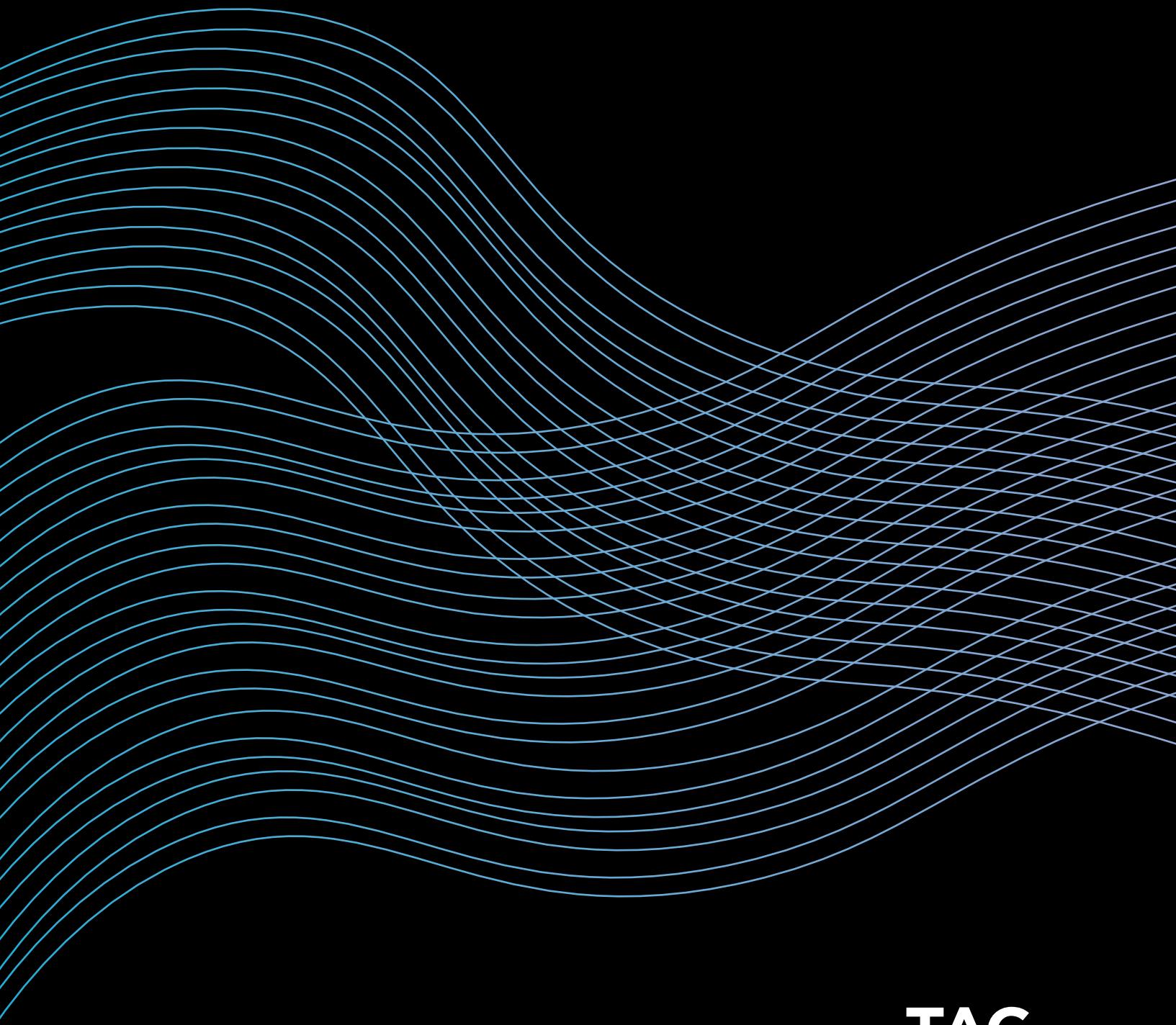
Pipeline Report » 2024

Antiretroviral Therapy



TAG
Treatment Action Group

The Antiretroviral Therapy Pipeline 2024

By Richard Jefferys

For the first time since the 2020 Pipeline Report, the past year has seen no new HIV drug approvals by the US Food and Drug Administration (FDA).

