Advancing the Treatment Paradigm for Serious Viral Diseases

JANUARY 2025

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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
- Rapid advancement of portfolio towards multiple near-term clinical readouts

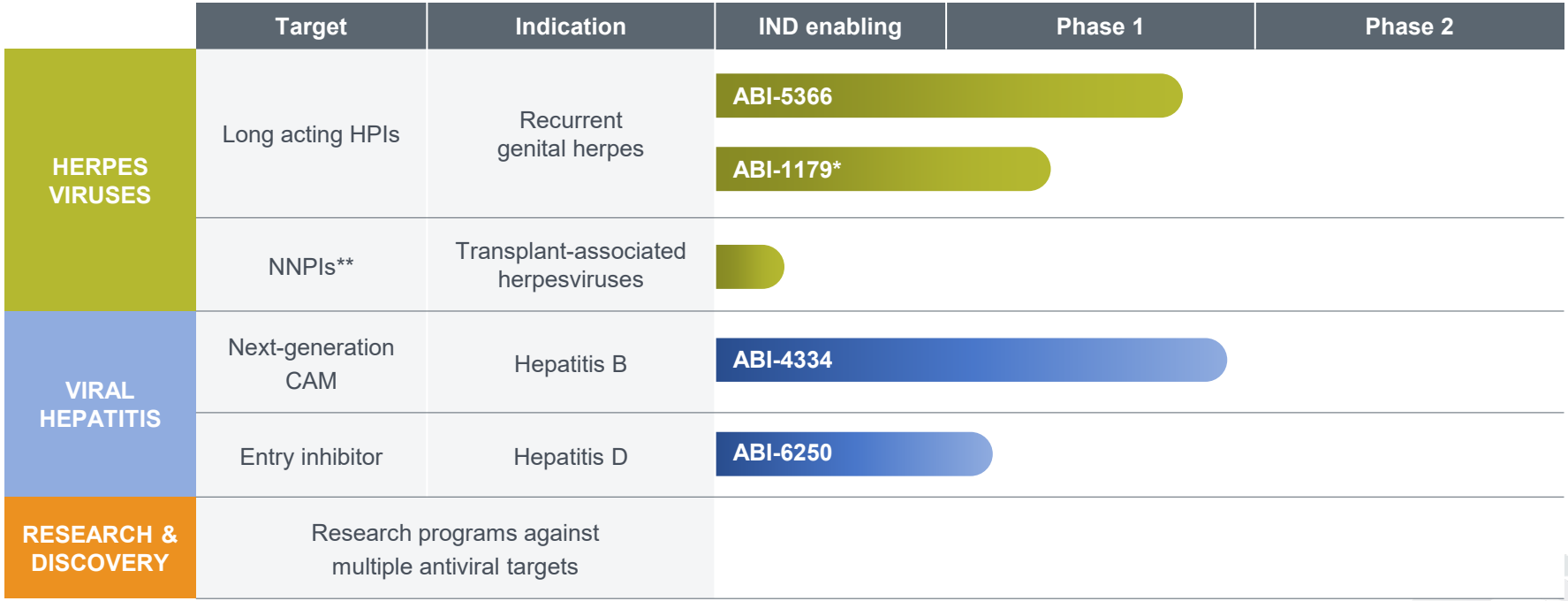
EXPERIENCED LEADERSHIP AND VIROLOGY-FOCUSED R&D ORGANIZATION

- 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 development programs targeting herpesviruses and viral hepatitis



HPI: Helicase-primase inhibitor; NNPI: Non-nucleoside polymerase inhibitor; CAM: Capsid assembly modulator

*Gilead contributed program; ** Assembly and Gilead combined program

Four clinical studies initiated in 2024 with data readouts anticipated in 2025

RECURRENT GENITAL HERPES

ABI-5366

PHASE 1B
in participants with RGH

ABI-1179

PHASE 1A
in healthy participants

Long-acting helicase-primase inhibitors

HEPATITIS B AND D

ABI-4334

PHASE 1B
in participants with chronic HBV

HBV

Next-gen CAM

ABI-6250

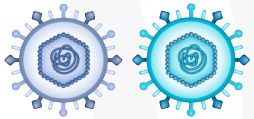
PHASE 1A
in healthy participants

HDV

Viral entry inhibitor

CAM: Capsid assembly modulator; RGH: Recurrent genital herpes

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 herpes[3]

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 weeks[6]

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 stigma[7]

INCREASED RISK OF HIV ACQUISITION
30% of incident HIV infections acquired via sexual transmission attributable to HSV-2 infection[8]

Source ; 1 .Benedetti et al. 1994 ; 2. Benedetti et al. 1999; 3.Fanfair et al. Sex Transm Dis. 2013; 4. McQuillan et al. NCHS Data Brief. 2018; 5. Alareeki et al. The Lancet Regional Health. 2022; 6. Corey et al Amer. Coll. Phys. 1983; 7. Catotti et al. Sex Transm. Dis. 1993; 8. Looker et al Lancet Inf Dis. 2020

HSV-2; herpes simplex virus type 2, cause of majority of recurrent genital herpes cases

