertain as to outcome. A failure of one or more clinical trials can occur at any stage of testing. The outcome of preclinical studies and early-stage clinical trials may not be predictive of the success of later clinical trials, and interim results of a clinical trial do not necessarily predict final results.

Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their drugs.

We do not know whether ongoing clinical trials will be completed on schedule or at all, or whether future clinical trials will begin on time, need to be redesigned, enroll patients on time or be completed on schedule, if at all. Clinical trials can be delayed for a variety of reasons, including delays related to:

- obtaining regulatory authorization to commence a trial;
- reaching agreement on acceptable terms with prospective contract research organizations, or CROs, and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and clinical trial sites;
- obtaining institutional review board or ethics committee approval at each clinical trial site;
- recruiting suitable patients to participate in a trial;
- the impact of any outbreak or pandemic on patient screening, patient enrollment, and follow-up;
- developing and validating any companion diagnostic to be used in the trial, to the extent we are required to do so;
- patients failing to comply with the clinical trial protocol or dropping out of a trial;
- clinical trial sites failing to comply with the clinical trial protocol or dropping out of a trial;
- addressing any conflicts with new or existing laws or regulations;
- the need to add new clinical trial sites;
- manufacturing sufficient quantities of product candidate for use in clinical trials and ensuring clinical trial material is provided to clinical sites in a timely manner; or
- obtaining advice from regulatory authorities regarding the statistical analysis plan to be used to evaluate the clinical trial data or other trial design issues.

We may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our ability to receive marketing approval or commercialize our product candidates, including:

- we may receive feedback from regulatory authorities that requires us to modify the design of our clinical trials;
- clinical trials of our product candidates may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon drug development programs;
- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate or participants may drop out of these clinical trials at a higher rate than we anticipate;

- our third-party contractors, including our CROs, may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;

- we, our investigators, or any of the overseeing IRBs or ethics committees might decide to suspend or terminate clinical trials of our product candidates for various reasons, including non-compliance with regulatory requirements, a finding that our product candidates have undesirable side effects or other unexpected characteristics, or a finding that the participants are being exposed to unacceptable health risks;

- the cost of clinical trials of our product candidates may be greater than we anticipate;

- the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate;

- regulators may revise the requirements for approving our product candidates, or such requirements may not be as we anticipate; and

- any future collaborators that conduct clinical trials may face any of the above issues and may conduct clinical trials in ways they view as advantageous to them but that are suboptimal for us.

If we are required to conduct additional clinical trials or other testing of our product candidates beyond those that we currently contemplate, if we are unable to successfully complete clinical trials of our product candidates or other testing, if the results of these trials or tests are not positive or are insufficiently positive to support marketing approval, or if there are safety concerns, we may:

- incur unplanned costs;

- be delayed in obtaining marketing approval for our product candidates or not obtain marketing approval at all;

- obtain marketing approval in some countries and not in others;

- obtain marketing approval for indications or patient populations that are narrower or more limited in scope than intended or desired;

- obtain marketing approval subject to significant use or distribution restrictions or with labeling that includes significant safety warnings, including boxed warnings;

- be subject to additional post-marketing testing requirements; or

- have the drug removed from the market after obtaining marketing approval.

Our drug development costs will also increase if we experience delays in testing or marketing approvals. We do not know whether clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all. Furthermore, we rely on third-party CROs and clinical trial sites to ensure the proper and timely conduct of our clinical trials, and while we have agreements governing their committed activities, we have limited influence over their actual performance. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring drugs to market before we do and impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

We may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.

Because we have limited financial and managerial resources, we focus on research programs and product candidates that we identify for specific indications. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial drugs or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable drugs. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other strategic arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate

If we are required to in the future and if we are unable to successfully develop companion diagnostic tests for our product candidates that require such tests, or experience significant delays in doing so, we may not realize the full commercial potential of these product candidates.

We may be required by the FDA to develop, either by ourselves or with collaborators, companion diagnostic tests for our product candidates for certain indications. To be successful, we or our collaborators will need to address a number of scientific, technical, regulatory and logistical challenges. We have no prior experience with medical device or diagnostic test development. If we choose to develop and seek FDA approval for companion diagnostic tests on our own, we will require additional personnel. We may rely on third parties for the design, development and manufacture of companion diagnostic tests for our therapeutic product candidates that require such tests. If these parties are unable to successfully develop companion diagnostics for these therapeutic product candidates, or experience delays in doing so, we may be unable to enroll enough patients for our current and planned clinical trials, the development of these therapeutic product candidates may be adversely affected, these therapeutic product candidates may not obtain marketing approval, and we may not realize the full commercial potential of any of these therapeutics that obtain marketing approval. Any failure to successfully develop this companion diagnostic may cause or contribute to delayed enrollment of this trial, and may prevent us from initiating or completing further clinical trials to support marketing approval for our product candidates. As a result, our business, results of operations and financial condition could be materially harmed.

We may not be successful in our efforts to identify or discover additional potential product candidates.

Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for a number of reasons, including:

- the research methodology used may not be successful in identifying potential product candidates;
- potential product candidates may, on further study, be shown to have harmful side effects or other characteristics that indicate that they are unlikely to be drugs that will receive marketing approval and/or achieve market acceptance; and
- potential product candidates may not be safe or effective in treating their targeted diseases.

Research programs to identify new product candidates require substantial technical, financial and human resources. If we are unable to identify suitable compounds for preclinical and clinical development, our business would be harmed.

If any of our product candidates receives marketing approval and we, or others, later discover that the drug is less effective than previously believed or causes undesirable side effects that were not previously identified, our ability, or that of any future collaborators, to market the drug could be compromised.

Clinical trials of our product candidates must be conducted in carefully defined subsets of patients who have agreed to enter into clinical trials. Consequently, it is possible that our clinical trials, or those of any future collaborator, may indicate an apparent positive effect of a product candidate that is greater than the actual positive effect, if any, or

alternatively fail to identify undesirable side effects. If one or more of our product candidates receives marketing approval and we, or others, discover that the drug is less effective than previously believed or causes undesirable side effects that were not previously identified, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw their approval of the drug or seize the drug;
- we, or any future collaborators, may be required to recall the drug, change the way the drug is administered or conduct additional clinical trials;
- additional restrictions may be imposed on the marketing of, or the manufacturing processes for, the particular drug;
- we may be subject to fines, injunctions or the imposition of civil or criminal penalties;
- regulatory authorities may require the addition of labeling statements, such as a "black box" warning or a contraindication;
- we, or any future collaborators, may be required to create a Medication Guide outlining the risks of the previously unidentified side effects for distribution to patients;
- we, or any future collaborators, could be sued and held liable for harm caused to patients;
- the drug may become less competitive in the marketplace; and
- our reputation may suffer.

Any of these events could have a material and adverse effect on our operations and business and could adversely impact our stock price.

Even if any of our product candidates receive marketing approval, they may fail to achieve the degree of market acceptance by physicians, patients, healthcare payors and others in the medical community necessary for commercial success.

If any of our product candidates receive marketing approval, they may nonetheless fail to gain sufficient market acceptance by physicians, patients, healthcare payors and others in the medical community. For example, current cancer treatments like chemotherapy and radiation therapy are well-established in the medical community, and doctors may continue to rely on these treatments. If our product candidates do not achieve an adequate level of acceptance, we may not generate significant revenues from sales of drugs and we may not become profitable. The degree of market acceptance of our product candidates, if approved for commercial sale, will depend on a number of factors, including:

- the efficacy and safety of the product;
- the potential advantages of the product compared to alternative therapies;
- the prevalence and severity of any side effects;
- whether the product is designated under physician and other provider treatment guidelines as a first-, second- or third-line therapy;
- our ability, or the ability of any future collaborators, to offer the product for sale at competitive prices;
- the product's convenience and ease of administration for patients and healthcare practitioners compared to alternative treatments;
- the willingness of the target patient population to try, and of physicians to prescribe, the product;

- limitations or warnings, including distribution or use restrictions and safety information contained in the product's approved labeling;
- the strength of sales, marketing and distribution support;
- changes in the standard of care for the targeted indications for the product; and
- the availability of coverage by, and the amount of reimbursement from, government payors, managed care plans and other third-party payors.

We face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do.

The pharmaceutical and biotechnology industries generally, and the cancer drug sector specifically, are highly competitive and characterized by rapidly advancing technologies, evolving understanding of disease etiology and a strong emphasis on proprietary drugs. We face competition with respect to ATRN-119 and our other product candidates, and will face competition with respect to any product candidates that we may seek to discover and develop or commercialize in the future, from major pharmaceutical, specialty pharmaceutical and biotechnology companies. There are a number of major pharmaceutical, specialty pharmaceutical and biotechnology companies that currently market and sell drugs or are pursuing the development of drugs for the treatment of cancer. Potential competitors also include academic institutions and governmental agencies and public and private research institutions.

There are a large number of companies developing or marketing treatments for cancer, including the indications for which we may develop product candidates. Many of the companies that we compete or may compete against in the future have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved drugs than we do. Small or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or that may be necessary for, our programs.
Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize drugs that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any drugs that we may develop. Our competitors also may obtain FDA or other comparable foreign regulatory approval for their drugs more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. The key competitive factors affecting the success of all of our product candidates, if approved, are likely to be their efficacy, safety, convenience, price, the effectiveness of companion diagnostics in guiding the use of related therapeutics, the level of generic competition and the availability of reimbursement from government and other third-party payors.

The most common methods of treating patients with cancer are surgery, radiation and drug therapy. There are a variety of available drug therapies marketed for cancer. In many cases, these drugs are administered in combination to enhance efficacy. Some of the currently-approved drug therapies are branded and subject to patent protection and may be established as the standard of care for treatment of indications for which we may choose to seek regulatory approvals. Many of these approved drugs are well-established therapies and are widely accepted by physicians, patients and third-party payors, and, even if our product candidates were to be approved, there can be no assurance that our product candidates would displace existing treatments. In addition to currently marketed therapies, there are also a number of drugs in late-stage clinical development to treat cancer, including the indications for which we are developing product candidates. These clinical-stage product candidates may provide efficacy, safety, convenience and other benefits that are not provided by currently-marketed therapies. As a result, they may provide significant competition for any of our product candidates for which we obtain regulatory approval.

We are developing ATRN-119, which is an orally bioavailable small molecule product candidate that targets Ataxia Telangiectasia and Rad3-related ("ATR") protein within the DNA damage response pathway. We are aware of other product candidates that are in clinical development for the treatment of various cancers through similar mechanisms of

action, including product candidates in clinical development being tested by Artios Pharma Ltd., AstraZeneca Plc, Bayer AG, IMPACT Therapeutics, Inc., and Repare Therapeutics, Inc., among others. If ATRN-119 were to be approved, it will compete with currently marketed drugs or drugs that may be approved for marketing by the FDA or comparable foreign regulatory authorities in the future and such competition will not be limited to drugs with similar mechanisms of action.

We are also developing APR-1051, which is an orally bioavailable small molecule inhibitor of WEE1, a key regulator of multiple phases of the cell cycle. We are aware of other product candidates that are in preclinical and clinical development for the treatment of various cancers through similar mechanisms of action, including product candidates developed by Debiopharm, IMPACT Therapeutics, Schrodinger and Zentalis Pharmaceuticals, among others. If APR-1051 were to be approved, it will compete with currently marketed drugs or drugs that may be approved for marketing by the FDA or comparable foreign regulatory authorities in the future and such competition will not be limited to drugs with similar mechanisms of action.

Our business and operations would suffer in the event of IT system failures, cybersecurity attacks, data breaches, or vulnerabilities in our or our third-party vendors' information security program or defenses.

Our business relies upon information technology systems operated by us and by our third party service providers. These systems may fail or experience operational disruption, experience cybersecurity attacks, or be damaged by computer viruses and unauthorized access. In the ordinary course of business, we collect, store and transmit confidential information (including but not limited to intellectual property, proprietary business information and personal information). It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We have developed, and continue to mature our policies and procedures to ensure the security and integrity of our information technology systems and confidential and proprietary information. If we do not continue to mature our cybersecurity defensive technological safeguards, policies and procedures or those safeguards, policies and procedures are insufficient to ensure the protection of our information technology systems and confidential and proprietary information, we may be vulnerable to security breaches or disruptions and system breakdowns or other damage or interruptions, and face legal and reputational risk. We also have outsourced elements of our operations to third parties, and as a result we manage a number of third-party vendors and other contractors and consultants who have access to or store our confidential information. While we endeavor to select providers with reasonable and industry standard information security programs, we are reliant on these third-party vendors' commitments regarding their information technology systems and cybersecurity programs. If our third-party vendors fail to protect their information technology systems and our confidential and proprietary information, we may be vulnerable to disruptions in service and unauthorized access to our confidential or proprietary information and we could incur liability and reputational damage and the further development and commercialization of our product candidates could be delayed. While we have not, to our knowledge, experienced any material IT system failures or cybersecurity attacks to date, we frequently must defend against and respond to cybersecurity incidents and attacks and cannot assure you that our data protection efforts and our investment in information technology will prevent significant breakdowns, data leakages, compromises of personal information or confidential commercial information, other operationally significant breaches in our systems or those of our third-party vendors and other contractors and consultants, or other cyber incidents that could have a material adverse effect upon our reputation, business, operations or financial condition. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs, business operations, a breach of sensitive personal information or a loss or corruption of critical data assets including trade secrets or other proprietary information. For example, the loss of clinical trial data from future clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. Such IT system failures, cybersecurity attacks or vulnerabilities to our or our third-party vendors' information security programs or defenses could result in legal liability, reputational damage, business interruption, and our competitive position could be harmed and the further development and commercialization of our products or any future products could be delayed or disrupted. Moreover, containing and remediating any IT system failure, cybersecurity attack or vulnerability may require significant investment of resources. Furthermore, significant security breaches or disruptions of our internal information technology systems or those of our third-party vendors and other contractors and consultants could result in the loss, misappropriation and/or unauthorized access, use, or disclosure of, or the prevention of access to, confidential information (including trade secrets or other intellectual property, proprietary business information and personal information), which could result in financial, legal, business and reputational harm to us.

If, in the future, we are unable to establish sales and marketing capabilities or enter into agreements with third parties to sell and market our product candidates, we may not be successful in commercializing our product candidates if and when they are approved.

We do not have a sales or marketing infrastructure and have no experience in the sale or marketing of pharmaceutical drugs. We are not currently a party to a strategic collaboration that provides us with access to a collaborator's resources in selling or marketing drugs. To achieve commercial success for any approved drug for which sales and marketing is not the responsibility of any strategic collaborator that we may have in the future, we must either develop a sales and marketing organization or outsource these functions to other third parties. In the future, we may choose to build a sales and marketing infrastructure to market or co-promote some of our product candidates if and when they are approved, or enter into collaborations with respect to the sale and marketing of our product candidates.

There are risks involved with both establishing our own sales and marketing capabilities and entering into arrangements with third parties to perform these services. For example, recruiting and training a sales force is expensive and time-consuming and could delay any commercial launch of a product candidate. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

Factors that may inhibit our efforts to commercialize our product candidates on our own include:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- limitations or restrictions on the ability of sales personnel to appropriately market the product to physicians or other healthcare professionals;
- the lack of complementary drugs to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines;
- unforeseen costs and expenses associated with creating an independent sales and marketing organization; and
- inability to obtain sufficient coverage and reimbursement from third-party payors and governmental agencies.

If we enter into arrangements with third parties to perform sales and marketing services, our revenues from the sale of drugs or the profitability of these revenues to us are likely to be lower than if we were to market and sell any drugs that we develop ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell and market our product candidates or may be unable to do so on terms that are favorable to us. Third parties may also fail to devote the necessary resources and attention to sell and market our product candidates effectively and we may not have sufficient control or oversight over third parties to ensure they sell and market our product candidates in compliance with all applicable law. If we do not establish sales and marketing capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

If the FDA or comparable foreign regulatory authorities approve generic versions of any of our product candidates that receive marketing approval, or such authorities do not grant our product candidates appropriate periods of data or market exclusivity before approving generic versions of our product candidates, the sales of our product candidates could be adversely affected.

Once an NDA is approved, the drug covered thereby becomes a "reference-listed drug" in the FDA's publication, "Approved Drug Products with Therapeutic Equivalence Evaluations." Manufacturers may seek marketing approval of generic versions of reference-listed drugs through submission of abbreviated new drug applications, or ANDAs, in the United States. In support of an ANDA, a generic manufacturer need not conduct clinical trials demonstrating safety and efficacy. Rather, the applicant generally must show that its drug is pharmaceutically equivalent to the reference listed

drug, in that it has the same active ingredient(s), dosage form, strength, route of administration and conditions of use or labeling as the reference-listed drug, and that the generic version is bioequivalent to the reference-listed drug, meaning it is absorbed in the body at the same rate and to the same extent. Generic drugs may be significantly less costly to bring to market than the reference-listed drug and companies that produce generic drugs are generally able to offer them at lower prices. Thus, following the introduction of a generic drug, a significant percentage of the sales of any branded product or reference-listed drug is typically lost to the generic drug.

The FDA may not approve an ANDA for a generic drug until any applicable period of non-patent exclusivity for the reference-listed drug has expired. The Federal Food, Drug, and Cosmetic Act, or FDCA, provides a period of five years of non-patent exclusivity for a new drug containing a new chemical entity, or NCE. During the exclusivity period, the FDA may not accept for review an ANDA or a 505(b)(2) NDA submitted by another company for another version of such product candidate where the applicant does not own or have a legal right of reference to all the data required for approval. However, an application may be submitted after four years if it contains a certification of patent invalidity or non-infringement. The FDCA also provides three years of marketing exclusivity for an NDA, 505(b)(2) NDA or supplement to an approved NDA if new clinical investigations, other than bioavailability studies, that were conducted or sponsored by the applicant are deemed by the FDA to be essential to the approval of the application, for example, for new indications, dosages or strengths of an existing product candidate. This three-year exclusivity covers only the conditions associated with the new clinical investigations and does not prohibit the FDA from approving ANDAs for product candidates containing the original active agent for other conditions of use. Five-year and three-year exclusivity will not delay the submission or approval of a full NDA. However, an applicant submitting a full NDA would be required to conduct or obtain a right of reference to all of the nonclinical studies and adequate and well-controlled clinical trials necessary to demonstrate safety and effectiveness. Manufacturers may seek to launch these generic drugs following the expiration of the marketing exclusivity period, even if we still have patent protection for our drug competition that our product candidates may face from generic versions of our product candidates could materially and adversely impact our future revenue, profitability and cash flows and substantially limit our ability to obtain a return on the investments we have made in those product candidates. Our future revenues, profitability and cash flows could also be materially and adversely affected and our ability to obtain a return on the investments we have made in those product candidates may be substantially limited if our product candidates, if and when approved, are not afforded the appropriate periods of non-patent exclusivity.

Even if we obtain regulatory approval of any product candidate, the approved product may be subject to post-approval studies and will remain subject to ongoing regulatory requirements. If we fail to comply, or if concerns are identified in subsequent studies, our approval could be withdrawn, and our product sales could be suspended.

If we are successful at obtaining regulatory approval for ATRN-119 or any of our other product candidates, regulatory agencies in the United States and other countries where a product will be sold may require extensive additional clinical trials or post-approval clinical trials that are expensive and time-consuming to conduct. These trials may reveal side effects or other harmful effects in patients that use our products after they are on the market, which may result in the limitation or withdrawal of our drugs from the market. Alternatively, we may not be able to conduct such additional trials, which might force us to abandon our efforts to develop or commercialize certain product candidates. Even if post-approval studies are not requested or required, after our products are approved and on the market, there might be safety issues that emerge over time that require a change in product labeling, additional post-market studies or clinical trials, imposition of distribution and use restrictions under a Risk Evaluation and Mitigation Strategy, or REMS, or withdrawal of the product from the market, which would cause our revenue to decline.

Additionally, any products that we may successfully develop will be subject to ongoing regulatory requirements after they are approved. These requirements will govern the manufacturing, packaging, marketing, distribution, and use of our products. If we fail to comply with such regulatory requirements, approval for our products may be withdrawn, and product sales may be suspended. We may not be able to regain compliance, or we may only be able to regain compliance after a lengthy delay, significant expense, lost revenues and damage to our reputation.

Even if we are able to commercialize any product candidate, such product candidate may become subject to unfavorable pricing regulations, third-party coverage and reimbursement policies or healthcare reform initiatives, which could harm our business.

The regulations that govern marketing approval, pricing, coverage and reimbursement for new drugs vary widely from country to country. Some countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we might obtain marketing approval for a product in a particular country, but then be subject to price regulations that delay our commercial launch of the product, possibly for lengthy time periods, and negatively impact the revenues we are able to generate from the sale of the product in that country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain marketing approval.

Our ability to commercialize any products successfully also will depend in part on the extent to which reimbursement and coverage for these products and related treatments will be available from government authorities, private health insurers and other organizations, and if reimbursement and coverage is available, the level of reimbursement and coverage. Government authorities and third-party payors, such as private health insurers and health maintenance organizations, decide which medications they will pay for and establish reimbursement levels. A primary trend in the healthcare industry in the United States and elsewhere is cost containment. Government authorities and third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications. Increasingly, the third-party payors who reimburse patients or healthcare providers, such as government and private insurance plans, are requiring that drug companies provide them with predetermined discounts from list prices, and are seeking to reduce the prices charged or the amounts reimbursed for medical products. We cannot be sure that coverage and reimbursement will be available for any drug that we commercialize and, if coverage and reimbursement are available, we cannot be sure as to the level of reimbursement. Reimbursement may impact the demand for, or the price of, any product candidate for which we obtain marketing approval. If reimbursement is not available or is available only to limited levels, we may not be able to successfully commercialize any product candidate for which we obtain marketing approval.

There may be significant delays in obtaining reimbursement for newly approved drugs, and coverage may be more limited than the purposes for which the drug is approved by the FDA or comparable foreign regulatory authorities. Moreover, eligibility for reimbursement does not imply that any drug will be reimbursed in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution. Interim reimbursement levels for new drugs, if applicable, may also not be sufficient to cover our costs and may not be made permanent. Reimbursement rates may vary according to the use of the drug and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost drugs, may be incorporated into existing payments for other items or services and may reflect budgetary constraints or imperfections in Medicare data. Net prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement rates. Our inability to promptly obtain coverage and adequate reimbursement rates from both government-funded and private payors for new products that we develop and for which we obtain marketing approval could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products and our overall financial condition.

Product liability lawsuits against us could cause us to incur substantial liabilities and to limit commercialization of any drugs that we may develop. Our insurance policies may be inadequate and may potentially expose us to unrecoverable risk.

We face an inherent risk of product liability exposure related to the testing of our product candidates in clinical trials and will face an even greater risk if we commercially sell any drugs that we may develop. If we cannot successfully defend ourselves against claims that our product candidates or drugs caused injuries, we will incur substantial liabilities. Regardless of merit or eventual outcome, liability claims may result in:

- decreased demand for any product candidates or drugs that we may develop;
- injury to our reputation and significant negative media attention;
- withdrawal of clinical trial participants;
- significant costs to defend the related litigation;
- substantial monetary awards to trial participants or patients;
- loss of revenue;
- reduced resources of our management to pursue our business strategy; and
- the inability to commercialize any drugs that we may develop.

We currently hold clinical trial liability insurance coverage for up to $5.0 million, but that coverage may not be adequate to cover any and all liabilities that we may incur. We would need to increase our insurance coverage when we begin the commercialization of our product candidates, if ever. Insurance coverage is increasingly expensive. We may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any liability that may arise.

Governments outside of the United States tend to impose strict price controls, which may adversely affect our revenues from the sales of our products, if any.

In some countries, particularly member states of the EU, the pricing of prescription pharmaceuticals is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after the receipt of marketing approval for a product. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various EU member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. In some countries, we, or our future collaborators, may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of our product candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third-party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of any product candidate approved for marketing is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business could be materially harmed.

An epidemic or pandemic disease outbreak could disrupt our business operations as well as the business or operations of our single third-party manufacturer, our CROs, clinical data management organizations, medical institutions and clinical investigators, or other third parties with whom we conduct business which may have a material adverse effect on our business, results of operations, financial condition and prospects.

An epidemic or pandemic disease outbreak could severely disrupt our operations or the operations of third parties that we depend on, including our single third-party contract manufacturer, our CROs, clinical data management organizations, medical institutions and clinical investigators, and have a material adverse effect on our business, results of operations, financial condition and prospects. In addition, supply chain disruptions due to an epidemic or pandemic disease outbreak could have a material adverse effect on the availability or cost of materials for the active pharmaceutical ingredients, or API for our product candidates. Quarantines, restrictions or bans in travel into and within the countries in which we operate, our manufacturer produces the API for our product candidates or where we conduct our clinical trials could impede, delay, limit or prevent the production or delivery or release of our product candidates to our trial sites, and trial investigators, patients or other critical staff could be restricted from traveling to our trial sites. In addition, some of our clinical sites could slow or cease patient recruitment, patient treatment and/or access to patient

data. Additionally, we and our employees have taken steps to avoid or reduce infection, including limiting travel and implementing remote work arrangements. It is possible that remote work arrangements will not be as efficient as physical operations, and this could adversely affect our business, operations and internal controls. Any or all of these factors could impede, delay, limit or prevent completion of our ongoing clinical trials, or require changes to our ongoing clinical trials, and ultimately lead to the delay or denial of regulatory approval of our product candidates, which would materially adversely affect our business, results of operations, financial conditions and prospects.

While there is significant uncertainty relating to the potential effect of the coronavirus on our business and operations, infections may become more widespread and travel restrictions may worsen, including in the United States, Sweden and other countries where our trials are conducted or the API for our product candidates is manufactured, any of which could have a material adverse effect our business, results of operations, financial conditions and prospects. Additionally, disruptions at the at FDA, the EMA and other regulators, caused by global health concerns, including delays in inspections of clinical trial or manufacturing sites required as part of the drug application review process, could result in delays of reviews and approvals of our product candidate or our proposed clinical trials.

The reactivation of p53 is a novel and unproven therapeutic approach and our development of eprenetapopt may never lead to a marketable product.

We believe that mutant p53 still has the potential to be an attractive target for novel cancer therapy due to the high incidence of p53 mutations across a range of cancer types and the universally inferior prognosis for cancer patients with mutated p53. However, to our knowledge, no one has advanced a product candidate with this mechanism of action into the market. The scientific evidence to support the feasibility of developing these product candidates is both preliminary and limited. For instance, even though eprenetapopt has shown promising results in preclinical studies and early-stage clinical trials, we may not succeed in demonstrating safety and efficacy of eprenetapopt in larger-scale clinical trials. In December 2020, we announced that our pivotal Phase 3 trial failed to meet its predefined primary endpoint of complete remission (CR) rate. On August 4, 2021, the U.S. Food and Drug Administration (FDA) placed a partial clinical hold on the clinical trials of eprenetapopt in combination with azacitidine in our myeloid malignancy programs. On August 11, 2021, the FDA placed a clinical hold on our clinical trial evaluating eprenetapopt with acalabrutinib or with venetoclax and rituximab in lymphoid malignancies. In the first quarter of 2022, FDA notified us that it would continue the partial clinical hold on three ongoing clinical studies in our myeloid program. However, we received clearance from FDA to proceed under our existing IND with a new trial in R/R MDS and AML.

Given these results, FDA feedback and the costs of continuing the p53 reactivator development programs, we have shifted our primary focus of our activities to the discovery and development of molecules targeting DDR pathways in oncology through synthetic lethality. Advancing eprenetapopt as a novel product to reactivate p53 creates significant challenges for us, including:

- obtaining marketing approval, as obtaining regulatory approval of a p53 reactivator from the FDA or comparable foreign regulatory authorities has never been done before;

- educating medical personnel regarding the potential efficacy and safety benefits, as well as the challenges, of incorporating our product candidates, if approved, into treatment regimens; and

- establishing the sale and marketing capabilities to gain market acceptance, if approved.

Risks related to our dependence on third parties

We rely on third parties to conduct our clinical trials and some aspects of our research and preclinical studies, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials, research and studies.

We currently rely on third parties, such as CROs, clinical data management organizations, medical institutions and clinical investigators, to conduct our clinical trials and expect to continue to rely upon third parties to conduct additional

clinical trials. We currently rely and expect to continue to rely on third parties to conduct some aspects of our research and preclinical studies. Any of these third parties may terminate their engagements with us at any time. If we need to enter into alternative arrangements, it would delay our drug development activities.

