

Preventing Perinatal HIV Transmission

This is a PDF version of the following document:

Module 5: [Prevention of HIV](#)

Lesson 1: [Preventing Perinatal HIV Transmission](#)

You can always find the most up-to-date version of this document at

<https://www.hiv.uw.edu/go/prevention/preventing-perinatal-transmission/core-concept/all>.

Background

Although a cumulative total is not well documented, the World Health Organization estimates that nearly 10 million cases of perinatal HIV transmission have occurred globally since the beginning of the HIV epidemic, with most of these in resource-poor settings.[1] In the United States, the annual number of perinatal HIV infections peaked at 1,650 cases in 1991.[2,3] Since 2018, the number of perinatally-acquired HIV infections among persons born in the United States has been fewer than 50 cases per year (Figure 1).[4] For pregnant women with HIV, the estimated rate of perinatal transmission of HIV in the absence of any HIV prevention intervention is approximately 25%; among children who acquire HIV perinatally, about 20% of the transmission events occur before 36 weeks of gestation, 50% between 36 weeks and delivery, and 30% during active labor and delivery.[5,6] With the use of antiretroviral therapy during pregnancy, followed by postnatal infant antiretroviral prophylaxis (and with the judicious use of elective cesarean section and the avoidance of breastfeeding), the current rate of perinatal HIV transmission rate in the United States is less than 1%.[7,8,9]

Impact of Antiretroviral Therapy on Perinatal HIV Transmission

- Impact of Zidovudine Monotherapy:** In 1994, the landmark Pediatric AIDS Clinical Trials Group (PACTG) 076 trial established that a three-part zidovudine regimen reduced perinatal HIV transmission by 67.5% when compared with placebo (Figure 2).[5] In this trial, the three-part regimen consisted of (1) oral zidovudine initiated at 14 to 34 weeks of gestation and continued throughout pregnancy, (2) intravenous zidovudine given during labor and delivery, and (3) oral zidovudine given to the newborn for 6 weeks. The HIV transmission rate (determined at 18 months after birth) was 8.3% in the three-part zidovudine group compared to 25.5% in the placebo group.[5] Later that year, the U.S. Public Health Service (USPHS) issued guidelines recommending the use of zidovudine to reduce perinatal HIV transmission. The PACTG study and the subsequent USPHS recommendations spurred a dramatic decline in the number of cases of HIV perinatal transmission during the 1990s in the United States.[10]
- Timing of Zidovudine Monotherapy:** In a retrospective study conducted in 1995-1997, investigators analyzed the relative benefit of zidovudine prophylaxis for the prevention of perinatal transmission of HIV based on the timing of when the zidovudine was administered.[11] The greatest transmission benefit was seen with zidovudine therapy if administered during pregnancy, but some benefit occurred even when zidovudine was given later (as intravenous therapy in the intrapartum period or as oral therapy for the infant within 48 hours of birth) (Figure 3).[11]
- Impact of Combination Antiretroviral Therapy:** Clinical trials and observational studies have shown that antiretroviral therapy started in the prenatal period markedly reduce the risk of perinatal

HIV transmission, with the greatest reduction in transmission seen with use of combination antiretroviral therapy ([Figure 4](#)).[\[10,12,13,14\]](#)

Information and Consultation Resources

This topic review will highlight key points from the Perinatal HIV Clinical Guidelines.[\[15\]](#) The full text of the Perinatal HIV Clinical Guidelines should be consulted for all management decisions and for further reading. In addition, expert consultation can be obtained by calling the National Clinician Consultation Center's [Perinatal HIV/AIDS Line](#) at 844-275-6222; this free resource provides information and clinical consultation to medical providers caring for pregnant women with HIV and their infants.

HIV Testing During Pregnancy

Routine HIV Testing in Pregnancy

Multiple organizations strongly recommend routine opt-out HIV testing for all pregnant women as early as possible in the pregnancy.[[16,17,18,19](#)] The recommendation to test all pregnant women for HIV applies to persons presenting at any stage of pregnancy, including during labor.[[16](#)] Early identification of HIV in pregnancy provides an opportunity to (1) administer antiretroviral therapy to persons with HIV during pregnancy, (2) optimize strategies during delivery to minimize transmission risk, (3) give post-delivery antiretroviral therapy to the newborn, and (4) counsel on avoiding breastfeeding—all of which markedly reduce the risk of perinatal HIV transmission. In addition, the sex partners of all pregnant women should undergo testing for HIV if their status is unknown.[[16](#)] Maternal HIV test results should be communicated to the newborn's medical provider and documented in the newborn's chart.[[16](#)]

Repeat Testing During Pregnancy

Pregnant women with a negative HIV test result in the first trimester of pregnancy should undergo repeat HIV testing in any of the following situations.[[16,17](#)]

- Risk factors that warrant repeat testing in the third trimester include those who have a sex partner with HIV with has a detectable (or unknown) HIV RNA level, those receiving care in facilities that have an HIV incidence of at least 1 case per 1,000 pregnant women per year, those who reside in jurisdictions with elevated HIV incidence, and those who reside in states that mandate third-trimester testing.[[16](#)]
- In addition, repeat third trimester HIV testing should be performed if a pregnant woman has a suspected or confirmed diagnosis of a sexually transmitted infection (STI).[[16](#)] Pregnant women with a confirmed STI and a confirmed negative HIV test should be referred for HIV preexposure prophylaxis (PrEP).[[16](#)]
- Pregnant women who present in labor with unknown HIV status (or who are at high risk for HIV acquisition but have not undergone repeat third-trimester HIV testing), should have an expedited HIV test (i.e., results available within 1 hour) performed during labor. If that is not feasible, then expedited HIV testing should be done in the immediate postpartum period.[[16](#)]
- Any pregnant or breastfeeding woman who presents with symptoms suggestive of acute HIV should have prompt diagnostic evaluation for acute HIV with an HIV-1/2 antigen antibody test and an HIV RNA, even if they have previously undergone HIV testing during the pregnancy.[[16,20](#)]

