



Advancing the Treatment Paradigm for Serious Viral Diseases

DECEMBER 2024

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Assembly Bio: Advancing the treatment paradigm for serious viral diseases



4 INVESTIGATIONAL THERAPIES IN CLINICAL STUDIES

- Focused on areas with high unmet medical need and significant market opportunity
- Strong execution towards multiple near-term data readouts



EXPERIENCED LEADERSHIP AND VIROLOGY-FOCUSED R&D ORGANIZATION

- R&D team with over 15 approved drugs in viral disease and hepatitis

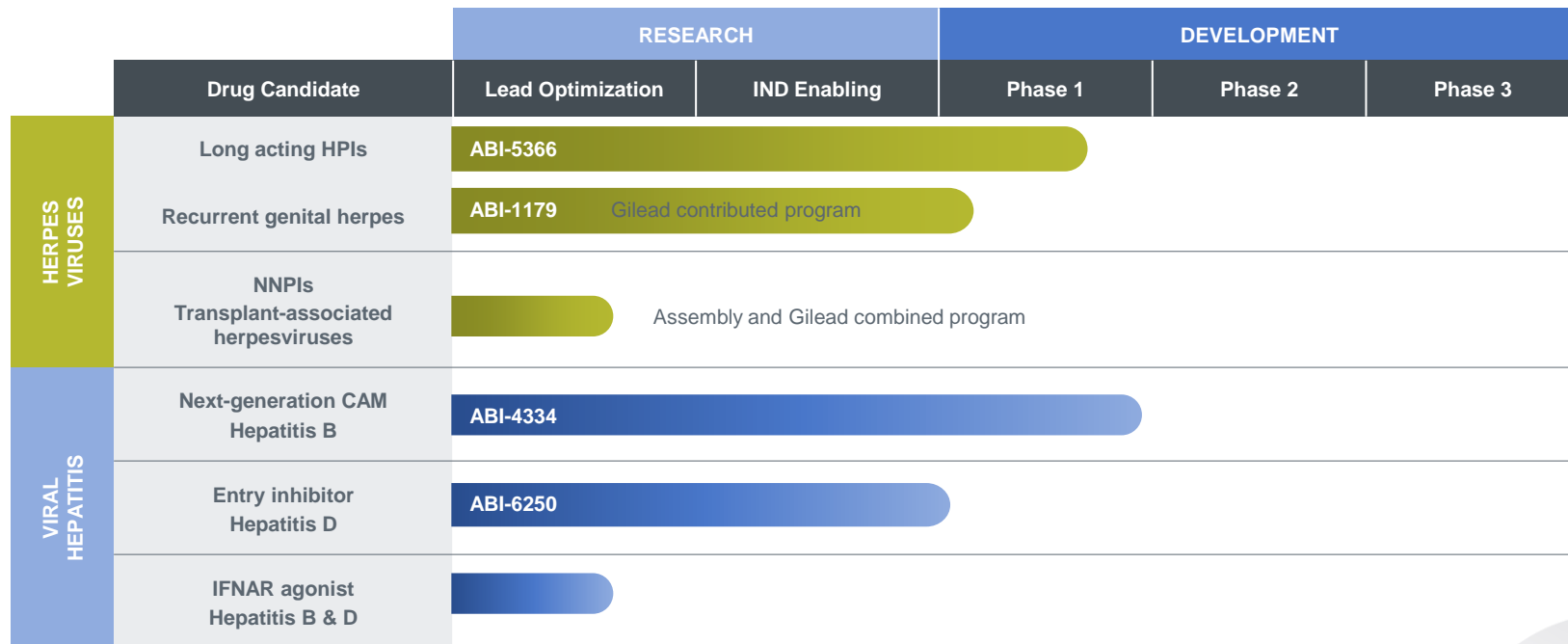


INDUSTRY LEADING PARTNER IN GILEAD

- Collaboration brings together the teams' expertise in virology and provides assets, funding, and an established partner for late stage development and commercialization

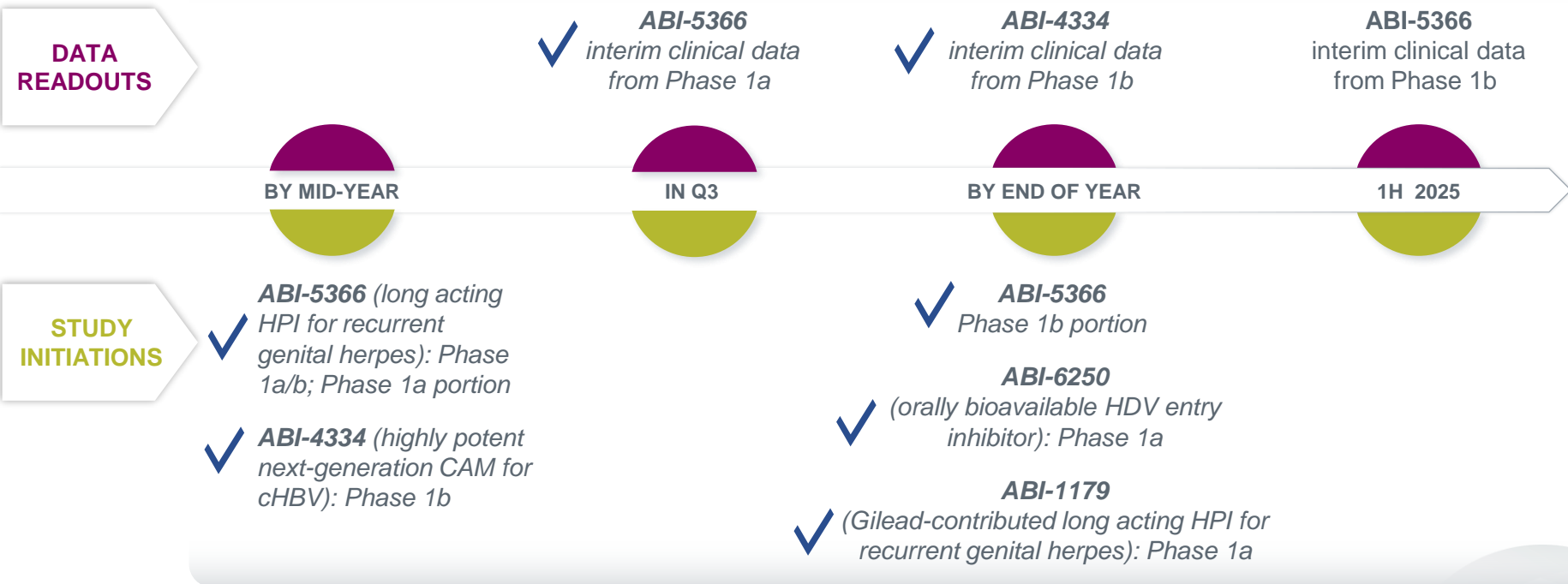


Differentiated pipeline of candidates targeting herpesviruses and viral hepatitis