Our reliance on these third parties for research and development activities will reduce our control over these activities but will not relieve us of our regulatory responsibilities. For example, we will remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan, study protocols for the trial, statistical analysis plan and other study-specific documents (for example, monitoring and blinding plans). Moreover, the FDA requires us to comply with standards, commonly referred to as GCP, International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use, or ICH, guidelines, and regulations regarding the informed consent process, safety reporting requirements, data collection guidelines, and other regulations for conducting, recording and reporting the results of clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. The EMA, also requires us to comply with similar standards. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any of our CROs fail to comply with applicable GCP requirements, the clinical data generated in our clinical trials may be deemed unreliable and the FDA, EMA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that upon inspection by a given regulatory authority, such regulatory authority will determine that any of our clinical trials comply with GCP and other applicable regulations. In addition, our clinical trials must be conducted with product produced under current Good Manufacturing Practices, or cGMP, regulations. Our failure to comply with these regulations may require us to conduct new clinical trials, which would delay the marketing approval process. We also are required to register certain ongoing clinical trials and post the results of certain completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within certain timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

Furthermore, these third parties may also have relationships with other entities, some of which may be our competitors. If these third parties do not successfully carry out their contractual duties, meet expected deadlines or conduct our clinical trials in accordance with regulatory requirements or our stated protocols, we will not be able to obtain, or may be delayed in obtaining, marketing approvals for our product candidates and will not be able to, or may be delayed in our efforts to, successfully commercialize our product candidates.

We also expect to rely on other third parties to store and distribute drug supplies for our clinical trials. Any performance failure on the part of such third parties could delay clinical development or marketing approval of our product candidates or commercialization of our product candidates, producing additional losses and depriving us of potential revenue from sales of drugs.

Although we currently plan to retain all commercial rights to our product candidates, we may enter into strategic collaborations for the development, marketing and commercialization of our product candidates. If those collaborations are not successful, the development, marketing and/or commercialization of our product candidates that are the subject of such collaborations would be harmed.

As we further develop our product candidates, we may build a commercial infrastructure with the capability to directly market it to a variety of markets and geographies. Although we currently plan to retain all commercial rights to our product candidates, we may enter into strategic collaborations for the development, marketing and commercialization of our product candidates. Our likely collaborators for any collaboration arrangements include large and mid-size pharmaceutical companies, regional and national pharmaceutical companies and biotechnology companies. If we do enter into any such arrangements with any third parties, we will likely have limited control over the amount and timing of resources that our collaborators dedicate to the development, marketing and/or commercialization of our product candidates. Our ability to generate revenues from these arrangements will depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements. In addition, any future collaborators may have the right to abandon research or development projects and terminate applicable agreements, including funding obligations, prior to or upon the expiration of the agreed upon terms.

Collaborations involving our product candidates would pose the following risks to us:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;

- collaborators may not perform their obligations as expected;

- collaborators may not pursue development, marketing and/or commercialization of our product candidates or may elect not to continue or renew development, marketing or commercialization programs based on clinical trial results, changes in the collaborator's strategic focus or available funding or external factors such as an acquisition that diverts resources or creates competing priorities;

- collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;

- collaborators could independently develop, or develop with third parties, drugs that compete directly or indirectly with our product candidates or product candidates;

- a collaborator with marketing and distribution rights to one or more drugs may not commit sufficient resources to the marketing and distribution of such drug or drugs;

- disagreements with collaborators, including disagreements over proprietary rights, contract interpretation or the preferred course of development, might cause delays or termination of the research, development or commercialization of product candidates, might lead to additional responsibilities for us with respect to product candidates, or might result in litigation or arbitration, any of which would be time-consuming and expensive;

- collaborators may not properly obtain, maintain, defend and enforce our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our proprietary information or expose us to potential litigation;

- collaborators may infringe, misappropriate or otherwise violate the intellectual property rights of third parties, which may expose us to litigation and potential liability;

- we may lose certain valuable rights under circumstances identified in any collaboration arrangement that we enter into, such as if we undergo a change of control;

- collaborations may be terminated and, if terminated, may result in a need for additional capital to pursue further development, marketing and/or commercialization of the applicable product candidates;

- collaborators may learn about our discoveries, data, proprietary information, trade secrets, or compounds and use this knowledge to compete with us in the future; and

- the number and type of our collaborations could adversely affect our attractiveness to future collaborators or acquirers.

Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner, or at all.

We are currently dependent on a single third party manufacturer for the manufacture of the active pharmaceutical ingredient for our product candidates. This reliance on a single third party increases the risk that we will not have sufficient quantities of our product candidates or drugs or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

We do not have any manufacturing facilities or personnel, and we currently have no plans to build our own clinical or commercial scale manufacturing capabilities. We currently contract with third parties for the manufacture of our product candidates for certain preclinical trials and clinical trial materials, including raw materials and consumables necessary for their manufacture, consistent with applicable cGMP requirements. We intend to continue to contract for these materials in the future, including commercial manufacture if our product candidates receive marketing approval.

The API and drug product for our product candidates is currently manufactured by a single contract manufacturer. Although we may do so in the future, we do not currently have arrangements in place for redundant supply of the API and drug product for our product candidates.

We expect to rely on third-party manufacturers or third-party collaborators for the manufacture of our product candidates for commercial supply of any of our product candidates for which we or any of our future collaborators obtain marketing approval. We may be unable to establish any agreements with third-party manufacturers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

- the possible failure of the third party to manufacture our product candidate according to our schedule, or at all, including if our third-party contractors give greater priority to the supply of other products over our product candidates or otherwise do not satisfactorily perform according to the terms of the agreements between us and them;

- the possible termination or nonrenewal of agreements by our third-party contractors at a time that is costly or inconvenient for us;

- the possible breach by the third-party contractors of our agreements with them;

- the failure of third-party contractors to comply with applicable regulatory requirements;

- the possible failure of the third party to manufacture our product candidates according to our specifications;

- the possible mislabeling of clinical supplies, potentially resulting in issues including the wrong dose amounts being supplied or active drug or placebo not being properly identified;

- the possibility of clinical supplies not being delivered to clinical sites on time, leading to clinical trial interruptions, or of drug supplies not being distributed to commercial vendors in a timely manner, resulting in lost sales; and

- the possible misappropriation of our proprietary information, including our trade secrets and know-how.

The facilities used by our contract manufacturers to manufacture our product candidates must be approved by the FDA or the EMA pursuant to inspections that will be conducted after we submit our NDA to the FDA or our MAA to the EMA. We do not have complete control over all aspects of the manufacturing process of, and are dependent on, our contract manufacturing partners for compliance with cGMP regulations for manufacturing both active drug substances and finished drug products. Third-party manufacturers may not be able to comply with cGMP regulations or similar regulatory requirements outside of the United States. If our contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or comparable foreign regulatory bodies, they will not be able to secure and/or maintain marketing approval for their manufacturing facilities. In addition, we do not have complete control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel. If the FDA, the EMA or a comparable foreign regulatory authority does not approve these facilities for the manufacture of our product candidates or if it withdraws any such approval in the future, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain marketing approval for or market our product candidates, if approved.

Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or drugs, operating restrictions and criminal

prosecutions, any of which could significantly and adversely affect supplies of our product candidates and harm our business and results of operations.

Any drugs that we may develop may compete with other product candidates and drugs for access to manufacturing facilities. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us.

Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval.

We do not currently have arrangements in place for redundant supply of the API of our product candidates. If our current contract manufacturer cannot perform as agreed, we may be required to replace that manufacturer. Although we believe that there are several potential alternative manufacturers who could manufacture our product candidates, we may incur added costs and delays in identifying and qualifying any such replacement.

Our current and anticipated future dependence upon others for the manufacture of our product candidates or drugs may adversely affect our future profit margins and our ability to commercialize any drugs that receive marketing approval on a timely and competitive basis.

Risks related to our intellectual property

If we are unable to obtain and maintain intellectual property protection for our product candidates or for our technology, our competitors could develop and commercialize products or technology similar or identical to ours, and our ability to successfully commercialize any product candidates we may develop, and our technology may be adversely affected.

Our commercial success will depend in large part on obtaining and maintaining patent, trademark and trade secret protection of our proprietary technologies and our product candidates, their respective components, formulations, methods used to manufacture them and methods of treatment, as well as successfully defending these patents against third-party challenges. We seek to protect our proprietary position by filing patent applications in the United States and abroad relating to our product candidates as well as other technologies that are important to our business. Our ability to stop unauthorized third parties from making, using, selling, offering to sell or importing our product candidates is dependent upon the extent to which we have rights under valid and enforceable patents or trade secrets that cover these activities.

The chemical structure of eprenetapopt is in the public domain. Accordingly, we do not own or license any composition of matter patents claiming the compound of eprenetapopt and will not in the future own or license any composition of matter patents claiming the chemical structure of eprenetapopt as described in the public domain. Our patent portfolio for eprenetapopt currently consists of method-of-use and formulation patent claims, and dosing, manufacturing processes, crystalline solid form, and combination therapy patent application claims. Our existing patents and any future patents we obtain may not be sufficiently broad to prevent others from using our technology or from developing competing products and technologies. Any failure to obtain or maintain patent protection with respect to eprenetapopt and our other product candidates could have a material adverse effect on our business, financial condition, results of operations and growth prospects. If it is later determined that our activities or product candidates infringe, misappropriate or otherwise violate the intellectual property of third parties we may be liable for damages, enhanced damages or subjected to an injunction, any of which could have a material adverse effect on our business.

The patenting process is expensive and time-consuming, and we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. In addition, we may not pursue or obtain patent protection in all relevant markets. During the course of business, we have decided not to pursue certain products or processes and have not pursued certain corresponding intellectual property. However, we may decide to pursue such products or processes again in the future. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection.

The patent position of pharmaceutical and biotechnology companies generally is highly uncertain and involves complex legal and factual questions for which many legal principles remain unresolved. In recent years patent rights have been the subject of significant litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Our pending and future patent applications may not result in patents being issued in the United States or in other jurisdictions which protect our technology or products or which effectively prevent others from commercializing competitive technologies and products.

Our ability to obtain and maintain valid and enforceable patents depends on whether the differences between our inventions and the prior art, including our own previously filed patent applications and scientific publications, allow our inventions to be patentable over the prior art. We are aware of certain scientific publications by our inventors and other third parties that disclose subject matter, including the composition of eprenetapopt, relating to certain of our patents, that may be used by third parties to challenge the validity and enforceability of our patents and patent applications. If such third parties are successful, we could lose valuable patent rights. In the United States, an inventor's own publication cannot be used as prior art to the inventor's patent application on the same subject matter when published less than one year before the effective filing date of the patent application. Such a publication may be considered prior art in certain jurisdictions that do not provide such a grace period. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we were the first to make the inventions claimed in our patents or pending patent applications, or that we were the first to file for patent protection of such inventions. In addition, the U.S. Patent and Trademark Office, or USPTO, might require that the term of a patent issuing from a pending patent application be disclaimed and limited to the term of another patent that is commonly owned or names a common inventor. Although we enter into non-disclosure and confidentiality agreements with parties who have access to confidential or patentable aspects of our research and development output, such as our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors, and other third parties, certain of these parties have and others may in the future breach the agreements and disclose such output before a patent application is filed, thereby jeopardizing our ability to seek patent protection.
Moreover, the coverage claimed in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted after issuance. Even if our patent applications issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner.

The issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, and our patents may be challenged in the courts or patent offices in the United States and abroad. Such challenges may result in the patent claims of our patents being narrowed, invalidated or held unenforceable, which could limit our ability to stop or prevent us from stopping others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and products. In addition, some of our owned patents and patent applications may in the future be co-owned with third parties. If we do not have exclusive control of the grant of licenses under any such third-party co-owners' interest in such patents or patent applications or we are otherwise unable to secure such exclusive rights, such co-owners may be able to license their rights to other third parties, including our competitors, and our competitors could market competing products and technology. In addition, we may need the cooperation of any such co-owners of our co-owned patents in order to enforce such patents against third parties, and such cooperation may not be provided to us.

Given the amount of time required for the development, testing and regulatory review of new product candidates, which may be extended due to epidemic or pandemic disease outbreaks, patents protecting such candidates might expire before or shortly after such candidates are commercialized. As a result, our patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours or otherwise provide us with a competitive advantage. Upon the expiration of our current patents, we may lose the right to exclude others from practicing these inventions based on patent exclusivity. The expiration of these patents could also have a similar material adverse effect on our business, results of operations, financial condition and prospects.

Our proprietary position for eprenetapopt depends upon patents that consist of method-of-use and formulation patent claims, which may not prevent a competitor or other third party from using the same product candidate for another use or in another formulation.

Composition-of-matter patent claims on the active pharmaceutical ingredient, or API, in pharmaceutical drug products are generally considered to be the favored form of intellectual property protection for drug products because such patents may provide protection without regard to any particular method of use or manufacture or formulation of the API used. The chemical structure of eprenetapopt is in the public domain. Accordingly, we do not own or license any composition of matter patents claiming the compound of eprenetapopt and will not in the future own or license any composition of matter patents claiming the chemical structure of eprenetapopt as described in the public domain.

Method-of-use patent claims protect the use of a product for the specified method and dosing or formulation patent claims cover dosing regimens or formulations of the API. These types of patent claims do not prevent a competitor or other third party from marketing an identical API for an indication that is outside the scope of the method claims or from developing a different dosing regimen or formulation that is outside the scope of the dosing or formulation claims. Moreover, with respect to method-of-use patents, even if competitors or other third parties do not actively promote their product for our targeted indications or uses for which we may obtain patents, physicians may recommend that patients use these products off-label, or patients may do so themselves. Although off-label use may infringe or contribute to the infringement of method-of-use patents, the practice is common and such infringement is difficult to prevent or prosecute.

In addition, there are numerous publications and other prior art that may be relevant to our patents and may be used to challenge the validity of such patents in litigation or other intellectual property-related proceedings. If such challenges are successful, our patents may be narrowed or found to be invalid and we may lose valuable intellectual property rights. Any of the foregoing could have a material adverse effect on our business, financial conditions and results of operations and prospects.

Issued patents covering our product candidates and other technologies could be narrowed or found invalid or unenforceable if challenged in court or before administrative bodies in the United States or abroad.

If we seek to enforce a patent covering our product candidates or other technologies against a third party, that third party could assert that such patent is invalid or unenforceable. In patent litigation in the United States, challenges to validity or enforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including lack of patentable subject matter, lack of novelty, obviousness, inadequate written description, indefiniteness, or lack of enablement. Grounds for an unenforceability assertion could be an allegation that relevant information was withheld from or a misleading statement was made to the USPTO during prosecution.

In addition, third parties may raise claims challenging the validity or enforceability of our patents before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include preissuance submission of prior art to the USPTO and re-examination, post-grant review, *inter partes* review, interference proceedings, derivation proceedings, and equivalent proceedings in foreign jurisdictions (*e.g.*, opposition proceedings). Moreover, we may have to participate in interference proceedings declared by the USPTO to determine priority of invention or in post-grant challenge proceedings, such as oppositions in a foreign patent office, that challenge our priority of invention or other features of patentability with respect to our patents and patent applications. An adverse determination in any such submission, proceeding or litigation could reduce the scope of, or invalidate or render unenforceable, our patent rights, allow third parties to commercialize our product candidates or other technologies and compete directly with us, without payment to us.

In the United States, an inventor's own publication may not be effective prior art to the inventor's patent application on the same subject matter when published less than one year before the effective filing date of the patent application. Such a publication might be considered prior art in certain jurisdictions that do not provide such a grace period. For those non-US jurisdictions, reliance on non-patent exclusivity may provide sufficient competitive protection to exclude others from commercializing generic versions of our products.

Such proceedings also may result in substantial cost and require significant time from our scientists and management, even if the eventual outcome is favorable to us. If we are unsuccessful in any such proceeding or other priority or inventorship dispute, we may be required to obtain and maintain licenses from third parties, including parties involved in any such interference proceedings or other priority or inventorship disputes. Such licenses may not be available on commercially reasonable terms or at all, or may be non-exclusive. If we are unable to obtain and maintain such licenses, we may need to cease the development, manufacture, and commercialization of one or more of the product candidates we may develop. The loss of exclusivity or the narrowing of our patent claims could limit our ability to stop others from using or commercializing similar or identical technology and products. Any of the foregoing could have a material adverse effect on our business, results of operations, financial condition and prospects.

We may be subject to other claims challenging the inventorship of our patents and other intellectual property.

We may also be subject to claims that former employees, collaborators or other third parties have an interest in our patents, trade secrets, or other intellectual property as an inventor or co-inventor. For example, we may have inventorship disputes arise from conflicting obligations of employees, consultants or others who are involved in developing our product candidates or other technologies. Litigation may be necessary to defend against these and other claims challenging inventorship of our patents, trade secrets or other intellectual property. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, intellectual property that is important to our product candidates and other technologies. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations and growth prospects.

If we do not obtain patent term extension or data exclusivity for any product candidates we may develop, our business may be materially harmed.

Depending upon the timing, duration and specifics of any FDA marketing approval of any product candidates we may develop, one or more of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly referred to as the Hatch-Waxman Act. The Hatch-Waxman Act permits a patent term extension of up to five years as compensation for patent term lost during the FDA regulatory review process. A patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, only one patent may be extended and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended. Similar extensions as compensation for patent term lost during regulatory review processes are also available in certain foreign countries and territories, such as in Europe under a Supplementary Patent Certificate. However, we may not be granted an extension in the United States and/or foreign countries and territories because of, for example, failing to exercise due diligence during the testing phase or regulatory review process, failing to apply within applicable deadlines, failing to apply prior to expiration of relevant patents, or otherwise failing to satisfy applicable requirements. Moreover, the applicable time period or the scope of patent protection afforded could be less than we request. If we are unable to obtain patent term extension or the term of any such extension is shorter than what we request, our competitors may obtain approval of competing products following our patent expiration, and our business, financial condition, results of operations and growth prospects could be materially harmed.

We may not be successful in obtaining, through acquisitions, in-licenses or otherwise, rights that may be necessary to our product candidates or other technologies.

The growth of our business may depend in part on our future ability to acquire or in-license any relevant third-party proprietary rights that we may identify as necessary or important to our business operations. For example, our programs may involve additional product candidates that may require the use of additional proprietary rights held by third parties. Our product candidates may also require specific formulations to work effectively and efficiently. These formulations may be covered by intellectual property rights held by others. We may develop products containing our compounds and pre-existing pharmaceutical compounds. These pharmaceutical compounds may be covered by intellectual property rights held by others. We may be required by the FDA or comparable foreign regulatory authorities to provide a companion diagnostic test or tests with our product candidates. These diagnostic test or tests may be covered by

intellectual property rights held by others. We may be unable to acquire or in-license such third-party intellectual property rights. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at all, which would harm our business. We may need to cease use of the compositions or methods covered by such third-party intellectual property rights, and may need to seek to develop alternative approaches that do not infringe, misappropriate or otherwise violate intellectual property rights which may entail additional costs and development delays, even if we were able to develop such alternatives, which may not be feasible. Even if we are able to obtain a license to such intellectual property rights, any such license may be non-exclusive, which may allow our competitors access to the same technologies licensed to us.

Additionally, we sometimes collaborate with academic institutions and clinical research organizations to accelerate our research or development under written agreements with these institutions and organizations. In certain cases, these institutions and organizations may own or jointly own with us inventions that are created under such collaborations and provide us with an option to negotiate a license to any of the institution's rights in such inventions. Regardless of such option, we may be unable to negotiate a license within the specified timeframe or under terms that are acceptable to us. If we are unable to do so, the institution or organization may offer the intellectual property rights to others, potentially blocking our ability to pursue our program and allowing third parties to compete with us.

The licensing and acquisition of third-party intellectual property rights is a competitive practice, and companies that may be more established, or have greater resources than we do, may also be pursuing strategies to license or acquire third-party intellectual property rights that we may consider necessary or attractive in order to commercialize our product candidates. More established companies may have a competitive advantage over us due to their larger size and cash resources or greater clinical development and commercialization capabilities. In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us. We also may be unable to license or acquire third-party intellectual property rights on terms that would allow us to make an appropriate return on our investment or at all. There can be no assurance that we will be able to successfully complete such negotiations and ultimately acquire the rights to the intellectual property surrounding the additional product candidates that we may seek to acquire. If we are unable to successfully obtain rights to third-party intellectual property that may be necessary, we may have to abandon development of such program and our business, results of operations, financial condition and prospects could suffer.

Changes in U.S. patent law could diminish the value of patents in general, thereby impairing our ability to protect our product candidates and technology.

Recent or future patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents. Assuming that other requirements for patentability are met, prior to March 2013, in the United States, the first to invent the claimed invention was entitled to the patent, while outside the United States, the first to file a patent application was entitled to the patent regardless of whether another inventor had made the invention earlier. In March 2013, under the Leahy-Smith America Invents Act, or America Invents Act, the United States moved from a "first-to-invent" to a "first-to-file" system. Under a "first-to-file" system, assuming the other requirements for patentability are met, the first inventor to file a patent application generally will be entitled to a patent on the invention regardless of whether another inventor had made the invention earlier. A third party that files a patent application in the USPTO after March 2013, but before us, could therefore be awarded a patent covering an invention of ours even if we had made the invention before it was made by such third party. Since patent applications in the United States and most other countries are confidential for a period of time after filing or until issuance, we cannot be certain that we were the first to either (i) file any patent application related to our product candidates or other technologies or (ii) invent any of the inventions claimed in our patents or patent applications.

The America Invents Act includes a number of other significant changes to U.S. patent law, including provisions that affect the way patent applications are prosecuted, redefine prior art and establish a new post-grant review system. These include allowing third party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent by USPTO-administered post-grant proceedings, including post-grant review, *inter partes* review, and derivation proceedings. Because of a lower evidentiary standard in USPTO proceedings compared to the evidentiary standard in United States federal courts necessary to invalidate a patent claim, a third party could potentially provide evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third

party may attempt to use the USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party in a district court action. An adverse determination in any such proceeding could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or result in our inability to manufacture or commercialize products without infringing third-party patent rights, all of which could have a material adverse effect on our business and financial condition. Accordingly, the America Invents Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents.

In addition, the patent positions of companies in the development and commercialization of biologics and pharmaceuticals are particularly uncertain. Recent U.S. Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. This combination of events has created uncertainty with respect to the validity and enforceability of patents, once obtained. Depending on future actions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that could have a material adverse effect on our existing patent portfolio and our ability to protect and enforce our intellectual property in the future.

We may become involved in lawsuits to protect or enforce our patents and other intellectual property rights, which could be expensive, time consuming and unsuccessful.

Competitors may infringe our patents, or we may be required to defend against claims of infringement. In addition, our patents also may become involved in inventorship, priority, validity or unenforceability disputes. To counter or defend against such claims can be expensive and time consuming. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful. For example, in an infringement proceeding, a court may decide that a patent owned by us is invalid or unenforceable. There is also the risk that, even if the validity of these patents is upheld, the court will refuse to stop the third party on the ground that such third party's activities do not infringe our owned patents, including finding that the other party's use of our patented technology falls under the safe harbor to patent infringement under 35 U.S.C. § 271(e)(1). Even if resolved in our favor, these lawsuits are expensive and would consume time and other resources, including distracting our personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions, or other interim proceedings or developments, and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation.

We may not be able to detect infringement against our patents which may be more difficult for formulation patents. Even if we detect infringement by a third party of our patents, we may choose not to pursue litigation against or settlement with the third party. If we later sue such third party for patent infringement, the third party may have certain legal defenses available to it, which otherwise would not be available except for the delay between when the infringement was first detected and when the suit was brought. Such legal defenses may make it impossible for us to enforce our patents against such third party.

If another party questions the patentability of any of our claims in our U.S. patents, the third party can request that the USPTO review the patent claims such as in an *inter partes* review, *ex parte* re-exam or post-grant review proceedings. These proceedings are expensive and may result in a loss of scope of some claims or a loss of the entire patent. In addition to potential USPTO review proceedings, we may become a party to patent opposition proceedings in the European Patent Office, or EPO, or similar proceedings in other foreign patent offices, where either our foreign patents are challenged. The costs of these opposition or similar proceedings could be substantial, and may result in a loss of scope of some claims or a loss of the entire patent. An unfavorable result at the USPTO, EPO or other patent office may

result in the loss of our right to exclude others from practicing one or more of our inventions in the relevant country or jurisdiction, which could have a material adverse effect on our business.

If we are sued for infringing, misappropriating or otherwise violating patents or other intellectual property rights of third parties, it will be costly and time consuming, and an unfavorable outcome in that litigation would have a material adverse effect on our business.

Our commercial success depends upon our ability to develop, manufacture, market and sell our product candidates and use our proprietary technologies without infringing, misappropriating or otherwise violating the intellectual property rights of third parties. There is a substantial amount of litigation involving patents and other intellectual property rights in the biotechnology and pharmaceutical industries. We may be exposed to, or threatened with, future litigation by third parties having patent or other intellectual property rights alleging that our product candidates and/or proprietary technologies infringe, misappropriate or otherwise violate their intellectual property rights. We cannot guarantee that our product candidates and other technologies that we have developed, are developing or may develop in the future will not infringe existing or future patents owned by third parties. U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields relating to our product candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that others may assert our product candidates infringe the patent rights of others. Moreover, it is not always clear to industry participants, including us, which patents cover various types of drugs, products or their methods of use or manufacture. Thus, because of the large number of patents issued and patent applications filed in our fields, there may be a risk that third parties may allege they have patent rights encompassing our product candidates, technologies or methods. It is also possible that patents owned by third parties of which we are aware, but which we do not believe are relevant to our product candidates or other technologies, could be found to be infringed by our product candidates or other technologies. In addition, because some patent applications in the United States may be maintained in secrecy until the patents are issued, patent applications in the United States and many foreign jurisdictions are typically not published until 18 months after filing, and publications in the scientific literature often lag behind actual discoveries, we cannot be certain that others have not filed patent applications covering our product candidates or technology. If any such patent applications issue as patents, and if such patents have priority over our patent applications or patents, we may be required to obtain rights to such patents owned by third parties which may not be available on commercially reasonable terms or at all, or may only be available on a non-exclusive basis.

If a third party claims that we infringe its intellectual property rights, we may face a number of issues even if we believe such claims are without merit, including, but not limited to:

- infringement and other intellectual property claims which, regardless of merit, may be expensive and time-consuming to litigate, may divert our management's attention from our core business and may impact our reputation;

- substantial damages for infringement, which we may have to pay if a court decides that the product candidate or technology at issue infringes on or violates the third party's rights, and, if the court finds that the infringement was willful, we could be ordered to pay treble damages and the patent owner's attorneys' fees;

- a court prohibiting us from developing, manufacturing, marketing or selling our product candidates, including eprenetapopt, or from using our proprietary technologies, unless the third party licenses its patent rights to us, which it is not required to do;

- if a license is available from a third party, we may have to pay substantial royalties, upfront fees and other amounts, and/or grant cross-licenses to intellectual property rights for our product candidates or such license is only available on a non-exclusive basis; and

- redesigning our product candidates or processes so they do not infringe, which may not be possible or may require substantial monetary expenditures and time.

Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations or could otherwise have a material adverse effect on our business, results of operations, financial condition and prospects. The occurrence of any of the foregoing could have a material adverse effect on our business, financial condition, results of operations or growth prospects.

We may choose to challenge the patentability of claims in a third party's U.S. patent by requesting that the USPTO review the patent claims in an *ex-parte* re-exam, *inter partes* review or post-grant review proceedings. These proceedings are expensive and may consume our time or other resources. We may choose to challenge a third party's patent in patent opposition proceedings in the EPO, or other foreign patent office. The costs of these opposition proceedings could be substantial, and may consume our time or other resources. If we fail to obtain a favorable result at the USPTO, EPO or other patent office then we may be exposed to litigation by a third party alleging that the patent may be infringed by our product candidates or proprietary technologies.

We may not be able to protect our intellectual property rights with patents throughout the world.

Filing, prosecuting and defending patents on all of our product candidates throughout the world would be prohibitively expensive, and the laws of some foreign countries may not protect our rights to the same extent as the laws of the United States. Competitors may use our technology in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we have patent protection but where enforcement is not as strong as in the United States. These products may compete with our product candidates in jurisdictions where we do not have any issued patents and our patent claims or other intellectual property rights may not be effective or sufficient to prevent them from so competing. Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biopharmaceuticals, which could make it difficult for us to stop the infringement of our patents or marketing of competing products against third parties in violation of our proprietary rights generally. The initiation of proceedings to enforce our intellectual property rights or proceedings by third parties to challenge the scope or validity of our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business and could put our patents at risk of being invalidated or interpreted narrowly.

Many countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such patent. If we are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position may be impaired, and our business, financial condition, results of operations, and growth prospects may be adversely affected.