Antepartum Management

Indications for Antiretroviral Therapy in Pregnancy

The Perinatal HIV Clinical Guidelines recommend using combination antiretroviral therapy for all pregnant women with HIV, regardless of CD4 count or HIV RNA level, to decrease the risk of perinatal HIV transmission and to benefit the pregnant woman's health.[14,21,22] All instances of antiretroviral exposure during pregnancy should be reported online to the [Antiretroviral Pregnancy Registry](#). The risk of perinatal HIV transmission increases with higher maternal plasma HIV RNA levels, but transmission can occur in pregnant women with low plasma HIV RNA levels.[23] Therefore, even pregnant women with a low plasma HIV RNA level should receive antiretroviral therapy. Regardless of antiretroviral therapy use, pregnant women with HIV may be at risk for adverse outcomes, such as hypertensive pregnancy disorders or neonatal complications, including preterm delivery, low birth weight infants, or stillbirth.

Timing of Initiating Antiretroviral Therapy in Pregnancy

Due to the overwhelming benefits of antiretroviral therapy in preventing perinatal HIV transmission, the Perinatal HIV Clinical Guidelines recommend that all women with HIV who become pregnant and are not receiving antiretroviral therapy should start antiretroviral therapy without delay.[22] Prior to starting antiretroviral therapy, HIV genotypic drug-resistance testing should be ordered, but treatment should not be delayed while waiting for the drug resistance test results; the antiretroviral regimen can subsequently be modified if needed, based on the HIV drug resistance test results.[22,24] Given that approximately 50% of perinatal transmissions occur between 36 weeks and the time of birth, intense efforts are warranted to lower HIV RNA levels as much as possible prior to the delivery, even for those individuals who are diagnosed with HIV late in pregnancy.[1,6]

Recommended Regimens in Treatment-Naïve Pregnant Women

The Perinatal HIV Clinical Guidelines provide recommendations for initial combination regimens for antiretroviral-naïve pregnant women that include five categories: preferred, alternative, insufficient data, not recommended except in special circumstances, and not recommended.[25] Recommended antiretroviral medications may differ from non-pregnant adults with HIV as physiologic changes during pregnancy may impact the absorption, distribution, metabolism, and excretion of these medications and lead to changes in drug concentrations and effectiveness.[25]

Preferred Regimens for Use as Initial Antiretroviral Therapy in Pregnancy

The preferred antiretroviral regimens for pregnant women who have not previously received antiretroviral therapy or long-acting injectable cabotegravir for HIV PrEP consist of a preferred dual nucleoside reverse transcriptase inhibitor (NRTI) backbone (tenofovir alafenamide-emtricitabine, tenofovir alafenamide plus lamivudine, tenofovir DF-emtricitabine, or tenofovir DF-lamivudine) plus a preferred integrase strand transfer inhibitor (INSTI) anchor drug (bictegravir or dolutegravir).[25,26] Note that bictegravir is available only as the fixed-dose combination bictegravir-tenofovir alafenamide-emtricitabine. For individuals who have previously received injectable cabotegravir, the preferred treatment is with a protease inhibitor (PI)-based regimen (twice-daily darunavir boosted with ritonavir plus a preferred NRTI dual backbone); this recommendation is based on concerns about possible integrase resistance in the setting of HIV acquisition during prior cabotegravir exposure for HIV PrEP ([Table 1](#)).[25]

Alternative Regimens for Use as Initial Antiretroviral Therapy in Pregnancy

The following table summarizes the recommendations for alternative initial regimens in pregnancy ([Table 2](#)). [25]

Women on Antiretroviral Therapy Who Become Pregnant

In most circumstances, if a woman with HIV is taking a fully suppressive antiretroviral regimen and becomes pregnant, she should continue the current antiretroviral regimen; discontinuing therapy could cause a viral rebound that could increase the risk of HIV transmission to the fetus.[27] There are several medications or regimens that require special consideration, including some that may require discontinuation.[27,28] The Perinatal HIV Clinical Guidelines provide detailed situation-specific recommendations for the use of antiretroviral drugs in pregnant women and nonpregnant women who are trying to conceive.[28] The following summarizes recommendations for several of these key recommendations.