The lone adult regulatory action involved an expanded indication for Biktarvy (a combination pill containing bictegravir, emtricitabine, and tenofovir alafenamide), which is now approved as a switch option to treat people with suppressed HIV viral loads and the known or suspected presence of the drug resistance mutation M184V/I. The revised indication is based on the results of a study demonstrating that Biktarvy was able to maintain suppression over 48 weeks in participants with HIV containing the M184V/I mutation, with no evidence of the emergence of new drug resistance mutations.

Additionally, ViiV Healthcare's Dovato (dolutegravir and lamivudine in a single pill) was approved for adolescents 12 years and older as a first line option or as an alternative for people on antiretroviral therapy (ART) with viral load suppression and no evidence of resistance to the components. TAG's Pipeline Report focuses primarily on adults, and approvals of formulations and dosing regimens for children and adolescents typically lag behind. A comprehensive analysis of 91 countries published last year found that this has been accompanied by a lag in global antiretroviral coverage for people under 15 with HIV: from 2010 – 2020, coverage increased from 26 percent to 74 percent for adults, compared to 16 percent to 54 percent for children (see reporting by Keith Alcorn for Aidsmap). A list of FDA-approved antiretrovirals for children can be found on the agency website.

The HIV capsid inhibitor lenacapavir (trade name Sunlenca) was approved as an HIV treatment for adults in the US in December 2022, with an indication for people with limited antiretroviral options. Research continues to assess the potential of lenacapavir for a broader population of people with HIV, administered either as an injectable every six months or in oral formulations.

Results from an ongoing trial of weekly dosing of oral lenacapavir were presented at the 2024 Conference on Retroviruses and Opportunistic Infections (CROI). The study pairs the drug with a weekly dose of islatravir, Merck's experimental nucleoside reverse transcriptase translocation inhibitor (NRTTI), consistent with the trend in recent years toward developing antiretroviral regimens with the potential for less frequent administration than daily pills.

A total of 104 participants were enrolled and randomly assigned to continue on daily Biktarvy or to switch to a regimen of 300 mg lenacapavir and 2 mg islatravir once weekly. Accounting for loss to follow up, 94.2% of each group were designated as achieving undetectable viral load at the 24 week timepoint. Only one recipient of the weekly combination displayed a viral load slightly above 50 copies/ml after 24 weeks, but levels declined below this threshold by week 30.

No serious adverse events related to the study drugs occurred, with the main side effects reported in lenacapavir/islatravir recipients being dry mouth and nausea (in two participants). Overall, rates of mild adverse events were higher in the group that switched compared to those remaining on Biktarvy (17.3% vs. 5.8%). There was no evidence of an adverse effect of islatravir on CD4 T cell or absolute lymphocyte counts, a problem previously seen with higher doses of the drug. The researchers are waiting to assess results after 48 weeks before making a decision on next steps.

The manufacturer Gilead Sciences is also testing a daily oral combination of lenacapavir plus the integrase inhibitor bictegravir for people currently on more complex ART regimens. At CROI 2024, preliminary results of the first phase II/III trial, named ARTISTRY-1, were presented as a poster. Participants entered taking an average of three pills per day (range: two–nine), and the change to a dual regimen of lenacapavir (at a dose of either 25 mg or 50 mg) and bictegravir was well tolerated and effectively maintained viral load suppression. The trial is now progressing into a phase III stage that will administer a fixed-dose combination pill containing 75 mg of bictegravir and 50 mg of lenacapavir. Another phase III trial — ARTISTRY-2 — is now recruiting and will compare continuing on Biktarvy to switching to the fixed-dose lenacapavir/bictegravir combination.

Gilead is continuing to evaluate the potential of long-acting (LA) broadly neutralizing antibodies (bNAbs) to act as partners for lenacapavir. Results from a small proof-of-concept study (described in last year's Pipeline Report) were published on January 30, 2024, in the *Lancet HIV*. The same regimen of lenacapavir plus the bNAbs teropavimab and zinlirvimab is now being assessed in a larger phase II trial.