Obtaining and maintaining our patent protection depends upon compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent prosecution process and following the issuance of a patent. In some cases, an inadvertent failure to comply with such requirements can be cured by payment of a late fee or by other means in accordance with the applicable rules. There are situations, however, in which non-compliance could result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case if our patent were in force, which would have a material adverse effect on our business.

We may be subject to claims that our employees, consultants or advisors have wrongfully used or disclosed alleged trade secrets of their current or former employers or claims asserting ownership of what we regard as our own intellectual property.

As is common in the biotechnology and pharmaceutical industries, we employ individuals who were previously employed at other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although no claims against us are currently pending, we may be subject to claims that these employees, consultants or advisors or we have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their current or former employers. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses, and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments, and, if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. This type of litigation or proceeding could substantially increase our operating losses and reduce our resources available for development activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other intellectual property related proceedings could adversely affect our ability to compete in the marketplace.

In addition, while it is our policy to require our employees and contractors who may be involved in the conception or development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who, in fact, conceives or develops intellectual property that we regard as our own. The assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Such claims could have a material adverse effect on our business, financial condition, results of operations, and growth prospects.

Confidentiality agreements with employees and third parties may not prevent unauthorized disclosure of trade secrets and other proprietary information.

In addition to the protection afforded by patents, we rely on trade secret protection and confidentiality agreements to protect proprietary know-how that is not patentable or that we elect not to patent, processes for which patents are difficult to enforce and any other elements of our platform technology and discovery and development processes that involve proprietary know-how, information or technology that is not covered by patents. However, trade secrets can be difficult to protect and we have limited control over the protection of trade secrets used by our collaborators and suppliers. Although we seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with parties who have access them, such as our employees, consultants, and outside scientific advisors, contractors and collaborators, we cannot guarantee that we have entered into such agreements with each party that may have or have had access to our trade secrets or proprietary technology and processes. Despite our efforts, any of these parties might breach the agreements and intentionally or inadvertently disclose our trade secret information and we may not be able to obtain adequate remedies for such breaches. In addition, competitors may otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques. Moreover, our competitors or other third parties may independently develop equivalent knowledge, methods and know-how.

Enforcing a claim that a third party illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. In addition, courts inside and outside the United States sometimes are less willing or unwilling to protect trade secrets. If we choose to go to court to stop a third party from using any of our trade secrets, we may incur substantial costs. These lawsuits may consume our time and other resources even if we are successful. If any of our trade secrets were determined to be lawfully obtained or independently developed by a competitor or other third party, we may not be able to prevent them from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor or other

third party, our competitive position, business, results of operations and prospects would be materially and adversely harmed.

Intellectual property rights do not necessarily address all potential threats.

The degree of future protection for our proprietary rights is uncertain because legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep our competitive advantage. For example:

- others may be able to make or use compounds that are similar to the pharmaceutical compounds used in our product candidates but that are not covered by the claims of our patents;

- the APIs in our current product candidates will eventually become commercially available in generic drug products, and no patent protection may be available with regard to formulation or method of use;

- we, or our future licensors or collaborators, might not have been the first to file patent applications for these inventions;

- we, or our future licensors or collaborators, might not have been the first to make the inventions covered by our issued patents or pending patent applications;

- others may independently develop similar or alternative technologies or duplicate any of our technologies;

- it is possible that our current or future pending or licensed patent applications will not result in issued patents;

- it is possible that public disclosures or publications, including disclosures or publications made by us, could be used in an attempt to invalidate our patents;

- issued patents that we hold rights to may be held invalid or unenforceable, including as a result of legal challenges by our competitors or other third parties;

- our competitors or other third parties might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets;

- it is possible that others may circumvent our patents;

- it is possible that there are unpublished applications or patent applications maintained in secrecy that may later issue with claims covering our products or technology similar to ours;

- the laws of foreign countries may not protect our proprietary rights to the same extent as the laws of the United States;

- the claims of our issued patents or patent applications, if and when issued, may not cover our product candidates;

- our issued patents may not provide us with any competitive advantages, may be narrowed in scope, or be held invalid or unenforceable as a result of legal challenges by third parties;

- the inventors of our patents or patent applications may become involved with competitors, develop products or processes which design around our patents, or become hostile to us or the patents or patent applications on which they are named as inventors;

- we have engaged in scientific collaborations in the past and will continue to do so in the future. Such collaborators may develop adjacent or competing products to ours that are outside the scope of our patents;

- we may not develop additional proprietary technologies for which we can obtain patent protection;

- we may choose not to pursue patent protection in order to maintain certain trade secrets or know-how, and a third party may subsequently obtain a patent covering such intellectual property;

- it is possible that product candidates or diagnostic tests we develop may be covered by third parties' patents or other exclusive rights; or

- the patents of others may have an adverse effect on our business.

Should any of these events occur, they could have a material adverse effect on our business, financial condition, results of operations and growth prospects.

If trademarks, brand names and trade names are not adequately protected or available, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

We may rely on trademarks, service marks, tradenames and brand names. We cannot assure you that our trademark applications will be approved. During trademark registration proceedings, we may receive rejections. Although we are given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, any registered or unregistered trademarks or trade names that we currently have or may in the future acquire may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names, which we need to build name recognition among potential partners or customers in our markets of interest. At times, competitors or other third parties may adopt trade names or trademarks similar to ours, thereby impeding our ability to build brand identity and possibly leading to market confusion. In addition, there could be potential trade name or trademark infringement claims brought by owners of other registered trademarks or trademarks that incorporate variations of our registered or unregistered trademarks or trade names. Over the long term, if we are unable to establish name recognition based on our trademarks and trade names, then we may not be able to compete effectively and our business may be adversely affected. Our efforts to enforce or protect our proprietary rights related to trademarks, trade secrets, domain names, copyrights or other intellectual property may be ineffective and could result in substantial costs and diversion of resources and could adversely affect our business, financial condition, results of operations and prospects.

Risks related to regulatory and marketing approval and other legal compliance matters

We have never obtained marketing approval for a product candidate and we may be unable to obtain, or may be delayed in obtaining, marketing approval for any of our product candidates.

We have never obtained marketing approval for a product candidate. The time required to obtain approval by the FDA and comparable foreign regulatory authorities is unpredictable but typically takes many years following the commencement of preclinical studies and clinical trials and depends upon numerous factors, including the substantial discretion of the regulatory authorities. In addition, extraneous factors, including an epidemic or pandemic disease outbreak, or other public health situations, could impact the timeline for FDA and comparable foreign regulatory authorities to review an application for one of our product candidates. It is possible that the FDA and comparable foreign regulatory authorities may refuse to accept for filing and substantive review any new drug applications, or NDAs, marketing authorization applications, or MAA, that we submit for our product candidates or may conclude after review of our data that our application is insufficient to obtain marketing approval of our product candidates. If the FDA, or comparable foreign regulatory authorities do not accept or approve our NDAs or MAAs for our product candidates, it may require that we conduct additional clinical, nonclinical or manufacturing validation studies and submit that data before it will reconsider our applications. Depending on the extent of these or any other regulatory authority-required studies, approval of any NDA, MAA or other application that we submit may be delayed by several years, or may

require us to expend more resources than we have available. It is also possible that additional studies, if performed and completed, may not be considered sufficient by the FDA or comparable foreign regulatory authorities to approve our NDAs or our MAAs.

Any delay in obtaining, or an inability to obtain, marketing approvals would prevent us from commercializing our product candidates, generating revenues and achieving and sustaining profitability. If any of these outcomes occur, we may be forced to abandon our development efforts for our product candidates, which could significantly harm our business.

Even if we complete the necessary preclinical studies and clinical trials, the marketing approval process is expensive, time-consuming and uncertain and may prevent us, or any future collaborators, from obtaining approvals for the commercialization of some or all of our product candidates. As a result, we cannot predict when or if, and in which territories, we, or any future collaborators, will obtain marketing approval to commercialize a product candidate.

The research, testing, manufacturing, labeling, approval, selling, marketing, promotion and distribution of drugs are subject to extensive regulation by the FDA and comparable foreign regulatory authorities, whose laws and regulations may differ from country to country. We, and any future collaborators, are not permitted to market our product candidates in the United States or in other countries until we or they receive approval of an NDA from the FDA or marketing approval from comparable foreign regulatory authorities. Our product candidates are in early stages of development and are subject to the risks of failure inherent in drug development. We have not submitted an application for or received marketing approval for any of our product candidates in the United States or in any other jurisdiction. We have limited experience in conducting and managing the clinical trials necessary to obtain marketing approvals, including FDA approval of an NDA.

The process of obtaining marketing approvals, both in the United States and abroad, is a lengthy, expensive and uncertain process. It may take many years, if approval is obtained at all, and can vary substantially based upon a variety of factors, including the type, complexity and novelty of the product candidates involved. Securing marketing approval requires the submission of extensive preclinical and clinical data and supporting information to regulatory authorities for each therapeutic indication to establish the product candidate's safety and efficacy. Securing marketing approval also requires the submission of information about the product manufacturing process to, and inspection of manufacturing facilities by, the regulatory authorities. The FDA or other comparable foreign regulatory authorities have substantial discretion and may determine that our product candidates are not safe and effective, only moderately effective or have undesirable or unintended side effects, toxicities or other characteristics that preclude our obtaining marketing approval or prevent or limit commercial use. Any marketing approval we ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved product not commercially viable.

Our product candidates could fail to receive marketing approval, or marketing approval for our product candidates could be limited or delayed, for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our clinical trials;

- we may be unable to demonstrate to the satisfaction of the FDA or comparable foreign regulatory authorities that a product candidate is safe and effective for its proposed indication;

- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;

- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;

- the FDA or comparable foreign regulatory authorities may disagree with our interpretation of data from preclinical studies or clinical trials;

- the data collected from clinical trials of our product candidates may not be sufficient to support the submission of an NDA or other submission and applications or to obtain marketing approval in the United States or elsewhere;

- the FDA or comparable foreign regulatory authorities may fail to approve the manufacturing processes or facilities of third-party manufacturers with which we contract for clinical and commercial supplies;

- the FDA or comparable foreign regulatory authorities may fail to approve any companion diagnostics that may be required in connection with approval of our therapeutic product candidates

- the FDA or the applicable foreign regulatory agency may fail to approve the formulation, labeling and/or the specifications for our product candidate

- changes in marketing approval policies during the development period, changes in or the enactment or promulgation of additional statutes, regulations or guidance or changes in regulatory review for each submitted drug application; and

- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

This lengthy approval process as well as the unpredictability of clinical trial results may result in our failing to obtain marketing approval to market ATRN-119, which would significantly harm our business, results of operations and prospects. Regulatory authorities have substantial discretion in the approval process and may refuse to accept any application or may decide that our data are insufficient for approval and require additional preclinical studies, clinical trials or other studies and testing. In addition, varying interpretations of the data obtained from preclinical studies and clinical trials could delay, limit or prevent marketing approval of a product candidate. Any marketing approval we, or any collaborators we may have in the future, ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved drug not commercially viable.

Any delay in obtaining or failure to obtain required approvals could materially adversely affect our ability or that of any collaborators we may have to generate revenue from the particular product candidate, which likely would result in significant harm to our financial position and adversely impact our stock price.

Failure to obtain marketing approval in foreign jurisdictions would prevent our product candidates from being marketed abroad. Any approval we are granted for our product candidates in the United States would not assure approval of our product candidates in foreign jurisdictions.

In order to market and sell our product candidates in the EU and many other jurisdictions, we, and any collaborators we may have in the future, must obtain separate marketing approvals and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing. The time required to obtain approval may differ substantially from that required to obtain FDA approval. The marketing approval process outside of the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside of the United States, it is required that the drug be approved for reimbursement before the drug can be approved for sale in that country. We, and any collaborators we may have in the future, may not obtain approvals from regulatory authorities outside of the United States on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside of the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA.

The U.K. having left the EU, the TCA and the Northern Ireland Protocol is likely to continue to affect European and worldwide economic conditions and could contribute to greater instability in the global financial markets. These effects could have an adverse effect on our business, investments, and future operations in Europe. There is a risk that trade between U.K. and EU businesses will be materially adversely affected, particularly in relation to highly regulated

products such as pharmaceuticals and products of animal-origin, due to the additional regulatory burdens being imposed on exporters/importers which may affect the availability of these products.

The consequences for the economies of the U.K. and the EU member states as a result of the U.K.'s withdrawal from the EU are still largely unknown and unpredictable. Given the lack of comparable precedent, it is unclear what the broader macro-economic and financial implications the U.K. having left the EU will have.

We, or any future collaborators, may not be able to obtain or maintain orphan drug exclusivity for our product candidates and, even if we do, that exclusivity many not prevent the FDA or the European Commission from approving competing products.

Regulatory authorities in some jurisdictions, including the United States and the EU, may designate drugs for relatively small patient populations as orphan drugs. Under the Orphan Drug Act, the FDA may designate a product as an orphan drug if it is a drug intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals annually in the United States, or a patient population greater than 200,000 in the United States where there is no reasonable expectation that the cost of developing the drug will be recovered from sales in the United States. Eprenetapopt has received orphan drug designation from the FDA for use in the treatment of high-risk myelodysplastic syndromes, or MDS, and orphan drug designation from the European Commission for MDS, AML, and ovarian cancer. We may seek orphan drug designations for eprenetapopt for other indications or for other of our product candidates. There can be no assurances that we will be able to obtain such designations.

In the United States, orphan drug designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. In addition, the company that obtains the first FDA approval for a designated orphan drug for a rare disease receives marketing exclusivity for use of that drug for the designated condition for a period of seven years. Once a product receives orphan drug exclusivity, a second product that is considered to be the same drug for the same indication generally may be approved during the exclusivity period only if the second product is shown to be "clinically superior" to the original orphan drug in that it is more effective, safer or otherwise makes a "major contribution to patient care" or the holder of exclusive approval cannot assure the availability of sufficient quantities of the orphan drug to meet the needs of patients with the disease or condition for which the drug was designated.

The European Commission can grant orphan drug product designation to products for which the sponsor can establish that it is intended for the diagnosis, prevention, or treatment of (1) a life-threatening or chronically debilitating condition affecting not more than five in 10,000 people in the European Union, or (2) a life threatening, seriously debilitating or serious and chronic condition in the European Union and that without incentives it is unlikely that sales of the drug in the European Union would generate a sufficient return to justify the necessary investment. In addition, it must be established that there is no other satisfactory method approved in the European Union of diagnosing, preventing or treating the condition, or if such a method exists, the proposed orphan drug will be of significant benefit to patients. Orphan drug designation is not a marketing authorization. It is a designation that provides a number of benefits, including fee reductions, regulatory assistance, and the possibility to apply for a centralized EU marketing authorization, as well as 10 years of market exclusivity following a marketing authorization. During this market exclusivity period, neither the EMA nor the European Commission nor the EU member states can accept an application or grant a marketing authorization for a 'similar medicinal product.' A 'similar medicinal product' is defined as a medicinal product containing a similar active substance or substances as contained in an authorized orphan medicinal product, and which is intended for the same therapeutic indication. The market exclusivity period for the authorized therapeutic indication may be reduced to six years if, at the end of the fifth year, it is established that the orphan designation criteria are no longer met, including where it is shown that the product is sufficiently profitable not to justify maintenance of market exclusivity. In addition, a competing similar medicinal product may in limited circumstances be authorized prior to the expiration of the market exclusivity period, including if it is shown to be safer, more effective or otherwise clinically superior to our product. Our product can lose orphan designation, and the related benefits, prior to us obtaining a marketing authorization if it is demonstrated that the orphan designation criteria are no longer met.

Even if we, or any future collaborators, obtain orphan drug designation for a product candidate, we, or they, may not be able to obtain or maintain orphan drug exclusivity for that product candidate. We may not be the first to obtain

marketing approval of any product candidate for which we have obtained orphan drug designation for the orphan-designated indication due to the uncertainties associated with developing drug products. If this happens, marketing approval for our product candidate may be delayed due to the first-approved product's orphan drug exclusivity, unless we demonstrate clinical superiority. We may not be able to demonstrate that our product is clinically superior to a first-approved product with orphan drug exclusivity, i.e., that it provides greater safety or efficacy or a major contribution to patient care. In addition, exclusive marketing rights in the United States may be limited if we seek approval for an indication broader than the orphan-designated indication or may be lost if the FDA later determines that the request for designation was materially defective or if we are unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition. Further, even if we, or any future collaborators, obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the product from competition because different drugs with different active moieties may be approved for the same condition. Even after an orphan drug is approved, the FDA can subsequently approve the same drug with the same active moiety for the same condition if the FDA concludes that the later drug is clinically superior in that it is shown to be safer, more effective or makes a major contribution to patient care or the manufacturer of the product with orphan exclusivity is unable to maintain sufficient product quantity. Orphan drug designation neither shortens the development time or regulatory review time of a drug nor gives the drug any advantage in the regulatory review or approval process.

In the United States, Congress is also considering updates to the orphan drug provisions of the FDCA in response to a recent 11th Circuit decision. Any changes to the orphan drug provisions could change our opportunities for, or likelihood of success in obtaining, orphan drug exclusivity and could materially adversely affect our business, financial condition, results of operations, cash flows and prospects.

Even if we, or any collaborators we may have in the future, obtain marketing approvals for our product candidates, the terms of approvals and ongoing regulation of our product candidates could require substantial expenditure of resources and may limit how we, or they, manufacture and market our product candidates, which could materially impair our ability to generate revenue.

Once marketing approval has been granted, an approved drug and its manufacturer and marketer are subject to ongoing review and extensive regulation. These requirements include submissions of safety and other post-marketing information and reports, user fee requirements, registration and listing requirements, requirements relating to manufacturing, quality control, quality assurance and corresponding maintenance of records and documents, requirements regarding the distribution of samples to physicians and recordkeeping. We, and any collaborators we may have in the future, must also comply with requirements concerning advertising and promotion for any of our product candidates for which we or they obtain marketing approval. Promotional communications with respect to prescription drugs are subject to a variety of legal and regulatory restrictions and must be consistent with the information in the drug's approved labeling. Thus, we, and any collaborators we may have in the future, may not be able to promote any drugs we develop for indications or uses for which they are not approved.

The FDA or comparable foreign regulatory authorities may also impose requirements for costly post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of a drug. For example, the approval may be subject to limitations on the indicated uses for which the drug may be marketed or to the conditions of approval, including the requirement to implement a REMS or comparable foreign equivalents, like the EU Risk Management Plan, or RMP, which could include requirements for a restricted distribution system. Manufacturers of approved drugs and those manufacturers' facilities are also required to comply with extensive FDA or comparable foreign regulatory authorities requirements, including ensuring that quality control and manufacturing procedures conform to cGMPs, which include requirements relating to quality control and quality assurance as well as the corresponding maintenance of records and documentation and reporting requirements. We, our contract manufacturers, our future collaborators and their contract manufacturers could be subject to periodic unannounced inspections by the FDA or comparable foreign regulatory authorities to monitor and ensure compliance with cGMPs.

Accordingly, assuming we, or our future collaborators, receive marketing approval for one or more of our product candidates, we, and our future collaborators, and our and their contract manufacturers will continue to expend time, money and effort in all areas of regulatory compliance, including manufacturing, production, product surveillance and quality control.

If we, and our future collaborators, are not able to comply with post-approval regulatory requirements, regulatory agencies or enforcement authorities may:

- issue warning letters;
- impose civil or criminal penalties;
- suspend regulatory approval;
- suspend any of our ongoing clinical trials;
- refuse to approve pending applications or supplements to approved applications submitted by us or our collaborators;
- impose restrictions on our operations, including closing our or our collaborators' manufacturing facilities; or
- seize or detain products or require a recall.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. Any failure to comply with ongoing regulatory requirements may significantly and adversely affect our ability to commercialize and generate revenue from our product candidates, if approved. If regulatory sanctions are applied or if regulatory approval is withdrawn, the value of our company and our operating results will be adversely affected.

The regulatory requirements and policies may change, and additional government regulations may be enacted for which we may also be required to comply. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or in other countries. If we or any future collaboration partner are not able to maintain regulatory compliance, we or such collaboration partner, as applicable, may face government enforcement action and our business will suffer. Moreover, our or our future collaborators' ability to market any future drugs could be limited, which could adversely affect our ability to achieve or sustain profitability. Further, the cost of compliance with post-approval regulations may have a negative effect on our operating results and financial condition.

The FDA's and other comparable regulatory authorities' policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates, which would impact our ability to generate revenue.

We also cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. The policies of the FDA and of comparable foreign regulatory authorities may change and additional government regulations may be enacted that could prevent, limit or delay regulatory licensure of our product candidates. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or abroad. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing licensure that we may have obtained and we may not achieve or sustain profitability. If these actions impose constraints on FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted.

Any of our product candidates for which we, or our future collaborators, obtain marketing approval in the future will be subject to substantial penalties if we, or they, fail to comply with regulatory requirements or if we, or they, experience unanticipated problems with our product candidates following approval.

Any of our product candidates for which we, or our future collaborators, obtain marketing approval in the future, will be subject to continual review by the FDA or comparable foreign regulatory authorities.

For example, in the United States, the FDA and other agencies, including the Department of Justice, or the DOJ, closely regulate and monitor the post-approval marketing and promotion of drugs to ensure that they are manufactured, marketed, and distributed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA imposes stringent restrictions on manufacturers' communications regarding off-label use and if we, or our future collaborators, do not market any of our product candidates for which we, or they, receive marketing approval for only their approved indications, we, or they, may be subject to warnings or enforcement action for off-label marketing. Violation of the FDCA and other statutes, including the False Claims Act, relating to the promotion and advertising of prescription drugs may lead to investigations or allegations of violations of federal and state healthcare fraud and abuse laws and state consumer protection laws.

In addition, later discovery of previously unknown adverse events or other problems with our product candidates or their manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may yield various results, including:

- litigation involving patients taking our drug;
- restrictions on such drugs, manufacturers or manufacturing processes;
- restrictions on the labeling or marketing of a drug;
- restrictions on drug distribution or use;
- requirements to conduct post-marketing studies or clinical trials;
- warning letters or untitled letters;
- withdrawal of the drugs from the market;
- refusal to approve pending applications or supplements to approved applications that we submit;
- recall of drugs;
- fines, restitution or disgorgement of profits or revenues;
- suspension or withdrawal of marketing approvals;
- damage to relationships with any potential collaborators;
- restrictions on coverage by third-party payors;
- unfavorable press coverage and damage to our reputation;
- refusal to permit the import or export of drugs;
- drug seizure; or
- injunctions or the imposition of civil or criminal penalties.

Recently enacted and future legislation, and any change in existing government regulations and policies, may increase the difficulty and cost for us and our future collaborators to obtain marketing approval of and commercialize our product candidates and affect the prices we, or they, may obtain.

In the United States and some foreign jurisdictions, there have been and continue to be a number of legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of our product candidates, restrict or regulate post-approval activities and affect our ability, or the ability of our future collaborators, to effectively sell any drugs for which we, or they, obtain marketing approval. We expect that current laws, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and additional downward pressure on the price that we, or our future collaborators, may receive for any approved drugs.

In the United States, the Congress and recent presidential administrations have enacted or are considering a number of legislative and regulatory proposals to change the healthcare system in ways that could affect our ability to sell our products, if approved, and to do so effectively. Among policy makers and payors in the United States and elsewhere, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and expanding access.

In the United States, the pharmaceutical industry has been a particular focus of efforts to reform the healthcare system and has been significantly affected by major legislative initiatives, including the PPACA, which contains provisions that may potentially affect the profitability of our products, including, for example, increased rebates for products sold to Medicaid programs, extension of Medicaid rebates to Medicaid managed care plans, mandatory discounts for certain Medicare Part D beneficiaries and annual fees based on pharmaceutical companies' share of sales to federal health care programs, and expansion of the entities eligible for discounts under the 340B pricing program. The framework of the PPACA continues to evolve as a result of executive, legislative, regulatory and administrative developments that have challenged the law and contribute to legal uncertainty that could affect the profitability of our products. See Part I, Item 1, "Government Regulation – U.S. Healthcare Reform" for further information.

We expect that these and other healthcare reform measures that may be adopted in the future may result in more rigorous coverage criteria and/or new payment methodologies, and place additional downward pressure on the price that we receive for any approved product and/or the level of reimbursement physicians receive for administering any approved product we might bring to market. Reductions in reimbursement levels and imposition of more rigorous coverage criteria or new payment methodologies may negatively impact the prices we receive or the frequency with which our products are prescribed or administered. Any coverage or reimbursement policies instituted by Medicare or other federal health care programs may result in similar policies from private payors. The implementation of cost containment measures or other healthcare reforms may affect our ability to generate revenue, attain or maintain profitability, or commercialize our product candidates. We expect that additional state and federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our product candidates or additional pricing pressures.

The pricing of prescription pharmaceuticals is also subject to governmental control outside the United States. In countries outside of the United States, pricing negotiations with governmental authorities can take considerable time after the receipt of marketing approval for a product. To obtain reimbursement or pricing approval in some countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidates to that of other available therapies. If reimbursement of our products is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our ability to generate revenues and become profitable could be impaired.

Legislative and regulatory proposals have also been made to expand post-approval requirements and restrict sales and promotional activities for drug products. We cannot be sure whether additional legislative changes will be enacted, or whether the FDA regulations, guidance or interpretations will be changed, or what the impact of such changes on the marketing approvals of our product candidates, if any, may be. In addition, increased scrutiny by the United States Congress of the FDA's approval process may significantly delay or prevent marketing approval, as well as subject us and any future collaborators to more stringent drug labeling and post-marketing testing and other requirements.

Regulatory proposals have been made to allow the importation of prescription drugs into the United States that are approved for marketing in Canada, and potentially other countries. If such proposal are implemented, and if any of our product candidates or other similar or equivalent drug products are approved in another ex-US jurisdiction, these regulatory proposals may impact the competition our product may face, if approved. We cannot be sure whether additional legislative changes will be enacted, or whether the FDA regulations, guidance or interpretations will be changed, or what the impact of such changes on the marketing approvals of our product candidates, if any, may be.

We may seek a breakthrough therapy designation for ATRN-119 or one or more of our other product candidates, but we might not receive such designation, and even if we do, such designation may not lead to a faster development or regulatory review or approval process.

We may seek a breakthrough therapy designation for ATRN-119 or one or more of our other product candidates. A breakthrough therapy is defined as a drug that is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening condition, and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. For drugs and biologics that have been designated as breakthrough therapies, interaction and communication between the FDA and the sponsor of the trial can help to identify the most efficient path for clinical development while minimizing the number of patients placed in ineffective control regimens. Drugs designated as breakthrough therapies by the FDA may also be eligible for priority review if supported by clinical data at the time the NDA is submitted to the FDA, and parts of the NDA may be submitted and reviewed on a rolling basis.

Designation as a breakthrough therapy is within the discretion of the FDA. Accordingly, even if we believe that one of our product candidates meets the criteria for designation as a breakthrough therapy, the FDA may disagree and instead determine not to make such designation. Even if we receive breakthrough therapy designation, the receipt of such designation for a product candidate may not result in a faster development or regulatory review or approval process compared to drugs considered for approval under conventional FDA procedures and does not assure ultimate approval by the FDA. In addition, even if one or more of our product candidates qualify as breakthrough therapies, the FDA may later decide that the product candidates no longer meet the conditions for qualification or decide that the time period for FDA review or approval will not be shortened. For example, in June 2022, FDA published a draft guidance document outlining considerations for the Agency in rescinding Breakthrough Therapy designation for products that no longer meet the requirements for that designation.

A fast track designation by the FDA for ATRN-119 or any of our other product candidates may not actually lead to a faster development or regulatory review or approval process.

If a drug is intended, whether alone or in combination with one or more other drugs, for the treatment of a serious or life-threatening condition and nonclinical or clinical data demonstrate the potential to address unmet medical need for this condition, a drug sponsor may apply for FDA fast track designation. We may not experience a faster development or regulatory review or approval process for any product candidates, if any, for which we obtain fast track designation compared to conventional FDA procedures. In addition, the FDA may withdraw fast track designation if it believes that the designation is no longer supported by data from our clinical development program. Fast track designation alone does not guarantee qualification for the FDA's priority review procedures.

We may seek priority review designation for one or more of our product candidates, but we might not receive such designation, and even if we do, such designation may not lead to a faster development or regulatory review or approval process.