- **Injectable Cabotegravir-Rilpivirine:** Data for the use of injectable cabotegravir-rilpivirine during pregnancy are limited. Accordingly, cabotegravir-rilpivirine should not be selected as first-line antiretroviral therapy in treatment-naïve pregnant women or for women who are actively trying to conceive.[28] For women who become pregnant while taking long-acting injectable cabotegravir-rilpivirine, expert consultation should be obtained. Shared clinical decision-making between patient and provider is recommended regarding whether to switch to a preferred antiretroviral regimen for pregnancy versus remaining on injectable cabotegravir-rilpivirine during pregnancy.[27] If the woman remains on injectable cabotegravir-rilpivirine during pregnancy, it should be dosed every 4 weeks and more frequent HIV RNA monitoring (e.g., every 1–2 months) is recommended.[27]
- **Oral Two-Drug Regimens:** There are limited data on oral two-drug regimens (dolutegravir-rilpivirine, dolutegravir-lamivudine, and doravirine-islatravir) for use in pregnancy. The oral 2-drug regimen dolutegravir-lamivudine is considered an *Alternative Regimen* for use in pregnancy.[25] If a woman becomes pregnant while taking either dolutegravir-lamivudine or dolutegravir-rilpivirine, the same 2-drug regimen can be continued, provided the woman has viral suppression, and if more frequent HIV RNA monitoring is conducted (typically every 1-2 months).[27] There are no recommendations at this time on the management of a woman with HIV who becomes pregnant while taking doravirine-islatravir.
- **Cobicistat-Boosted Regimens:** Use of cobicistat-containing antiretroviral regimens during pregnancy is associated with lower plasma drug concentrations, particularly during the second and third trimesters.[27,29] Therefore, cobicistat-containing regimens may have an increased risk of virologic failure late in the pregnancy.[27,29] As such, initiating antiretroviral therapy with a cobicistat-containing regimen is not recommended for pregnant women. If a woman becomes pregnant while taking a fully suppressive antiretroviral regimen that includes cobicistat, continuing the regimen can be considered with shared decision-making, provided there is frequent HIV RNA monitoring (e.g., every 1–2 months) throughout the pregnancy.[27,28] Alternatively, the medical provider may consider switching to a more effective and preferred regimen for use during pregnancy.[27,28]
- **Doravirine:** There are insufficient data on doravirine in pregnancy to recommend its use at this time. If a woman with suppressed plasma HIV RNA levels on a doravirine-containing regimen becomes pregnant, then the decision regarding whether to switch must be made in consultation with the clinical provider, taking into account the possibility of viral rebound that may occur during a regimen change.[27,30] If the decision is made to continue the same regimen, then HIV RNA levels should be monitored more frequently, typically every 1 to 2 months.[27,30]
- **Fostemsavir, Ibalizumab, Maraviroc, and Lenacapavir:** Although these medications are not recommended for use as initial antiretroviral therapy in pregnancy due to limited data, they are often used as part of a combination antiretroviral therapy for individuals who are highly treatment-experienced with complex HIV drug resistances. If such an individual were to become pregnant, expert consultation is recommended. Shared clinical decision-making should be used to determine if a regimen change is indicated, and the patient should be informed about the lack of pregnancy safety data with these medications. If the decision is made to continue the same regimen, then HIV RNA levels should be monitored more frequently, typically every 1 to 2 months.[28]

Pregnant Women with Prior Antiretroviral Experience but Not on Therapy

Some women with HIV who become pregnant may have previously received antiretroviral medication but are not currently taking any antiretroviral medications at the time when they are first evaluated during their pregnancy. In this situation, it is very important to obtain detailed information regarding past regimens, tolerance of prior medications, evidence of prior virologic failure, and resistance testing data, if available.[31] If the pregnant woman's current HIV RNA level is above the threshold for genotypic drug-resistance testing (typically greater than 200 copies/mL), then resistance testing should be ordered prior to starting the antiretroviral regimen during the pregnancy. After the drug resistance test blood sample has been obtained, antiretroviral therapy should be started, with modification of the regimen as needed when results from the drug resistance test become available.[31] For pregnant women who previously took antiretroviral therapy and had no history of virologic failure or HIV drug resistance, reinitiation of antiretroviral therapy is generally uncomplicated. For treatment-experienced persons with suspected multidrug-resistant HIV, selecting an antiretroviral regimen depends on drug-resistance testing, and should be done by or in conjunction with an HIV treatment specialist.[31]

Antiretroviral-Naïve Pregnant Women who Present in the Third Trimester

Because INSTI-based regimens cause a very rapid decline in HIV RNA levels (estimated 2 log decline in 2 weeks), the Perinatal HIV Clinical Guidelines recommend using bicitgravir-tenofovir alafenamide-emtricitabine or a dolutegravir-based regimen for pregnant women who are starting antiretroviral therapy late in pregnancy.[14,32,33]

Monitoring HIV RNA and CD4 Count During Pregnancy

For pregnant women with HIV, the following is recommended for monitoring HIV RNA levels during pregnancy:[34]

- An HIV RNA level at the first antenatal visit.
- For pregnant women initiating (or changing) an antiretroviral drug regimen, check the HIV RNA level after 2 to 4 weeks and then monthly until viral suppression has been achieved (i.e., HIV RNA ≤ 50 copies/mL). In pregnancy, achieving undetectable levels quickly is crucial, as lower viral loads—especially ≤ 50 copies/mL—are linked to the lowest risk of perinatal transmission.
- In pregnant women with undetectable HIV RNA levels, check HIV RNA levels at least every 3 months.
- For all pregnant women, check an HIV RNA level at approximately 36 weeks of gestation (or within 4 weeks of planned delivery) to inform decisions about mode of delivery.

For pregnant women with HIV, the following is recommended for monitoring of CD4 cell count during pregnancy.[34]

- The CD4 cell count should be checked at the first antenatal visit.
- Women who have been on antiretroviral therapy for at least 2 years with consistently suppressed HIV RNA levels and CD4 counts consistently greater than 300 cells/mm³ do not need CD4 count monitoring after the initial antenatal visit during pregnancy.
- Monitoring of CD4 cell counts should be conducted every 3 to 6 months during pregnancy for women who have any of the following: (1) receipt of antiretroviral therapy for less than 2 years and a CD4 count less than 300 cells/mm³, or (2) inconsistent adherence, or (3) detectable HIV RNA levels. For pregnant women who have been on antiretroviral therapy for less than 2 years and have a CD4 count greater than or equal to 300 cells/mm³, the CD4 cell count should be monitored every 6 months.

Pregnant Women Who Have Not Achieved Viral Suppression

Management of pregnant women who have not achieved virologic suppression is complex and should typically involve expert consultation or management by a specialist.[35] Management should include drug resistance testing if HIV RNA levels are adequately elevated (typically greater than 200 copies/mL) to perform

genotypical drug-resistance testing. Note: expert consultation can be obtained by contacting The National Clinical Consultation Center [Perinatal HIV/AIDS hotline](#) (844-275-6222).