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 1995[1]

LIMITED EFFICACY

Only 1/3 with frequent outbreaks achieve recurrence prevention[1]

HIGH TRANSMISSION

Less than 50% transmission reduction[2]

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 genital herpes for profile of weekly dosing with superior efficacy to SOC

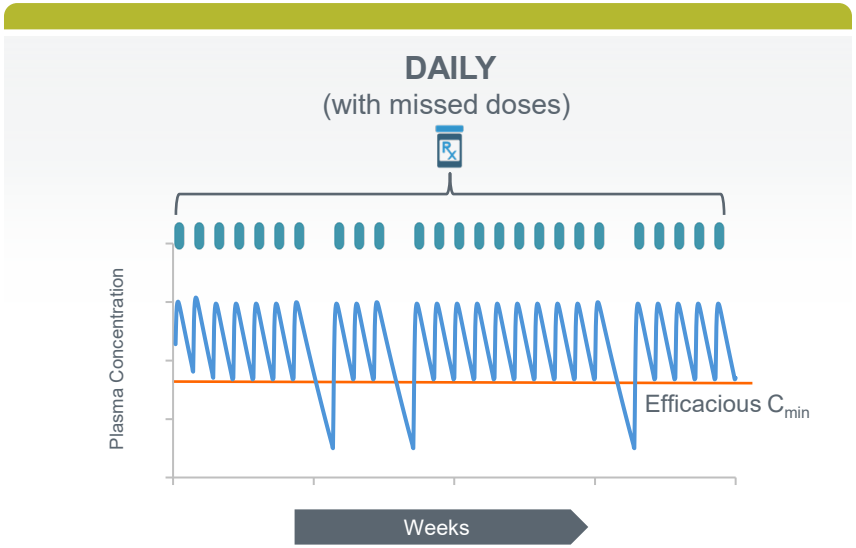
Additional Opportunities: Transmission prevention, patients with fewer recurrences, oro-facial herpes, injectable formulations

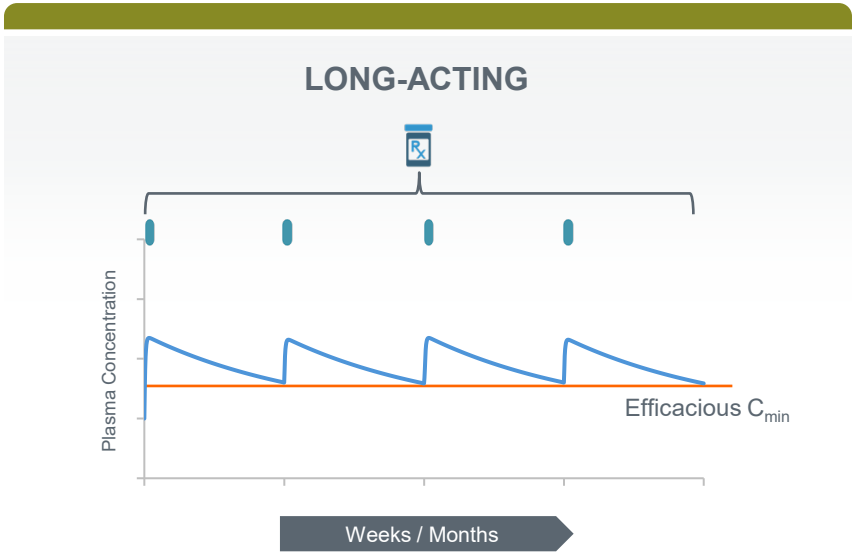
THERE IS AN URGENT NEED FOR INNOVATIVE THERAPIES that offer improved efficacy and greater convenience

Source: 1. Valtrex (Valacyclovir) US package insert; 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; 2. Corey, et al. NEJM. 2004; 3. Physician interviews commissioned by Assembly Bio

SOC, Standard of Care

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





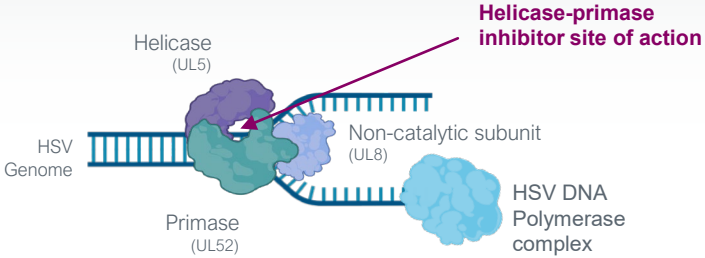
- 72% of HSV patients with recurrent outbreaks prefer suppressive therapy to episodic treatment[1]
- Long-acting therapy ⟶ consistent drug levels, better compliance[2]
  - Medication adherence for chronic illness is only ~50% with stigma, AE anxiety, high dosing frequency being common barriers[3]
  - Superior efficacy shown for long-acting therapy in HIV in individuals with a history of adherence challenges[4]