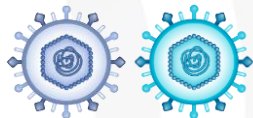
2024 key objectives and anticipated progress

Four candidates in clinical studies and on track for multiple data readouts



Development Programs

ABI-5366 and ABI-1179



Long-acting HSV helicase-primase inhibitors (HPIs) for recurrent genital herpes

ABI-5366 – Phase 1b ongoing

ABI-1179 – Phase 1a ongoing

Genital herpes is a serious condition that impacts millions of individuals in the US/EU

MILLIONS AFFECTED IN US/EU5

4M+

recurrent (3+/yr)
genital herpes^{1,2}

8M+

diagnosed with
genital herpes³

60M+

people living
with HSV-2^{4,5}

SERIOUS HEALTH IMPACTS



PROLONGED PAIN AND SYMPTOMS

Painful lesions, lymphadenopathy and urinary problems that can persist 2-3 weeks⁶



FREQUENT RECURRENCES

Most people with an initial symptomatic genital HSV-2 infection experience frequent recurrences (3-15 times in a year)^{1,2}



PSYCHOSOCIAL IMPACT

Significant impairment to quality of life through anxiety, concerns about transmission, depression, and social stigma⁷



INCREASED RISK OF HIV ACQUISITION

30% of incident HIV infections acquired via sexual transmission attributable to HSV-2 infection⁸



ABI-5366: Advancing recurrent genital herpes treatment to overcome current limitations

CURRENT STANDARD OF CARE

- Daily chronic suppressive therapy with viral polymerase inhibitors (e.g., acyclovir, valacyclovir)
- No new therapies approved since 1995¹

LIMITED EFFICACY



Only 1/3^a with frequent outbreaks achieve recurrence prevention¹

HIGH TRANSMISSION



Less than 50% transmission reduction²

HIGH PILL BURDEN



Lifelong daily treatment:
Up to 1 gram,
1-3x/day^{1,3}

ABI-5366: INNOVATIVE POTENTIAL

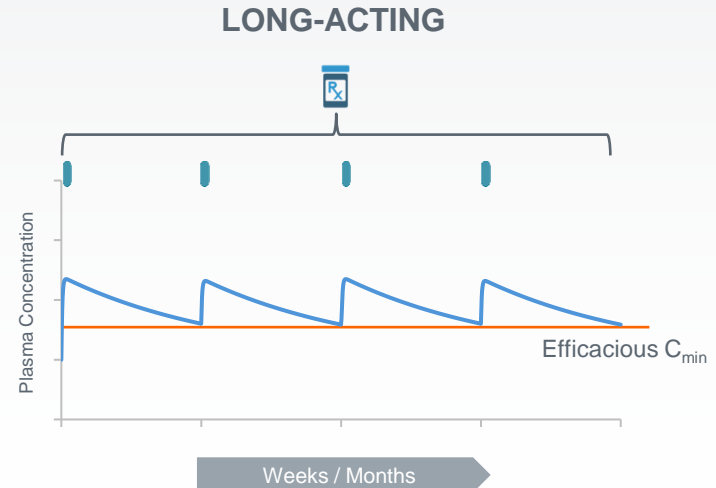
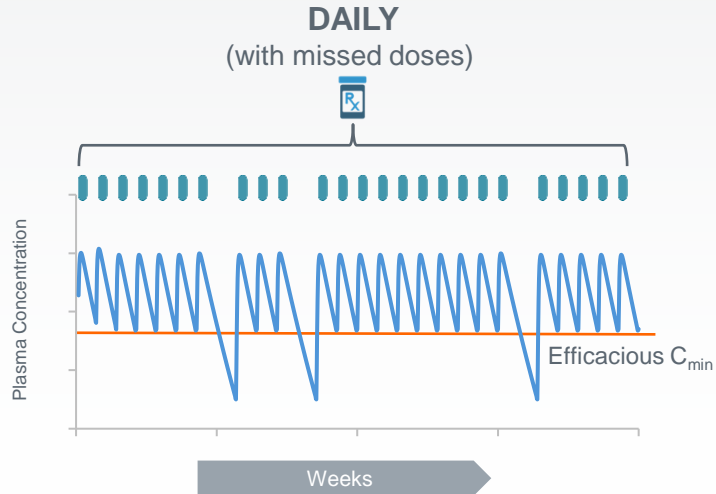
- ✓ **SUPERIOR EFFICACY:** Targeting superior efficacy to SOC; much greater potency demonstrated preclinically
- ✓ **LONG-ACTING:** Evaluating weekly and monthly oral dosing, with the goal of improving efficacy, adherence, and clinical outcomes
- ✓ **>\$1 BILLION** market opportunity for recurrent disease

ADDITIONAL OPPORTUNITIES: Transmission prevention, patients with fewer recurrences, orofacial herpes, injectable formulations

THERE IS AN URGENT NEED FOR INNOVATIVE THERAPIES
that offer improved efficacy and greater convenience

a. Recurrence free for a year on treatment in a study of patients with 6 or more annual recurrences; did not include discontinued, withdrawn, or lost in follow-up