Intrapartum Management

For pregnant women with HIV, the major management decisions at the time of labor are whether to administer intravenous zidovudine and whether to perform cesarean section. These decisions are primarily based on the pregnant woman's antiretroviral history during the pregnancy and recent HIV RNA levels. Pregnant women who have been taking antiretroviral therapy prior to onset of labor should continue taking their antiretroviral regimen on schedule (or as close to as possible) during and after labor.[36] If, however, the oral antiretroviral regimen includes zidovudine and the pregnant woman receives intravenous zidovudine during labor, the oral zidovudine can be held while she receives intravenous zidovudine.[36]

In Labor without Antepartum Antiretroviral Therapy

Expedited HIV-1/2 antigen-antibody immunoassay is recommended for pregnant women who present in labor and have unknown HIV antibody status and for pregnant women who have a high risk for HIV acquisition but were not tested for HIV during their third trimester of pregnancy.[36] In addition, any pregnant woman presenting in labor with symptoms of acute HIV (or with a history of a recent HIV exposure) should get an HIV RNA level in addition to an expedited HIV antigen-antibody immunoassay.[36] Pregnant women who have a reactive test (preliminary positive) should be assumed to have HIV, and all available prevention measures (for the pregnant woman and the infant) should be initiated immediately to reduce the risk of perinatal transmission.[36] If the initial HIV antigen-antibody immunoassay is positive, additional confirmatory testing should be performed with an HIV-1/2 differentiation assay and an HIV RNA level.[36] In this situation, the infant should immediately start on oral antiretroviral therapy, and potential continuation of antiretroviral therapy for the mother and infant will depend on the results of subsequent HIV confirmatory tests.[36]

- **Intrapartum Zidovudine:** Since a substantial proportion of perinatal HIV transmission occurs at or near the time of delivery, intrapartum intravenous zidovudine should be provided to all pregnant women with HIV who are newly diagnosed at the time of labor, pregnant women with known HIV who are not taking antiretroviral therapy late in pregnancy, and pregnant women with HIV who have an unknown HIV RNA level.[36] The administration of intravenous zidovudine should include individuals who have a positive HIV antigen-antibody immunoassay, but confirmatory testing (HIV RNA and/or HIV antibody differentiation) results are not yet known. The use of intrapartum and postpartum zidovudine for the newborn reduces the risk of perinatal HIV transmission from 27% to 10%.[11]
- **Cesarean Delivery:** Most experts recommend cesarean delivery for pregnant women newly diagnosed with HIV at the time of labor and for those with known HIV who are not on antiretroviral therapy, since these women are likely to have an HIV RNA level above 1,000 copies/mL—the threshold for elective cesarean section.[36] Cesarean delivery is also recommended for pregnant women with HIV who have a known HIV RNA level of greater than 1,000 copies/mL obtained within 4 weeks of delivery.[36] The benefit of cesarean section after rupture of membranes or onset of labor is unknown.

Guidance for Intravenous Zidovudine Use in Labor

Intravenous zidovudine, when given early in labor, rapidly crosses the placenta and thus can efficiently provide high systemic levels of zidovudine for the infant. Available data show the use of intravenous zidovudine in labor reduces perinatal HIV transmission when the pregnant woman has an HIV RNA level greater than 1,000 copies/mL near the time of delivery—defined as 34 to 36 weeks of gestation or within 4 weeks before delivery.[37] Accordingly, the Perinatal HIV Clinical Guidelines recommendation for the use of intravenous zidovudine for the pregnant woman during delivery depends on the individual's HIV RNA level near the time of delivery and whether there are any concerns regarding adherence with antiretroviral medication near delivery.[36]

- **HIV RNA Level >1,000 copies/mL, Unknown, or Suspected to be >1,000 copies/mL:** Intravenous zidovudine during delivery is recommended in all these settings. In addition, if there is

doubt about a pregnant woman's adherence with the antiretroviral therapy regimen near delivery, then intravenous zidovudine during delivery is recommended, regardless of the prior HIV RNA level.

- **HIV RNA Level between 50 and 1,000 copies/mL:** For pregnant women with HIV who have an HIV RNA level between 50 and 1,000 copies/mL within 4 weeks of delivery, inadequate data exist to guide a clear recommendation, but some experts would use intravenous zidovudine in this setting; these situations should be addressed, ideally with expert consultation, on a case-by-case basis.
- **Maternal HIV RNA Level ≤ 50 copies/mL:** The use of intrapartum zidovudine is not required in pregnant women who have an HIV RNA level equal to or less than 50 copies/mL within 4 weeks of delivery, if they are receiving and adhering with antiretroviral therapy.

Dosing of Zidovudine in Labor

For women who present in labor, if indicated, intravenous zidovudine should ideally be started at the onset of active labor. The recommended intravenous dose of zidovudine during labor is a 2 mg/kg loading dose over the first hour, followed by a continuous infusion of 1 mg/kg/hour for at least 2 hours (total minimum of 3 hours); the intravenous zidovudine should be continued throughout labor until delivery.[\[36,38\]](#) If a cesarean section is scheduled, the same dosing is recommended, but the loading dose should ideally be started 3 hours before the scheduled procedure. The intravenous zidovudine should ideally be started at the onset of active labor. For pregnant women scheduled to have a cesarean delivery, the intravenous infusion should be started at least 3 hours prior to the scheduled delivery and continued until delivery.[\[36\]](#)

Indications for Cesarean Section Delivery

The guidance for performing cesarean delivery to prevent HIV transmission depends predominantly on the pregnant woman's HIV RNA level near delivery. For this reason, obtaining an HIV RNA level at approximately 36 weeks' of gestation is recommended. Note that for pregnant women, HIV coinfection with either hepatitis C virus (HCV) or hepatitis B virus (HBV) is not an independent indication for cesarean section.[\[39,40\]](#) In addition, the pregnant woman's CD4 cell count has no bearing on recommendations regarding cesarean delivery. The Perinatal HIV Clinical Guidelines recommend the following based on the HIV RNA level of the pregnant woman:[\[36\]](#)