If the FDA determines that a product candidate offers a treatment for a serious condition and, if approved, the product would provide a significant improvement in safety or effectiveness, the FDA may designate the product candidate for priority review. A priority review designation means that the goal for the FDA to review an application is six months from the 60-day filing date, rather than the standard review period of ten months. We may request priority review for our product candidates. The FDA has broad discretion with respect to whether or not to grant priority review status to a product candidate, so even if we believe a particular product candidate is eligible for such designation or status, the FDA

may decide not to grant it. Moreover, a priority review designation does not necessarily mean a faster development or regulatory review or approval process or necessarily confer any advantage with respect to approval compared to conventional FDA procedures. Receiving priority review from the FDA does not guarantee approval within the six-month review cycle or at all.

Our relationships with healthcare providers, physicians and third-party payors will be subject to applicable anti-kickback, fraud and abuse and other healthcare laws and regulations, which could expose us to penalties, including criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.

Although we do not currently have any products on the market, we are subject to a variety of regulatory requirements, including healthcare statutory and regulatory requirements and enforcement by the U.S. federal and state governments and the foreign governments of the countries in which we conduct our business. Even though we are not in a position to make patient referrals and do not bill Medicare, Medicaid, or other government or commercial third-party payors, our relationships with healthcare providers, physicians and third-party payors will subject us to healthcare statutory and regulatory requirements and enforcement by the U.S. federal government and the states and foreign governments in which we conduct our business. Our future arrangements with healthcare providers, physicians and third-party payors and patients may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute our products for which we obtain marketing approval. See Part I, Item 1, "Government Regulation – Healthcare Law and Regulation" for more detail.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations, guidance, case law or other applicable law. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, individual imprisonment, exclusion from participation in federal healthcare programs, such as Medicare and Medicaid, disgorgement, reputational harm, additional oversight and reporting obligations pursuant to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with applicable laws and regulations, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to market our products, if approved, and adversely impact our financial results. Although effective compliance programs can mitigate the risk of investigation and prosecution for violations of these laws and regulations, these risks cannot be entirely eliminated. Any action against us for an alleged or suspected violation could cause us to incur significant legal expenses and could divert our management's attention from the operation of our business, even if our defense is successful. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found not to be in compliance with applicable laws, it may be costly to us in terms of money, time and resources, and they may be subject to criminal, civil or administrative sanctions, including exclusions from government-funded healthcare programs.

Our employees and consultants may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements, which could cause significant liability for us and harm our reputation.

We are exposed to the risk of our employees and consultants committing fraud or other misconduct, including intentional failures to comply with FDA regulations or similar regulations of comparable foreign regulatory authorities, provide accurate information to the FDA or comparable foreign regulatory authorities, comply with manufacturing standards we may establish, comply with federal and state healthcare fraud and abuse laws and regulations and similar laws and regulations established and enforced by comparable foreign regulatory authorities, report financial information or data accurately or disclose unauthorized activities to us. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, incentive programs and other business arrangements. Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown

or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws, standards or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and results of operations, including the imposition of significant fines or other sanctions.

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could have a material adverse effect on our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of hazardous and flammable materials, including chemicals and biological materials.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development or commercialization efforts. Failure to comply with these laws and regulations also may result in substantial fines, penalties or other sanctions.

Laws and regulations governing any international operations we may have in the future may preclude us from developing, manufacturing and selling certain product candidates outside of the United States and require us to develop and implement costly compliance programs.

If we expand our operations outside of the United States, we must comply with numerous laws and regulations in each jurisdiction in which we plan to operate, such as the applicable anti-bribery, anti-corruption, anti-money laundering regulations. The creation and implementation of international business practices compliance programs is costly and such programs are difficult to enforce, particularly where reliance on third parties is required.

The FCPA, prohibits any U.S. individual or business from paying, offering, authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with certain accounting provisions requiring the company to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations. The anti-bribery provisions of the FCPA are enforced primarily by the DOJ. The Securities and Exchange Commission, or SEC, is involved with enforcement of the books and records provisions of the FCPA.

Compliance with the FCPA is expensive and difficult, particularly in countries in which corruption is a recognized problem. In addition, the FCPA presents particular challenges in the pharmaceutical industry, because, in many countries, hospitals are operated by the government, and doctors and other hospital employees are considered foreign officials. Certain payments to hospitals in connection with clinical trials and other work have been deemed to be improper payments to government officials and have led to FCPA enforcement actions.

Violation of the FCPA can result in significant civil and criminal penalties. Indictment alone under the FCPA can lead to suspension of the right to do business with the U.S. government until the pending claims are resolved. Conviction of a violation of the FCPA can result in long-term disqualification as a government contractor. The termination of a government contract or relationship as a result of our failure to satisfy any of our obligations under laws governing

international business practices would have a negative impact on our operations and harm our reputation and ability to procure government contracts. The SEC also may suspend or bar issuers from trading securities on U.S. exchanges for violations of the FCPA's accounting provisions.

We are also subject to other laws and regulations governing our international operations, including applicable import and export control regulations, economic sanctions on countries and persons administered or enforced by the U.S. government (including, without limitation, the Office of Foreign Assets Control of the U.S. Department of the Treasury), anti-money laundering laws, customs requirements and currency exchange regulations, collectively referred to as the trade control laws. We can provide no assurance that we will be completely effective in ensuring our compliance with all applicable legal requirements, including trade control laws. If we are not in compliance with applicable trade control laws, we may be subject to criminal and civil penalties, disgorgement and other sanctions and remedial measures, and legal expenses, which could have an adverse impact on our business, results of operations, financial condition and prospects. Likewise, any investigation of any potential violations of these trade control laws by U.S. or other authorities could also have an adverse impact on our reputation, our business, results of operations, financial condition and prospects.

Various laws, regulations and executive orders also restrict the use and dissemination outside of the United States, or the sharing with certain non-U.S. nationals, of information classified for national security purposes, as well as certain products and technical data relating to those products. If we expand our presence outside of the United States, it will require us to dedicate additional resources to comply with these laws, and these laws may preclude us from developing, manufacturing, or selling certain drugs and product candidates outside of the United States, which could limit our growth potential and increase our development costs. The failure to comply with laws governing international business practices may result in substantial penalties, including suspension or debarment from government contracting.

Security breaches, loss of data and other disruptions could compromise sensitive information related to our business or prevent us from accessing critical information and expose us to liability, which could adversely affect our business and our reputation.

In the ordinary course of our business, we collect and store sensitive data, including personally identifiable information, intellectual property and proprietary business information owned or controlled by ourselves and other parties. We manage and maintain our applications and data utilizing a combination of on-site systems, managed data centers and cloud-based data centers. We utilize external security and infrastructure vendors to manage our information technology systems and data centers. These applications and data encompass a wide variety of business-critical information, including research and development information, commercial information, and business and financial information. We face a number of risks relative to protecting this critical information, including loss of access or disruptions to our IT systems, inappropriate use or disclosure of protected information, inappropriate modification, and the risk of our being unable to adequately monitor, audit and modify our controls over our critical information. This risk extends to the third-party vendors and subcontractors we use to manage this sensitive data.

The secure processing, storage, maintenance and transmission of this critical information are vital to our operations and business strategy. Although we take measures to protect sensitive data from unauthorized access, use or disclosure, including the development of policies and procedures to protect our information technology systems and confidential and proprietary information, there is no guarantee we can protect our data from data security incidents, and our information technology and infrastructure may be vulnerable to attacks by hackers or viruses or breached due to employee or vendor error, malfeasance or other malicious or inadvertent disruptions from internal or external threats. Any such breach or interruption could compromise our networks and the information stored there could be accessed by unauthorized parties, manipulated, publicly disclosed, lost or stolen. Any such access, breach or other loss of information could result in legal claims or proceedings, and liability under federal or state laws that protect the privacy of personal information, such as HIPAA, HITECH, and regulatory penalties. Notice of breaches must be made to affected individuals, the Secretary of the Department of Health and Human Services, and notice may need to be made to the media or other data protection regulators. Such incidents, and the publicity they may generate, could harm our reputation and our ability to compete. Unauthorized access, loss or dissemination could also damage our reputation or disrupt our operations, including our ability to conduct our analyses, process claims and appeals, conduct research and development activities, collect, process and prepare company financial information, provide information about our tests and other

patient and physician education and outreach efforts through our website, and manage the administrative aspects of our business.

Penalties for violations of these laws vary. For instance, penalties for failure to comply with a requirement of HIPAA and HITECH vary significantly and include civil monetary penalties of up to (as recently adjusted for inflation) $55,910 per violation, not to exceed approximately $1.68 million per calendar year for each provision of HIPAA that is violated and, in certain circumstances, criminal penalties with fines up to $250,000 per violation and/or imprisonment. However, a single breach incident can result in multiple violations, which can lead to significant financial penalties. In addition, numerous breach incidents could lead to possible penalties in excess of $1.68 million. A person who knowingly obtains or discloses individually identifiable health information in violation of HIPAA may face a criminal penalty of up to $50,000 and up to one-year imprisonment. The criminal penalties increase if the wrongful conduct involves false pretenses or the intent to sell, transfer or use identifiable health information for commercial advantage, personal gain or malicious harm.

Further, various states, such as California and Massachusetts, have implemented similar privacy laws and regulations, such as the California Confidentiality of Medical Information Act, that impose restrictive requirements regulating the use and disclosure of health information and other personally identifiable information. These laws and regulations are not necessarily preempted by HIPAA, particularly if a state affords greater protection to individuals than HIPAA. Where state laws are more protective, we have to comply with the stricter provisions. In addition to fines and penalties imposed upon violators, some of these state laws also afford private rights of action to individuals who believe their personal information has been misused. California's patient privacy laws, for example, provide for penalties of up to $250,000 and permit injured parties to sue for damages. The interplay of federal and state laws may be subject to varying interpretations by courts and government agencies, creating complex compliance issues for us and data we receive, use and share, potentially exposing us to additional expense, adverse publicity and liability.

Further, as regulatory focus on privacy issues continues to increase and laws and regulations concerning the protection of personal information expand and become more complex, these potential risks to our business could intensify. Moreover, privacy and cybersecurity laws and regulations are evolving, and may continue to add additional compliance costs and legal risks. For example, the California legislature passed the CCPA, which came into effect January 1, 2020. The CCPA requires companies doing business in California to disclose information regarding the collection, use and sharing of a consumer's personal data, and comply with certain qualified privacy rights requests, including rights to request deletion of or to stop the sale of their personal information. While the CCPA includes certain exemptions for data protected by HIPAA or in certain research contexts, the law covers a wide range of data we may process in other contexts. The CCPA also permits the imposition of civil penalties and expands existing state security laws by providing a private right of action for consumers in certain circumstances where consumer data is subject to a breach. Interpretations of the CCPA may continue to evolve with regulatory guidance and enforcement actions from the California Attorney General. The CPRA, which expands the CCPA, passed in November 2020. The CPRA will, among other things, impose additional data protection obligations on companies doing business in California, including additional consumer rights processes, limitations on data uses, new audit requirements for higher risk data, and opt outs for certain uses of sensitive data. It has also created a new California data protection agency authorized to issue substantive regulations and could result in increased privacy and information security enforcement. That rulemaking process is ongoing. Following the CPRA, Virginia, Colorado, Utah and Connecticut have enacted similar, but not completely consistent, comprehensive privacy legislation that will also go into effect in January and July 2023, respectively. Many other states are considering similar legislation in addition to the consideration of comprehensive privacy legislation at the federal level. If passed, such laws will require additional resources to ensure compliance, and may have potentially conflicting requirements that would make compliance challenging.

Compliance with U.S. and international data protection laws and regulations could cause us to incur substantial costs or require us to change our business practices and compliance procedures in a manner adverse to our business. Moreover, complying with these various laws could require us to take on more onerous obligations in our contracts, restrict our ability to collect, use and disclose data, or in some cases, impact our ability to operate in certain jurisdictions. We have policies and procedures in place, and have conducted an independent third-party audit, to support our compliance with all applicable data protection laws and regulations, and are continually improving our data protection program to address compliance risks and evolving requirements. Nevertheless, our efforts to comply with data protection laws and evaluate

as well as oversee our third party vendors' compliance with data protection laws and our contractual requirements may be insufficient to mitigate all data protection risks or compliance obligations, which could result in regulatory scrutiny, legal liability, reputational risk or operational disruption. Failure by us or by our third-party vendors to comply with U.S. and international data protection laws and regulations could result in government enforcement actions (which could include civil or criminal penalties), private litigation and/or adverse publicity and could negatively affect our operating results and business. Claims that we or our third-party vendors have violated individuals' privacy rights, failed to comply with data protection laws, or breached our contractual obligations, even if we or our third-party vendor, as applicable, are not found liable, could be expensive and time consuming to defend and could result in adverse publicity that could harm our business.

Any clinical trial programs we conduct or research collaborations we enter into in the European Economic Area ("EEA")/UK may subject us to the EU General Data Protection Regulation 2016/679 (the "EU GDPR") as implemented by countries within the EEA. In addition, where we conduct programs and collaborations in the UK we may be subject to the UK Data Protection Act 2018 and the UK General Data Protection Regulation, (together the "UK GDPR").

We are subject to the EU GDPR, which applies extra-territorially and implements stringent operational requirements on controllers (e.g., sponsors) and processors (e.g., CROs, laboratories) of personal data. For controllers this includes, for example, high standards for obtaining valid consent from individuals to process their personal data (where consent is the legal ground relied upon), the requirements to provide detailed disclosures to individuals, short timelines for personal data breach notifications to data protection authorities and data subjects, limitations on retention of personal data, additional considerations where processing health data and other "special categories of personal data" and specific obligations where third-party processors are engaged. The EU GDPR also prohibits the international transfer of personal data from the EEA to countries outside of the EEA unless made to a country deemed to have "adequate" data privacy laws by the European Commission or a data transfer mechanism has been put in place. Until recently, one such data transfer mechanism was the EU-US Privacy Shield. However, in July 2020 the Court of Justice of the European Union ("CJEU") declared the Privacy Shield to be invalid for purposes of international transfers. The CJEU also imposed further restrictions on use of standard contractual clauses (SCCs) (i.e., an EU-style data transfer agreement) including, a requirement for companies to carry out a transfer privacy impact assessment, which among other things, assesses laws governing access to personal data in the recipient country and considers whether supplementary measures that provide privacy protections additional to those provided under SCCs will need to be implemented to ensure an essentially equivalent level of data protection to that afforded in the EEA. Moreover, new versions of the SCCs (new EU SCCs) have recently been published requiring additional compliance and implementation efforts. In turn, the findings of the CJEU will have significant implications for cross-border data flows.

Further, the EU GDPR provides that EU Member States may establish their own laws and regulations further restricting the processing of genetic data, biometric data, health data and other personal data, which could limit our ability to use and share such personal data or could cause our costs to increase. The EU GDPR imposes onerous accountability obligations requiring controllers and processors to maintain a record of their data processing activities and policies and procedures to demonstrate compliance with the EU GDPR. The EU GDPR also grants certain privacy rights to individuals (e.g., the right to access or erase their personal data). While we have established some data protection policies and have a maturing compliance program, additional resources will be needed to fully comply with the EU GDPR, including for evolving regulatory guidance. If our or our vendors' or service providers' privacy or data security measures fail to comply with the EU GDPR requirements, we may be subject to litigation, regulatory investigations, enforcement notices requiring us to stop or change the way we use personal data and/or fines of up to 20 million Euros of the total worldwide annual turnover of the preceding financial year, whichever is higher, as well as compensation claims for financial or non-financial loss by affected individuals, negative publicity, reputational harm and a potential loss of business and goodwill. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our practices.

Relatedly, following the UK's withdrawal from the EU (i.e., Brexit), the EU GDPR has been implemented in the United Kingdom (as the UK GDPR). The UK GDPR site alongside the UK Data Protection Act 2018 which implements certain derogations in the EU GDPR into UK law. The requirements of the UK GDPR are (at this time) largely aligned with those under the EU GDPR and as such, may lead to similar compliance and operational costs with potential fines for

non-compliance of up to £17.5 million or 4% of annual worldwide turnover. As a result, we are potentially exposed to two parallel data protection regimes, each of which authorizes fines and the potential for divergent enforcement actions. It should also be noted that reliance on the new EU SCCs for transfers from the UK requires additional documentation in the form of a UK Addendum.

Risks related to employee matters and managing growth

Our future success depends on our ability to retain our President and Chief Executive Officer and our Senior Vice President and Chief Financial Officer, and to attract, retain and motivate qualified personnel.

We are highly dependent on Oren Gilad, Ph.D., our President and Chief Executive Officer and John P. Hamill, our Senior Vice President and Chief Financial Officer, as well as the other principal members of the scientific team. Our agreements with Dr. Gilad and Mr. Hamill do not prevent them from terminating their employment with us at any time. We do not maintain "key person" insurance for any of our executives or other employees. However, the loss of the services of any of these persons could impede the achievement of our research, development and commercialization objectives.

Recruiting and retaining qualified scientific, clinical, manufacturing and sales and marketing personnel will also be critical to our success. We may not be able to attract and retain these personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us.

We expect to expand our development and regulatory capabilities and potentially our sales and marketing capabilities, and as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.

We expect to experience growth in the number of our employees and the scope of our operations, particularly in the areas of drug development, clinical operations, regulatory affairs and, potentially, sales and marketing. To manage our anticipated future growth, we must continue to implement and improve our managerial, operational and financial systems, expand our facilities and continue to recruit and train additional qualified personnel. Due to our limited financial resources and the limited experience of our management team in managing a company with such anticipated growth, we may not be able to effectively manage the expansion of our operations or recruit and train additional qualified personnel. The physical expansion of our operations may lead to significant costs and may divert our management and business development resources. Any inability to manage growth could delay the execution of our business plans or disrupt our operations.

We will need to expand our organization, and may experience difficulties in managing this growth, which could disrupt operations.

Our future financial performance and our ability to commercialize our product candidates and compete effectively will depend, in part, on our ability to effectively manage any future growth. We expect to hire additional employees for our managerial, clinical, scientific and engineering, operational, manufacturing, sales and marketing teams. We may have operational difficulties in connection with identifying, hiring and integrating new personnel. Future growth would impose significant additional responsibilities on our management, including the need to identify, recruit, maintain, motivate and integrate additional employees, consultants and contractors. Also, our management may need to divert a disproportionate amount of our attention away from our day-to-day activities and devote a substantial amount of time to managing these growth activities. We may not be able to effectively manage the expansion of our operations, which may result in weaknesses in our infrastructure, give rise to operational mistakes, loss of business opportunities, loss of employees and reduced productivity among remaining employees. Our expected growth could require significant capital expenditures and may divert financial resources from other projects, such as the development of our product candidates. If we are unable to

effectively manage our growth, our expenses may increase more than expected, our ability to generate and/or grow revenues could be reduced, and we may not be able to implement our business strategy.

Many of the other pharmaceutical companies that we compete against for qualified personnel and consultants have greater financial and other resources, different risk profiles and a longer history in the industry than us. They also may provide more diverse opportunities and better chances for career advancement. Some of these characteristics may be more appealing to high-quality candidates and consultants than what we have to offer. If we are unable to continue to attract and retain high-quality personnel and consultants, the rate and success at which we can select and develop our product candidates and our business will be limited.

Our employees, independent contractors, principal investigators, consultants, commercial collaborators, service providers and other vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could have an adverse effect on our results of operations.

We are exposed to the risk that our employees and contractors, including principal investigators, consultants, commercial collaborators, service providers and other vendors may engage in fraudulent or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or other unauthorized activities that violate the laws and regulations of the FDA and other similar regulatory bodies, including those laws that require the reporting of true, complete and accurate information to such regulatory bodies, manufacturing standards, federal and state healthcare fraud and abuse and health regulatory laws and other similar foreign fraudulent misconduct laws, or laws that require the true, complete and accurate reporting of financial information or data. Misconduct by these parties may also involve the improper use or misrepresentation of information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. It is not always possible to identify and deter third-party misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and financial results, including the imposition of significant civil, criminal and administrative penalties, damages, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, reputational harm, diminished profits and future earnings, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Risks related to tax matters

We have significant deferred tax assets, which may become devalued if we do not generate sufficient future taxable income, applicable corporate tax rates are reduced or if we experience an ownership change.

Our total net deferred tax assets as of December 31, 2023 were $49.4 million. Of that amount, $25.2 million relates to gross deferred tax assets in Aprea AB. Our anticipated activities are also expected to result in future significant net operating losses in the United States and Sweden resulting in additional deferred tax assets. Utilization of most deferred tax assets is dependent on generating sufficient future taxable income in the appropriate jurisdiction and/or entity. The company has provided a valuation allowance of $49.4 million on our net deferred tax assets as of December 31, 2023, because, based on all available evidence, it is considered more likely than not that all the recorded deferred tax assets will not be realized in a future period. Additionally, most of our deferred tax assets are determined by reference to applicable corporate income tax rates in Sweden or the United States. Accordingly, in the event of a reduction of any such corporate income tax rates, the carrying value of certain of our deferred tax assets would decrease.

Moreover, our ability to use our net operating losses and other deferred tax assets to offset future taxable income in Sweden and the United States may be significantly limited if we experience an ownership change. For Swedish income tax purposes, an ownership change will generally occur when one, or several shareholders together, acquire shares representing more than 50 percent of the voting power over a five year period (under special provisions in Chapter 40 of the Swedish Income Tax Act; 1999:1229). Such an ownership change results in the forfeiture of tax losses carried forward exceeding 200 percent of the cost of the change of control. In this calculation, capital contributions to the

company prior to the ownership change and in the preceding two years should reduce the cost of the change of control. Due to potential ownership changes under the Swedish Income Tax Act, we may be limited in our ability to realize a tax benefit on our deferred tax assets, whether or not we attain profitability in future years.

For U.S. federal income tax purposes, an ownership change will generally occur when the percentage of our stock (by value) owned by one or more "5 percent shareholders" (as defined in the U.S. Internal Revenue Code of 1986, as amended) has increased by more than 50% over the lowest percentage owned by such shareholders at any time during the prior three years (calculated on a rolling basis). We anticipate that we will incur losses in the United States in the foreseeable future related to our research and development activities. Due to potential ownership changes under Section 382 of the Code, we may be limited in our ability to realize a tax benefit from the use of our deferred tax assets, whether or not we attain profitability in future years. We believe the Merger likely resulted in an ownership change under Section 382 of the Code, and, accordingly, our net operating losses and other deferred tax assets are subject to limitations.

In addition, our ability to utilize any future net operating losses may be limited by Pub. L. 115-97, commonly known as the Tax Cuts and Jobs Act of 2017 ("TCJA"). Under the TCJA, as amended by the CARES Act, the amount of our net operating losses incurred in taxable years beginning after December 31, 2020 that we are permitted to deduct in any taxable year is limited to 80% of our taxable income in such year, where taxable income is determined without regard to the net operating loss deduction itself, while allowing unused net operating losses to be carried forward indefinitely. Under the CARES Act, net operating losses arising in taxable years beginning before January 1, 2021 are not subject to the 80% limitation.

For these reasons, a material devaluation in our deferred tax assets due to insufficient taxable income, lower corporate income tax rates or ownership change would have an adverse effect on our results of operations and financial condition.

We may have taxable income as a result of the purging election made following the Holdco Reorganization

While not entirely clear, we intend to treat Aprea AB as having been a passive foreign investment company, or PFIC, for U.S. federal income tax purposes prior to the Holdco Reorganization and treat the Company as having succeeded to the tax basis and holding periods of those shareholders in Aprea AB that exchanged their shares for our common stock. Based on such treatment, and absent a purging election as described below, the stock of Aprea AB held by the Company would have retained its status as stock of a PFIC with respect to all periods prior to the Holdco Reorganization (the "PFIC Taint") and therefore, absent a prior election by those shareholders to treat Aprea AB as a qualified electing fund, the Company, would have been subject to certain adverse U.S. federal income tax consequences with respect to distributions received on such stock and gain recognized on the disposition of such stock. In order to purge the PFIC Taint on the stock of Aprea AB, and avoid such adverse tax consequences, following the Holdco Reorganization we made a purging election in the form of a deemed dividend election under which, for U.S. federal income tax purposes, Aprea AB will be deemed to have made a distribution to the Company of all of its current and accumulated earnings and profits as determined for U.S. federal income tax purposes. Because Aprea AB did not have any accumulated or current year earnings and profits as of December 31, 2019, we do not expect the purging election to result in any incremental U.S. federal income taxes.

We may be subject to current taxation on some of the income of our foreign subsidiaries even absent any cash distributions

Because we hold directly or indirectly all of the shares of our foreign subsidiaries, including Aprea AB, such subsidiaries are treated as controlled foreign corporations ("CFC") for U.S. federal income tax purposes. For U.S. federal income tax purposes, the Company will therefore need to include in its taxable income each year Aprea AB's "subpart F income," and "global intangible low-taxed income", if any, even if no distributions are made.

Our foreign subsidiaries may directly become subject to U.S. federal income tax and be subject to a branch profits tax in the United States, which could reduce our after-tax returns and the value of our shares.

We currently intend to conduct substantially all of our businesses and operations in a manner such that our foreign subsidiaries will not be treated as engaged in a trade or business in the United States and will not be subject to additional U.S. income tax or branch profits tax. However, it is not entirely clear when a foreign subsidiary is treated as being engaged in a trade or business in the United States for U.S. federal income tax purposes and travel restrictions may further limit our ability to reduce the risk of our foreign subsidiaries being treated as engaged in a U.S. trade or business. Accordingly, we cannot assure you that the Internal Revenue Service ("IRS") will not contend, perhaps successfully, that our foreign subsidiaries were engaged in a trade or business in the United States or are subject to more U.S. income tax than they currently incur. A foreign corporation deemed to be so engaged would be subject to U.S. federal income tax, as well as branch profits tax, on its income that is treated as effectively connected with the conduct of that trade or business unless the corporation is entitled to relief under an applicable tax treaty, which is determined on an annual basis.

The ongoing effects of the 2017 Tax Cuts and Jobs Act and GILTI could make our results difficult to predict.

Our effective tax rate may fluctuate in the future as a result of the TCJA, which included significant enacted changes in U.S. income tax law many aspects of which are not entirely clear and with respect to which some guidance has not yet been finalized. The enacted tax legislation included, among other new provisions, a reduction in the corporate tax rate, new limitations on the deductibility of net interest, the base erosion and anti-abuse minimum tax and new rules related to the global intangible low-taxed income of our foreign subsidiaries ("GILTI"). GILTI may require us to include in taxable income certain income of our foreign subsidiaries that are CFCs, though we may be eligible to claim foreign tax credits with respect to some of the taxes paid by such subsidiaries. While the U.S. tax authorities issued proposed and final regulations for GILTI, there are still certain aspects of the TCJA that remain unclear. We will continue to review the impact of GILTI and the other changes resulting from the TCJA as further guidance is issued. Any further guidance may result in changes to the interpretations and assumptions we made and actions we may take, which as a result may impact the amounts recorded with respect to international provisions of the TCJA, possibly materially.

Changes in U.S. federal income tax law and other jurisdictions could materially adversely affect an investment in our common shares.

It is possible that tax laws in the United States and other jurisdictions will be changed. It remains difficult to predict whether or when there will be any tax law changes or further guidance by the authorities in the U.S. or elsewhere in the world that will have a material adverse effect on our business.

Risks related to our common stock

There is no guarantee that the Merger will increase stockholder value.

We cannot guarantee that the Merger and the related transactions will not impair stockholder value or otherwise adversely affect our business. The acquisition poses significant integration challenges between our businesses and management teams which could result in management and business disruptions, any of which could harm our results of operation, business prospects, and impair the value of such acquisition to our stockholders. Additionally, our preclinical studies or clinical trials may not replicate or advance the results of the research programs and pre-clinical studies that were completed by Atrin prior to the Merger, which may also materially and adversely affect our business, results of operations and prospects.

Our executive officers, directors and principal stockholders may have substantial influence over matters submitted to stockholders for approval. This may prevent new investors from influencing significant corporate decisions.

As of December 31, 2023, our executive officers and directors and our stockholders which own more than 5% of our outstanding common stock beneficially owned shares representing approximately 32.1% of our common stock. As a result, if these stockholders were to choose to act together, they may have substantial influence over matters submitted to our stockholders for approval, as well as our management and affairs. For example, these persons, if they choose to act together, would control the election of directors and approval of any merger, consolidation or sale of all or substantially

all of our assets. This concentration of voting power could delay or prevent an acquisition of our company, or other significant corporate decisions, on terms that other stockholders may desire.