1. Romanowski, et al. Sex Trans Dis. 2003; 2. Okoli, et al. Mental Health Nurs. 2021; Engel, et al. JAMA. 1990; 3. WHO. Adherence to Long-Term Therapies: Evidence for Action; 4. ViiV Press Release Mar. 6, 2024

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

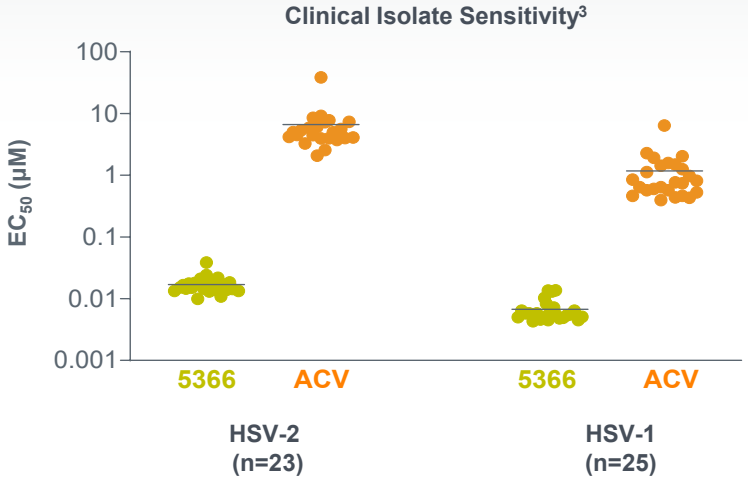
- Pritelivir showed greater reductions in HSV shedding, fewer days with lesions & pain vs. approved SOC in investigational studies[1]

Derisked safety profile for HPI class

- Amenamevir, approved for use in Japan in herpes zoster and for episodic HSV, has treated over 1.2M people[2]

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

1. Wald, et al. JAMA 2016; 2. Shiraki, et al. Viruses 2021; 3. Contreras et al. 2023. IHW

RGH, recurrent genital herpes; HPI, helicase-primase inhibitor; QD, once daily; SOC, standard of care

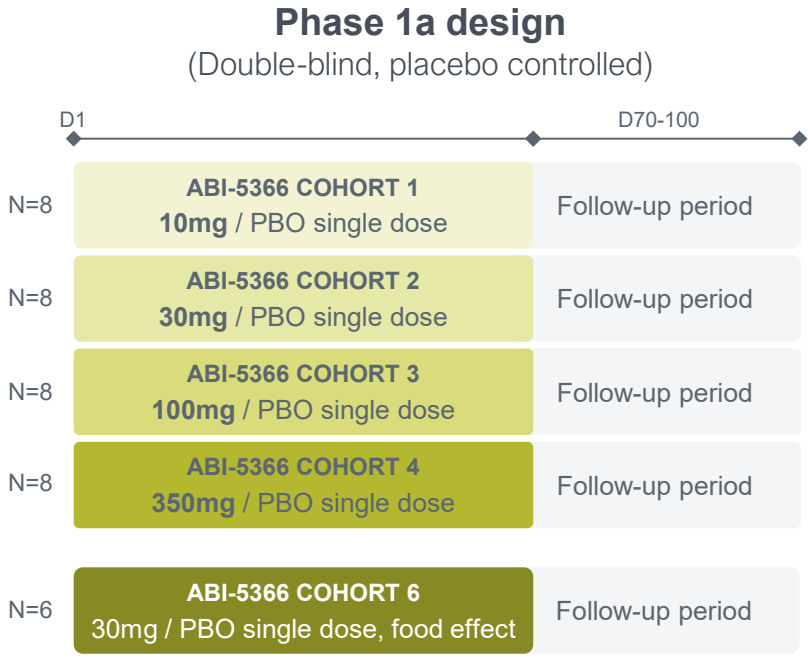
Positive ABI-5366 Ph 1a interim data support initiation of Ph 1b

- ABI-5366 has completed Phase 1a dose escalation from 10mg through 350mg
- 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

Interim ABI-5366 Phase 1a data as of October 25, 2024; includes safety data from 58-70 days of follow-up by cohort and pharmacokinetic data to 29 days of follow-up

ABI-5366-101 Phase 1a study design



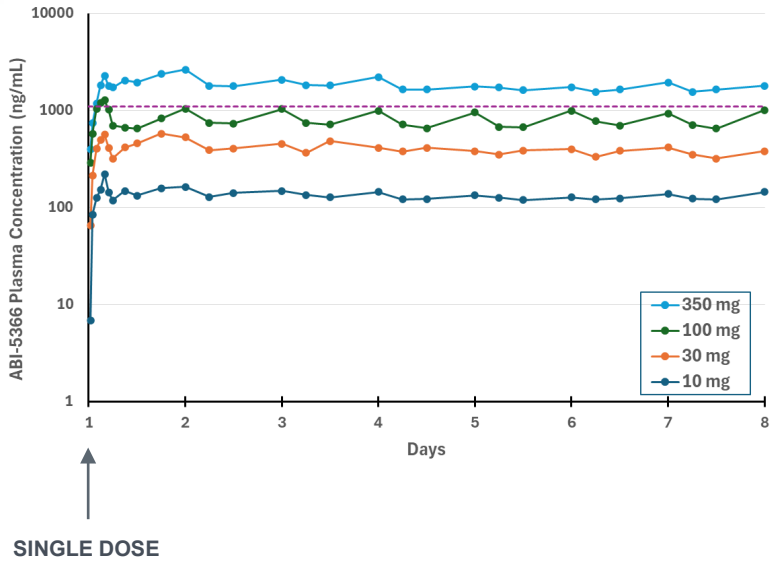
Total: 38 participants (8/cohort 1-4; 6 for cohort 6 [food effect])