- **HIV RNA Level $>1,000$ copies/mL or Unknown HIV RNA Level:** A scheduled cesarean delivery at 38 weeks of gestation is recommended for all pregnant women with HIV who have an HIV RNA level greater than 1,000 copies/mL within 4 weeks of delivery or with unknown HIV RNA levels near the time of delivery, regardless of whether they are receiving antiretroviral therapy. If, however, antiretroviral therapy is initiated late in pregnancy (with an INSTI-based antiretroviral therapy regimen), rapid viral load reduction would be expected, and some experts would consider extending the pregnancy beyond 38 weeks, with the goal of achieving virologic suppression and avoiding cesarean birth. In this situation, establishing an individualized birth plan to extend the pregnancy past 38 weeks should be done with expert consultation and shared decision-making, and guidance is available from the National Perinatal HIV/AIDS Clinical Consultation Center.
- **HIV RNA $\leq 1,000$ copies/mL:** Insufficient data exist to indicate cesarean delivery would reduce the risk of HIV transmission for pregnant women receiving antiretroviral therapy who have detectable viremia that is less than or equal to 1,000 copies/mL within 4 weeks of delivery. Accordingly, cesarean delivery is not recommended for the purpose of preventing HIV transmission for pregnant women who have an HIV RNA level of less than 1,000 copies/mL within 4 weeks of delivery.
- **HIV RNA Level $>1,000$ copies/mL and Rupture of Membranes:** For pregnant women who have an HIV RNA level above 1,000 copies/mL within 4 weeks of delivery, but who present with rupture of membranes (or present after the onset of labor), the benefit of cesarean delivery is unknown; a meta-analysis has found that the risk of HIV transmission increases by 2% every hour following rupture of membranes. Management of these women should be individualized.
- **HIV RNA Level $\leq 1,000$ copies/mL and Rupture of Membranes:** For pregnant women receiving antiretroviral therapy who have an HIV RNA level less than or equal to 1,000 copies/mL within 4 weeks

of delivery, the duration of membrane rupture has not been shown to correlate with risk of perinatal HIV transmission and vaginal delivery is recommended in this setting.[[36,41,42,43](#)] Complex cases should be managed in consultation with an expert in HIV perinatal transmission.

Timing for Cesarean Section Delivery

Despite the potential risk of iatrogenic prematurity, the American Congress of Obstetricians and Gynecologists (ACOG) and the Perinatal HIV Clinical Guidelines recommend performing an elective cesarean delivery for pregnant women who have an HIV RNA level greater than 1,000 copies/mL (or unknown HIV RNA levels) at 38 weeks of gestation to avoid onset of labor.[[36](#)] If the pregnant woman has an HIV RNA level less than 1,000 copies/mL and the decision is made to perform cesarean delivery for obstetric reasons, the elective cesarean delivery should be performed at the standard time for the specific obstetrical indication.[[36](#)]

Obstetric Procedures and Risk of HIV Transmission

Although limited data exist regarding the impact of obstetrical procedures on HIV transmission risk, the Perinatal HIV Clinical Guidelines recommend against routine use of the following procedures: artificial rupture of membranes, invasive fetal scalp monitoring with scalp electrodes, and operative delivery with forceps or vacuum extractor (particularly for women with an HIV RNA level that is 50 copies/mL or higher or unknown HIV RNA level).[[13](#)] If, however, any of these procedures are deemed to have a clear obstetrical indication, they should be performed. The possible risk of HIV transmission from these procedures is likely lower in pregnant women who have an undetectable HIV RNA level at the time of delivery. Epidural anesthesia is considered safe during labor, regardless of the antiretroviral regimen the individual is receiving.[[36](#)] In addition, the indications for episiotomy should be the same for pregnant women with or without HIV.

Acute HIV in Pregnancy and in the Postpartum Period

Diagnosis of Acute HIV in Women who are Pregnant or Breastfeeding

Women who are pregnant or breastfeeding have an increased risk of acquiring HIV.[\[44,45\]](#) Acute HIV that occurs during pregnancy or while breastfeeding confers a very high risk of HIV transmission to the child because of the high HIV RNA levels in the mother's plasma, genital tract, and breastmilk that occur with acute infection. In one cohort study in New York State, investigators reported the rate of perinatal transmission was 22% among neonates born to women who acquired HIV during pregnancy compared to 1.8% of newborns born to women who did not acquire HIV during pregnancy.[\[46\]](#) Therefore, pregnant or breastfeeding women with symptoms of acute retroviral syndrome should undergo prompt evaluation for acute HIV infection.[\[20\]](#) When acute HIV is suspected during pregnancy or while breastfeeding, the evaluation should include an HIV RNA assay in combination with an HIV-1/2 antigen-antibody immunoassay.[\[20\]](#) If acute HIV is diagnosed during pregnancy or in a breastfeeding person, an HIV drug resistance genotype should be simultaneously ordered, along with antiretroviral therapy initiation, and contact should be initiated with a pediatric HIV expert.[\[24\]](#)

Antiretroviral Therapy for Acute HIV in Pregnancy

Given the high risk of HIV transmission to the fetus in the setting of acute maternal HIV infection, the Perinatal HIV Clinical Guidelines recommend that pregnant or breastfeeding women with acute HIV infection should immediately begin triple antiretroviral therapy while the HIV drug resistance genotype is pending.