Long-acting therapies can improve uptake, adherence, and efficacy



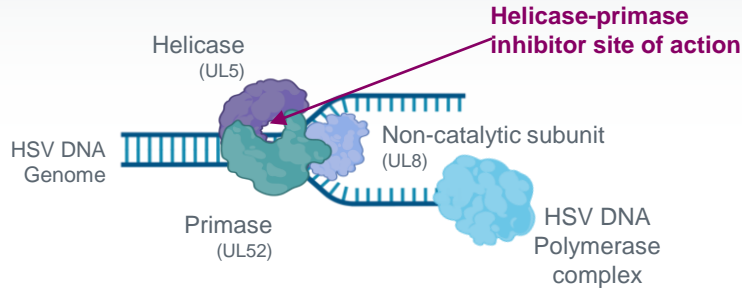
- 72% of HSV patients with recurrent outbreaks prefer suppressive therapy to episodic treatment¹
- Long-acting therapy → consistent drug levels, better compliance²
 - Medication non-adherence for chronic illness is ~50% with stigma, AE anxiety, high dosing frequency being common barriers³
 - Superior efficacy shown for long-acting therapy in HIV in individuals with a history of adherence challenges⁴



HSV helicase-primase inhibition is a clinically validated mechanism; ABI-5366 shows very high potency preclinically

HSV HELICASE-PRIMASE COMPLEX

An essential HSV enzyme complex with no host equivalent



Clinically-validated efficacy of HPI class in RGH

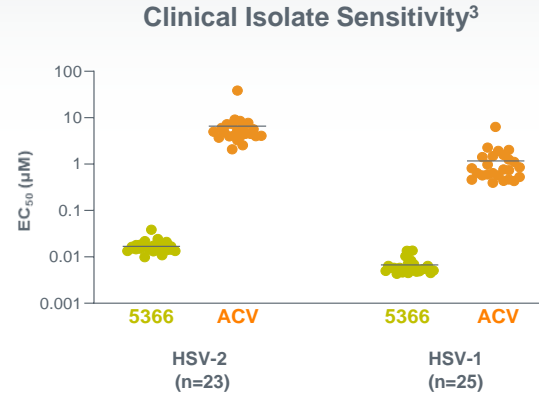
- Pritelivir showed greater reductions in HSV shedding, fewer days with lesions & pain vs. approved SOC in investigational studies¹

Derisked safety profile for HPI class

- Amenamevir, approved for use in Japan in herpes zoster and for episodic HSV, has treated over 1.2M people²

ABI-5366

Highly potent against HSV-1 and HSV-2 in antiviral assays



ABI-5366 400-fold more potent than acyclovir against both HSV-1 and HSV-2 isolates

Positive ABI-5366 Ph 1a interim data support initiation of Ph 1b

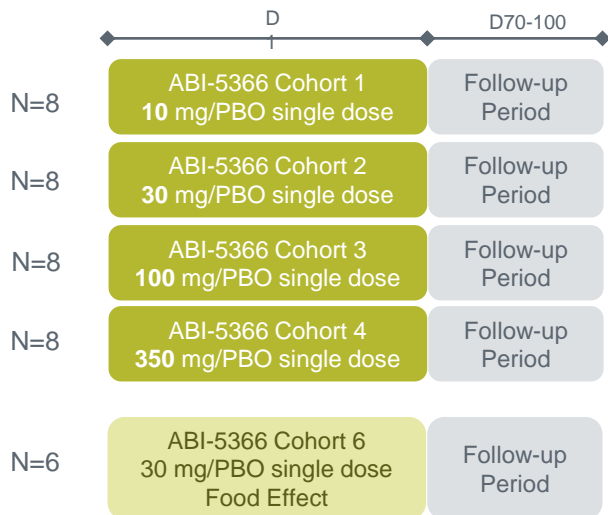
- **ABI-5366 has completed Phase 1a dose escalation from 10 mg through 350 mg**
- **No safety signals identified**
 - No grade 3 or 4 adverse events
 - No serious adverse events
 - No significant treatment-related lab abnormalities noted
 - Exposures of up to 70 days
- **Pharmacokinetic profile supports once-weekly and once-monthly regimens**
 - Projected half-life of approximately 20 days across doses tested
 - Assembly Bio's target exposure of 1100 ng/mL reached; doses within Phase 1a dose range projected to maintain this target exposure with weekly or monthly dosing

Phase 1b in participants with recurrent genital herpes in progress



ABI-5366-101 Phase 1a study design

Phase 1a Design (Double Blind Placebo Controlled)



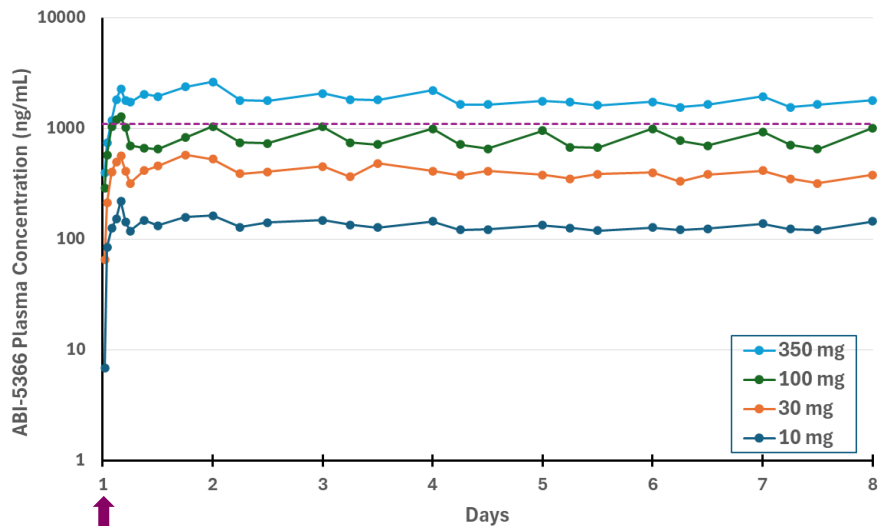
- Key parameters: $T_{1/2}$ and C_{min}
- Enrolled in New Zealand
- Cohort 3 safety/PK triggered opening of Ph1b portion
- Optional 5th SAD cohort available for future evaluation

Total: 38 participants (8/cohort 1-5; 6 for cohort 6 [food effect])