- 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

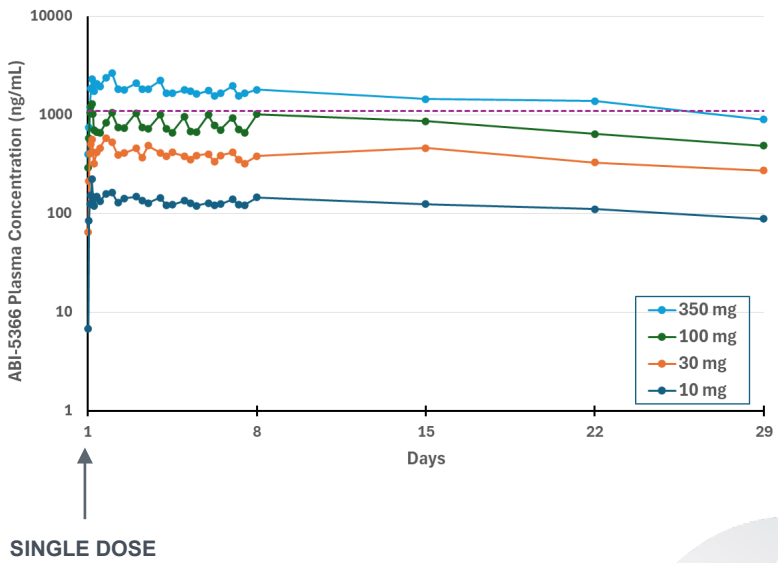
Follow-up period extended from 70 to 100 days due to extended pharmacokinetic (PK) profile

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

Pharmacokinetics through Day 8



Extended pharmacokinetics through Day 29



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

Interim ABI-5366 Phase 1a data as of October 25, 2024; includes pharmacokinetic data to 29 days of follow-up, by cohort

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

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

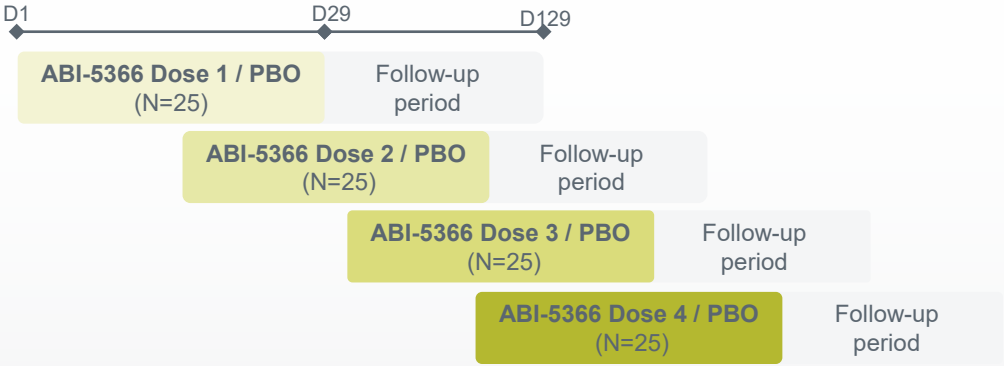
	ABI-5366 10mg / PBO	ABI-5366 30mg / PBO	ABI-5366 100mg / PBO	ABI-5366 350mg / PBO
	N=8	N=8	N=8	N=8
Duration of follow-up, median (range) - days	70 (70-76)	70 (68-70)	70 (68-70)	58 (58-64)
Number (%) of subjects with any TEAE	7 (87.5)	5 (62.5)	6 (75)	6 (75)
Grade 1	7 (87.5)	5 (62.5)	6 (75)	6 (75)
Grade 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)



Total: 100 participants (20 PBO [5/arm]) exploring 4 dose levels

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

Key efficacy assessments

Anogenital swabs (Day 8-36)