- **Acute HIV in Pregnancy:** For women who are pregnant and have acute HIV and have not previously received long-acting injectable cabotegravir for HIV PrEP, the preferred antiretroviral regimen (regardless of the trimester) is bictegravir-tenofovir alafenamide-emtricitabine or dolutegravir plus a preferred dual NRTI backbone (tenofovir alafenamide-emtricitabine, tenofovir alafenamide plus lamivudine, tenofovir DF-emtricitabine, tenofovir DF-lamivudine).[\[20\]](#) Dolutegravir-lamivudine, an alternative regimen, should not be used for empiric treatment of acute or recent HIV infection, as it requires results for HIV RNA, HIV genotype, and hepatitis B testing.[\[20\]](#) If the pregnant woman has been previously exposed to long-acting injectable cabotegravir for HIV PrEP, twice-daily ritonavir-boosted darunavir plus a preferred dual NRTI backbone.[\[20\]](#) If needed, adjustments to the regimen can be made once the genotype results are known.[\[20\]](#)

Acute HIV in the Postpartum Period

If acute HIV is suspected in a breastfeeding mother in the postpartum period, the mother should receive counseling to immediately stop breastfeeding to reduce the risk of HIV transmission to the child.[\[20\]](#) In this situation, expert consultation should be obtained regarding the evaluation and management of the breastfeeding infant who may have been exposed to HIV.[\[20\]](#) If acute HIV is diagnosed in the mother, then breastfeeding should be permanently discontinued, HIV drug resistance genotype should be ordered, and the mother newly diagnosed with HIV should be promptly started on antiretroviral therapy.[\[20\]](#) Note that in the postpartum period, darunavir can be boosted with either cobicistat or ritonavir, and both the boosting agent and darunavir can be given once daily.[\[20,47\]](#) Selection of an appropriate postpartum antiretroviral regimen should be based on recommendations in the Adult and Adolescent ARV Guidelines.[\[48\]](#)

Management of Infants with Perinatal HIV Exposure

Appropriate antiretroviral management of infants born to pregnant women with HIV plays a significant role in preventing perinatal HIV transmission. Conceptually, it is important to understand three different types of antiretroviral regimens used in the management of newborns with *in utero* or intrapartum exposure to HIV: (1) prophylaxis (one or more medications used as antiretroviral prophylaxis), (2) presumptive HIV therapy (three-drug combinations), and (3) treatment for documented HIV infection of the newborn (three-drug combinations) ([Table 3](#)).[49]

Neonatal Antiretroviral Medications Based on Risk of HIV Acquisition

All newborns with *in utero* and/or intrapartum exposure to HIV should receive antiretroviral medications in the neonatal period, with the first doses initiated as soon as possible after birth, ideally within 6 hours following delivery.[49] The regimens chosen are based on the neonate's risk of HIV acquisition and the infant's HIV NAT results at birth. The stratified risk of perinatal HIV transmission is estimated primarily by (1) whether the mother received antiretroviral therapy during pregnancy, (2) the mother's HIV RNA level after week 20 gestation, and (3) the mother's HIV RNA within the 4 weeks prior to delivery ([Table 4](#)).[49]

Dosing of Antiretroviral Medications in Neonates

As outlined in the following table, the dosing for all antiretroviral medications in newborns should be based on weight and gestational age ([Table 5](#)).[49]

Additional Initial Care of the Neonate Exposed to HIV

In addition to providing antiretroviral management for all neonates born to women with HIV, other aspects of care need to be addressed. Following delivery, infants born to persons with HIV require hematological monitoring in addition to routine infant care; there is no evidence that changes in routine bathing practices or timing of circumcision are required.[50] A complete blood count (CBC) and differential should be performed at birth prior to the initiation of infant antiretroviral drug prophylaxis and again at 4 weeks of age, since anemia is the primary complication of zidovudine.[50] In addition, some experts advise checking serum chemistry and liver function tests depending on which antiretroviral therapies the infant was exposed to *in utero*.

Evaluating the Infant for HIV

Initial HIV testing in infants should be performed using an HIV nucleic acid test (NAT)—with either an HIV DNA or HIV RNA assay.[51] Routine HIV antigen-antibody testing should not be used to diagnose HIV in newborns, since HIV antibody crosses the placenta and can persist for 6–18 months of age.[51] In addition, the HIV p24 antigen is less sensitive than HIV NAT.[51] For the criteria listed below for presumptive and definitive exclusion of infant HIV infection, the child should not have any laboratory or clinical indicator that may suggest HIV infection (e.g., a low CD4 cell count or any clinical findings).

- **Recommended Testing:** The recommended schedule for HIV NAT in infants with perinatal HIV exposure depends on whether the risk of HIV acquisition is considered low or high. Infants considered to be at high-risk for perinatal acquisition of HIV should have HIV NATs performed at birth, 14 to 21 days of life, 1 to 2 months of age, 2 to 3 months of age, and 4 to 6 months of age. Infants with a low risk of perinatal HIV exposure (who are not breastfed) should have HIV NAT performed at 14 to 21 days of life, 1 to 2 months of age, and 4 to 6 months of age; testing at birth is not required but should be considered if there is concern for follow-up. For low-risk infants who are breastfed, birth HIV testing is recommended ([Figure 6](#)).[51] For infants who received presumptive HIV therapy, the HIV testing should be repeated 2–6 weeks after the antiretroviral therapy is stopped; this typically corresponds with the 2–3 month testing.
- **Recommended Subsequent Testing for Breastfed Infants:** For infants with perinatal exposure

for whom breastfeeding continues after the infant is 6 months of age, NAT testing should be continued and performed every 3 months.[51] Further, HIV NAT should be obtained at 6 weeks, 3 months, and 6 months after cessation of breastfeeding, regardless of the age when breastfeeding is stopped.[51]