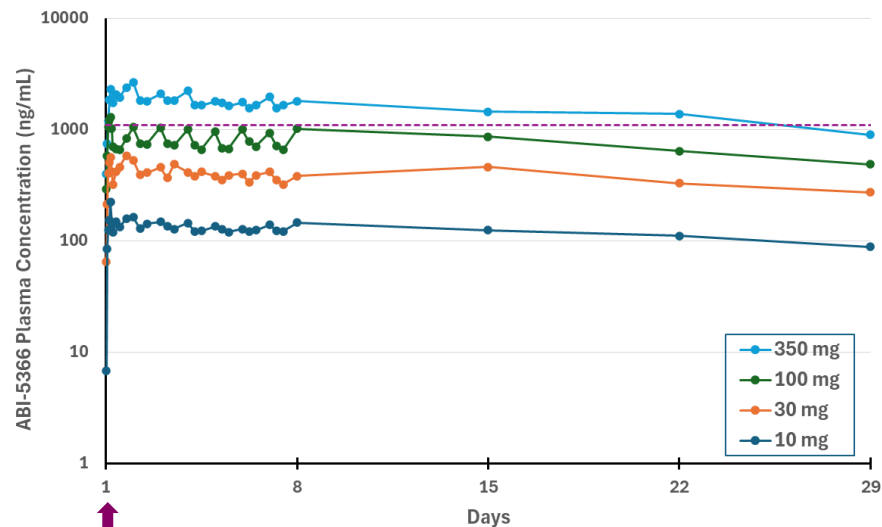
ABI-5366 single-dose pharmacokinetics achieve and maintain projected therapeutic levels

Pharmacokinetics Through Day 8



Single dose

Extended Pharmacokinetics Through Day 29



Single dose

----- 1100 ng/mL: Target human plasma concentration derived from pritelivir, adjusted for ABI-5366 protein shift and potency



ABI-5366 blinded interim phase 1a safety as of October 25, 2024

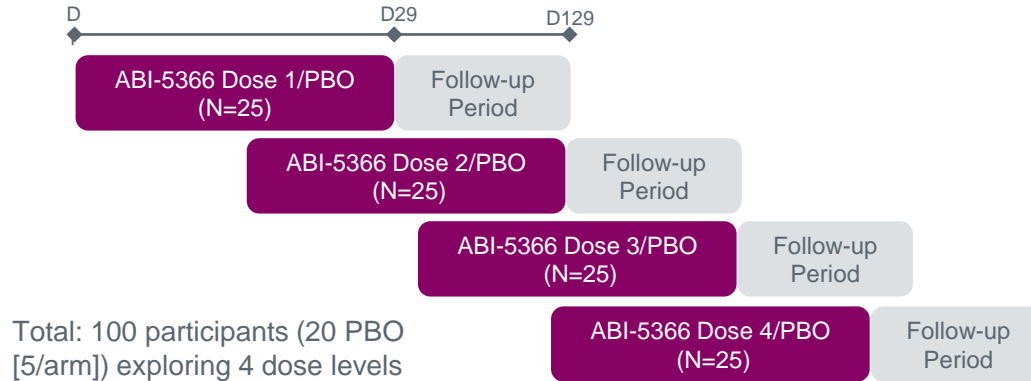
Study remains blinded; PBO and ABI-5366 participants are combined in columns

	ABI-5366 10 mg / PBO	ABI-5366 30 mg / PBO	ABI-5366 100 mg / PBO	ABI-5366 350mg / PBO
	N=8	N=8	N=8	N=8
Duration of Follow-up, median (range) - days	70 (70-76)	70 (68-70)	70 (68-70)	58 (58-64)
Number (%) of Subjects with Any TEAE	7 (87.5)	5 (62.5)	6 (75)	6 (75)
Grade 1	7 (87.5)	5 (62.5)	6 (75)	6 (75)
Grade 2	1 (12.5)	2 (25)	1 (12.5)	2 (25)
Grade 3	0	0	0	0
Grade 4	0	0	0	0
TEAE Related to ABI-5366/PBO, n (%)	0	0	0	0
SAE, n (%)	0	0	0	0
TEAE leading to study termination, n (%)	0	0	0	0
Death, n (%)	0	0	0	0
Number (%) of Subjects with Any Lab Abnormality	5 (62.5)	4 (50)	5 (62.5)	4 (50)
Grade 1	5 (62.5)	4 (50)	4 (50)	3 (37.5)
Grade 2	0	3 (37.5)	1 (12.5)	2 (25)
Grade 3	1 (12.5)*	0	0	0
Grade 4	0	0	0	0

* Day 36 Creatinine Kinase, returned to normal on Day 46

ABI-5366-101 Phase 1b study design

Phase 1b Design (Double Blind Sequential Cohorts)



- Weekly and monthly regimens will be evaluated
- Final analysis from pooled placebo versus active
- Expected to enroll in New Zealand and Australia
- In participants seropositive for HSV-2 with recurrent genital herpes

Key efficacy assessments

Patient Diary of symptoms

- Lesion rate
- Days with lesions
- Days with pain/symptoms

Anogenital swabs (Day 8-36)

- Viral shedding rate
- HSV DNA > 4 log₁₀ copies/ mL

**Interim Phase 1b data
expected in 1H2025**



ABI-1179: Strengthens potential of long-acting helicase-primase inhibitor portfolio



Structurally distinct HSV helicase-primase inhibitor licensed from Gilead

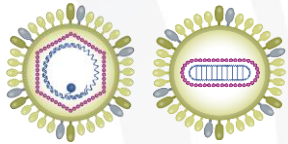


Preclinical potency, PK and safety profile to date support once weekly oral dosing



Phase 1a portion of 1a/b study in progress





ABI-6250: Oral hepatitis D virus entry inhibitor

Phase 1a ongoing

Chronic HDV is a serious life-threatening disease and major unmet need with limited treatment options



12 – 72 million

PEOPLE ESTIMATED TO BE CHRONICALLY INFECTED WITH HDV GLOBALLY¹

70% progress to cirrhosis within 10 years²



Very limited treatment options

BULEVIRTIDE, LARGE MOLECULE ENTRY INHIBITOR, ONLY APPROVED DRUG (EU ONLY)

Safe and highly effective in long-term clinical trials, but requires daily injection and cold storage