Provisions in our corporate charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our certificate of incorporation and our bylaws may discourage, delay or prevent a merger, acquisition or other change in control of us that stockholders may consider favorable, including transactions in which common stockholders might otherwise receive a premium for our shares. These provisions could also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, because our board of directors is responsible for appointing the members of our management team, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Among other things, these provisions:

- establish a classified board of directors such that not all members of the board are elected at one time;
- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- limit the manner in which stockholders can remove directors from the board;
- establish advance notice requirements for stockholder proposals that can be acted on at stockholder meetings and nominations to our board of directors;
- require that stockholder actions must be effected at a duly called stockholder meeting and prohibit actions by our stockholders by written consent;
- limit who may call stockholder meetings;
- authorize our board of directors to issue preferred stock without stockholder approval, which could be used to institute a "poison pill" that would work to dilute the stock ownership of a potential hostile acquirer, effectively preventing acquisitions that have not been approved by our board of directors; and
- require the approval of the holders of at least 75% of the votes that all our stockholders would be entitled to cast to amend or repeal certain provisions of our charter or bylaws.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner.

If securities analysts do not or do not continue to publish research or reports about our business or if they publish negative evaluations of our business, the price of our stock could decline.

The trading market for our common stock is and will rely in part on the research and reports that industry or financial analysts publish about us or our business. If one or more of the analysts who currently cover our business downgrade their evaluations of our business, or in the event we obtain additional coverage and one or more of the new analysts issues an adverse evaluation of our business, the price of our stock could decline. If one or more of these analysts cease to cover our stock, we could lose visibility in the market for our stock, which in turn could cause our stock price to decline.

The price of our common stock has been and may continue to be volatile and fluctuate substantially.

Our stock price has been and is likely to continue to be volatile. The stock market in general and the market for pharmaceutical and biotechnology companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, our stockholders may not be able to sell our common stock at or above the price they paid for it. The market price for our common stock may be influenced by many factors, including:

- the timing and results of clinical trials of ATRN-119 and any of our other product candidates;
- regulatory actions with respect to our product candidates or our competitors' products and product candidates;
- the success of existing or new competitive products or technologies;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, collaborations or capital commitments;
- establishment or termination of collaborations for our product candidates or development programs;
- failure or discontinuation of any of our development programs;
- results of clinical trials of product candidates of our competitors;
- regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- the level of expenses related to any of our product candidates or development programs;
- the results of our efforts to discover, develop, acquire or in-license additional product candidates or products;
- actual or anticipated changes in estimates as to financial results or development timelines;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or other stockholders;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in estimates or recommendations by securities analysts, if any, that cover our stock;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- general economic, industry and market conditions; and
- the other factors described in this "Risk Factors" section.

We could be subject to securities class action litigation.

In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for us because pharmaceutical companies have experienced significant stock price volatility in recent years. If we face such litigation, it could result in substantial costs and a diversion of management's attention and our resources, which could harm our business.

We are an "emerging growth company" and a "smaller reporting company," and the reduced disclosure requirements applicable to emerging growth companies or smaller reporting companies may make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. We may remain an emerging growth company for up to five years, which is December 31, 2024, or until such earlier time as we have more than $1.235 billion in annual revenue, the market value of our stock held by non-affiliates is more than $700 million or we issue more than $1 billion of non-convertible debt over a three-year period. For so long as we remain an emerging growth company, we are permitted and intend to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or Section 404, not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements, being permitted to present only two years of audited financial statements and a correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure, reduced disclosure obligations regarding executive compensation and exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and shareholder approval of any golden parachute payments not previously approved. We cannot predict whether investors will find our common stock less attractive if we rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. An emerging growth company can therefore delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. However, we are choosing to "opt out" of such extended transition period, and, as a result, we will comply with new or revised accounting standards on the relevant dates on which adoption of such standards is required for public companies that are not emerging growth companies. The JOBS Act provides that our decision to opt out of the extended transition period for complying with new or revised accounting standards is irrevocable.

We are also a "smaller reporting company," as such term is defined in Rule 12b-2 of the Exchange Act, meaning that the market value of our common stock held by non-affiliates is less than $700 million and our annual revenue is less than $100 million during the most recently completed fiscal year. We may continue to be a smaller reporting company if either (i) the market value of our common stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our common stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

We continue to incur increased costs as a result of operating as a public company as we become subject to additional laws, regulations and listing exchange standards, and our management will continue to be required to devote substantial time to new compliance initiatives.

As a public company, and particularly after we are no longer an "emerging growth company" or a "smaller reporting company," we will incur significant legal, accounting and other expenses that we did not incur as a private company. In addition, the Sarbanes-Oxley Act of 2002 and rules subsequently implemented by the SEC and Nasdaq have imposed

various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. Our management and other personnel will need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations will increase our legal and financial compliance costs and will make some activities more time-consuming and costly. For example, we expect that these rules and regulations may make it more difficult and more expensive for us to obtain director and officer liability insurance.

Pursuant to Section 404, we are required to furnish a report by our management on our internal control over financial reporting, including an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. However, while we remain an emerging growth company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with Section 404 within the prescribed period, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants and adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. There is a risk that neither we nor our independent registered public accounting firm will be able to conclude within the prescribed timeframe that our internal control over financial reporting is effective as required by Section 404. This could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

Accounting principles and related pronouncements, implementation guidelines and interpretations we apply to a wide range of matters that are relevant to our business, including, but not limited to, revenue recognition, leases and stock-based compensation, are complex and involve subjective assumptions, estimates and judgments by our management. Changes in accounting pronouncements or their interpretation or changes in underlying assumptions, estimates or judgments by our management could significantly change our reported or expected financial performance.

Because we do not anticipate paying any cash dividends on our common stock for the foreseeable future, capital appreciation, if any, of our common stock may be investors' sole source of gain.

We have never declared or paid cash dividends on our common stock. We currently intend to retain all of our future earnings, if any, to finance the growth and development of our business. In addition, the terms of any future debt agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be investors' sole source of gain for the foreseeable future.

Sales of a substantial number of shares of our common stock by our existing stockholders in the public market could cause our stock price to fall.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock. As of December 31, 2023, we had outstanding 3,736,673 shares of common stock. In addition, 28,112 shares of common stock are issuable upon the conversion of preferred stock issued in connection with the Merger.

Our certificate of incorporation designates the state courts in the State of Delaware or, if no state court located within the State of Delaware has jurisdiction, the federal court for the District of Delaware, as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could discourage lawsuits against the company and our directors, officers and employees.

Our certificate of incorporation provides that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware (or, if the Court of Chancery does not have jurisdiction, the federal district court for the District of Delaware) will be the sole and exclusive forum for any derivative action or proceeding brought on our behalf under Delaware law, any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or employees to our company or our stockholders, any action asserting a claim against us arising

pursuant to any provision of the Delaware General Corporation Law or our certificate of incorporation or bylaws, any action asserting a claim against us governed by the internal affairs doctrine, or any other action asserting an "internal corporate claim," as defined in Section 115 of the Delaware General Corporation Law. These exclusive-forum provisions do not apply to claims under the Securities Act of 1933, as amended, or the Securities Act, or the Exchange Act. This exclusive forum provision may limit the ability of our stockholders to bring a claim in a judicial forum that such stockholders find favorable for disputes with us or our directors, officers or employees, which may discourage such lawsuits against us and our directors, officers and employees. If a court were to find the exclusive-forum provision in our certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could harm our results of operations.

We are required to meet the Nasdaq Stock Market, or Nasdaq, continued listing requirements and other Nasdaq rules, and if we fail to meet such rules and requirements, we may be subject to delisting. Delisting could negatively affect the price of our common stock, which could make it more difficult for us to sell securities in a future financing or for you to sell our common stock.

We are required to meet the continued listing requirements of Nasdaq and other Nasdaq rules, including those regarding director independence and independent committee requirements, minimum stockholders' equity, minimum share price and certain other corporate governance requirements. If we do not meet these continued listing requirements, our common stock could be delisted. Delisting would cause us to pursue eligibility for trading of these securities on other markets or exchanges, including the OTC BB or QB markets, or on the OTC "pink sheets." In such case, our stockholders' ability to trade, or obtain quotations of the market value of our common stock would be severely limited because of lower trading volumes and transaction delays. These factors could contribute to lower prices and larger spreads in the bid and ask prices of our securities. There can be no assurance that our securities, if delisted from the Nasdaq Capital Market in the future, would be listed on a national securities exchange, a national quotation service, the OTC markets or the pink sheets. Delisting from Nasdaq, or even the issuance of a notice of potential delisting, would also result in negative publicity, make it more difficult for us to raise additional capital, cause us to lose eligibility to register the sale or resale of our shares on Form S-3 and the automatic exemption from registration under state securities laws for exchange-listed securities, adversely affect the market liquidity of our securities, decrease securities analysts' coverage of us or diminish investor, supplier and employee confidence.

Item 1B. Unresolved Staff Comments

None.

Item 1C. Cybersecurity

Risk Management and Strategy

We are a clinical-stage biopharmaceutical company and we are solely focused on developing novel synthetic lethality-based cancer therapeutics that target DNA damage response pathways. Therefore, we do not consider that we face significant cybersecurity risk and have not adopted a formal cybersecurity risk management program or process for assessing cybersecurity risk currently. We assess material risks from cybersecurity threats on an ongoing basis, including any potential unauthorized access to or occurrence on or conducted through our information systems that may result in adverse effects on the confidentiality, integrity, or availability of our information systems or any information residing therein. To this end, we utilize an outsourced information technology consultant, who we believe has sufficient experience and expertise with regard to cybersecurity matters, to implement systems and procedures designed to reduce, respond to and monitor for cybersecurity threats and vulnerabilities. Our outsourced information technology consultant conducts proactive patching and monitoring of all of our existing systems and has implemented systems and procedures to mitigate cybersecurity risks that we believe are appropriate for a company of our size, stage of growth and financial condition. In addition, we carry insurance with coverage for cyber events that we believe is suitable for a company of our size, stage of growth and financial condition.

As of the date of this Annual Report on Form 10-K, we are not aware of any cybersecurity threats, including as a result of any previous cybersecurity incidents, that have materially affected us, including our business strategy, results of operations or financial condition. However, as discussed under "Risk Factors" in Part I, Item 1A of this Annual Report,

cybersecurity threats pose multiple risks to us, including potentially to our results of operations and financial condition. For additional information concerning risks related to cybersecurity, *see* Item 1.A. *Risk Factors: "Our business and operations would suffer in the event of IT system failures, cybersecurity attacks, data breaches, or vulnerabilities in our or our third-party vendors' information security program or defenses."*

Governance

Management is responsible for the day-to-day management of the risks we face, while our Board of Directors as a whole has responsibility for the oversight of risk management, including as to material risks from cybersecurity threats. In its risk oversight role, our Board of Directors has the responsibility to satisfy itself that the risk management processes designed and implemented by management are appropriate and functioning as designed. The Board of Directors has delegated to the Audit Committee of the Board of Directors the responsibility for the oversight of information technology (including cybersecurity) risks. In general, we seek to address cybersecurity risks through a cross-functional approach that is focused on preserving the confidentiality, integrity, and availability of the information that we collect and store by identifying, preventing, and mitigating cybersecurity threats and effectively responding to cybersecurity incidents when they occur.

Item 2. Properties

We have a facility in Doylestown, Pennsylvania which consists of office and laboratory space of approximately 1,550 square feet under an operating lease agreement that expires in December 2024. We believe that are current facilities are suitable and adequate to meet our current needs. We believe that suitable additional or substitute space will be available as needed to accommodate any potential expansion of our operations.

Item 3. Legal Proceedings

None.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Market Information and Holders of Record

Our common stock is listed on the Nasdaq Capital Market under the symbol "APRE".

As of March 26, 2024, we had approximately 215 holders of record of our common stock. The actual number of shareholders is greater than this number of record holders and includes shareholders who are beneficial owners but whose shares are held in street name by brokers and other nominees. The number of holders of record also does not include shareholders whose shares may be held in trust by other entities.

Dividends

We have never declared or paid a cash dividend on our capital stock. We currently intend to retain any future earnings and do not expect to pay any dividends in the foreseeable future. Any future determinations to pay cash dividends will be made at the discretion of our board of directors, subject to applicable laws, and will depend on a number of factors, including our financial condition, results of operations, capital requirements, contractual restrictions, general business conditions, and any other factors that our board may deem relevant.

Securities Authorized for Issuance under Equity Compensation Plans

Information regarding the Securities Authorized for Issuance under our Equity Compensation Plans will be included in an amendment to this Annual Report in Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

Stock Performance Graph

As a smaller reporting company, we are not required to provide the information requested by this item pursuant to Item 201 of Regulation S-K.

Unregistered sales of equity securities

None.

Use of proceeds from registered securities

On October 7, 2019, we completed our IPO, in which we sold 6,516,667 shares of common stock, $0.001 par value per share, which included the exercise in full by the underwriters of their option to purchase an additional 850,000 shares of common stock, at a price to the public of $15.00 per share. The offer and sale of the shares in the IPO was registered under the Securities Act pursuant to registration statements on Form S-1 (File No. 333-233662), which was filed with the SEC on September 6, 2019 and amended subsequently and declared effective on October 2, 2019, and Form S-1MEF, which was filed and declared effective with the SEC on October 2, 2019. The underwriters of the offering were J.P. Morgan Securities LLC, Morgan Stanley & Co. LLC and RBC Capital Markets, LLC.

Our registration statements relating to the IPO registered common stock with a maximum aggregate offering price of up to $103,500,005. We raised approximately $90.9 million in net proceeds after deducting underwriting discounts and commissions of $6.8 million but before deducting other offering expenses. No offering expenses were paid directly or indirectly to any of our directors of officers (or their associates) or persons owning ten percent or more of any class of our equity securities or to any other affiliates.

Through December 31, 2023, we have used approximately $74.6 million of the net proceeds from our IPO for matters described in our final IPO prospectus filed with the SEC on October 4, 2019, or our IPO prospectus. There has been no material change in the planned use of proceeds from our IPO, as described in our IPO prospectus.

Repurchases of equity securities by the issuer

None.

Item 6. [Reserved]

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of financial condition and results of operations is provided to enhance the understanding of, and should be read in conjunction with Part I, Item I, "Business" and Item 8, 'Financial Statements and Supplementary Data." For information on risks and uncertainties related to our business that may make past performance not indicative of future results or cause actual results to differ materially from any forward-looking statements, see "Special Note Regarding Forward-Looking Statements," and Part I, Item 1A, 'Risk Factors."

Overview

We are a clinical-stage biopharmaceutical company focused on precision oncology through synthetic lethality. Our approach is built upon a platform of integrated discovery technologies to enrich our pipeline with novel targets in synthetic lethality and cancer treatment. Together with our expertise in small molecule drug discovery, we are applying the capabilities of our discovery platform to the development of new precision oncology therapies and the identification of patient populations most likely to benefit.

Aprea Therapeutics AB was originally incorporated in 2002 and commenced principal operations in 2006. On September 20, 2019, we consummated a reorganization, pursuant to which all of the issued and outstanding stock and options of Aprea Therapeutics AB were exchanged for common stock, preferred stock or options, as applicable, of Aprea Therapeutics, Inc. As a result, Aprea Therapeutics AB became a wholly-owned subsidiary of Aprea Therapeutics, Inc.

On May 16, 2022, we acquired Atrin Pharmaceuticals Inc. ("Atrin"), in accordance with the terms of the Agreement and Plan of Merger dated May 16, 2022 (the "Merger Agreement"), by and among us, ATR Merger Sub I Inc., a Delaware corporation and our wholly owned subsidiary ("First Merger Sub"), ATR Merger Sub II LLC, a Delaware limited liability company and wholly owned subsidiary of Aprea ("Second Merger Sub") and Atrin. Pursuant to the Merger Agreement, First Merger Sub merged with and into Atrin, pursuant to which Atrin was the surviving corporation and became a wholly owned subsidiary of Aprea (the "First Merger"). Immediately following the First Merger, Atrin merged with and into the second Merger Sub, pursuant to which Second Merger Sub was the surviving entity. The former Atrin business is now our business.

We believe that synthetic lethality has the potential to impact patients' lives and treatment strategies for a wide range of cancer types. We aspire to become a leader in this emerging field and are establishing a pipeline of clinical and preclinical programs that we believe may have broad application to cancer treatment.

Our most advanced synthetic lethality product candidate is ATRN-119, a clinical-stage small molecule inhibitor of ataxia telangiectasia and Rad3-related, or ATR, a kinase that plays a critical role in DDR. ATR is one of several key regulators of the response to defective DNA replication and DNA damage, which occurs more commonly in cancer cells than in normal cells. We are enrolling patients into a Phase 1/2a clinical trial to evaluate ATRN-119 under an investigational new drug application, or IND. The first four dose cohorts have been completed, and patients with advanced solid tumors having mutations in defined DDR-related genes continue to be enrolled into additional cohorts of the Phase 1 dose escalation part of the trial. The primary endpoint of this Phase 1 part is to evaluate the tolerability and pharmacokinetics of ATRN-119 when administered orally on a continuous, once-daily schedule. We anticipate ATRN-119 Phase 1 readout to be available in the first quarter of 2025.

We have several additional, wholly owned synthetic lethality programs. We are targeting WEE1, a kinase that is a key regulator of multiple phases of the cell cycle. Our lead WEE1 inhibitor product candidate is APR-1051. In March 2024, the FDA cleared our IND application for APR-1051. In addition, we also have an early preclinical research program, which is currently in the lead optimization stage, for an undisclosed DDR target.

In addition to development of these drugs as single agents, we are evaluating potential expansion opportunities for our product candidates through combination with other agents such as poly (ADP-ribose) polymerase inhibitors, or PARPi, where we believe a combination of therapeutic agents may enhance synthetic lethality. We are also evaluating

combination opportunities within our pipeline, including research on the combination of ATRN-119 and APR-1051 that is supported by a Phase II SBIR grant from the National Cancer Institute.

Prior to the acquisition of Atrin, we were engaged in the clinical development of cancer therapeutics that reactivate the mutant p53 tumor suppressor protein. Our lead product candidate was APR-246, or eprenetapopt. Following our failed pivotal Phase 3 trial in December 2020, we engaged in a thorough evaluation of strategic options leading to the acquisition of Atrin and shifting our focus to the Atrin assets. We do not currently have any ongoing preclinical studies or clinical trials involving our reactivators of mutant p53 and our primary focus is on the discovery and development of molecules targeting DDR pathways in oncology through synthetic lethality.

We have assembled a team with extensive experience in the discovery, development and commercialization of oncology drugs to support our mission of developing novel synthetic lethality-based cancer therapeutics.

Corporate Background

Aprea Therapeutics AB, or Aprea AB, was originally incorporated in 2002 and commenced principal operations in 2006. We incorporated Aprea Therapeutics, Inc. (the "Company") in May 2019. In September 2019 we completed a corporate reorganization and, as a result, all of the issued and outstanding stock of Aprea AB was exchanged for common stock, preferred stock or options, as applicable, of the Company. As a result of such transactions, Aprea AB became a wholly-owned subsidiary of the Company. On May 16, 2022 we completed the acquisition of Atrin as more fully described below.

We have devoted substantially all of our resources to developing our product candidates, building our intellectual property portfolio, business planning, raising capital and providing general and administrative support for these operations. To date, we have financed our operations primarily through the net proceeds received from the initial public offering of our common stock and sales of common stock through public offerings.

Agreement and Plan of Merger

On May 16, 2022, we acquired Atrin in accordance with the terms of the Agreement and Plan of Merger dated May 16, 2022 (the "Merger Agreement"), by and among us, ATR Merger Sub I Inc., a Delaware corporation and our wholly owned subsidiary ("First Merger Sub"), ATR Merger Sub II LLC, a Delaware limited liability company and our wholly owned subsidiary ("Second Merger Sub") and Atrin. Pursuant to the Merger Agreement, First Merger Sub merged with and into Atrin, pursuant to which Atrin was the surviving corporation and became a wholly owned subsidiary of Aprea (the "First Merger"). Immediately following the First Merger, Atrin merged with and into the Second Merger Sub, pursuant to which Second Merger Sub was the surviving entity (the "Second Merger", together with the First Merger, the "Merger"). The Merger is intended to qualify as a tax-free reorganization for U.S. federal income tax purposes. Our board of directors approved the Merger Agreement and the related transactions. The consummation of the Merger was not subject to approval of our stockholders. The Atrin acquisition was accounted for as an asset acquisition for accounting purposes (see Note 3 to our consolidated financial statements).

Under the terms of the Merger Agreement, at the closing of the Merger, we issued to the securityholders of Atrin, 55,869 shares of our common stock and 2,949,630 shares of Series A Non-Voting Convertible Preferred Stock, each share of which is convertible into 10 shares of our common stock on a pre-Reverse Stock Split basis. In addition, we assumed outstanding Atrin stock options, which became options to purchase 163,757 shares of our common stock.

Pursuant to the Merger Agreement, we held our annual stockholders' meeting on July 28, 2022 where, among other matters, the following matters were approved; (i) the conversion of the Series A Non-Voting Convertible Preferred Stock into shares of Common Stock in accordance with Nasdaq Listing Rule 5635(a) and (ii) the ratification of the appointment by our Board of Directors of additional directors.

Through December 31, 2023, a total of 2,893,403 shares of Series A Non-Voting Convertible Preferred Stock were converted into 1,446,701 shares of common stock. As of December 31, 2023, a total of 56,227 shares of Series A Non-Voting Convertible Preferred Stock remained outstanding.

Contingent Value Rights Agreement

In accordance with the Merger Agreement, on May 16, 2022, we and the Rights Agent (as defined therein) executed and delivered a contingent value rights agreement (the "CVR Agreement"), pursuant to which each holder of our common stock as of May 16, 2022, other than former stockholders of Atrin, is entitled to one contractual contingent value right issued by us, subject to and in accordance with the terms and conditions of the CVR Agreement, for each share of our common stock held by such holder. Each contingent value right entitles the holder thereof to receive certain cash payments equal to 70% of the net proceeds, if any received by us, related to the disposition of tangible and intangible assets related to our legacy business of developing and commercializing cancer therapeutics that reactivate mutant p53 tumor suppressor protein, including but not limited to APR-246, or eprenetapopt, APR-548, and all associated analogs in the 2 year period following the closing of the transaction. The contingent value rights are not transferable, except in certain limited circumstances as will be provided in the CVR Agreement, will not be certificated or evidenced by any instrument, and will not be registered with the SEC or listed for trading on any exchange. No payments under the CVR Agreement have been made to date.

Reverse Stock Split

On November 16, 2022, our stockholders approved a proposal at a special meeting of stockholders to amend our Amended and Restated Certificate of Incorporation ("Certificate of Incorporation") to effect a reverse stock split ("Reverse Stock Split") of our common stock, par value $0.001 (the "Common Stock") at a ratio of between one-for-3 and one-for-20, inclusive (the "Split Ratio Range"), with the final determination of such ratio within the Split Ratio Range to be approved by the Board of Directors (the "Board") following stockholder approval. Following the special meeting, the Board approved a final split ratio of one-for-20. Following such approval, we filed an amendment to our Certificate of Incorporation (the "Amendment") with the Secretary of State of the State of Delaware to effect the Reverse Stock Split, with an effective time of 5:00 p.m. on February 10, 2023. No fractional shares were issued as a result of the Reverse Stock Split. Stockholders who would have otherwise been entitled to receive a fractional share received a cash payment in lieu thereof. The Reverse Stock Split affected all shares of our Common Stock outstanding immediately prior to the effective date of the Reverse Stock Split, as well as the number shares of common stock available for issuance under our equity incentive plans. In addition, the reverse stock split effected a reduction in the number of shares of common stock issuable upon the exercise of stock options restricted stock units outstanding.

Liquidity

Since our inception, we have incurred significant losses on an aggregate basis. We have not yet commercialized any of our product candidates, which are in various phases of preclinical and clinical development, and we do not expect to generate revenue from sales of any products for several years, if at all. Our ability to generate product revenue sufficient to achieve profitability will depend on the successful development and eventual commercialization of one or more of our product candidates. Our net losses were $14.3 million, $112.7 million and $37.1 million for the years ended December 31, 2023, 2022 and 2021, respectively. As of December 31, 2023, we had an accumulated deficit of $308.1 million. These losses have resulted primarily from costs incurred in connection with research and development activities, patent investment, and general and administrative costs associated with our operations. We expect to continue to incur significant expenses and increasing operating losses for at least the next several years.

We anticipate that our expenses will increase substantially if and as we:

- initiate and conduct clinical trials and additional preclinical research for our product candidates;
- seek to identify and develop additional product candidates;
- seek marketing approvals for any of our product candidates that successfully complete clinical trials, if any;
- establish a sales, marketing, manufacturing and distribution infrastructure to commercialize any products for which we may obtain marketing approval;

- require the manufacture of larger quantities of our product candidates for clinical development and potential commercialization;
- maintain, expand, protect and enforce our intellectual property portfolio;
- acquire or in-license other drugs and technologies;
- defend against any claims of infringement, misappropriation or other violation of third-party intellectual property;
- hire and retain additional clinical, quality control and scientific personnel;
- build out new facilities or expand existing facilities to support our ongoing development activity;
- add operational, financial and management information systems and personnel, including personnel to support our drug development, any future commercialization efforts; and
- continue to operate as a public company.

Furthermore, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to product manufacturing, marketing, sales and distribution.

As a result, we will need additional financing to support our continuing operations. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of public or private equity or debt financings or other sources, which may include collaborations with third parties. We may be unable to raise additional funds or enter into other agreements or arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such agreements as and when needed, we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our product candidates.

Because of the numerous risks and uncertainties associated with product development, we are unable to predict the timing or amount of increased expenses or when or if we will be able to achieve or maintain profitability. Even if we are able to generate revenue from product sales, we may not become profitable. If we fail to become profitable or are unable to sustain profitability on a continuing basis, then we may be unable to continue our operations at planned levels and be forced to reduce or terminate our operations.

As of December 31, 2023, we had cash and cash equivalents of $21.6 million. We believe that our existing cash and cash equivalents as of December 31, 2023 and the upfront gross proceeds of approximately $16.0 million received from our private placement of our common stock and warrants in March 2024, before deducting placement agent fees and offering costs of approximately $1.4 million, will be sufficient to meet our currently projected operating expenses and capital expenditure requirements into the third quarter of 2025. We have based this estimate on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect. See "—Liquidity and Capital Resources."

Components of our results of operations

Grant revenue

We have not generated any revenue from product sales and do not expect to generate any revenue from the sale of products in the near future. If our development efforts for any of our product candidates are successful and result in marketing approval or collaboration or license agreements with third parties, we may generate revenue in the future from a combination of product sales or payments from collaboration or license agreements that we may enter into with third parties.

Our revenue is primarily generated through grants from government organizations. Grant revenue is recognized during the period that the research and development services occur, as qualifying expenses are incurred or conditions of the grants are met. Associated expenses are recognized when incurred as research and development expense. We concluded that payments received under these grants represent conditional, nonreciprocal contributions, as described in ASC *958, Not*-for-Profit Entities, and that the grants are *not* within the scope of ASC *606,* Revenue from Contracts with Customers, as the organizations providing the grants do *not* meet the definition of a customer.

Operating expenses

Our expenses since inception have consisted solely of research and development costs and general and administrative costs.

Research and development expenses

Research and development expenses consist primarily of costs incurred for our research activities, including our discovery efforts, and the development of our product candidates, and include:

- expenses incurred under agreements with third parties, including contract research organizations, or CROs, that conduct research, preclinical activities and clinical trials on our behalf as well as contract manufacturing organizations, or CMOs, that manufacture our product candidates for use in our preclinical and clinical trials;

- salaries, benefits and other related costs, including stock-based compensation expense, for personnel engaged in research and development functions;

- costs of outside consultants, including their fees, stock-based compensation and related travel expenses;

- costs of laboratory supplies and acquiring, developing and manufacturing preclinical study and clinical trial materials;

- expenses related to compliance with regulatory requirements; and

- facility-related expenses, which include direct depreciation costs and allocated expenses for rent and maintenance of facilities and other operating costs.

We expense research and development costs as incurred. We recognize costs for certain development activities, such as clinical trials, based on an evaluation of the progress to completion of specific tasks using data such as patient enrollment, clinical site activations, or information provided to us by our vendors and our clinical investigative sites. Payments for these activities are based on the terms of the individual agreements, which may differ from the pattern of costs incurred, and are reflected in our financial statements as prepaid or accrued research and development expenses.

We typically use our employee and infrastructure resources across our development programs. We track outsourced development costs and payments made to our research partners by product candidate or development program, but we do not allocate personnel costs or other internal costs to specific development programs or product candidates.

Research and development activities are central to our business model. Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. We expect that our research and development expenses will continue to increase for the foreseeable future as we initiate clinical trials for ATRN-119 and other product candidates and continue to discover and develop additional product candidates.