CROI 2024 saw the public debut of results obtained with Gilead's new integrase inhibitor candidate GS-1720. An initial analysis of pharmacokinetics (drug absorption and duration in the body) in HIV-negative participants demonstrated suitability to weekly dosing. Subsequently, four groups of seven people living with HIV who were not on ART received doses of 30 mg, 150 mg, 450 mg, or 900 mg, respectively, on two consecutive days, leading to an average viral load decline ranging from 1.74 – 2.44 $\log_{10}$ after 11 days of follow up. There were no serious adverse events related to the drug and no participant has so far displayed evidence of integrase inhibitor resistance (analyses of the 30 mg and 900 mg dose cohorts are not yet completed). The desired drug levels were achieved in recipients of the 450 mg or 900 mg doses and all experienced viral load declines greater than 2 $\log_{10}$.

The unexpected adverse effects of high islatravir doses on CD4 T cell and absolute lymphocyte counts has led the manufacturer, Merck, to pursue an alternative candidate, MK-8527, from the same NRTTI class. New information from a phase I single dose study featured at CROI 2024 indicates the drug is amenable to weekly or possibly monthly dosing. Viral load declines in people with HIV not on ART averaged a little over 1 $\log_{10}$ after seven days across a range of doses from 0.5 mg to 10 mg. No serious adverse events occurred, supporting further clinical development.

There are four new additions to the pipeline in 2024:

Gilead's LA integrase inhibitor candidate GS-6212 has now been added to a master research protocol assessing novel antiretrovirals in people with HIV (joining GS-1720 and the LA NNRTI bavtavirine, previously known as GS-5894). The pipeline page on Gilead's website also lists two other LA drugs as being in phase I trials: GS-4182, a capsid inhibitor, and GS-1614, a prodrug of Merck's islatravir being developed collaboratively with Merck and Scripps Research (see January 4, 2024, press release). Neither trial appears to be entered into public clinical trial registries.

Researchers at the University of Washington have launched the first clinical trial of their novel LA "drug combination nanoparticle" (DCNP) formulation of three approved antiretrovirals: lopinavir, ritonavir, and tenofovir. The study will evaluate a single dose administered to adult participants without HIV. The work is part of an ongoing program named Targeted Long-acting Combination AntiRetroviral Therapy (TLC-ART), supported by the National Institutes of Health (NIH) and UNITAID with the aim of developing safe and potentially scalable LA combination regimens.

TABLE: ARV PRODUCTS IN DEVELOPMENT

Product	Class/Type	Company	Development Phase
Lenacapavir (Sunlenca)	**Capsid inhibitor**	**Gilead**	**Approved for people with limited options Phase II, III**

- FDA label indication for "heavily treatment-experienced adults with multidrug resistant HIV-1 infection failing their current antiretroviral regimen due to resistance, intolerance, or safety considerations" in combination with other antiretroviral(s).
- The 52-week results from the phase II/III CAPELLA study in people with multidrug-resistant HIV, published in *the Lancet HIV* in July 2023, demonstrating high rates of viral load suppression and good safety profile.
- A completed phase II trial (CALIBRATE) assessed lenacapavir in combination with approved ARVs in ART-naive people with HIV. Results after 54 weeks were published in *the Lancet HIV* in January 2023.
- Preliminary results from the ongoing phase II and III ARTISTRY-1 trial investigating daily oral lenacapavir in combination with bictegravir as a switch option for people on more complex ART regimens presented as a poster at CROI 2024. The study has now entered the phase III stage and is evaluating a fixed-dose combination pill containing 50 mg lenacapavir and 75 mg bictegravir.
- The ARTISTRY-2 phase III trial is enrolling people currently receiving Biktarvy for at least six months and comparing continuing on the regimen to switching to the fixed-dose lenacapavir/bictegravir combination pill.
- A phase II trial in combination with islatravir, in partnership with Merck, results after 24 weeks presented at CROI 2024.
- Results from a completed phase Ib trial combining lenacapavir with two LA broadly neutralizing antibodies, teropavimab and zinlirvimab, published in *the Lancet HIV* in January 2024. A larger phase II study of the same regimen is ongoing.