ABI-6250, an opportunity to simplify treatment

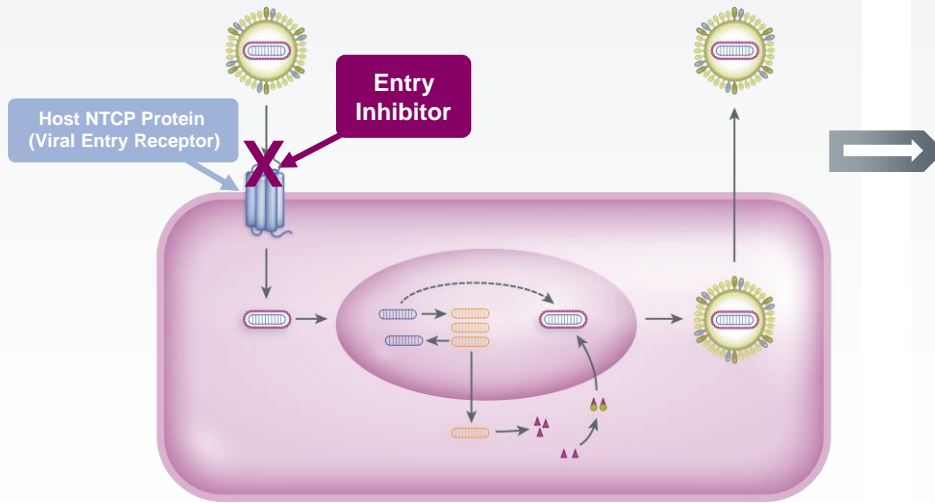
SMALL MOLECULE TARGETING SAME MECHANISM AS BULEVIRTIDE

An oral treatment is expected to further enhance treatment uptake and diagnosis rates



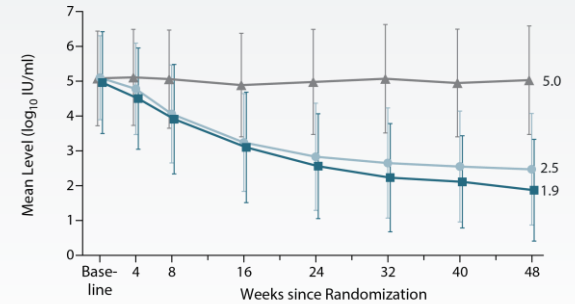
Inhibition of HDV entry lowers viral load and normalizes ALT

Blocking entry prevents infection of liver cells

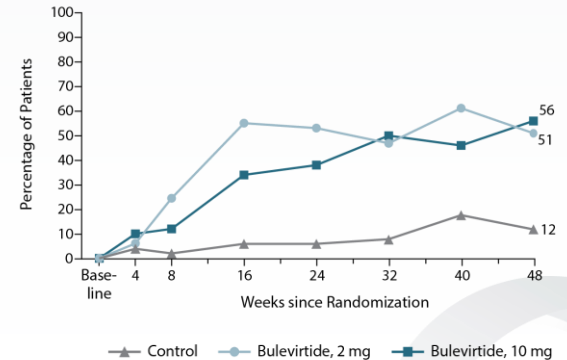


Entry inhibition: a clinically validated target¹

Viral Load Reductions

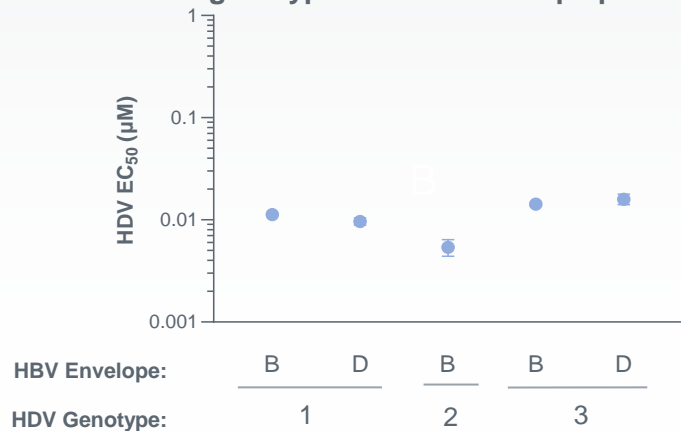


ALT Normalization

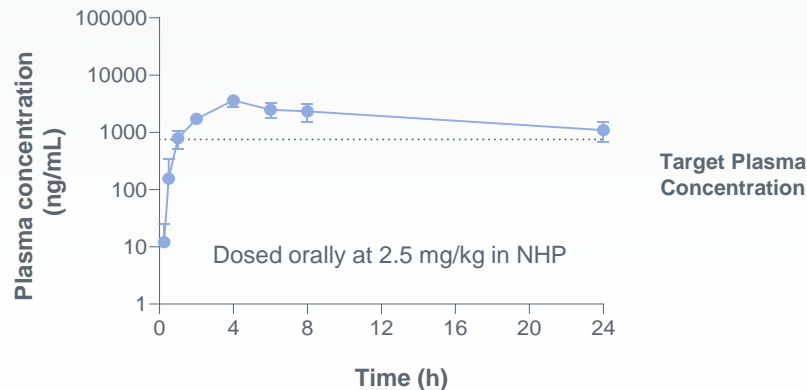


ABI-6250: Preclinical studies show potent pan-genotypic preclinical activity against HDV, favorable safety profile and projected oral QD PK

ABI-6250: <16 nM against all tested HDV genotypes & HBV envelope proteins¹



ABI-6250: exceeded target therapeutic plasma concentrations when given orally to preclinical species¹



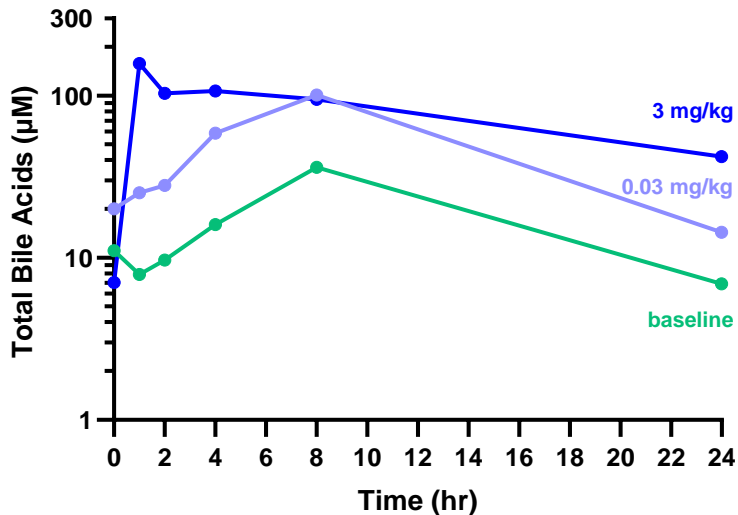
Potential to be first oral option for a clinically-validated mechanism of action (viral entry)