- e.g., viral shedding rate

Daily diary of symptoms

- e.g., days with lesions

INTERIM PHASE 1B data expected in 1H2025

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

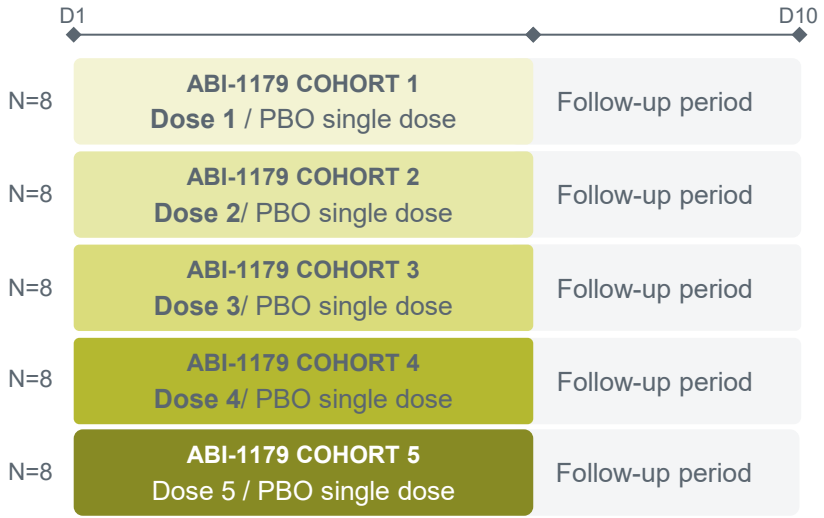
Structurally distinct HSV helicase-primase inhibitor licensed from Gilead

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

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

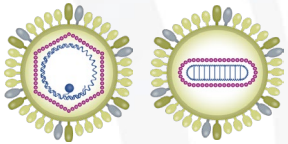
ABI-1179-101 Phase 1a study design

Phase 1a design
(Double-blind, placebo controlled)



Total: Up to 46 participants (8/cohort 1-5; 6 for cohort 6 [food effect])

- Key parameters: $T_{1/2}$ and C_{min}
- Enrolling in New Zealand
- Optional food effect cohort available for evaluation



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 GLOBALLY[1]

70% progress to cirrhosis within 10 years[2]

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

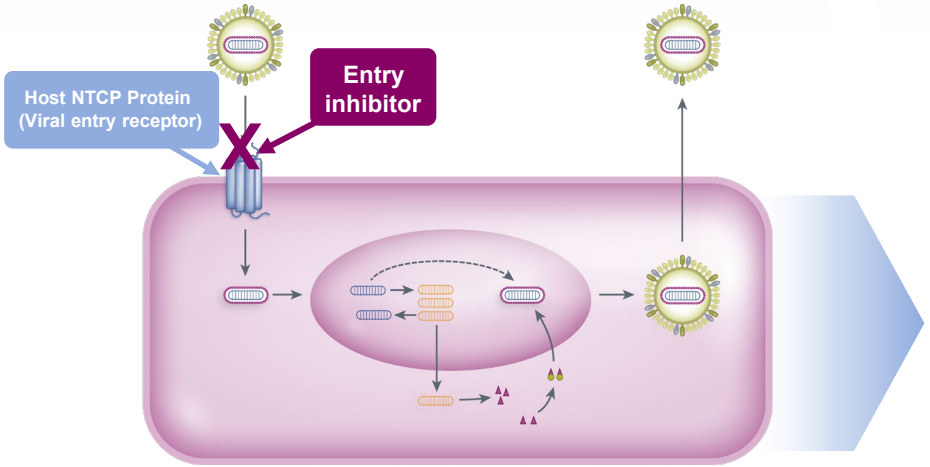
SMALL MOLECULE TARGETING SAME MECHANISM AS BULEVIRTIDE

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

1. Negro & Lok 2023; 2. WHO 2023.

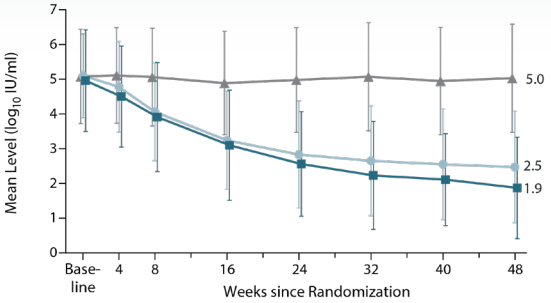
Inhibition of HDV entry lowers viral load and normalizes ALT

Blocking entry prevents infection of liver cells

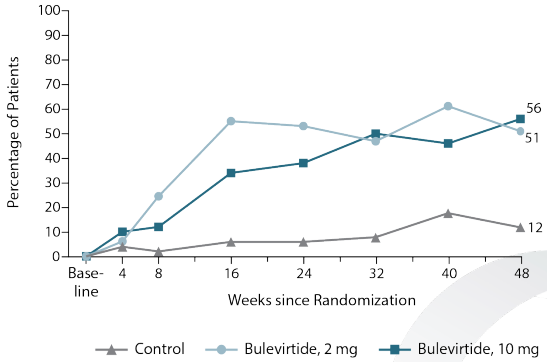


Entry inhibition: a clinically validated target[1]