Product	Class/Type	Company	Development Phase
Islatravir	**NRTTI**	**Merck**	**Phase III**

- All islatravir trials were placed on full or partial clinical holds in December 2021 due to declines in total lymphocyte and CD4+ T cell counts observed among both HIV-positive and HIV-negative recipients. After further investigation and consultation with the FDA, a more limited development program investigating low once-daily or once-weekly dosing is being pursued. Treatment trials of higher doses remain on partial clinical hold (no new screening or enrollment), and the PrEP development program for HIV-negative people has been discontinued.
- Trials now include:
  - A phase III trial of a once-daily fixed-dose formulation with doravirine and 0.25 mg of islatravir for people who received the combination in earlier studies.
  - A phase III trial for treatment-naive people comparing a once-daily fixed-dose formulation with doravirine and 0.25 mg of islatravir with Biktarvy (bictegravir/emtricitabine/tenofovir alafenamide).
  - Two phase III switch studies: one for people on any standard ART regimen, and one for people receiving Biktarvy.
  - A phase II trial of once-weekly dosing of 2 mg islatravir with lenacapavir in partnership with Gilead. Preliminary results after 24 weeks presented at CROI 2024 (see main text).
  - Open-label follow-up study for certain participants in trials of the 0.75 mg once-daily fixed-dose formulation with doravirine.
  - Several previous trials involving higher doses are ongoing but under partial clinical holds, including phase III trials of the 0.75 mg once-daily fixed-dose formulation with doravirine in treatment-naive, virologically suppressed people (switch B) and a phase IIb trial of once-weekly dosing in combination with the NNRTI MK-8507.
  - Results from the switch A (now completed) and switch B studies were published in *Lancet HIV* on May 8, 2024 (see Molina et al and Mills et al). The results showed that switching to the islatravir regimen achieved comparable viral load suppression, but both papers note that decreases in CD4 cell and white blood cell counts preclude further development of the 0.75 mg dose.
- Results from a trial of the 0.75 mg once-daily fixed-dose formulation with doravirine in heavily treatment-experienced people with HIV were presented at the 2023 European AIDS Conference, suggesting the potential for viral load benefit but noting that the higher dose could be associated with CD4 T cell decreases. The lower islatravir dose has been deemed unsuitable for this population.
- Presentations at CROI 2023 described the analyses supporting the decision to evaluate 0.25 mg daily dosing and 2 mg weekly dosing on the basis that they are unlikely to have negative effects on white blood cell counts.
- Phase IIb trial results were published in *Lancet HIV* on May 14, 2021. A brief report describing results after 96 weeks of follow-up was published in *JAIDS* in September 2022.
- Phase Ib safety, PK, and antiretroviral activity results were published in *The Lancet HIV* on January 3, 2020.
- Results from drug interaction studies with doravirine and dolutegravir and tenofovir disoproxil fumarate have been published, reporting no significant interactions.

Product	Class/Type	Company	Development Phase
Albuvirtide (Aikening)	**Fusion inhibitor**	**Frontier**	**Phase II/III**

- Approved in China in June 2018 based on 48-week data from the phase III TALENT study, which demonstrated the superiority of albuvirtide plus ritonavir-boosted lopinavir over lopinavir/ritonavir plus two NRTIs as second-line therapy.
- A trial in the United States is evaluating albuvirtide in combination with the broadly neutralizing antibody 3BNC117 as LA maintenance therapy for people with suppressed viral load.
- The combination of albuvirtide and 3BNC117 was being investigated in people with multidrug-resistant HIV in a phase II trial launched in September 2020. The study was slated to end in December 2022, but the registry record hasn't been updated since September 2021, rendering the current status unclear.
- The effects of albuvirtide and 3BNC117 on the HIV reservoir and viral load rebound after an ART interruption were due to be assessed in a phase II trial, however the registry record has also been neglected and the study was never listed as open for enrollment. Inquiries to company representatives about the status of these studies have not been answered.
- The most recent presentation was at the 2023 European AIDS Conference, where a poster described a possible effect in enhancing CD4 T cell recovery in people with suboptimal CD4 T cell increases on standard ART.