We cannot determine with certainty the duration and costs of planned clinical trials of our product candidates or if, when, or to what extent we will generate revenue from the commercialization and sale of any our product candidates for which we obtain marketing approval. We may never succeed in obtaining marketing approval for any of our product

candidates. The duration, costs and timing of clinical trials and development of our product candidates will depend on a variety of factors, including:

- the scope, rate of progress, expense and results of any future clinical trials of our product candidates and other research and development activities that we may conduct;
- uncertainties in clinical trial design and patient enrollment rates;
- significant and changing government regulation and regulatory guidance;
- the timing and receipt of, and any limitations imposed by regulatory bodies on, any marketing approvals; and
- the expense of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights.

A change in the outcome of any of these variables with respect to the development of a product candidate could mean a significant change in the costs and timing associated with the development of that product candidate. For example, if the U.S. Food and Drug Administration, or FDA, or another regulatory authority in a foreign jurisdiction were to require us to conduct clinical trials beyond the scope we currently anticipate, or additional clinical trials beyond those that we anticipate will be required for the completion of clinical development of a product candidate, or if we experience significant trial delays due to patient enrollment or other reasons, we would be required to expend significant additional financial resources and time on the completion of clinical development.

General and administrative expenses

General and administrative expenses consist primarily of salaries and other related costs, including stock-based compensation, for personnel in our executive, finance, corporate and business development and administrative functions. General and administrative expenses also include legal fees relating to patent and corporate matters; professional fees for accounting, auditing, tax and consulting services; insurance costs; travel expenses; and facility-related expenses, which include direct depreciation costs and allocated expenses for rent and maintenance of facilities and other operating costs.

We expect that our general and administrative expenses will increase in the future as we increase our headcount to support personnel in research and development and to support our operations generally, and as we increase our activities related to the potential commercialization of our product candidates. We also expect to continue to incur increased expenses associated with being a public company, including costs of accounting, audit, legal, regulatory and tax-related services associated with maintaining compliance with exchange listing and SEC requirements; director and officer insurance costs; and investor and public relations costs.

Acquired In-Process Research and Development Expense

Acquired in-process research and development ("IPR&D") expense resulted from the Atrin acquisition in May 2022 which was accounted for as an asset acquisition. The acquisition cost allocated to acquire IPR&D with no alternative future use was recorded as an expense at the acquisition date and no additional IPR&D expense relating to the Atrin acquisition is expected to be reported in future periods.

Other income and expense

Interest income and expense

Interest income consists of income earned on our cash and cash equivalents. Interest expense consists of the interest component associated with our facility leases. Our interest income initially increased as our cash and cash equivalents were higher due to the cash proceeds received from our IPO. Such interest income is subsequently decreasing as (i) our cash balance decreases as we continue to fund operations and (ii) a change in interest rates.

Foreign currency gain and loss

Our consolidated financial statements are presented in U.S. dollars, which is our reporting currency. The financial position and results of operations of our subsidiary Aprea AB is measured using the foreign subsidiary's local currency as the functional currency. Aprea AB cash accounts holding U.S. dollars are remeasured based upon the exchange rate at the date of remeasurement with the resulting gain or loss included in the consolidated statement of operations and comprehensive loss. Expenses of such subsidiaries have been translated into U.S. dollars at average exchange rates prevailing during the period. Assets and liabilities have been translated at the rates of exchange on the consolidated balance sheet date. The resulting translation gain and loss adjustments are recorded directly as a separate component of stockholders' equity and as other comprehensive loss on the consolidated statement of operations and comprehensive loss.

Income taxes

We have not recorded any U.S. federal, state or foreign income tax expense or benefits for the net losses we have incurred in any year, due to our uncertainty of realizing a benefit from those items. We have provided a valuation allowance for the full amount of the net deferred tax assets as, based on all available evidence, it is considered more likely than not that all the recorded deferred tax assets will not be realized in a future period.

Critical accounting policies and use of estimates

Our management's discussion and analysis of financial condition and results of operations is based on our financial statements, which have been prepared in accordance with generally accepted accounting principles in the United States. The preparation of our financial statements and related disclosures requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, costs and expenses in our financial statements. We base our estimates on historical experience, known trends and events and various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in more detail in the notes to our financial statements, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our financial statements.

Accrued research and development expenses

As part of the process of preparing our financial statements, we are required to estimate our accrued research and development expenses at each balance sheet. This process involves reviewing open contract and purchase orders, communicating with our personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated costs incurred for the services when we have not yet been invoiced or otherwise notified of the actual costs. The majority of our service providers invoice us in arrears for services performed, on a pre-determined schedule or when contractual milestones are met; however, some require advanced payments. We make estimates of our accrued expenses as of each balance sheet date in our financial statements based on facts and circumstances known to us at that time. Examples of estimated accrued research and development expenses include fees paid to:

- CROs in connection with performing research activities on our behalf and conducting preclinical studies and clinical trials on our behalf;
- investigative sites or other service providers in connection with clinical trials;
- vendors in connection with preclinical and clinical development activities; and

- vendors related to product manufacturing and development and distribution of preclinical and clinical supplies.

We base our expenses related to preclinical studies and clinical trials on our estimates of the services received and efforts expended pursuant to quotes and contracts with CROs that conduct and manage preclinical studies and clinical trials on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the expense. Payments under some of these contracts are fee for service or depend on factors such as the successful enrollment of patients and the completion of clinical trial milestones. In accruing fees, we estimate the time period over which services will be performed, and multiple factors including enrollment of patients, number of sites activated and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from our estimate, we adjust the accrual or amount of prepaid expense accordingly. Although we do not expect our estimates to be materially different from amounts actually incurred, our understanding of the status and timing of services performed relative to the actual status and timing of services performed may vary and may result in us reporting amounts that are too high or too low in any particular period. To date, we have not made any material adjustments to our prior estimates of accrued research and development expenses.

Stock-based compensation

We measure stock options and other stock-based awards granted to employees and directors based on their fair value on the date of the grant and recognize compensation expense of those awards, over the requisite service period, which is generally the vesting period of the respective award. We apply the straight-line method of expense recognition to all awards with only service-based vesting conditions and apply the graded-vesting method to all awards with performance-based vesting conditions or to awards with both service-based and performance-based vesting conditions.

For stock-based awards granted to non-employees, compensation expense is recognized over the period during which services are rendered by such non-employees until completed in accordance with the FASB issued ASU No. 2018-07, Compensation-Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting. The new standard largely aligns the accounting for share-based payment awards issued to employees and nonemployees by expanding the scope of ASC 718 to apply to nonemployee share-based transactions, as long as the transaction is not effectively a form of financing.

We estimate the fair value of each stock option grant on the date of grant using the Black-Scholes option-pricing model, which uses as inputs the fair value of our common stock and assumptions we make for the volatility of our common stock, the expected term of our stock options, the risk-free interest rate for a period that approximates the expected term of our stock options and our expected dividend yield.

We also award restricted stock units ("RSUs") to employees and directors. RSUs are generally subject to forfeiture if employment terminates prior to completion of the vesting restrictions. We expense the cost of the RSUs, which is determined to be the fair market value of the shares of common stock underlying the RSUs at the date of grant, ratably over the period during which the vesting restrictions lapse.

Emerging growth company and smaller reporting company status

We are an emerging growth company (EGC), as defined in the JOBS Act. Under this act, emerging growth companies are permitted to delay adopting new or revised accounting standards applicable to public companies until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

We may remain classified as an EGC until the end of the fiscal year in which the fifth anniversary of our IPO occurs, which is December 31, 2024, although if the market value of our common stock that is held by non-affiliates exceeds $700 million as of the last trading day of the second quarter before that time or if we have annual gross revenues of

$1.235 billion or more in any fiscal year, we would cease to be an EGC as of December 31 of the applicable year. We also would cease to be an EGC if we issue more than $1 billion of non-convertible debt over a three-year period.

We are also a "smaller reporting company," as such term is defined in Rule 12b-2 of the Exchange Act, meaning that the market value of our common stock held by non-affiliates is less than $700 million and our annual revenue is less than $100 million during the most recently completed fiscal year. We may continue to be a smaller reporting company if either (i) the market value of our common stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our common stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

Results of operations

Comparison of the years ended December 31, 2023 and 2022

	Years ended December 31,		
	2023	2022	Change
Grant revenue	$ 583,231	$ —	$ —
Operating expenses:			
Research and development	7,627,491	16,402,273	(8,774,782)
General and administrative	8,427,703	20,969,771	(12,542,068)
Acquired in-process research and development	—	76,020,184	(76,020,184)
Total operating expenses	16,055,194	113,392,228	(97,337,034)
Loss from operations	(15,471,963)	(113,392,228)	97,920,265
Other income (expense):			
Interest income	1,224,133	448,667	775,466
Foreign currency (loss) gain	(38,926)	281,534	(320,460)
Total other income	1,185,207	730,201	455,006
Net loss	$ (14,286,756)	$ (112,662,027)	$ 98,375,271

Grant revenue

Grant revenue from the National Cancer Institute of the National Institutes of Health ("NIH") for the year ended December 31, 2023 was approximately $0.6 million. There was no grant revenue for the year ended December 31, 2022.

Research and development expenses

	Years ended December 31,		
	2023	2022	Change
APR-246	$ 69,514	$ 4,529,279	$ (4,459,765)
ATRN-119	2,644,988	661,744	1,983,244
APR-1051	2,839,626	—	2,839,626
Other early-stage development programs	360,016	1,255,708	(895,692)
Unallocated research and development expenses	1,713,347	9,955,542	(8,242,195)
Total research and development expenses	$ 7,627,491	$ 16,402,273	$ (8,774,782)

Research and development expenses for the year ended December 31, 2023 were $7.6 million, compared to $16.4 million for the year ended December 31, 2022. The overall decrease of $8.8 million was primarily due to the following:

- a decrease of $4.5 million related to the close out of our clinical trials of eprenetapopt and APR-246;

- a decrease of $0.9 million in pre-clinical development activities;

- a decrease of $2.5 million in personnel costs primarily related to the close out of our research facility in Sweden during 2022; and

- a decrease of $6.0 million in non-cash stock-based compensation expense. The decrease in non-cash stock-based compensation expense was primarily related to the accelerated vesting of all outstanding and unvested stock options and RSUs in connection with the Atrin Acquisition which occurred in the second quarter of 2022, as well as, lower non-cash stock-based compensation expense during 2023.

The above decreases were offset, in part by:

- an increase of $2.0 million related to our Phase 1/2a clinical trial evaluating ATRN-119 which enrolled its first subject in Q1 2023; and

- an increase of $2.8 million related to IND enabling studies for APR-1051, our small molecule WEE1 inhibitor.

General and administrative expenses

General and administrative expenses for the year ended December 31, 2023 were $8.4 million, compared to $21.0 million for the year ended December 31, 2022. The decrease of $12.5 million was primarily related to:

- a decrease of $10.6 million in non-cash stock-based compensation expense. The decrease in non-cash stock-based compensation expense was related to the accelerated vesting of all outstanding and unvested stock options and RSUs in connection with the Atrin Acquisition which occurred in the second quarter of 2022, as well as, lower non-cash stock-based compensation expense during 2023;

- a decrease in insurance premiums of $2.1 million; and

- a decrease of $0.7 million in professional fees primarily associated with post-acquisition activities during 2022.

The above increase was offset, in part by the following:

- an increase of $0.1 million in personnel costs primarily related to severance expense for our former executives; and

- an increase of $0.9 million in consulting costs related to board fees, recruiting fees and other general consulting fees.

Other income and expense

Foreign currency loss was $38,926 for the year ended December 31, 2023 compared to a foreign currency gain of $0.3 million for the year ended December 31, 2022. The change in the foreign currency of $0.3 was primarily due to a weakening of the U.S. dollar against the Swedish Krona during the year ended December 31, 2023 as compared to the year ended December 31, 2022.

Interest income increased to $1.2 million for the year ended December 31, 2023, as compared to $0.4 million for the year ended December 31, 2022, primarily due to increased market interest rates. Interest income for the years ended December 31, 2023 and 2022 primarily consisted of interest earned on our cash and cash equivalents.

Comparison of the years ended December 31, 2022 and 2021

	Year Ended December 31,		
	2022	2021	Change
Operating expenses:			
Research and development	$ 16,402,273	$ 23,895,875	$ (7,493,602)
General and administrative	20,969,771	13,550,478	7,419,293
Acquired in-process research and development	76,020,184	—	76,020,184
Total operating expenses	113,392,228	37,446,353	75,945,875
Loss from operations	(113,392,228)	(37,446,353)	(75,945,875)
Other income:			
Interest income	448,667	1,648	447,019
Foreign currency gain (loss)	281,534	317,402	(35,868)
Total other income	730,201	319,050	411,151
Net loss	$ (112,662,027)	$ (37,127,303)	$ (75,534,724)

Research and development expenses

	Year Ended December 31,		
	2022	2021	Change
APR-246	$ 4,529,279	$ 12,213,069	$ (7,683,790)
ATRN-119	661,744	—	661,744
Other early-stage development programs	1,255,708	4,315,990	(3,060,282)
Unallocated research and development expenses	9,955,542	7,366,816	2,588,726
Total research and development expenses	$ 16,402,273	$ 23,895,875	$ (7,493,602)

Research and development expenses for the year ended December 31, 2022 were $16.4 million, compared to $23.9 million for the year ended December 31, 2021. The overall decrease of $7.5 million was primarily due to the overall activity in connection with the wrap up and close out of the legacy Aprea clinical trials, manufacturing and preclinical activities as follows:

- a decrease of $2.6 million in pre-clinical development activities;
- a decrease of $2.5 million related to the close out of our Phase 1/2 solid tumor trial;
- a decrease of $1.4 million related to the close out of our pivotal Phase 3 clinical trial of eprenetapopt with azacitidine for frontline treatment of *TP53* mutant MDS;
- a decrease of $1.3 million in manufacturing expenses;
- a decrease of $0.8 million related to the close out of our Phase 1/2 clinical trial in relapsed/refractory *TP53* mutant chronic lymphoid leukemia (CLL) assessing eprenetapopt with venetoclax and rituximab and eprenetapopt with ibrutinib in order to further assess eprenetapopt in hematological malignancies;
- a decrease of $0.7 million related to the close out of our Phase 1 dose-escalation clinical trial of APR-548, a next generation p53 reactivator;
- a decrease of $0.4 million related to the close out of our Phase 1 AML clinical trial;
- a decrease of $0.4 million in pharmacovigilance expenses; and
- a decrease of $0.4 million in drug storage expenses.

The above decreases were offset, in part by:

- an increase of $3.2 million in non-cash stock-based compensation expense. The increase in non-cash stock-based compensation expense was related to the accelerated vesting of all outstanding and unvested stock options and RSUs in connection with the Atrin acquisition which occurred in the second quarter of 2022; and

- an increase of $0.7 million related to the development of ATRN-119

General and administrative expenses

General and administrative expenses for the year ended December 31, 2022 were $21.0 million, compared to $13.6 million for the year ended December 31, 2021. The increase of $7.4 million was primarily related to:

- an increase of $6.0 million in non-cash stock-based compensation expense. The increase in non-cash stock-based compensation expense was related to the accelerated vesting of all outstanding and unvested stock options and RSUs in connection with the Atrin acquisition which occurred in the second quarter of 2022; and

- an increase in legal expenses of $1.3 million associated with post-acquisition activities, our preferred stock conversion, and our reverse stock split.

The above increase was offset, in part by the following:

- a decrease in D&O insurance of $0.3 million.

Other income and expense

Foreign currency gain was $0.3 million for each of the years ended December 31, 2022 and 2021. Interest income for the year ended December 31, 2022 was $0.4 million and consisted primarily of interest earned on our cash and cash equivalents offset in part, by interest expense associated with our facility leases.

Liquidity and capital resources

Since our inception, we have incurred significant losses on an aggregate basis. We have not yet commercialized any of our product candidates, which are in various phases of preclinical and clinical development, and we do not expect to generate revenue from sales of any products for several years, if at all. Our ability to generate product revenue sufficient to achieve profitability will depend on the successful development and eventual commercialization of one or more of our product candidates. Since 2019, our primary source of funds has been from the public sales of our common stock. As of December 31, 2023, we had cash and cash equivalents of $21.6 million. We believe that our existing cash and cash equivalents as of December 31, 2023 and the gross proceeds of approximately $16.0 million from the issuance of our common stock and warrants in March 2024, before deducting placement agent fees and offering costs of approximately $1.4 million, will be sufficient to meet our currently projected operating expenses and capital expenditure requirements into the third quarter of 2025.

On November 12, 2020, we filed a shelf registration statement, or the 2020 Shelf Registration Statement, with the SEC for the issuance up to $350 million, and up to $50 million under the Sales Agreement, as discussed below, which was declared effective on November 30, 2020. We filed a prospectus supplement to the 2020 Shelf Registration Statement dated September 2, 2022 for the sale of up to $14,744,728 of shares of our common stock pursuant to the Sales Agreement. The 2020 Shelf Registration Statement expired in November 2023.

On November 12, 2020, we entered into a Sales Agreement, or the Sales Agreement, with SVB Leerink LLC, or SVB. Pursuant to the terms of the Sales Agreement, we were able, from time to time, in our sole discretion, to issue and sell through SVB, acting as sales agent, up to $50.0 million of shares of our common stock. The Sales Agreement has been terminated and is no longer effective. During the years ended December 31, 2023, 2022 and 2021, we issued and sold

26,302 shares, 38,481 shares and 18,338 shares, respectively, of common stock under the Sales Agreement resulting in net proceeds of approximately $0.3 million, $0.7 million and $1.5 million, respectively.

On January 26, 2024, we filed a shelf registration statement, or the 2024 Shelf Registration Statement, with the SEC for issuance of up to $150 million, including a prospectus for the sale of $1 million under the ATM Agreement, as discussed below, which was declared effective on February 2, 2024. We subsequently filed a prospectus supplement to the 2024 Shelf Registration Statement for the sale of up to $2 million of shares of our common stock pursuant to the ATM Agreement.

On January 26, 2024, we entered into an At the Market Offering Agreement, or the ATM Agreement, with H.C. Wainright & Co., LLC, or HCW. Pursuant to the ATM Agreement and the prospectus supplement filed in connection therewith, we may, from time to time, in our sole discretion, issue and sell through HCW, acting as sales agent and/or principal, up to $2 million of shares of our common stock. We have not made any sales under the ATM Agreement to date. In March 2024, we terminated the ATM agreement with HCW.

On March 11, 2024, we entered into a securities purchase agreement with certain purchasers, or the Purchasers, pursuant to which we agreed to issue and sell to the Purchasers, and the Purchasers agreed to purchase from us (i) 1,687,712 shares of our common stock at a purchase price of $7.29 per share, (ii) pre-funded common stock purchase warrants to purchase an aggregate of up to 507,076 shares of our common stock at an exercise price of $0.001 per share, (iii) tranche A common stock purchase warrants to purchase up to 1,097,394 shares of our common stock at an exercise price of $7.29 per share, or the Tranche A Warrants, and (iv) tranche B common stock purchase warrants to purchase up to 1,097,394 shares of our common stock at an exercise price of $9.1125 per share, or the Tranche B Warrants. The Tranche A Warrants will be exercisable until the earlier of (i) the three-year anniversary of issuance and (ii) 30 days after we announce the recommended Phase 2 dose for ATRN-119, and, following such announcement, the daily volume weighted average price of our common stock equals or exceeds $14.58 for 30 consecutive trading days. The Tranche B Warrants will be exercisable until the earlier of (i) the five-year anniversary of issuance and (ii) 30 days after we announce the recommended Phase 2 dose for APR-1051 and, following such announcement, the daily volume weighted average price of our common stock equals or exceeds $18.225 for 30 consecutive trading days. To the extent that the exercise of a Tranche A Warrant or Tranche B Warrant would result in the holder beneficially owning greater than 4.99% (or, at the election of the holder, greater than 9.99%) of our outstanding common stock immediately following such exercise, the holder will instead receive pre-funded warrants in substantially the same form as the pre-funded warrants issued at closing. The aggregate gross proceeds from the issuance of common stock and warrants totaled approximately $16.0 million, before deducting placement agent fees and offering costs of approximately $1.4 million, and the gross proceeds from potential future warrant cash exercises is expected to be approximately $18.0 million.

In the future, we may periodically offer securities in amounts, prices and terms to be announced when and if the securities are offered. If any of the securities covered by the 2024 Shelf Registration Statement are offered for sale, a prospectus supplement will be prepared and filed with the SEC containing specific information about the terms of such offering at that time.

Cash flows

The following table summarizes our sources and uses of cash for each of the periods presented:

	Year ended December 31,		
	2023	**2022**	**2021**
Net cash provided by (used in):			
Operating activities	$ (12,177,608)	$ (25,011,136)	$ (37,686,179)
Investing activities	(93,093)	—	—
Financing activities	5,139,990	682,973	1,747,012
Change in cash and cash equivalents	$ (7,130,711)	$ (24,328,163)	$ (35,939,167)

Operating activities

Cash used in operating activities resulted primarily from our net losses adjusted for non-cash charges and changes in components of working capital. Net cash used in operating activities was $12.2 million for the year ended December 31, 2023 compared to $25.0 million for the year ended December 31, 2022. The decrease in net cash used in operating activities of $12.8 million was primarily attributable to an decrease in our net loss of $98.4 million, which was largely due to acquired IPR&D associated with the Atrin acquisition partially offset by a non-cash charge for acquired IPR&D of $72.5 million and a change in operating assets and liabilities of $3.4 million, partially offset by a decrease in non-cash stock-based compensation of $16.5 million.

Net cash used in operating activities was $25.0 million for the year ended December 31, 2022 compared to $37.7 million for the year ended December 31, 2021. The decrease in net cash used in operating activities of $12.7 million was primarily attributable to an increase in our net loss of $75.8 million, which was largely due to acquired IPR&D associated with the Atrin acquisition of $76.0 million and a net decrease in operating assets and liabilities of $1.8 million, partially offset by an increase in non-cash stock-based compensation of $9.2 million.

Investing activities

Cash used in investing activities for the years ended December 31, 2023, 2022 and 2021 was $93,093, $0 and $0, respectively. Cash used in investing activities for 2023 represented the acquisition of property and equipment.

Financing activities

Net cash provided by financing activities was $5.1 million for the year ended December 31, 2023. Cash provided by financing activities was attributable to the net proceeds of $4.9 million, after deducting underwriting discounts and offering expenses of approximately $0.6 million, received from the sale of 1,050,000 shares of common stock in February 2023 and the net proceeds of approximately $0.3 million, after deducting approximately $8,000 in issuance costs, received from sales of common stock under the Sales Agreement.

Net cash provided by financing activities was $0.7 million for the year ended December 31, 2022 which was attributable to the net proceeds received from sales of common stock under the Sales Agreement.

Net cash provided by financing activities was $1.7 million for the year ended December 31, 2021. Cash provided by financing activities was attributable to net proceeds of $1.5 million received from sales of common stock under the Sales Agreement and $0.2 million from the exercise of stock options.

Funding requirements

We expect our expenses to increase in connection with our ongoing and planned development activities. In addition, we have incurred and continue to incur additional costs associated with operating as a public company. We expect that our expenses will increase substantially if and as we:

- initiate and conduct clinical trials and additional preclinical research for our product candidates;
- seek to identify and develop additional product candidates;
- seek marketing approvals for any of our product candidates that successfully complete clinical trials, if any;
- establish a sales, marketing, manufacturing and distribution infrastructure to commercialize any products for which we may obtain marketing approval;
- require the manufacture of larger quantities of our product candidates for clinical development and potentially commercialization;

- maintain, expand, protect and enforce our intellectual property portfolio;
- acquire or in-license other drugs and technologies;
- defend against any claims of infringement, misappropriation or other violation of third-party intellectual property;
- hire and retain additional clinical, quality control and scientific personnel;
- build out new facilities or expand existing facilities to support our ongoing development activity;
- add operational, financial and management information systems and personnel, including personnel to support our drug development, any future commercialization efforts and our transition as a public company; and
- continue to operate as a public company.

As of December 31, 2023, we had cash and cash equivalents of $21.6 million. We believe that our existing cash and cash equivalents as of December 31, 2023 and the upfront gross proceeds of approximately $16.0 million received from our private placement of our common stock and warrants in March 2024, before deducting placement agent fees and offering costs of approximately $1.4 million, will be sufficient to meet our currently projected operating expenses and capital expenditure requirements into the third quarter of 2025. We have based this estimate on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect.

Because of the numerous risks and uncertainties associated with the development of our product candidates and programs and because the extent to which we may enter into collaborations with third parties for development of our product candidates is unknown, we are unable to estimate the timing and amounts of increased capital outlays and operating expenses associated with completing the research and development of our product candidates. Our future capital requirements will depend on many factors, including:

- the scope, progress, results and costs of our planned clinical trials, drug discovery and preclinical research for our product candidates;
- the number of future product candidates that we pursue and their development requirements;
- the costs, timing and outcome of regulatory review of our product candidates;
- the extent to which we acquire or invest in businesses, products and technologies, including entering into or maintaining licensing or collaboration arrangements for product candidates on favorable terms, and although we may explore such opportunities from time to time during the normal course of business, we currently have no commitments or agreements to complete any such transactions;
- the costs and timing of future commercialization activities, including drug sales, marketing, manufacturing and distribution, for any of our product candidates for which we receive marketing approval, to the extent that such sales, marketing, manufacturing and distribution are not the responsibility of any collaborator that we may have at such time;
- the amount of revenue, if any, received from commercial sales of our product candidates, should any of our product candidates receive marketing approval;
- the costs of preparing, filing and prosecuting patent applications, maintaining, protecting and enforcing our intellectual property rights and defending intellectual property-related claims;
- our headcount growth and associated costs as we expand our business operations and our research and development activities; and

- the costs of operating as a public company.

As a result, we will need additional financing to support our continuing operations. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of public or private equity or debt financings or other sources, which may include collaborations with third parties and grants from government and other (non-government) organizations. We may be unable to raise additional funds or enter into other agreements or arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such agreements as and when needed, we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our product candidates. In addition, our ability to engage in certain types of capital raising transactions may be limited by the Listing Rules of the Nasdaq Stock Market and/or General Instruction I.B.6 of Form S-3 if the market value of our common stock held by non-affiliates is ever below $75 million at a time we seek to utilize our effective registration statement on Form S-3.

Because of the numerous risks and uncertainties associated with product development, we are unable to predict the timing or amount of increased expenses or when or if we will be able to achieve or maintain profitability. Even if we are able to generate revenue from product sales, we may not become profitable. If we fail to become profitable or are unable to sustain profitability on a continuing basis, then we may be unable to continue our operations at planned levels and be forced to reduce or terminate our operations.

Developing drug products, including conducting preclinical studies and clinical trials, is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain marketing approval for any product candidates or generate revenue from the sale of any products for which we may obtain marketing approval. In addition, our product candidates, if approved, may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of drugs that we do not expect to be commercially available for many years, if ever. Accordingly, we will need to obtain substantial additional funds to achieve our business objectives.

Adequate additional funds may not be available to us on acceptable terms, or at all. We do not currently have any committed external source of funds. To the extent that we raise additional capital through the sale of equity or convertible debt securities, ownership interests in our securities may be diluted, and the terms of these securities may include liquidation or other preferences and anti-dilution protections that could adversely affect the rights of our common stockholders. Additional debt or preferred equity financing, if available, may involve agreements that include restrictive covenants that may limit our ability to take specific actions, such as incurring debt, making capital expenditures or declaring dividends, which could adversely impact our ability to conduct our business, and may require the issuance of warrants, which could potentially dilute existing ownership interest.

If we raise additional funds through collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technology, future revenue streams, research programs, or product candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings or collaborations, strategic alliances or licensing arrangements with third parties when needed, we may be required to delay, limit, reduce and/or terminate our product development programs or any future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Contractual obligations and commitments

We have an annual operating lease for office and laboratory space in Doylestown, Pennsylvania which was renewed for 2024 and is currently set to expire on December 31, 2024. Rent expense under this lease is $110,000 annually and the company has applied the short-term exception to this lease.

We enter into contracts in the normal course of business with CROs and CMOs for clinical trials, preclinical research studies and testing, manufacturing and other services and products for operating purposes. These contracts do not contain any minimum purchase commitments and are cancelable by us upon prior notice of 30 days and, as a result, are

not included in the table of contractual obligations above. Payments due upon cancelation consist only of payments for services provided and expenses incurred up to the date of cancelation.

Off-balance sheet arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, as defined in the rules and regulations of the SEC.

Recent accounting pronouncements

From time to time, new accounting pronouncements are issued by the Financial Accounting Standards Board ("FASB") or other standard setting bodies that we adopt as of the specified effective date.