Viral Load Reductions



ALT Normalization

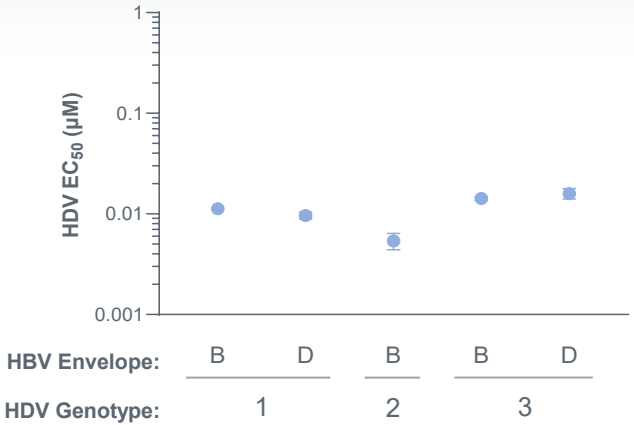


1. Wedemeyer NEJM 2023

ALT, alanine transaminase; NTCP, Sodium taurocholate cotransporting polypeptide

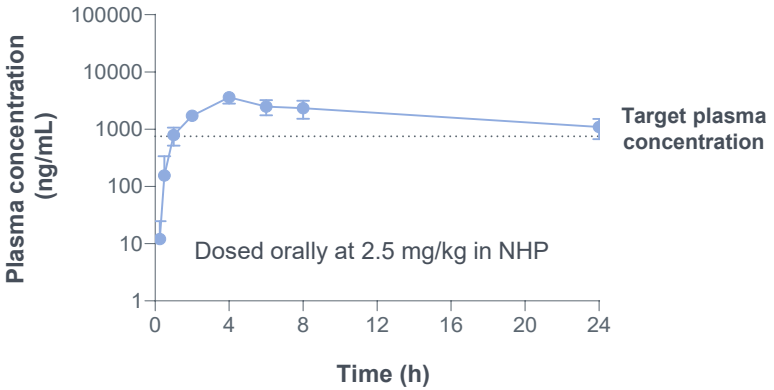
ABI-6250: Potential for the first oral option for HDV supported by preclinical profile

Potent pan-genotypic activity[1]



<16 nM against all tested HDV genotypes and HBV envelope proteins

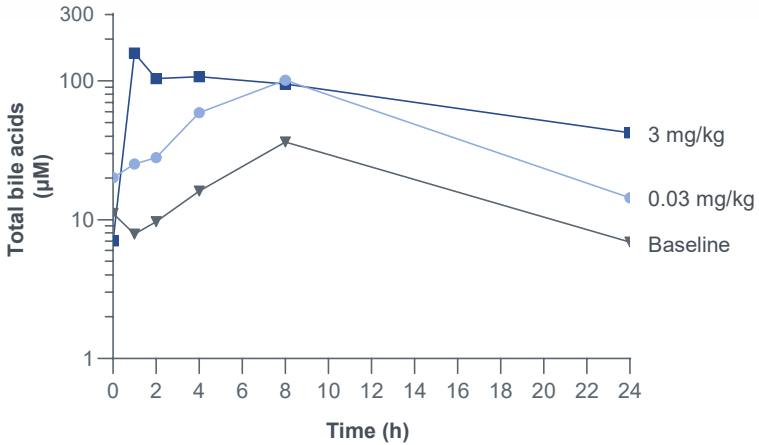
Projected oral QD PK[1]



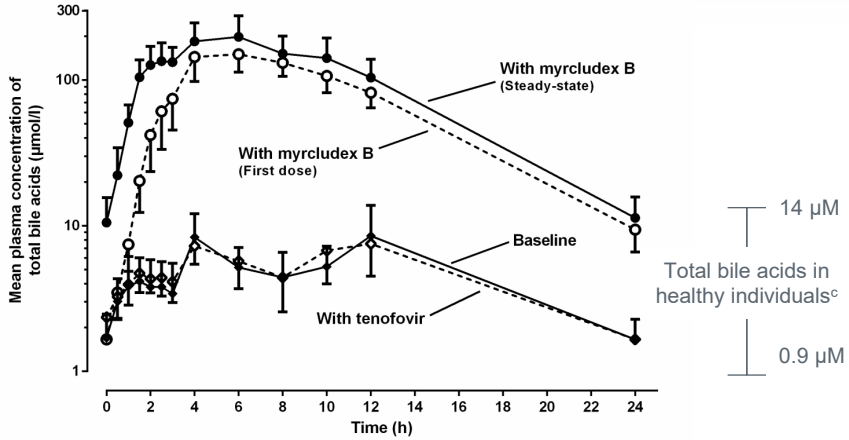
Preclinical potency, PK and safety profile support potential as first oral HDV option

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

ABI-6250: Single oral dose in NHPs[a]



Clinical bile acid elevations seen with SC Bulevirtide[b]



CTA approved December 2024

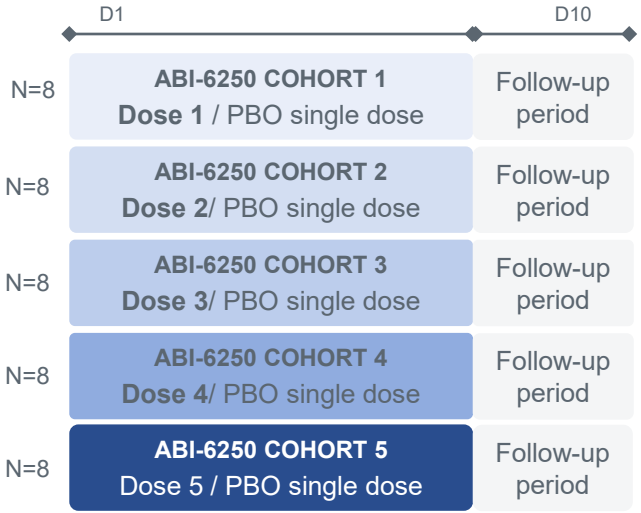
Biomarker enables early Phase 1a read on target engagement