PRO 140 (leronlimab)	**CCR5 antagonist**	**CytoDyn**	**Phase II/III**

- Leronlimab is a monoclonal antibody designed to block the interaction between HIV and CCR5, the primary coreceptor the virus uses to enter and infect cells.
- In October 2022, CytoDyn voluntarily withdrew its biologics license application to the FDA for the treatment of multidrug-resistant HIV because of problems with the data. The fate of the drug in the context of HIV appears very uncertain, with the company reported to be focusing on non-alcoholic steatohepatitis.
- Former CytoDyn CEO Nader Pourhassan was indicted in December 2022 for securities fraud schemes related to leronlimab, along with an associate, Kazem Kazempour, who ran the company that managed CytoDyn's clinical trials.
- The FDA placed holds on both HIV and COVID-19 programs for leronlimab in March 2022. Participants receiving leronlimab through trial extensions were transitioned to alternative therapeutics. On February 29, 2024, CytoDyn announced the hold on HIV had been lifted but, on a subsequent investor call, stated that "we're choosing to prioritize other applications at this time."
- The FDA previously rejected a BLA from the manufacturer in July 2020, citing lack of information necessary for a review. The recent indictment alleges that CytoDyn was aware that the submission was inadequate but went ahead in an effort to mislead investors in the company.
- Preliminary results from the dose-escalating CD03 phase II/III evaluation of weekly subcutaneous PRO 140 as single-agent monotherapy in virologically suppressed people were presented as a poster at CROI 2019. Rates of virological failure were high in the 350 mg and 525 mg dose groups (65.9% and 33%, respectively), but suppression was better maintained in the ongoing 700 mg dose group (6 out of 43 participants experienced virological failure, defined as two consecutive viral loads ≥200 copies/mL).
- Primary efficacy results from the CD02 phase IIb/III trial of PRO 140 in treatment-experienced people were reported at ASM Microbe 2018.
- The CD01 phase Ib trial and extension study, demonstrating moderate efficacy of PRO 140 single-agent maintenance therapy, were published online in April 2018. In a paper published in *PLoS Pathogens* on March 31, 2022, researchers report that five participants in the extension study were able to maintain HIV viral load suppression for over seven years while receiving the 700 mg dose.
- Dr. Jonah Sacha at Oregon Health & Science University is planning to conduct a leronlimab study in a person with HIV who requires a stem cell transplant to treat a concurrent condition. Several people with HIV, most famously Timothy Ray Brown, have been cured of the infection after receipt of stem cell transplants from donors with the CCR5D32 mutation (which causes immune cells to be resistant to most HIV variants), but in this case, such a donor couldn't be identified. The goal of the study is to assess whether blocking CCR5 with leronlimab can protect the newly transplanted immune system cells from HIV infection and possibly achieve a cure in the absence of the CCR5D32 mutation.

Product	Class/Type	Company	Development Phase
Semzuvolimab (UB-421)	**CD4 attachment inhibitor**	**United BioPharma**	**Phase II/III**

- Results from a small phase II trial evaluating weekly or biweekly UB-421 as a single-agent maintenance therapy during an 8- or 16-week ART interruption were published in *the New England Journal of Medicine* in April 2019. No cases of virological failure (defined as >400 copies/mL) were documented.
- In August 2022, the company announced that the FDA had approved an NIAID-sponsored, 25-person phase II trial of UB-421 in combination with optimized background ART regimen in people with multidrug-resistant HIV.
- A phase III trial in combination with an optimized background ART regimen in treatment-experienced participants is planned but not yet enrolling.
- A phase II trial exploring the effects of UB-421 on the HIV reservoir and another HIV cure-related proof-of-concept phase II trial testing UB-421 in combination with the latency-reversing agent chidamide (an histone deacetylase inhibitor) have been completed, with results yet to be presented.
- A phase I trial assessing delivery via subcutaneous injection has also been completed, with results pending.

Ulonivirine (MK-8507)	**NNRTI**	**Merck**	**Phase IIb**

- Initially evaluated in a phase I trial in 2014/2015.
- Favorable PK, antiretroviral activity, and resistance profile were reported in studies published in *JAIDS* and *Antimicrobial Agents and Chemotherapy* in 2021.
- A study highlighting an increase in exposure to fluoride associated with MK-8507 administration was published in the *Journal of Clinical Pharmacology* on August 21, 2021. The authors state that at doses used in trials "fluoride levels are not expected to exceed a clinically relevant threshold in most individuals."
- A phase IIb trial is testing a once-weekly combination with islatravir; currently among the Merck trials placed on partial hold by the FDA (see islatravir entry above).
- A planned phase I study of MK-8507 in HIV-negative participants with mild or moderate hepatic impairment has not yet opened for enrollment.