Favorable preclinical safety profile observed in GLP tox studies

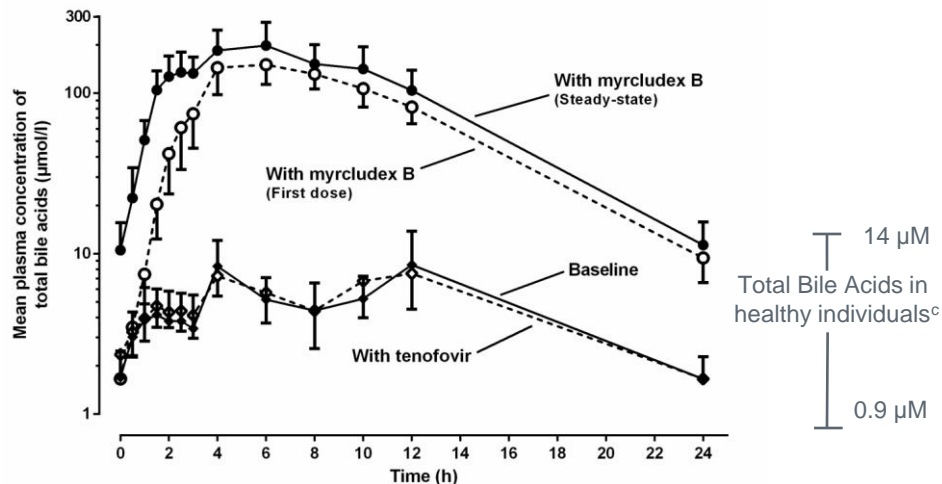


ABI-6250: Preclinical studies show target engagement via bile acid elevation (seen clinically with NTCP entry inhibitors)

ABI-6250: NHPs orally treated with single dose^a

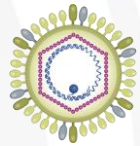


Clinical bile acid elevations seen with SC Bulevirtide^b



Phase 1a studies of ABI-6250 in progress

Biomarker enables early Phase 1a read on target engagement



ABI-4334: Next-generation CAM for hepatitis B

Phase 1b ongoing

HBV is a major unmet medical need globally



HBV PREVALENCE:

254M¹



DIAGNOSED:

33M¹



TREATED:

7M¹

Up to 1,100,000 people

DIED IN 2022¹ FROM HBV-RELATED CAUSES

Treatments are life-long

INHIBIT VIRUS BUT CURE RATES VERY LOW

Opportunity to improve outcomes

AND INCREASE NUMBER OF PATIENTS DIAGNOSED AND TREATED, with development of finite and curative therapies

**No new MOAs approved for HBV
in >25 years**

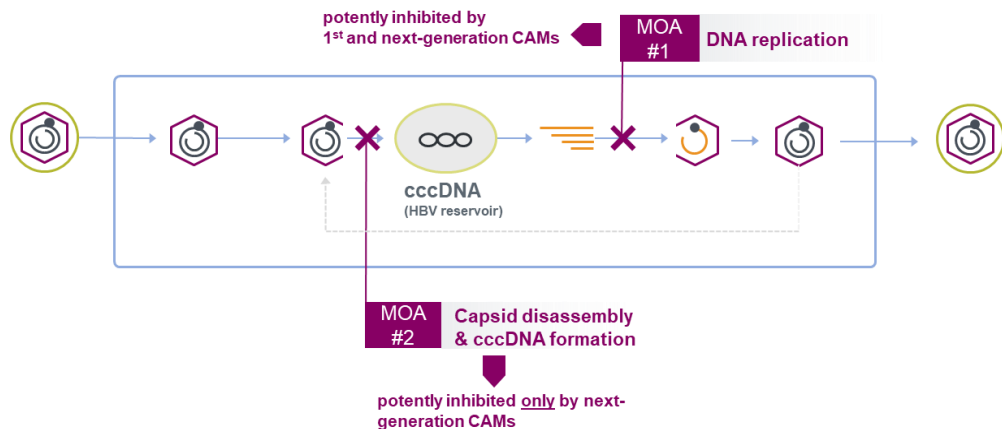


ABI-4334, a next-generation capsid assembly modulator

Phase 1a PK data support the potential for high antiviral potency

CAPSID ASSEMBLY MODULATORS (CAMs)

Direct-acting antivirals with two distinct mechanisms of action (MOAs)



ABI-4334 PHASE 1a PK

Supportive of the ability to achieve double-digit multiples over $paEC_{50}$

	4334 Ph1a Cohorts ¹	
	100mg ^a	200mg ^a
Fold of $C_{min}/paEC_{50}$ MOA #1 (antiviral)	79x	175x
Fold of $C_{min}/paEC_{50}$ MOA #2 (cccDNA)	15x	34x

^a Based on observed data on day 8



Study ABI-4334-102: Phase 1b design

8 active and 2 placebo participants per cohort

28 days of
QD dosing

150 mg 4334 (complete)

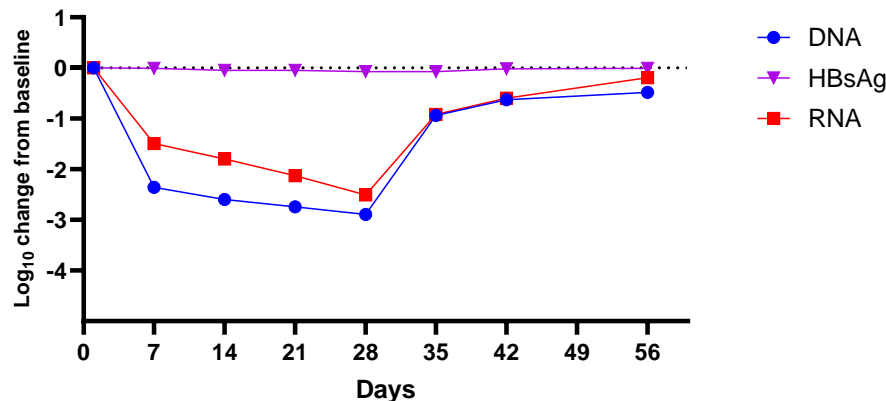
400 mg 4334 (enrolling)