[a]Assembly Bio internal data; [b]Blank et al.; Clin Pharm Therapy, 2017; myrcludex B is the former name for bulevirtide [c] Liu et al.; SciRep. 2017

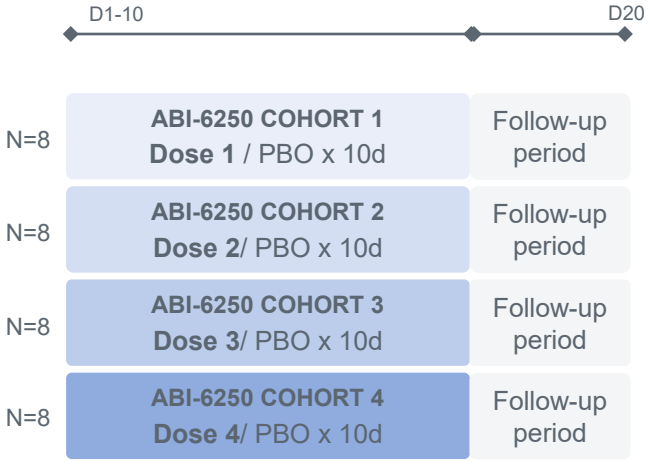
CTA: Clinical trial application

ABI-6250-101 Phase 1a study design

Phase 1a single-ascending doses



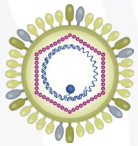
Phase 1a multiple-ascending doses



- **Key outcomes:**
  - Safety and pharmacokinetics
  - Confirmatory pharmacodynamic biomarkers of target engagement (Bile acid and CP-1 elevations) with single and multiple doses

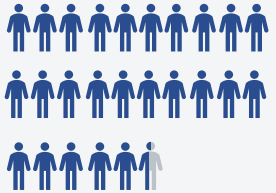
PHASE 1A
study in progress

ABI-4334: Next-generation CAM for hepatitis B



Phase 1b ongoing

HBV is a major unmet medical need globally



HBV PREVALENCE:
254M[1]

DIAGNOSED:
33M[1]

TREATED:
7M[1]

Up to 1,100,000 people
DIED IN 2022[1] 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

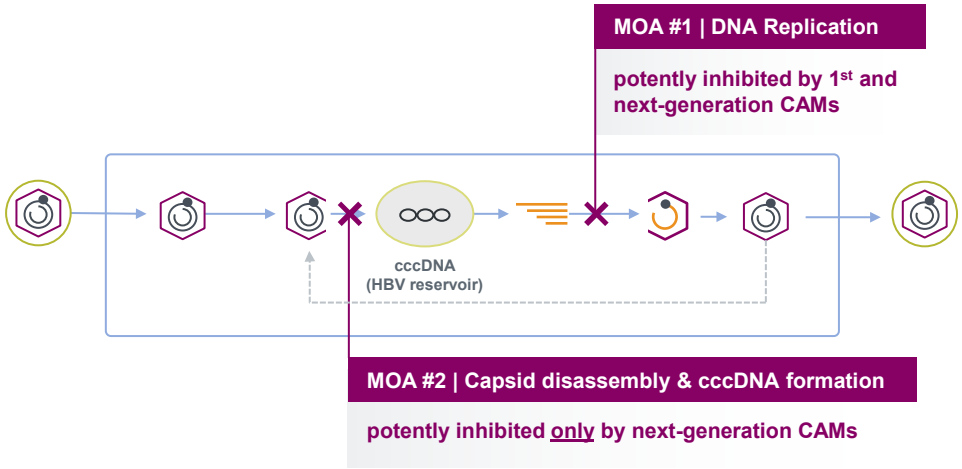
1. WHO (2024)