Cabotegravir (LA), VRC07-523LS	**INSTI, bNAb**	**ViiV/Vaccine Research Center**	**Phase II**

- A completed NIAID-sponsored phase II trial investigated the combination of LA cabotegravir with the LA bNAb VRC07-523LS developed by the Vaccine Research Center at the US NIH. Participants switched from standard ART and underwent a 46-week period of intermittent administration of LA cabotegravir + VRC07-523LS before reinstituting their oral ART regimen.
- Results presented at CROI 2024 indicated that the combination was safe and maintained viral load suppression in most recipients; however, there were several cases of viral load increases and one participant developed integrase inhibitor resistance. The researchers suggest a better understanding of mechanisms of virologic breakthrough is needed.
- Results from baseline screening for HIV resistance against VRC07-523LS were presented at CROI 2023. The authors report that HIV samples from approximately 70% of the potential participants met prespecified criteria for susceptibility to the bNAb, while 14% showed evidence of resistance. In the remaining cases, samples could not be evaluated because of the technical limitations of the assay.

Product	Class/Type	Company	Development Phase
VH3810109 (N6-LS)	**bNAb**	**ViiV**	**Phase II**

- bNAb licensed from the NIH by ViiV Healthcare.
- Results from an ongoing phase II trial presented at HIV Glasgow 2022, CROI 2023, and CROI 2024 reporting good tolerability and antiretroviral activity after a single infusion or subcutaneous injection. Virologic response was associated with HIV susceptibility to the bNAb (retrospectively assessed from baseline samples).
- A phase I trial investigating subcutaneous administration with recombinant human hyaluronidase PH20 (rHuPH20), which allows for large volumes of antibody to be delivered via the subcutaneous route, has been completed in HIV-negative participants. Results were reported at CROI 2024: injection site reactions, including grade 3 erythema (reddening of the skin), were common but typically resolved within seven days. The researchers conclude that the approach was "generally safe and well tolerated."
- An ongoing phase IIb study is evaluating VH3810109 (delivered either via infusion or subcutaneously with rHuPH20) combined with the LA injectable integrase inhibitor cabotegravir in adults with HIV.

Lipovirtide	**Fusion inhibitor**	**Shanxi Kangbao Biological Product Co., Ltd.**	**Phase II**

- A phase I trial evaluating a single injection of lipovirtide in treatment-naive people with HIV and a 24-person phase I trial of multiple dosing have been completed in China.
- A phase II trial in China combining lipovirtide with lamivudine and tenofovir is recruiting.

VH3739937/ GSK3739937	**Maturation inhibitor**	**ViiV/GlaxoSmithKline**	**Phase I**

- A candidate LA HIV maturation inhibitor. A phase I study in HIV-negative volunteers has been completed; the results were published in *Pharmacology Research and Perspectives* in June 2023, showing good tolerability and the potential for once-weekly dosing.
- A phase II trial investigating antiretroviral activity, safety, tolerability, and PK in people with HIV naive to ART is registered but not yet open for enrollment.

MK-8527	**NRTTI**	**Merck**	**Phase I**

- Merck disclosed that that MK-8527 is an NRTTI in a September 2022 press release.
- Phase I trials completed in South Africa and Romania.
- The results were presented at CROI 2024, demonstrating viral load declines of around 1 $\log_{10}$ with no serious adverse events (see main text).

HRF-4467	**Maturation inhibitor**	**Hetero Labs Limited**	**Phase I**

- Phase I trial in HIV-negative volunteers due to take place in India. Regulatory review information is available online (see page 13).
- A poster abstract about HRF-4467 was presented at the 2021 Cold Spring Harbor Retroviruses meeting, but the content is not publicly available.

CPT31	**Novel D-peptide HIV entry inhibitor**	**Navigen, Inc.**	**Phase I**

- Entry inhibitor that has shown activity in the macaque model of SHIV infection.
- A phase Ia trial in HIV-negative participants has been completed; the results are posted to ClinicalTrials.gov.
- The manufacturer Navigen isn't planning further development but is looking to license or sell the compound to a larger pharmaceutical company (Alan Mueller, PhD, personal communication, April 26, 2023, shared with permission).