- **Testing for Non-B Virus Subtypes:** Due to the increasing proportion of foreign-born children with HIV in the United States, testing for non-B viral subtypes is now recommended, and HIV NAT should be performed in a laboratory that will detect non-B HIV subtypes if the birthing parent is known to have or suspected to have non-B subtype HIV.[50,51]
- **Antibody Testing After 12 Months of Age:** A negative HIV antibody test at 12 to 18 months of age provides further confirmation of the child's HIV-negative status, and some experts perform antibody testing at this age in infants with prior negative HIV NAT.[50,51]
- **Presumptive Exclusion of HIV:** In non-breastfed infants, HIV can presumptively be excluded when any of the following criteria are met: (1) two or more negative HIV NATs (one at age ≥ 2 weeks and one test at ≥ 4 weeks), (2) one negative virologic test at age ≥ 8 weeks at least 2 weeks after discontinuation of multidrug antiretroviral prophylaxis, or (3) one negative HIV antibody test at age ≥ 6 months.[51]
- **Definitive Exclusion of HIV:** Definitive exclusion of HIV in non-breastfed infants can be based on either (1) two or more negative virologic tests (one test at age ≥ 1 month and at least 2-6 weeks after discontinuing multidrug antiretroviral prophylaxis and another test at age ≥ 4 months), or (2) two negative HIV antibody tests obtained from separate specimens at age ≥ 6 months.[51]
- **Indeterminate HIV Status:** This refers to an HIV-exposed child aged younger than 18 months of age who was born to a person with HIV, and the child does not meet the criteria for having HIV or for not having contracted HIV.[51]

***Pneumocystis* Pneumonia Prophylaxis for the Infant**

At 4 to 6 weeks of age, all infants born to individuals with HIV should begin prophylaxis for *Pneumocystis* pneumonia unless HIV has been presumptively excluded with virologic testing.[50] With appropriate testing, most infants with perinatal HIV exposure will not require *Pneumocystis* pneumonia prophylaxis, as HIV can be presumptively excluded by the time postnatal antiretroviral prophylaxis is completed.[50] The preferred agent for *Pneumocystis* pneumonia prophylaxis in neonates is trimethoprim-sulfamethoxazole.[52] The prophylaxis for *Pneumocystis* pneumonia can be discontinued if the HIV diagnosis in the child is presumptively or definitively excluded.

Postpartum Follow-Up for Women with HIV

Infant Feeding recommendations in the United States

All pregnant women should receive counseling on breastfeeding.[53] The options and recommendations in the Perinatal HIV Clinical Guidelines for breastfeeding and infant feeding, as outlined below, should be informed by whether the mother is taking antiretroviral therapy and has suppressed plasma HIV RNA levels.[49,53] If the mother indicates a desire for breastfeeding, discussions and plans for infant antiretroviral prophylaxis during breastfeeding should take place during the antepartum period and be readdressed at birth and at regular intervals.

- **Mother Does Not Have Virologic Suppression:** In general, for women with HIV who give birth and who are not on antiretrovirals (or are taking antiretrovirals without virologic suppression during pregnancy), breastfeeding is not recommended. These women should be given information on formula or banked pasteurized donor human milk in order to mitigate the risk of HIV transmission to the infant from breast milk.
- **Mother has Suppressed HIV RNA Levels:** For women with HIV who give birth and are taking antiretroviral therapy and have undetectable plasma HIV RNA levels, studies in resource-limited settings have shown the risk of HIV transmission via breastfeeding in the setting of virologic suppression is quite low (less than 1%), albeit not zero.[53,54,55] For women with sustained viral suppression on antiretroviral therapy, the Perinatal HIV Clinical Guidelines recommend the mother and medical provider engage in informed, shared decision-making regarding the risk-benefit ratio of breastfeeding. Regardless of whether the patient chooses to breastfeed or formula feed, their health care provider should support the decision.

Antiretroviral Therapy for Infants When Mother is Breastfeeding

For those women with sustained viral suppression who choose to breastfeed, due to lack of data, there is no consensus on the optimal antiretroviral therapy regimen and duration for infants. Most experts would recommend one of the following three options for the newborn: (1) extending the duration of zidovudine prophylaxis from 2 weeks to 4–6 weeks, (2) using nevirapine prophylaxis for 6 weeks, or (3) extending the duration of nevirapine throughout breastfeeding.[49] The following summarizes recommendations for infant antiretroviral therapy based on the mother's HIV RNA levels.[49]

Sustained Maternal Viral Suppression (HIV RNA

Summary Points

- All pregnant women should undergo screening for HIV, including women who present in labor without prior testing during the pregnancy.
- For pregnant women with HIV, perinatal HIV transmission rates of less than 1% can be achieved with a comprehensive, multipronged approach that includes suppressive combination antiretroviral therapy during pregnancy, use of elective cesarean section (when indicated), intravenous zidovudine during labor (when indicated), and postnatal infant antiretroviral prophylaxis.
- All pregnant women should receive antiretroviral therapy throughout the pregnancy. The preferred initial antiretroviral regimens for women who have never previously received antiretrovirals consist of bictegravir-tenofovir alafenamide-emtricitabine or dolutegravir plus a preferred dual NRTI backbone. In most circumstances, women with established HIV who become pregnant and are already taking fully suppressive antiretroviral therapy should continue the same regimen. Consideration should be given to switching from any 2-drug regimen or any regimen that contains cobicistat.
- Laboratory monitoring of HIV RNA levels should occur every 3 months during pregnancy to evaluate for viral suppression; more frequent HIV RNA monitoring (every 1 to 2 months) may be needed depending on the antiretroviral regimen taken during pregnancy. Obtaining an HIV RNA level at 36 weeks of gestation, or within 4 weeks of planned delivery, is important in making decisions about delivery and newborn management.
- Pregnant women who present late to prenatal care should start on antiretroviral therapy immediately, and additional interventions, including intravenous zidovudine and elective cesarean section, may be recommended to help decrease the risk of perinatal transmission.
- For pregnant women with HIV, cesarean section and intravenous zidovudine during labor are indicated if the HIV RNA level is greater than 1,000 copies/mL within the 4 weeks prior to delivery (or if they have an unknown HIV RNA level within the 4 weeks prior to delivery).
- Evaluation for HIV infection of infants younger than 18 months of age who are born to women with HIV requires use of HIV nucleic acid amplification tests; a positive HIV antibody test is not reliable since HIV antibodies cross the placenta and often persist in the infant for at least 18 months. Infants born to women with HIV should receive antiretroviral management based on the infant's risk of having acquired HIV.
- Women with untreated HIV who give birth are advised to avoid breastfeeding due to the risk of transmitting HIV to their infant through colostrum and breastmilk and the availability of affordable, safe, and acceptable feeding alternatives. Postpartum women who have undetectable HIV RNA levels on stable antiretroviral therapy should have a discussion with their healthcare provider regarding the risks and benefits of breastfeeding.