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 $paEC_{50}$

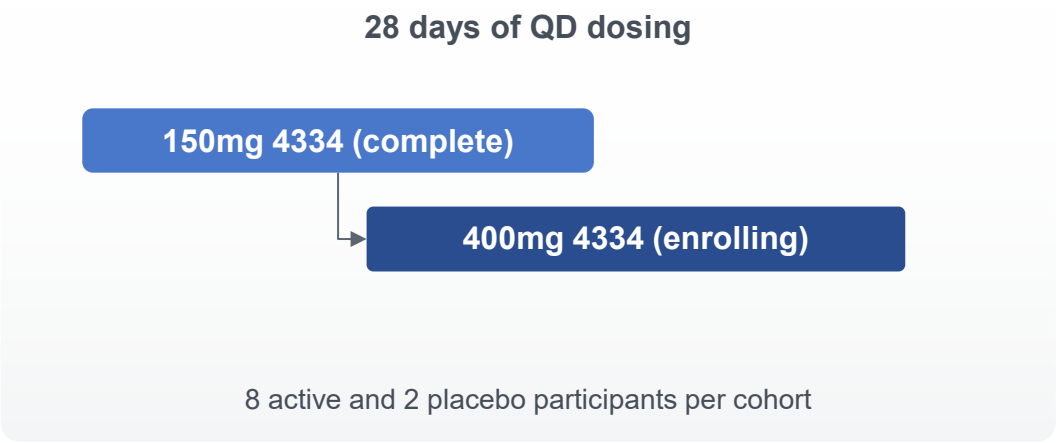
	4334 Ph1a Cohorts[1]	
	100mg[a]	200mg[a]
Fold of $C_{min}/paEC_{50}$ MOA #1 (antiviral)	79x	175x
Fold of $C_{min}/paEC_{50}$ MOA #2 (cccDNA)	15x	34x

[a] Based on observed data on day 8

1. Gane et al. EASL ILC 2023, Poster # SAT-186

cccDNA, covalently closed circular DNA ; C_{min}, daily minimum plasma trough concentration; $paEC_{50}$, protein-adjusted concentration of a drug that gives half-maximal response; PK, Pharmacokinetics

Study ABI-4334-102: Phase 1b design

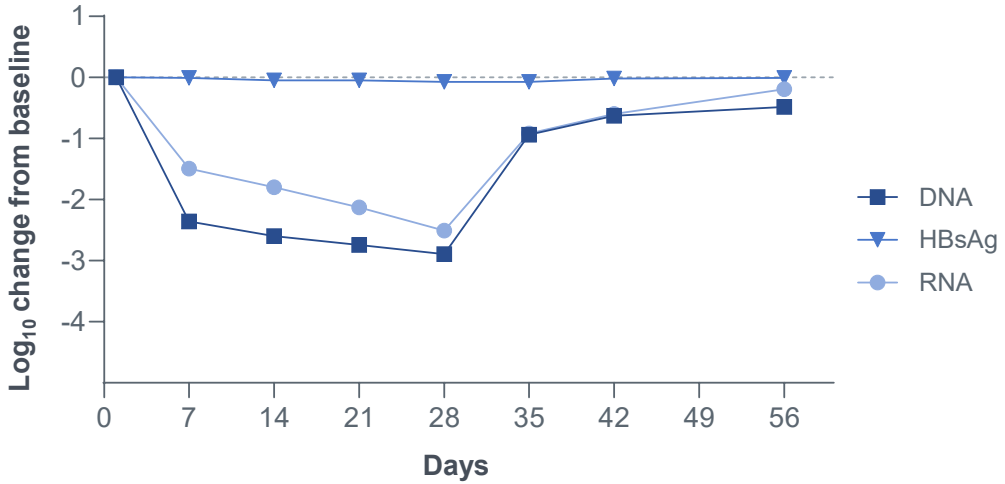


INTERIM DATA FOR 150MG COHORT released Q4 2024

400MG DATA expected in 1H 2025

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

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



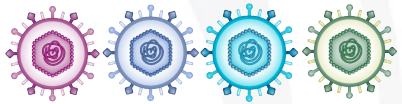
- 2.9 log_{10} IU/mL mean decline in HBV DNA over 28 days observed in 150mg cohort
- For 4 participants with detectable HBV RNA at baseline, 2.5 log_{10} U/mL mean decline observed
- Limited changes in HBsAg observed as expected

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 150mg / PBO (n=10)	ABI-4334 400mg / 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



Oral broad-spectrum non-nucleoside polymerase inhibitor (NNPI) for transplant-associated herpesviruses

IND-enabling studies

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

60,000 PATIENTS AFFECTED[1]

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 broad spectrum herpesvirus 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. Car 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

1. EBMT, OPTN, UNOS, and IRODAT (estimate for transplanted-associated herpesvirus reflects US and EU only).

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

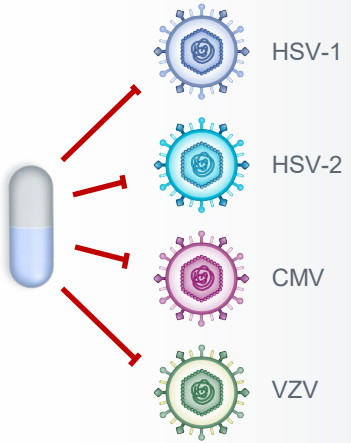
Conserved viral polymerase offers potential for broad-spectrum herpesvirus inhibition

Opportunity to advance current standard of care

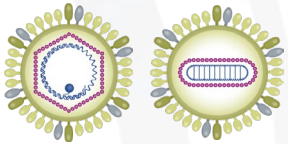
- Improve efficacy
- Simplify treatment (1 agent to target 4 viruses)
- Improve tolerability and reduce drug-drug interactions

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



IND-enabling studies ongoing



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

GILEAD
Creating Possible

- ✓ 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

assemblybio

- ✓ 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

Partnership overview

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

Nasdaq: ASMB