- Study enrolling HBeAg-positive or HBeAg-negative cHBV infected participants not on NrtI
- Endpoints include measures of antiviral efficacy (HBV DNA)

**Interim data for 150 mg cohort released Q4 2024
400 mg data expected in 1H2025**



ABI-4334 interim data: Strong antiviral activity observed in participants receiving 150 mg in Phase 1b



- 2.9 log₁₀ IU/mL mean decline in HBV DNA over 28 days observed in 150 mg cohort
- For 4 participants with detectable HBV RNA at baseline, 2.5 log₁₀ U/mL mean decline observed
- Limited changes in HBsAg observed as expected



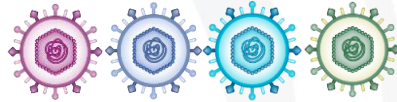
ABI-4334-102 blinded interim safety as of November 14, 2024

Study remains blinded; PBO and ABI-4334 participants are combined in columns

	ABI-4334 150 mg/PBO (n=10)	ABI-4334 400 mg/PBO (n=6)
Subjects with Any TEAE, n (%)	6 (60%)	4 (66.7%)
Grade 1, n (%)	2 (20%)	1 (16.7%)
Grade 2, n (%)	3 (30%)	3 (50%)
Grade 3, n (%)	1 (10%)*	0
Grade 4, n (%)	0	0
TEAE Related to Study Drug, n (%)	6 (60%)	0
Serious TEAE, n (%)	0	0
TEAE Leading to Study Drug Discontinuation, n (%)	0	0
Death	0	0
Number (%) of Subjects with Any Graded TE Lab Abnormalities	8 (80%)	5 (83.3%)
Grade 1, n (%)	7 (70%)	5 (83.3%)
Grade 2, n (%)	5 (50%)	3 (50%)
Grade 3, n (%)	2 (20%)**	0
Grade 4, n (%)	0	0

*ALT elevation; ** ALT elevation (n=1) and Total Bilirubin Increased (n=1) in separate participants
All Grade 3 Labs and AEs resolved by Day 28 with continued dosing of ABI-4334/PBO

Research Pipeline



Oral pan-herpes non-nucleoside polymerase inhibitor (NNPI) for transplant-associated herpesviruses

Multiple herpesviruses can cause significant morbidity and mortality in immunocompromised transplant recipients

60,000 PATIENTS AFFECTED¹

AMONG TRANSPLANT PATIENTS:

 ~60% are CMV positive

 ~60% are HSV positive

 ~80% are VZV positive

Lifelong latent infections

FREQUENTLY REACTIVATE DURING IMMUNOSUPPRESSION

Uncontrolled viral replication

AND SEVERE DISEASE DURING REACTIVATION

Risk of graft loss and death

SOC antivirals are:

- PARTIALLY EFFICACIOUS
- NOT BROAD SPECTRUM
- HAVE TOLERABILITY AND DRUG INTERACTION LIMITATIONS

An oral pan-herpes antiviral could improve efficacy and greatly simplify treatment

Patel and Paya. Clin. Microbiol. Rev. 1997; Breuer, *et al.* Mol. Diagn. Ther. 2012; Clark, *et al.* Semin. Respir. Crit. Care Med. 2013; Haidar and Singh. Curr. Opin. Infect. Dis. 2019; Beyar-Katz *et al.* Clin. Microbiol. Infect. 2020; Kwon *et al.* Transp. Infect. Dis. 2021; Wutzler *et al.* Vaccine 2001; Bauer *et al.* BMC Infect. Dis. 2010; Reynolds *et al.* Public Health Rep. 2010; Lanzieri *et al.* Int. J. Gynaecol. Obstet. 2016; Lachmann *et al.* PLoS One 2018; Patton *et al.* Clin. Infect. Dis. 2018; Ayoub *et al.* BMC Med. 2019; Zuhair *et al.* Rev. Med. Virol. 2019; Zhang *et al.* Virol. J. 2022; Marty *et al.* NEJM 2017; Limaye *et al.* JAMA 2023; Witzke *et al.* Transp. 2012; Witzke *et al.* Transp. 2018

Assembly Bio's oral pan-herpes polymerase inhibitor program is designed to provide significant innovation over current standard of care

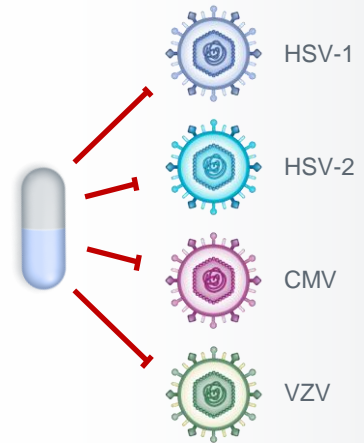
Conserved viral polymerase offers potential for broad-spectrum herpesvirus inhibitors

Opportunity to advance over current standard of care

- Improve efficacy
- Simplify treatment (1 agent to target 4 viruses)
- Improve tolerability and reduce drug-drug interactions

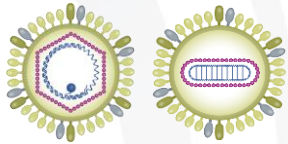
Gilead collaboration expands portfolio and augments program

- Assembly and Gilead contribute extensive expertise and active programs
- Combined effort anticipated to speed candidate nomination and enhance chance for clinical success