We do not believe that any recently issued, but not yet effective accounting pronouncements, if adopted, would have a material impact on our financial statements.

Item 7A. Quantitative and qualitative disclosures about market risk

Interest Rate Risk

We are exposed to market risk related changes in interest rates. As of December 31, 2023, our cash equivalents consisted of bank deposits and money market accounts. Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of U.S. interest rates. However, historical fluctuations in interest income have not been significant for us.

Foreign Currency Exchange Rate Risk

We face market risk to the extent that changes in foreign currency exchange rates affect our non-U.S. dollar functional currency foreign subsidiary's revenues, expenses, assets and liabilities. The financial position and results of operations of our subsidiary Aprea AB is measured using the foreign subsidiary's local currency as the functional currency. Aprea AB cash accounts holding U.S. dollars are remeasured based upon the exchange rate at the date of remeasurement with the resulting gain or loss included in the consolidated statement of operations and comprehensive loss.

Our investments in foreign subsidiaries with a functional currency other than the U.S. dollar are generally considered long-term. In addition, we do not believe that we currently have any significant direct foreign exchange risk. Accordingly, we have not used any derivative financial instruments to hedge exposure to such risk.

Inflation Risk

Inflation generally affects us by increasing our cost of labor and pricing of contracts. We do not believe that inflation has had a material effect on our business, financial condition, or results of operations during the year ended December 31, 2023.

Item 8. Financial Statements and Supplementary Data

Aprea Therapeutics, Inc.
Index to Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm (PCAOB ID 274) F-2
Report of Independent Registered Public Accounting Firm (PCAOB ID 42) F-3
Consolidated Balance Sheets as of December 31, 2023 and 2022 ..... F-4
Consolidated Statements of Operations and Comprehensive Loss for the years ended December 31, 2023, 2022 and 2021 ..... F-5
Consolidated Statements of Convertible Preferred Stock and Stockholders' Equity for the years ended December 31, 2023, 2022 and 2021 ..... F-6
Consolidated Statements of Cash Flows for the years ended December 31, 2023, 2022 and 2021 ..... F-7
Notes to Consolidated Financial Statements F-8

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Aprea Therapeutics, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheet of Aprea Therapeutics, Inc. and Subsidiaries (the "Company") as of December 31, 2023, and the related consolidated statements of operations and comprehensive loss, convertible preferred stock and stockholders' equity and cash flows for the year then ended, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the consolidated financial position of the Company as of December 31, 2023, and the consolidated results of their operations and their cash flows for the year then ended, in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audit. We are a public accounting firm registered with the Public Company Accounting Oversight Board (Unites States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audit, we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audit included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audit also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audit provides a reasonable basis for our opinion.

/s/ EisnerAmper LLP

We have served as the Company's auditor since 2023.

Philadelphia, Pennsylvania
March 26, 2024

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Aprea Therapeutics, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheet of Aprea Therapeutics, Inc. (the Company) as of December 31, 2022, the related consolidated statements of operations and comprehensive loss, convertible preferred stock and stockholders' equity and cash flows for each of the two years in the period ended December 31, 2022, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2022, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2022, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits, we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We served as the Company's auditor from 2019 to 2023.

Iselin, New Jersey
March 30, 2023

Aprea Therapeutics, Inc.
Consolidated Balance Sheets

	December 31, 2023	December 31, 2022
Assets		
Current assets:		
Cash and cash equivalents	$ 21,606,820	$ 28,786,647
Prepaid expenses and other current assets	914,275	1,366,859
Total current assets	22,521,095	30,153,506
Property and equipment, net	88,362	2,321
Restricted cash	40,717	—
Total assets	$ 22,650,174	$ 30,155,827
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 1,670,369	$ 842,754
Accrued expenses	2,186,262	2,358,332
Deferred grant revenue	528,974	—
Total current liabilities	4,385,605	3,201,086
Commitments and contingencies (Note 10)		
Series A convertible preferred stock, $0.001 par value, 40,000,000 shares authorized; 56,227 shares issued and outstanding at December 31, 2023 and 2022, respectively	1,311,063	1,311,063
Stockholders' equity:		
Common stock, $0.001 par value, 400,000,000 shares authorized, 3,736,673 and 2,655,269 shares issued and outstanding at December 31, 2023 and 2022, respectively	3,736	2,655
Additional paid-in capital	335,644,204	330,060,836
Accumulated other comprehensive loss	(10,611,273)	(10,623,408)
Accumulated deficit	(308,083,161)	(293,796,405)
Total stockholders' equity	16,953,506	25,643,678
Total liabilities and stockholders' equity	$ 22,650,174	$ 30,155,827

See accompanying notes to consolidated financial statements.

Aprea Therapeutics, Inc.
Consolidated Statements of Operations and Comprehensive Loss

	Year Ended December 31,		
	2023	2022	2021
Grant revenue	$ 583,231	$ —	$ —
Operating expenses:			
Research and development	7,627,491	16,402,273	23,895,875
General and administrative	8,427,703	20,969,771	13,550,478
Acquired in-process research and development	—	76,020,184	—
Total operating expenses	16,055,194	113,392,228	37,446,353
Loss from operations	(15,471,963)	(113,392,228)	(37,446,353)
Other income:			
Interest income, net	1,224,133	448,667	1,648
Foreign currency (loss) gain	(38,926)	281,534	317,402
Total other income	1,185,207	730,201	319,050
Net loss	$ (14,286,756)	$ (112,662,027)	$ (37,127,303)
Other comprehensive gain (loss):			
Foreign currency translation	12,135	(264,452)	(321,695)
Total comprehensive loss	$ (14,274,621)	$ (112,926,479)	$ (37,448,998)
Net loss per share attributable to common stockholders, basic and diluted	$ (3.95)	$ (67.99)	$ (34.88)
Weighted-average common shares outstanding, basic and diluted	3,617,607	1,657,055	1,064,325

See accompanying notes to consolidated financial statements

Aprea Therapeutics, Inc.
Consolidated Statements of Convertible Preferred Stock and Stockholders' Equity

	Series A Convertible Preferred Stock		Common Stock		Additional Paid-in	Accumulated other comprehensive	Accumulated	Total stockholders'
	Shares	Amount	Shares	Amount	capital	loss	deficit	equity
Balance at December 31, 2020	—	—	1,059,340	$ 1,059	$ 231,438,483	$ (10,037,261)	$ (144,007,075)	$ 77,395,207
Exercise of stock options	—	—	11,319	11	208,356	—	—	208,367
Vesting of restricted stock units	—	—	3,970	4	(4)	—	—	—
Issuance of common stock pursuant to at-the-market stock sales, net	—	—	18,338	18	1,538,627	—	—	1,538,645
Stock-based compensation	—	—	—	—	7,813,743	—	—	7,813,743
Foreign currency translation	—	—	—	—	—	(321,695)	—	(321,695)
Net loss	—	—	—	—	—	—	(37,127,303)	(37,127,303)
Balance at December 31, 2021	—	—	1,092,967	$ 1,092	$ 240,999,206	$ (10,358,956)	$ (181,134,378)	$ 49,506,964
Vesting of restricted stock units			21,251	21	(21)	—	—	—
Issuance of preferred stock upon acquisition of Atrin	2,949,630	$ 68,777,468	—	—	—	—	—	—
Issuance of common stock upon acquisition of Atrin	—	—	55,869	56	1,329,643	—	—	1,329,699
Value of assumed stock options	—	—	—	—	2,602,850	—	—	2,602,850
Issuance of common stock pursuant to at-the-market stock sales, net	—	—	38,481	39	682,934	—	—	682,973
Conversion of preferred stock into common stock	(2,893,403)	(67,466,405)	1,446,701	1,447	67,464,958	—	—	67,466,405
Stock-based compensation	—	—	—	—	16,981,266	—	—	16,981,266
Foreign currency translation	—	—	—	—	—	(264,452)	—	(264,452)
Net loss	—	—	—	—	—	—	(112,662,027)	(112,662,027)
Balance at December 31, 2022	56,227	$ 1,311,063	2,655,269	$ 2,655	$ 330,060,836	$ (10,623,408)	$ (293,796,405)	$ 25,643,678
Vesting of restricted stock units			5,102	5	(5)	—	—	—
Issuance of common stock, net	—	—	1,050,000	1,050	4,870,815	—	—	4,871,865
Issuance of common stock pursuant to at-the-market stock sales, net	—	—	26,302	26	268,099	—	—	268,125
Stock-based compensation	—	—	—	—	444,459	—	—	444,459
Foreign currency translation	—	—	—	—	—	12,135	—	12,135
Net loss	—	—	—	—	—	—	(14,286,756)	(14,286,756)
Balance at December 31, 2023	56,227	$ 1,311,063	3,736,673	$ 3,736	$ 335,644,204	$ (10,611,273)	$ (308,083,161)	$ 16,953,506

See accompanying notes to consolidated financial statements.

Aprea Therapeutics, Inc.
Consolidated Statements of Cash Flows

	Year Ended December 31,		
	2023	**2022**	**2021**
Cash flows from operating activities:			
Net loss	$ (14,286,756)	$ (112,662,027)	$ (37,127,303)
Adjustments to reconcile net loss to net cash used in operating activities:			
Acquired in-process research and development	—	72,523,293	
Depreciation and amortization	7,052	4,403	12,829
Stock-based compensation	444,459	16,981,266	7,813,743
Amortization of right of use lease asset	—	182,042	258,848
Foreign currency loss (gain)	38,926	(281,534)	(317,402)
Changes in operating assets and liabilities:			
Prepaid expenses and other current assets	451,994	2,190,086	(109,338)
Accounts payable	827,463	(858,513)	(2,730,587)
Accrued expenses	(189,720)	(2,903,450)	(5,218,241)
Deferred grant revenue	528,974	—	—
Lease liability	—	(186,702)	(268,728)
Net cash used in operating activities	(12,177,608)	(25,011,136)	(37,686,179)
Cash flows from investing activities:			
Purchases of property and equipment	(93,093)	—	—
Net cash used in investing activities	(93,093)	—	—
Cash flows from financing activities:			
Proceeds from the exercise of stock options	—	—	208,367
Proceeds from issuance of common stock	5,788,918	682,973	1,538,645
Common stock issuance costs	(648,928)	—	—
Net cash provided by financing activities	5,139,990	682,973	1,747,012
Change in cash, cash equivalents and restricted cash	(7,130,711)	(24,328,163)	(35,939,167)
Effect of exchange rate changes on cash	(8,399)	38,758	(2,467)
Cash, cash equivalents and restricted cash—beginning of year	28,786,647	53,076,052	89,017,686
Cash, cash equivalents and restricted cash—end of period	$ 21,647,537	$ 28,786,647	$ 53,076,052
Reconciliation of cash, cash equivalents and restricted cash			
Cash and cash equivalents	$ 21,606,820	$ 28,786,647	$ 53,076,052
Restricted cash	40,717	—	—
Total cash, cash equivalents and restricted cash	$ 21,647,537	$ 28,786,647	$ 53,076,052
Non-cash investing and financing activities:			
Operating lease liabilities arising from obtaining right-of-use assets	$ —	$ 123,786	$ 124,043
Issuance of convertible preferred stock and common stock in connection with acquisition	—	70,107,167	—

See accompanying notes to consolidated financial statements.

1. Nature of business and basis of presentation

Nature of business—Aprea Therapeutics, Inc. (the "Company") is a clinical-stage biopharmaceutical company focused on precision oncology through synthetic lethality. The Company began principal operations in 2006 and is headquartered in Doylestown, Pennsylvania. Prior to the acquisition of Atrin Pharmaceuticals Inc. ("Atrin"), the Company was engaged in the clinical development of cancer therapeutics that reactivate the mutant p53 tumor suppressor protein. In December 2020, the Company announced that its pivotal Phase 3 myelodysplastic syndromes trial failed to meet its predefined primary endpoint of complete remission (CR) rate. Given these results, FDA feedback and the costs of continuing the APR-246 development program, the Company shifted focus of its activities to the assets acquired in the May 16, 2022 acquisition of Atrin (see Note 3). The Company's lead product candidate, which was acquired in the Atrin acquisition, is ATRN-119, a Phase 1-ready small molecule ATR inhibitor being developed for solid tumor indications.

Agreement and plan of merger—On May 16, 2022, the Company acquired Atrin (the "Atrin Acquisition"). Under the terms of the Agreement and Plan or Merger dated May 16, 2022 (the "Merger Agreement"), the Company issued to the stockholders of Atrin 55,869 shares of the Company's common stock, par value $0.001 per share, and 2,949,630 shares of Series A Non-Voting Convertible Preferred Stock ("Series A Preferred Stock") (as described below). The Series A Preferred Stock had a conversion value on the closing date of $68.8 million. In addition, the Company assumed options granted under the Atrin stock option plan, which became options to purchase 163,757 shares of the Company's common stock. See Note 3 for additional information.

Series A Preferred Stock—In connection with the Atrin Acquisition, the Company issued 2,949,630 shares of Series A Preferred Stock. Each share of Series A Preferred Stock is convertible into 10 shares of common stock on a pre-Reverse Stock Split (as defined below) basis.

The Company held a stockholders' meeting on July 28, 2022 where approval of the conversion of the Series A Preferred Stock into shares of the Company's common stock in accordance with Nasdaq Listing Rule 5635(a) was received. A majority of the Series A Preferred Stockholders elected to convert their Series A Preferred Stock into common stock during the second half of 2022 (see Note 8).

Reverse stock split—On February 10, 2023, the Company effectuated a one-for-twenty reverse stock split of its outstanding shares of common stock (the "Reverse Stock Split"). The Reverse Stock Split reduces the Company's shares of outstanding common stock, stock options and RSU's. Fractional shares of common stock that would have otherwise resulted from the Reverse Stock Split were rounded down to the nearest whole share and cash in lieu of payments were made to stockholders. All share and per share data for all periods presented in the accompanying financial statements and the related disclosures have been adjusted retrospectively to reflect the Reverse Stock Split. The number of authorized shares of common stock and the par value per share remains unchanged.

Basis of presentation and management plans—The accompanying financial statements are prepared in conformity with accounting principles generally accepted in the United States ("U.S. GAAP"). The accompanying financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the satisfaction of liabilities in the normal course of business.

Since its inception, the Company has devoted substantially all of its efforts to business planning, research and development, recruiting management and technical staff, and raising capital, and has financed its operations through the issuance of convertible preferred stock and common stock.

The Company is subject to risks common to companies in the biopharmaceutical industry. There can be no assurance that the Company's research and development will be successfully completed, that adequate protection for the Company's intellectual property will be maintained, that any therapeutic products developed will obtain required regulatory approval or that any approved or consumer products will be commercially viable. Even if the Company's development efforts are successful, it is uncertain when, if ever, the Company will generate significant product sales.

The Company believes that the December 31, 2023 cash balance of approximately $21.6 million and the upfront gross proceeds of approximately $16 million received from our private placement of our common stock and warrants in March 2024, before deducting placement agent fees and offering costs of approximately $1.4 million, will be sufficient to meet our currently projected operating expenses and capital expenditure requirements into the third quarter of 2025. In the event that additional funds are not available thereafter, management would expect to significantly reduce expenditures to conserve cash, which would involve scaling back or curtailing new development activity.

2. Summary of significant accounting policies

Principles of consolidation—The consolidated financial statements include the accounts of the Company and its wholly owned subsidiaries Aprea Therapeutics AB, which was incorporated in May 2009, Aprea US, Inc., which was incorporated in June 2016 and ATR Pharmaceuticals LLC which was incorporated in May 2022. Management has concluded it has a single reporting segment for purposes of reporting financial condition and results of operations. All intercompany transactions and balances have been eliminated.

Use of estimates—The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue, and expenses as of and during the reporting period. The Company bases estimates and assumptions on historical experience when available and on various factors that it believes to be reasonable under the circumstances. The Company assesses estimates on an ongoing basis; however, actual results could materially differ from those estimates. Significant items subject to such estimates and assumptions, are used for, but not limited to, include stock-based compensation and accounting for research and development costs.

Foreign currency and currency translation—The functional currency for Aprea Therapeutics AB is the Swedish Krona. Assets and liabilities of Aprea Therapeutics AB are translated into United States dollars at the exchange rate in effect on the balance sheet date. Operating expenses are translated at the average exchange rate in effect during the period. Unrealized translation gains and losses are recorded as a cumulative translation adjustment, which is included in the consolidated statements of stockholders' equity as a component of accumulated other comprehensive loss. Adjustments that arise from exchange rate changes on transactions denominated in a currency other than the local currency are included in other income (expense), net in the consolidated statements of operations and comprehensive loss as incurred.

Concentrations of credit risk—Financial instruments that potentially subject the Company to significant concentration of credit risk consist primarily of cash. Periodically, the Company may maintain deposits in financial institutions in excess of government insured limits. Management believes that the Company is not exposed to significant credit risk as the Company's deposits are held at financial institutions that management believes to be of high credit quality, and the Company has not experienced any losses on these deposits.

Cash and cash equivalents— The Company considers all highly liquid investments with original maturities of three months or less at the date of purchase to be cash equivalents.

Restricted cash— The Company has restricted cash of approximately $41,000 that is securing the Company's credit card program.

Property and equipment—Property and equipment are recorded at cost. Expenditures for repairs and maintenance are expensed as incurred. When assets are retired or disposed of, the assets and related accumulated depreciation are eliminated from the accounts, and any resulting gain or loss is included in the determination of net income or loss. Fixed assets acquired for research and development purposes are assessed for alternative future use. Depreciation is provided using the straight-line method over the estimated useful lives of the related assets. Leasehold improvements are amortized over the shorter of the lease term or the estimated useful life of the asset.

Asset category	Estimated useful life
Computer equipment and software	3 years
Laboratory equipment and office furniture	7 years

Impairment of long-lived assets—Periodically, the Company evaluates its long-lived assets, which consist primarily of property and equipment, for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets may not be recoverable. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to the future undiscounted net cash flows expected to be generated by the asset. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the asset exceeds the fair value of the asset. To date, no impairments have occurred.

Fair value of financial instruments—The accounting standard for fair value measurements provides a framework for measuring fair value and requires expanded disclosures regarding fair value measurements. Fair value is defined as the price that would be received upon sale of an asset or paid to transfer a liability between market participants at measurement dates. ASC Topic 820, Fair Value Measurement ("ASC 820"), establishes a three-level valuation hierarchy for instruments measured at fair value. The hierarchy is based on the transparency of inputs to the valuation of an asset or liability as of the measurement date. The hierarchy defines three levels of valuation inputs, of which the first two are considered observable and the last is considered unobservable:

- Level 1 inputs: Quoted prices in active markets for identical assets or liabilities.
- Level 2 inputs: Inputs other than quoted prices included within Level 1 that are either directly or indirectly observable, such as quoted market prices, interest rates and yield curves.
- Level 3 inputs: Unobservable inputs developed using estimates or assumptions developed by the Company, which reflect those that a market participant would use in pricing the asset or liability.

To the extent that the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. Accordingly, the degree of judgment exercised by the Company in determining fair value is greatest for instruments categorized in Level 3. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

The Company's financial instruments consist of cash and cash equivalents, restricted cash, accounts payable and accrued expenses. The carrying amount of accounts payable and accrued expenses is considered a reasonable estimate of fair value due to the short-term maturity.

Accounting for leases—At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease based on specific facts and circumstances, the existence of an identified asset(s), if any, and the Company's control over the use of the identified asset(s), if applicable. Operating lease liabilities and their corresponding right-of-use assets are recorded based on the present value of future lease payments over the expected lease term. The interest rate implicit in lease contracts is typically not readily determinable. As such, the Company utilizes the incremental borrowing rate, which is the rate incurred to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment.

The Company has elected not to separate lease and non-lease components as a single component. Operating leases are recognized on the balance sheet as right of use (ROU) lease assets, lease liabilities current and lease liabilities non-current. Fixed rents are included in the calculation of the lease balances while variable costs paid for certain operating and pass-through costs are excluded. Lease expense is recognized over the expected term on a straight-line basis. The Company has also elected the short-term lease exemption for all leases with an original term of less than 12 months.

Revenue recognition— The Company's revenue is primarily generated through grants from government organizations. Grant revenue is recognized during the period that the reimbursable research and development services occur, as qualifying expenses are incurred or conditions of the grants are met. Grant revenue received in advance is recorded as deferred grant revenue and recognized as revenue once the conditions for revenue recognition are met. Associated expenses are recognized when incurred as research and development expense. The Company concluded that payments received under these grants represent conditional, nonreciprocal contributions, as described in ASC *958, Not*-for-Profit Entities, and that the grants are *not* within the scope of ASC *606,* Revenue from Contracts with Customers, as the organizations providing the grants do *not* meet the definition of a customer.

Research and development costs—Research and development costs are charged to expense as incurred. Research and development expenses incurred in performing research and development activities, include salaries and benefits, materials and supplies, preclinical expenses, stock-based compensation expense, depreciation of equipment, contract services, and other outside expenses. Costs for certain development activities are recognized based on an evaluation of the progress to completion of specific tasks using or information provided to the Company by its vendors on their actual costs incurred. Payments for these activities are based on the terms of the individual arrangements, which may differ from the pattern of costs incurred, and are reflected in the financial statements as prepaid or accrued research and development.

Stock-based compensation—The Company measures stock options and other stock-based awards granted to employees and directors based on their fair value on the date of the grant and recognize compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award. The Company applies the straight-line method of expense recognition to all awards with only service based vesting conditions.

For stock-based awards granted to non-employees, compensation expense is recognized over the period during which services are rendered by such non-employees until completed in accordance with ASC 718.

The Company estimates the fair value of each stock option grant on the date of grant using the Black Scholes option pricing model, which uses as inputs the fair value of the Company's common stock and assumptions the Company makes for the volatility of its common stock, the expected term of its stock options, the risk-free interest rate for a period that approximates the expected term of its stock options and its expected dividend yield. The Company elects to account for forfeitures when they occur.

The Company also awards restricted stock units ("RSUs") to employees and directors. RSUs are generally subject to forfeiture if employment terminates prior to the completion of the vesting restrictions. The Company expenses the cost of the RSUs, which is determined to be the fair market value of the shares of common stock underlying the RSUs at the date of grant, ratably over the period during which the vesting restrictions lapse.

Income taxes—The Company accounts for income tax in accordance with ASC 740-10, Income Taxes ("ASC 740-10"), which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the Company's financial statements and tax returns. Deferred tax assets and liabilities are determined based upon the differences between the financial statement carrying amounts and the tax bases of existing assets and liabilities and for loss and credit carryforwards, using enacted tax rates expected to be in effect in the year in which the differences are expected to reverse. Deferred tax assets are reduced by a valuation allowance if it is more likely than not that these assets may not be realized. The Company determines whether it is more likely than not that a tax position will be sustained upon examination. If it is not more likely than not that a position will be sustained, none of the benefit attributable to the position is recognized. The tax benefit to be recognized for any tax position that meets the more-likely-than-not recognition threshold is calculated as the largest amount that is more than 50% likely of being realized upon resolution of the contingency. The Company accounts for interest and penalties related to uncertain tax positions as part of its provision for income taxes.

Net loss per share—The Company has reported losses since inception and has computed basic net loss per share attributable to common stockholders by dividing net loss attributable to common stockholders by the weighted-average number of common shares outstanding for the period, without consideration for potentially dilutive securities. The Company computes diluted net loss per common share after giving consideration to all potentially dilutive common shares, including options to purchase common stock, outstanding during the period determined using the treasury-stock and if-converted methods, except where the effect of including such securities would be antidilutive. Because the Company has reported net losses since inception, these potential common shares have been anti-dilutive and basic and diluted loss per share have been the same.

The following table sets forth the potentially dilutive securities that have been excluded from the calculation of diluted net loss per share because to include them would be anti-dilutive (in common stock equivalent shares):

	Year ended December 31,		
	2023	2022	2021
Convertible preferred stock (as converted)	28,112	28,112	—
Options to purchase common stock	596,466	480,274	229,308
Unvested restricted stock units	23,870	12,734	19,985
Total shares of common stock equivalents	648,448	521,120	249,293

Acquired in-process research and development---The Company measures and recognizes asset acquisitions that are not deemed to be business combinations based on the cost to acquire the assets, including transaction costs. In an asset acquisition, the cost allocated to acquire in-process research and development ("IPR&D) with no alternative future use is charged to expense at the allocation date. See Note 3 – "Acquisition of Atrin" for additional information.

Segment Information— The Company manages its operations as a single segment for the purposes of assessing performance and making operating decisions. The financial information is regularly reviewed by the chief operating decision maker ("CODM") in deciding how to allocate resources. The Company's CODM is its chief executive officer.

Recently issued accounting pronouncements---From time to time, new accounting pronouncements are issued by the Financial Accounting Standards Board ("FASB") or other standard setting bodies that the Company adopts as of the specified effective date.

Management does not believe that any recently issued, but not yet effective accounting pronouncements, if adopted, would have a material impact on the accompanying financial statements.

3. Acquisition of Atrin Pharmaceuticals

On May 16, 2022, the Company completed its acquisition of Atrin in accordance with the terms of the Merger Agreement as described in Note 1 – "Nature of business and basis of presentation". Under the terms of the Merger Agreement, the Company issued 55,869 shares of common stock and 2,949,630 shares of Series A Preferred Stock. Each

share of Series A Preferred Stock is convertible into 10 shares of Common Stock on a pre-Reverse Stock Split basis. A majority of the Series A Preferred Stockholders elected to convert their Series A Preferred Stock into common stock during the second half of 2022 (see Note 8).

The Company concluded the Atrin acquisition was not the acquisition of a business, as substantially all of the fair value of the non-monetary assets acquired was concentrated in a single identifiable asset, ATRN-119.

The Company determined that the cost to acquire the Atrin assets was $76.2 million, based on the fair value of the equity consideration issued and including direct costs of the acquisition of $3.5 million. The net assets acquired in connection with the Atrin acquisition were recorded at their estimated fair values as of May 16, 2022, which is the date the Atrin acquisition was completed. The following table summarizes the net assets acquired based on their estimated fair values as of May 16, 2022:

Acquired IPR&D	$ 76,020,184
Cash and cash equivalents	2,489,745
Prepaid expenses and other assets	34,579
Accounts payable and accrued liabilities	(2,336,462)
Total Acquisition Value	$ 76,208,046

The Atrin acquisition was accounted for as an asset acquisition as Atrin was not considered to be a business under ASC 805 or SEC Rule 11-01(d). In the estimation of fair value of the asset purchase consideration, the Company used the carrying value of the cash and cash equivalents, prepaid expenses, accounts payable, and accrued liabilities as the most reliable indicator of fair value based on the associated short-term nature of the balances. The remaining fair value was attributable to the acquired IPR&D. Since Atrin was in preclinical development and no clinical trials had commenced at the time of the acquisition, the cost attributable to the IPR&D was expensed in the Company's consolidated statements of operations and comprehensive loss for the year ended December 31, 2022, as the acquired IPR&D had no alternative future use, as determined by the Company in accordance with U.S. GAAP.

As a result of the Atrin acquisition, the Company announced in May 2022 it was closing its research facility in Sweden and reducing its related workforce in Sweden. The closure of the Swedish research facility and the reduction in workforce resulted in total expenses for employee severance and employee benefits of approximately $1.1 million, of which was recorded as of May 16, 2022. As of December 31, 2023 and 2022, the remaining liability is approximately $0 and $0.1 million.

In connection with the Atrin acquisition, a non-transferable contingent value right (a "CVR") was distributed to the Aprea stockholders of record as of the close of business on May 13, 2022. Holders of the CVR will be entitled to receive certain stock and/or cash payments from proceeds received by the Company, if any, related to the disposition of its legacy assets in the 2 year period following the closing of the transaction. The CVR had a deminimis value as of May 16, 2022 and December 31, 2023 and 2022.

4. Property and equipment

Property and equipment consist of the following:

	December 31, 2023	December 31, 2022
Lab equipment	$ 133,226	$ 40,133
Computer equipment	5,258	5,258
Property and equipment, at cost	138,484	45,391
Less accumulated depreciation and amortization	(50,122)	(43,070)
Property and equipment—net	$ 88,362	$ 2,321

Depreciation expense for the years ended December 31, 2023, 2022 and 2021 was $7,052, $4,403, $12,829, respectively.

5. Leases

During 2023, the Company was party to one operating lease for office and laboratory space. The Company's finance leases are immaterial both individually and in the aggregate. The Company has elected to apply the short-term lease exception to all leases of one year or less. Rent expense for years ended December 31, 2023, 2022 and 2021 was $79,991, $329,673 and $342,550, respectively, which is included in operating expenses.