Product	Class/Type	Company	Development Phase
VH4004280	**Capsid inhibitor**	**ViiV**	**Phase I**
■ First-in-human phase I trial HIV-negative volunteers evaluating safety, tolerability, and PK has been completed. ■ A phase I trial in the United Kingdom is assessing various oral formulations and the effects of combining with food, also in HIV-negative volunteers. ■ An international phase IIa proof-of-concept study has recruited people with HIV who are naive to ART to assess antiretroviral activity, safety, tolerability, and PK after oral administration. ■ A phase IIa trial is investigating single doses of LA injectable formulations given either subcutaneously or intramuscularly to HIV-negative participants.			
STP0404	**Integrase inhibitor**	**ST Pharm Co., Ltd.**	**Phase I**
■ HIV-1 integrase inhibitor targeting the LEDGF/p75-integrase interaction site. ■ Results from a phase I study in HIV-negative men were presented at AIDS 2022, reporting favorable safety and PK and plans for a phase IIa clinical trial to be initiated in the United States. A company press release stated the trial would start in the fourth quarter of 2022, and it is now registered and recruiting at multiple sites in the US. ■ A paper published in *PLoS Pathogens* in July 2021 described preclinical results.			
VH4524184	**INSTI**	**ViiV**	**Phase I**
■ A phase I trial evaluating safety, tolerability, PK, and effects on liver enzyme (cytochrome P450 3A) activity in HIV-negative participants is recruiting. ■ A drug-drug interaction study looking at the effects of VH4524184 taken together with an oral contraceptive (Loestrin) is recruiting HIV-negative cisgender women. ■ A phase I trial of LA injectable formulations in HIV-negative people is recruiting. ■ A small phase IIa proof-of-concept trial in people with HIV who have not yet started ART is recruiting and plans to enroll 28 participants.			
VH4011499	**Capsid inhibitor**	**ViiV**	**Phase I**
■ A first-in-human phase I trial evaluating safety, tolerability, and PK in HIV-negative participants has been completed. ■ An international phase IIa proof-of-concept study has recruited people with HIV who are naive to ART to assess antiretroviral activity, safety, tolerability, and PK. ■ A phase IIa trial is investigating single doses of LA injectable formulations given either subcutaneously or intramuscularly to HIV-negative participants. ■ Phase I assessment of the effects of food on bioavailability began in April 2024.			
Bavtavirine (GS-5894)	**NNRTI**	**Gilead**	**Phase I**
■ LA NNRTI evaluated under a phase I open-label master protocol, which has recently been completed. Results are pending.			
GS-1720	**INSTI**	**Gilead**	**Phase I**
■ LA INSTI evaluated under a phase I open-label master protocol, which has recently been completed. ■ Preliminary results presented at CROI 2024 (see main text).			

Product	Class/Type	Company	Development Phase
GS-6212	**INSTI**	**Gilead**	**Phase I**
■ LA INSTI evaluated under a phase I open-label master protocol, which has recently been completed. Results are pending.			
GS-4182	**Capsid inhibitor**	**Gilead**	**Phase I**
■ Listed as being in a phase I trial on the Gilead website pipeline page, no other information available.			
GS-1614	**NRTTI**	**Gilead/Merck**	**Phase I**
■ An LA prodrug of Merck's islatravir being developed in a collaboration involving Calibr, the drug discovery and development division of Scripps Research. ■ Listed as being in a phase I trial on the Gilead website pipeline page.			
TLC-ART 101 (lopinavir, ritonavir, and tenofovir)	**PI + NRTI**	**University of Washington**	**Phase I**
■ Three approved antiretroviral drugs in a "drug combination nanoparticle" (DCNP) LA injectable formulation. ■ First-in-human phase I trial underway in HIV-negative adults.			

ABBREVIATIONS

ART: antiretroviral therapy

ARV: antiretroviral

ASM: American Society for Microbiology

bNAb: broadly neutralizing antibody

CROI: Conference on Retroviruses and Opportunistic Infections

FDA: US Food and Drug Administration

INSTI: integrase strand transfer inhibitor

LA: long-acting

NIAID: US National Institute of Allergy and Infectious Diseases

NIH: National Institutes of Health

NNRTI: non-nucleoside reverse transcriptase inhibitor

NRTI: nucleoside reverse transcriptase inhibitor

NRTTI: nucleoside reverse transcriptase translocation inhibitor

PK: pharmacokinetic(s)

PrEP: Pre-exposure prophylaxis

SHIV: Simian-human immunodeficiency virus