Multiple series of potent, broad-spectrum herpesvirus inhibitors identified





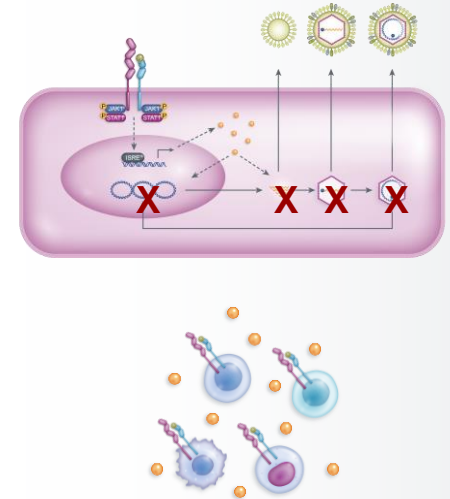
Oral, liver-focused IFNAR agonist for hepatitis B and hepatitis D

A small-molecule liver-focused IFNAR agonist could provide significant innovation over current standard of care

IFN- α is an approved therapy for HBV and associated with functional cure in some patients; however, tolerability limits its use

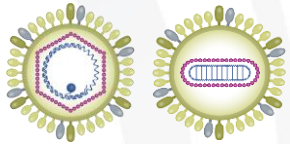
Small molecule agonists identified which closely mimic IFN- α biology, including ISG induction *in vitro* and *in vivo*

Selectively activating the IFN- α pathway in the liver (vs systemically) is expected to significantly improve tolerability



Lead optimization of multiple IFN- α receptor agonists in progress





Gilead Collaboration

Assembly-Gilead partnership combines Gilead's pioneering vision with Assembly's deep R&D expertise to bring next-gen virology medicines to patients



Brings together the two team's knowledge and expertise in antiviral research, clinical development, and commercialization



Strengthened portfolio with two programs targeting HSV and transplant-associated herpesviruses received from Gilead



Extends Assembly's cash runway with total upfront cash payment and equity investment of \$100 million, plus potential future payments receivable from Gilead



- ✓ Leader in antivirals, with a track record in developing transformative medicines, cures and access strategies
- ✓ Innovative medicines have helped to transform the lives of those living with viral hepatitis, having developed a cure for hepatitis C while continuing to develop new treatments for chronic hepatitis B and D



- ✓ Deep R&D expertise and agile, experienced team that has rapidly discovered and developed a promising portfolio of compounds designed to address unmet needs in herpesviruses and hepatitis B and D



KEY FINANCIALS

\$100M Total Upfront Consideration

- ~\$85M cash and ~\$15M equity investment

Additional equity investment of ~\$20M at a premium

Contingent Payments Per Program

- Opt-in fee of at least \$45M per program
- Regulatory & commercial milestones up to \$330M

Royalties

- High single-digits to high-teens

40% US profit/cost share option on all programs

\$75M Collaboration Extension Payments

- 3rd, 5th, and 7th years of the collaboration

STRUCTURE

Long-Term Partnership and Collaboration

- Assembly contributes all current and future programs
- Gilead contributes two herpesvirus programs

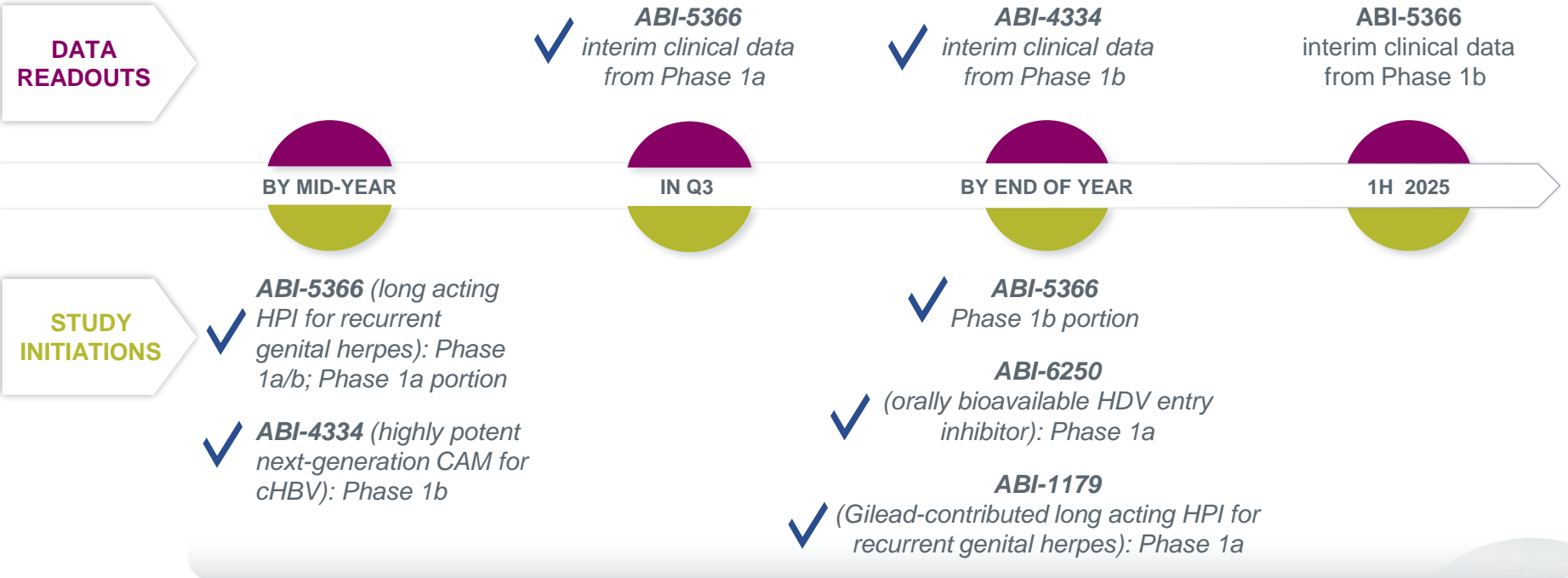
Responsibilities and Options

- Assembly primarily responsible for R&D before opt-in
- Gilead may opt-in to each program, with ability to extend option from end of Phase 1 to end of Phase 2 for most programs
- Gilead controls all development and commercialization after exercise of the option
- Assembly may opt-in to US cost/profit share and, for certain programs, co-promote
- Assembly may continue development or license programs upon Gilead opt-out



2024 key objectives and anticipated progress

Four candidates in clinical studies and on track for multiple data readouts





Nasdaq: ASMB