The Company also has an annual operating lease for office and laboratory space in Doylestown, Pennsylvania which was renewed for 2024 and is currently set to expire on December 31, 2024. Rent expense under this lease is $110,000 annually and the Company has applied the short-term exception to this lease. The Company has no lease obligations beyond 2024.

The Company had an operating lease in Boston, Massachusetts for office space which expired in December 2022. The Company also had an operating lease for office and laboratory space in Solna, Sweden which was terminated effective November 30, 2022.

The Company was party to one operating lease in 2023 that it applied the short-term lease exception. Quantitative information regarding the Company's leases for the years ended December 31, 2022 and 2021 is as follows:

	Year ended December 31,	
Lease Cost	**2022**	**2021**
Operating lease cost	$ 233,628	$ 233,364
Other Information		
Operating cash flows paid for amounts included in the measurement of lease liabilities	$ 245,584	$ 255,078
Operating lease liabilities arising from obtaining right-of-use assets	$ 123,786	$ 124,043
Weighted average remaining lease term (years)	—	0.50 - 1.00
Weighted average discount rate	3.0 - 4.3%	3.0 - 4.3%

6. Accrued expenses

Accrued expenses consist of the following:

	December 31, 2023	December 31, 2022
Professional fees	$ 138,601	$ 75,012
Compensation, severance and benefits	1,016,960	1,397,977
Research and development	856,575	688,858
Other	174,126	196,485
Total accrued expenses	$ 2,186,262	$ 2,358,332

7. Income taxes

The components of net loss are as follows:

	Year ended December 31,		
	2023	**2022**	**2021**
Foreign	$ (365,750)	$ (6,377,901)	$ (13,229,828)
Domestic	(13,921,006)	(106,284,126)	(23,897,475)
Net loss	$ (14,286,756)	$ (112,662,027)	$ (37,127,303)

A reconciliation of the effect of applying the federal statutory rate to the net loss and the effective income tax rate:

	Year ended December 31,		
	2023	2022	2021
Statutory federal income tax rate	21.0 %	21.0 %	21.0 %
Earnings in jurisdictions taxed at rates different from the statutory U.S. federal tax rate	— %	— %	(0.1)%
Permanent differences	— %	(0.6)%	— %
Section 162(m) limitation	10.3 %	(2.5)%	— %
In-process research and development	— %	(13.5)%	— %
Changes in valuation allowance	(31.1)%	(3.7)%	(18.2)%
Other	(0.2)%	(0.7)%	(2.7)%
Effective income tax rate	— %	— %	— %

Significant components of the Company's deferred taxes as of December 31, 2023 and 2022 are as follows:

	December 31,	
	2023	2022
Deferred tax assets:		
Net operating loss carryforward	$ 41,784,757	$ 38,839,281
Stock compensation	3,955,371	2,309,828
Amortization	56,882	118,259
Capitalized research and development costs	3,487,955	2,362,347
Fixed Assets	3,574	—
Accrued Expenses	155,320	—
Gross deferred tax assets	49,443,859	43,629,715
Valuation allowance	(49,443,859)	(43,629,689)
Total deferred tax assets	—	26
Deferred tax liabilities:		
Fixed assets	—	(26)
Total deferred tax liabilities	—	(26)
Net deferred tax assets (liabilities)	$ —	$ —

The Company has no income tax expense due to operating losses incurred for the years ended December 31, 2023, 2022 and 2021, respectively. The Company has provided a valuation allowance for the full amount of the net deferred tax assets as, based on all available evidence, it is considered more likely than not that all the recorded deferred tax assets will not be realized in a future period. At December 31, 2023, the Company has $118.2 million, $65.5 million, and $66.3 million of foreign, federal and state net operating loss carryforwards, respectively, that expire at various dates through 2037. Certain of these foreign, federal and state net operating loss carryforwards may be subject to Internal Revenue Code Section 382 or similar provisions, which impose limitations on their utilization.

The valuation allowance increased in 2023 and 2022 by $5.8 million and $1.5 million, respectively due to the increase in the deferred tax assets by the same amounts; primarily due to net operating loss carryforwards. Realization of the future tax benefits is dependent on many factors, including the Company's ability to generate taxable income within the net operating loss carryforward period. Under the provisions of the U.S. Internal Revenue Code and Sweden tax law, certain changes in the Company's ownership, including a sale of the Company or significant changes in ownership due to sales of equity, may have limited, or may limit in the future, the amount of net operating loss carryforwards that could be used annually to offset future taxable income. For U.S. and Swedish income tax purposes, the Company has not completed a

study to assess whether a change of control has occurred or whether there have been changes of control since the Company's formation due to the complexity and cost associated with such study and because there could be additional changes in control in the future. As a result, the Company is not able to estimate the effect of the change in control, if any, on the Company's ability to utilize U.S. or Swedish net operating losses or other tax attribute carryforwards in the future. For Swedish income tax purposes, the Company's net operating losses may be subject to limitations in accordance with the country's group contribution restriction laws.

The Company files tax returns in Sweden, the United States, Massachusetts and Pennsylvania. Income tax returns prior to 2020 in the United States and Massachusetts are no longer subject to examination and income tax returns prior to 2017 are no longer subject to examination in Sweden. The Company is not currently under examination by the IRS or any other jurisdictions for any tax years.

As tax law is complex and often subject to varied interpretations, it is uncertain whether some of the Company's tax positions will be sustained upon examination. Tax liabilities associated with uncertain tax positions represent unrecognized tax benefits, which arise when the estimated benefit recorded in the Company's financial statements differs from the amounts taken or expected to be taken in a tax return because of the uncertainties described above. Substantially all of these unrecognized tax benefits, if recognized, would benefit the Company's effective income tax rate.

As of December 31, 2023 and 2022, the Company had approximately $0.1 million and $0.1 million of liabilities, respectively, related to uncertain tax positions. As the Company's uncertain tax positions can be offset by available net operating losses, the Company did not recognize interest and penalties for 2023, 2022 and 2021.

For tax years beginning after January 1, 2022, U.S. Corporations are now mandated to capitalize direct research and development costs and costs deemed incidental to research under Section 174 of the tax code. For the years ended December 31, 2023 and 2022 the Company has capitalized approximately $7.8 million and $9.0 million of costs deemed direct or incidental to research and development.

8. Stockholders' equity

The total number of shares of all classes of capital stock that the Company is authorized to issue is 440,000,000 shares, consisting of 400,000,000 shares of common stock, par value $0.001 per share and 40,000,000 shares of preferred stock, par value $0.001 per share.

Reverse Stock Split

On February 10, 2023, the Company effectuated a one-for-twenty reverse stock split of its outstanding shares of common stock (the "Reverse Stock Split"). The Reverse Stock Split reduces the Company's shares of outstanding common stock, stock options and RSU's. Fractional shares of common stock that would have otherwise resulted from the Reverse Stock Split were rounded down to the nearest whole share and cash in lieu of payments were made to stockholders. All share and per share data for all periods presented in the accompanying financial statements and the related disclosures have been adjusted retrospectively to reflect the Reverse Stock Split. The number of authorized shares of common stock and the par value per share remains unchanged.

Conversion of Series A Preferred Stock

As discussed in Note 1 and Note 3, the Company issued to the shareholders of Atrin 2,949,630 shares of Series A Preferred Stock as partial consideration of the Atrin acquisition. Each share of Series A Preferred Stock is convertible into 10 shares of common stock on a pre-Reverse Stock Split basis. The Company held a stockholders' meeting on July 28, 2022 where approval of the conversion of the Series A Preferred Stock into shares of the Company's common stock in accordance with Nasdaq Listing Rule 5635(a) was received. As of December 31, 2023, a total of 2,893,403 shares of

Series A Preferred Stock was converted into 1,446,701 shares of common stock. As of December 31, 2023, a total of 56,227 shares of Series A Preferred Stock remained outstanding.

Common Stock

The holders of common stock are entitled to one vote for each share of common stock. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Company, after the payment or provision for payment of all debts and liabilities of the Company, the holders of common stock shall be entitled to share in the remaining assets of the Company available for distribution, if any.

Shelf Registration Statement

On November 12, 2020, the Company filed a universal shelf registration statement with the SEC for the issuance of common stock, preferred stock, warrants, rights, debt securities and units up to an aggregate of $350.0 million (the "2020 Shelf Registration Statement"). On November 30, 2020, the 2020 Shelf Registration Statement was declared effective by the SEC and on November 30, 2023 the 2020 Shelf Registration Statement expired. The 2023 Shelf Registration Stated included an at-the-market offering program with SVB Leerink LLC (the "SVB ATM Program") and the Company filed a Prospectus Supplement dated September 2, 2022, for the sale of up to $14,744,728 of shares of the Company's common stock pursuant to its SVB ATM Program. The Company agreed to pay a commission of 3% of the gross proceeds of any common stock sold in connection with the SVB ATM Program. During the years ended December 31, 2023, 2022 and 2021, the Company issued and sold 26,302 shares, 38,481 shares and 18,338 shares, respectively, of common stock under the SVB ATM Program resulting in net proceeds to the Company of approximately $0.3 million, $0.7 million and $1.5 million, respectively. The SVB ATM Program has terminated is no longer effective.

In February 2023, the Company issued and sold 1,050,000 shares of common stock at a public offering price of $5.25 per share pursuant to the 2020 Shelf Registration Statement resulting in net proceeds to the Company of approximately $4.9 million, after deducting underwriting discounts and offering expenses of approximately $0.6 million.

On January 26, 2024, the Company filed a new shelf registration statement (the "2024 Shelf Registration Statement") with the SEC for issuance of up to $150 million, including a prospectus for the sale of $1 million under the ATM Agreement, as discussed below, which was declared effective on February 2, 2024. The Company subsequently filed a prospectus supplement to the 2024 Shelf Registration Statement for the sale of up to $2 million of shares of common stock pursuant to the ATM Agreement. On January 26, 2024, the Company entered into an At the Market Offering Agreement (the "ATM Agreement") with H.C. Wainright & Co., LLC ("HCW"). Pursuant to the ATM Agreement and the prospectus supplement filed in connection therewith, the Company may, from time to time, in its sole discretion, issue and sell through HCW, acting as sales agent and/or principal, up to $2 million of shares of common stock. The Company has not made any sales under the ATM Agreement to date. In March 2024, the Company terminated the ATM Agreement with HCW.

9. Stock option plans

In September 2019, the Company's Board of Directors approved the 2019 Equity Incentive Plan (the "2019 Plan) and each outstanding option to purchase Aprea AB ordinary shares pursuant to a previous plan was cancelled and the Company issued to each holder of such Aprea AB option, a substitute option to purchase, on the same terms and conditions as were applicable to such Aprea AB option, shares of the Company's common stock pursuant to the 2019 Plan.

The Board of Directors has the discretion to provide for accelerated vesting under the 2019 Plan. At December 31, 2023, there were 61,637 shares available for future grant under the 2019 Plan.

The Company recorded stock-based compensation expense of $0.4 million, $17.0 million and $7.8 million during the years ended December 31, 2023, 2022 and 2021, respectively. As of December 31, 2023, there was $0.6 million of

unrecognized compensation cost related to nonvested share-based compensation arrangements granted under the 2019 Plan, which is expected to be recognized over a weighted-average period of approximately 2.8 years.

The fair value of each option award is estimated on the date of grant using Black-Scholes, with the assumptions noted in the table below. Expected volatility for the Company's common stock was determined based on an average of the historical volatility of a peer group of similar public companies. The expected term of options granted to employees was calculated using the simplified method, which represents the average of the contractual term of the option and the weighted-average vesting period of the option. The Company uses the simplified method because it does not have sufficient historical option exercise data to provide a reasonable basis upon which to estimate expected term. The contractual life of the option was used for the expected life of options granted to non-employee. The assumed dividend yield is based upon the Company's expectation of not paying dividends in the foreseeable future. The risk-free rate for periods within the expected life of the option is based upon the Swedish Government Bond Rate in effect at the time of grant.

The assumptions used in Black-Scholes are as follows:

	Year ended December 31,		
	2023	**2022**	**2021**
Expected volatility	84.8%-91.6%	84.4%-89.6%	88.1%-90.2%
Risk-free rate	3.41%-4.73%	1.95%-2.69%	0.96%-1.04%
Expected dividend yield	0%	0%	0%
Expected term in years	5.50-10.00	6.08-10.00	5.50 - 6.08

A summary of option activity under the Plan during the years ended December 31, 2023, 2022 and 2021 are as follows:

	Number of options	**Weighted-average exercise price per share**	**Weighted average remaining contractual term (in years)**	**Aggregate intrinsic value**
Outstanding at December 31, 2020	188,552	$ 182.00	6.8	
Granted	58,980	117.40		
Exercised	(11,319)	18.40		
Cancelled/Forfeited	(6,905)	330.60		
Outstanding at December 31, 2021	229,308	$ 169.00	6.6	
Granted	96,798	31.40		
Options assumed in Atrin merger	163,733	14.21		
Exercised	—	—		
Cancelled/Forfeited	(9,565)	118.60		
Outstanding at December 31, 2022	480,274	$ 89.49	6.8	$
Granted	123,062	5.68		
Exercised	—	—		
Cancelled/Forfeited	(6,870)	21.80		
Outstanding at December 31, 2023	596,466	$ 72.95	6.2	$ 45,825
Exercisable at December 31, 2023	464,086	$ 91.82	5.3	$ —
Vested or expected to vest at December 31, 2023	596,466	$ 72.95	6.2	$ 45,825

The weighted-average grant date fair value of options granted during the years ended December 31, 2023, 2022 and 2021, was $4.35, $23.68 and $85.82, per share, respectively.

Restricted Stock Units

During the year ended December 31, 2023, the Company granted the following RSU's:

- a total of 17,493 RSUs to executive officers of the Company which vest ratably on the 1st, 2nd and 3rd anniversaries of the grant date.
- a total of 3,000 RSUs to non-employee directors of the Company which vest on the one-year anniversary of the grant date.

During the year ended December 31, 2022, the Company granted the following RSU's:

- a total of 9,320 RSUs to executive officers of the Company which vest ratably on the 1st, 2nd and 3rd anniversaries of the grant date.
- a total of 3,414 RSUs to non-employee directors of the Company which vest on the one-year anniversary of the grant date.
- a total of 11,330 RSUs to executive officers and certain other employees of the Company which vest ratably on the 1st, 2nd and 3rd anniversaries of the grant date. These RSUs vested on May 16, 2022 in connection with the acquisition of Atrin.

During the year ended December 31, 2021, the Company granted the following RSU's:

- a total of 25,000 RSUs to executive officers and certain other employees of the Company, 800 of which were canceled prior to vesting. The remaining RSUs vested on May 16, 2022 in connection with the acquisition of Atrin.
- a total of 1,150 RSUs to non-employee directors of the Company. These RSUs vested on May 16, 2022 in connection with the acquisition of Atrin.

As of December 31, 2023, there was $0.2 million of unrecognized compensation cost related to RSUs granted under the 2019 Plan, which is expected to be recognized over a weighted-average period of approximately 1.7 years.

The following table shows restricted stock unit activity during the year ended December 31, 2023:

	Shares	Weighted-average grant date fair value
Outstanding at December 31, 2020	—	$ —
Granted	26,150	118.20
Vested	(5,365)	118.80
Cancelled/Forfeited	(800)	120.00
Outstanding at December 31, 2021	19,985	$ 118.20
Granted	24,064	28.68
Vested	(30,981)	88.21
Cancelled/Forfeited	(334)	114.60
Outstanding at December 31, 2022	12,734	$ 21.80
Granted	20,493	8.81
Vested	(5,102)	21.80
Cancelled/Forfeited	(4,255)	21.80
Outstanding at December 31, 2023	23,870	$ 10.00

10. Commitments and contingencies

From time to time, the Company may be party to litigation arising in the ordinary course of its business. The Company was not subject to any material legal proceedings during the years ended December 31, 2023 and 2022, and, to its

knowledge, no material legal proceedings are currently pending or threatened. The Company records a provision for contingent losses when it is both probable that a liability has been incurred and the amount of the loss can be reasonably estimated. As of December 31, 2023, the Company has not recorded a provision for any contingent losses.

11. Subsequent events

March 2024 Private Placement

On March 11, 2024, the Company entered into a securities purchase agreement with certain purchasers (the "Purchasers") pursuant to which the Company agreed to issue and sell to the Purchasers, and the Purchasers agreed to purchase from the Company (i) 1,687,712 shares of the Company's common stock at a purchase price of $7.29 per share, (ii) pre-funded common stock purchase warrants to purchase an aggregate of up to 507,076 shares of the Company's common stock at an exercise price of $0.001 per share, (iii) tranche A common stock purchase warrants to purchase up to 1,097,394 shares of the Company's common stock at an exercise price of $7.29 per share (the "Tranche A Warrants"), and (iv) tranche B common stock purchase warrants to purchase up to 1,097,394 shares of the Company's common stock at an exercise price of $9.1125 per share (the "Tranche B Warrants"). The Tranche A Warrants will be exercisable until the earlier of (i) the three-year anniversary of issuance and (ii) 30 days after the Company announces the recommended Phase 2 dose for ATRN-119, and, following such announcement, the daily volume weighted average price of the Company's common stock equals or exceeds $14.58 for 30 consecutive trading days. The Tranche B Warrants will be exercisable until the earlier of (i) the five-year anniversary of issuance and (ii) 30 days after the Company announces the recommended Phase 2 dose for APR-1051 and, following such announcement, the daily volume weighted average price of the Company's common stock equals or exceeds $18.225 for 30 consecutive trading days. To the extent that the exercise of a Tranche A Warrant or Tranche B Warrant would result in the holder beneficially owning greater than 4.99% (or, at the election of the holder, greater than 9.99%) of the Company's outstanding common stock immediately following such exercise, the holder will instead receive pre-funded warrants in substantially the same form as the pre-funded warrants issued at closing. The aggregate upfront gross proceeds from the issuance of common stock totaled approximately $16.0 million, before deducting placement agent fees and offering costs of approximately $1.4 million, and the gross proceeds from potential future warrant cash exercises is expected to be approximately $18.0 million.

ATM Agreement

On January 26, 2024, the Company entered into the ATM Agreement with HCW. The Company has not made any sales under the ATM Agreement to date. In March 2024, the Company terminated the ATM Agreement with HCW.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

Our management, with the participation of our chief executive officer and chief financial officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2023. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, mean controls and other procedures of a company that are designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms. Disclosure controls include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to management, including our principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2023, our chief executive officer and chief financial officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable level.

Management's Annual Report on Internal Controls Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act). Our internal control system was designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes, in accordance with generally accepted accounting principles in the United States. Due to inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness of the internal control over financial reporting to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with policies and procedures may deteriorate. Our management, under the supervision and with the participation of our chief executive officer and chief financial officer, evaluated the effectiveness of our internal control over financial reporting as of the end of the period covered by this Annual Report on Form 10-K based on the framework in Internal Control---Integrated Framework (2013 framework) issued by the Committee of Sponsoring Organizations of the Treadway Commission, or COSO. Based on such evaluation, our management concluded that our internal control over financial reporting was effective as of the end of the period covered by this Annual Report on Form 10-K.

This Annual Report on Form 10-K does not include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. Our auditors will not be required to opine on the effectiveness of our internal control over financial reporting pursuant to Section 404(b) of the Sarbanes-Oxley Act of 2002 until we are no longer an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting that occurred during our most recent fiscal quarter that materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information

During the three (3) months ended December 31, 2023, no director or officer adopted or terminated any contract, instruction or written plan for the purchase or sale of company securities intended to satisfy the affirmative defense conditions of Rule 10b5-1(c) of the Exchange Act and/or any non-Rule 10b5-1 trading arrangement..

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information required by this item will be included in an amendment to this Annual Report on Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

Item 11. Executive Compensation

The information required by this item will be included in an amendment to this Annual Report on Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this item will be included in an amendment to this Annual Report on Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

Item 13. Certain Relationships and Related Transactions and Director Independence

The information required by this item will be included in an amendment to this Annual Report on Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

Item 14. Principal Accounting Fees and Services

The information required by this item will be included in an amendment to this Annual Report on Form 10-K or incorporated by reference from our definitive proxy statement to be filed pursuant to Rule 14A.

PART IV

Item 15. Exhibits, Financial Statement Schedules

The following documents are filed as part of this Annual Report on Form 10-K:

(1) Financial Statements

The information concerning our consolidated financial statements, and Report of Independent Registered Public Accounting Firm required by this Item is incorporated by reference herein to the section of this Annual Report on Form 10-K in Item 8, entitled "Financial Statements and Supplementary Data."

(2) Financial Statement Schedules

All schedules have been omitted because the required information is not present or not present in amounts sufficient to require submission of the schedules, or because the information required is included in the Financial Statements or notes thereto.

(3) Exhibits

List of Exhibits required by Item 601 of Regulation S-K.

Exhibit Number	Description of Document
2.1##†	Agreement and Plan of Merger, dated May 16, 2022 by and among Aprea Therapeutics, Inc., ATR Merger Sub I Inc., ATR Merger Sub II LLC and Atrin Pharmaceuticals Inc. (incorporated by reference to Exhibit 2.1 to the Current Report on Form 8-K filed on May 17, 2022)
3.1##	Amended and Restated Certificate of Incorporation of Aprea Therapeutics, Inc. (incorporated by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on October 7, 2019)
3.2##	Certificate of Amendment to Amended and Restated Certificate of Incorporation of Aprea Therapeutics, Inc. (incorporated by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on February 13, 2023)
3.3##	Certificate of Designation of Series A Non-Voting Convertible Preferred Stock (incorporated by reference to Exhibit 3.1 to the Current Report on Form 8-K filed on May 17, 2022)
3.4##	Amended and Restated Bylaws of Aprea Therapeutics, Inc. (incorporated by reference to Exhibit 3.1 to the Quarterly Report on Form 10-Q for the quarter ended September 30, 2020, filed on November 6, 2020)
4.1##	Description of Aprea Therapeutics, Inc. Common Stock, $0.001 par value (incorporated by reference to Exhibit 4.1 to the Annual Report on Form 10-K for the year ended December 31, 2020, filed on March 16, 2021)
4.2##	Form of Pre-Funded Warrant (March 2024 Offering) (incorporated by reference to Exhibit 4.1 to the Current Report on Form 8-k filed on March 12, 2024).
4.3##	Form of Tranche A Warrant (March 2024 Offering) (incorporated by reference to Exhibit 4.2 to the Current Report on Form 8-k filed on March 12, 2024).
4.4##	Form of Tranche B Warrant (March 2024 Offering) (incorporated by reference to Exhibit 4.3 to the Current Report on Form 8-k filed on March 12, 2024).
10.1##+	Form of 2019 Stock Incentive Plan and form of agreements thereunder (incorporated by reference to Exhibit 10.1 to the Registration Statement on Form S-1 (File No. 333-233662)).
10.2##+	Form of 2019 Employee Stock Purchase Plan (incorporated by reference to Exhibit 10.2 to the Registration Statement on Form S-1 (File No. 333-233662))
10.3##†	Service Agreement, between Aprea AB and Syngene International Private Limited (incorporated by reference to Exhibit 10.3 to the Registration Statement on Form S-1 (File No. 333-233662))
10.4##	Amended and Restated Registration Rights Agreement by and among Aprea Therapeutics, Inc. and the shareholders party thereto (incorporated by reference to Exhibit 10.4 to the Registration Statement on Form S-1 (File No. 333-233662))

Exhibit Number	Description of Document
10.5##	Form of Registration Rights Agreement, by and among Aprea Therapeutics, Inc. and certain securityholders (incorporated by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on May 17, 2022)
10.6##+	Form of Indemnification Agreement between Aprea Therapeutics, Inc. and each of its directors and executive officers (incorporated by reference to Exhibit 10.5 to the Registration Statement on Form S-1 (File No. 333-233662))
10.7##+	Form of Executive Employment Agreement (incorporated by reference to Exhibit 10.7 to the Registration Statement on Form S-1 (File No. 333-233662))
10.8##+	Confidential Severance Agreement and General Release between Aprea Therapeutics, Inc. and Scott M. Coiante (incorporated by reference to Exhibit 10.19 to the Annual Report on Form 10-K filed on March 30, 2023)
10.9##+	Employment Agreement between Aprea Therapeutics, Inc. and Oren Gilad (incorporated by reference to Exhibit 10.20 to the Annual Report on Form 10-K filed on March 30, 2023)
10.10##+	Employment Agreement between Aprea Therapeutics, Inc. and John P. Hamill (incorporated by reference to Exhibit 10.21 to the Annual Report on Form 10-K filed on March 30, 2023)
10.11##†	Master Manufacturing and Supply Agreement, between Aprea Therapeutics AB and Siegfried Hameln GmbH (incorporated by reference to Exhibit 10.11 to the Registration Statement on Form S-1 (File No. 333-233662))
10.12##+	Atrin Pharmaceuticals LLC 2016 Amended and Restated Equity Compensation Plan (incorporated by reference to Exhibit 4.3 to the Registration Statement on Form S-8 (File No. 333-265411))
10.13##+	Amendment No. 1 to the 2016 Amended and Restated Equity Compensation Plan (incorporated by reference to Exhibit 4.4 to the Registration Statement on Form S-8 (File No. 333-265411))
10.14†##	Securities Purchase Agreement dated March 11, 2024 by and between Aprea Therapeutics, Inc. and the purchasers named on the signature pages thereto (incorporated by reference to Exhibit 10.1 to the Current Report on Form 8-K filed on March 12, 2024).
10.15##	Form of Registration Rights Agreement dated as of March 11, 2024 by and between Aprea Therapeutics Inc. and the purchasers named therein (incorporated by reference to Exhibit 10.2 to the Current Report on Form 8-K filed on March 12, 2024).
10.16##	Placement Agency Agreement, dated as of March 11, 2024 by and between Aprea Therapeutics, Inc. and Maxim Group LLC (incorporated by reference to Exhibit 10.3 to the Current Report on Form 8-k filed on March 12, 2024).
19*	Aprea Therapeutics, Inc. Insider Trading Policy.
21.1*	Subsidiaries of Aprea Therapeutics, Inc.
23.1*	Consent of Independent Registered Public Accounting Firm
23.2*	Consent of Independent Registered Public Accounting Firm

Exhibit Number	Description of Document
31.1*	Certification of Principal Executive Officer pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2*	Certification of Principal Financial Officer pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1**	Certification of Principal Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2**	Certification of Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
97*	Aprea Therapeutics, Inc. Policy for Recovery of Erroneously Awarded Incentive Compensation.
101.INS	Inline XBRL Instance Document – the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH	XBRL Taxonomy Extension Schema With Embedded Linkbase Documents
104	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101).

Previously filed.

* Filed herewith.

\+ Indicates a management contract or compensatory plan.

† Portions of this exhibit have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The Registrant agrees to furnish supplementally a copy of any omitted schedule to the SEC upon its request; provided, however, that the Registrant may request confidential treatment pursuant to Rule 24b-2 of the Exchange Act for any schedule so furnished.

** The certifications furnished in Exhibit 32.1 and Exhibit 32.2 hereto are deemed to accompany this Annual Report and will not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, except to the extent that the registrant specifically incorporates it by reference.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, on March 26, 2024.

APREA THERAPEUTICS, INC.

By /s/ OREN GILAD
Oren Gilad, Ph.D.
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Oren Gilad and John Hamill, as his or her attorney-in-fact, with the power of substitution, for each of them in any and all capacities, to sign any amendments to this Annual Report on Form 10-K, and to file the same, with exhibits thereto and other documents in connection therewith, with the SEC, hereby ratifying and confirming all that said attorney-in-facts, or their substitutes, may do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant in the capacities and on the dates indicated.

Signature	Title	Date
/s/ OREN GILAD Oren Gilad, Ph.D.	Chief Executive Officer and President (Principal Executive Officer)	March 26, 2024
/s/ JOHN P. HAMILL John P. Hamill	Chief Financial Officer (Principal Financial and Accounting Officer)	March 26, 2024
/s/ JEAN-PIERRE BIZZARI Jean-Pierre Bizzari, M.D.	Director	March 26, 2024
/s/ MARC DUEY Marc Duey	Director	March 26, 2024
/s/ MICHAEL GRISSINGER Michael Grissinger	Director	March 26, 2024
/s/ GABRIELA GRUIA Gabriela Gruia, M.D.	Director	March 26, 2024
/s/ JOHN B. HENNEMAN, III John B. Henneman, III.	Director	March 26, 2024
/s/ RIFAT PAMUKCU. Rifat Pamukcu, M.D.	Director	March 26, 2024
/s/ RICHARD PETERS Richard Peters, M.D., Ph.D.	Director	March 26, 2024
/s/ BERND R. SEIZINGER Bernd R. Seizinger, M.D., Ph.D.	Director	March 26, 2024