Citations

1. McGowan JP, Shah SS. Prevention of perinatal HIV transmission during pregnancy. *J Antimicrob Chemother.* 2000;46:657-68.
[\[PubMed Abstract\]](#) -
2. Whitmore SK, Taylor AW, Espinoza L, Shouse RL, Lampe MA, Nesheim S. Correlates of mother-to-child transmission of HIV in the United States and Puerto Rico. *Pediatrics.* 2012;129:e74-81.
[\[PubMed Abstract\]](#) -
3. Centers for Disease Control and Prevention (CDC). Achievements in public health. Reduction in perinatal transmission of HIV infection--United States, 1985-2005. *MMWR Morb Mortal Wkly Rep.* 2006;55:592-7.
[\[PubMed Abstract\]](#) -
4. Centers for Disease Control and Prevention. Monitoring Selected National HIV Prevention and Care Objectives by Using HIV Surveillance Data—United States and 6 Dependent Areas, 2022. *HIV Surveillance Supplemental Report.* 2024;29(No. 2). Published May 2024.
[\[CDC\]](#) -
5. Connor EM, Sperling RS, Gelber R, et al. Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. Pediatric AIDS Clinical Trials Group Protocol 076 Study Group. *N Engl J Med.* 1994;331:1173-80.
[\[PubMed Abstract\]](#) -
6. Kourtis AP, Bulterys M, Nesheim SR, Lee FK. Understanding the timing of HIV transmission from mother to infant. *JAMA.* 2001;285:709-12.
[\[PubMed Abstract\]](#) -
7. Nesheim S, Taylor A, Lampe MA, et al. A framework for elimination of perinatal transmission of HIV in the United States. *Pediatrics.* 2012;130:738-44.
[\[PubMed Abstract\]](#) -
8. Townsend CL, Cortina-Borja M, Peckham CS, de Ruiter A, Lyall H, Tookey PA. Low rates of mother-to-child transmission of HIV following effective pregnancy interventions in the United Kingdom and Ireland, 2000-2006. *AIDS.* 2008;22:973-81.
[\[PubMed Abstract\]](#) -
9. Warszawski J, Tubiana R, Le Chenadec J, et al. Mother-to-child HIV transmission despite antiretroviral therapy in the ANRS French Perinatal Cohort. *AIDS.* 2008;22:289-99.
[\[PubMed Abstract\]](#) -
10. Cooper ER, Charurat M, Mofenson L, et al. Combination antiretroviral strategies for the treatment of pregnant HIV-1-infected women and prevention of perinatal HIV-1 transmission. *J Acquir Immune Defic Syndr.* 2002;29:484-94.
[\[PubMed Abstract\]](#) -
11. Wade NA, Birkhead GS, Warren BL, et al. Abbreviated regimens of zidovudine prophylaxis and perinatal transmission of the human immunodeficiency virus. *N Engl J Med.* 1998;339:1409-14.
[\[PubMed Abstract\]](#) -
12. Siegfried N, van der Merwe L, Brocklehurst P, Sint TT. Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection. *Cochrane Database Syst Rev.* 2011;:CD003510.

[\[PubMed Abstract\]](#) -

13. Mandelbrot L, Mayaux MJ, Bongain A, et al. Obstetric factors and mother-to-child transmission of human immunodeficiency virus type 1: the French perinatal cohorts. SEROGEST French Pediatric HIV Infection Study Group. *Am J Obstet Gynecol.* 1996;175(3 Pt 1):661-7.
[\[PubMed Abstract\]](#) -
14. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Initial Use of Antiretroviral Therapy During Pregnancy. March 31, 2026.
[\[HIV.gov\]](#) -
15. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. March 31, 2026.
[\[HIV.gov\]](#) -
16. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the use of antiretroviral drugs during pregnancy and interventions to reduce perinatal HIV transmission in the United States. Pregnancy and postpartum HIV testing and identification of perinatal and postnatal HIV exposure. May 19, 2025.
[\[HIV.gov\]](#) -
17. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR Recomm Rep.* 2006;55:1-17.
[\[PubMed Abstract\]](#) -
18. Chou R, Cantor AG, Zakher B, Bougatsos C. Screening for HIV in pregnant women: systematic review to update the 2005 U.S. Preventive Services Task Force recommendation. *Ann Intern Med.* 2012;157:719-28.
[\[PubMed Abstract\]](#) -
19. Moyer VA; U.S. Preventive Services Task Force. Screening for HIV: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med.* 2013;159:51-60.
[\[PubMed Abstract\]](#) -
20. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Special Populations. Early (Acute and Recent) HIV Infection. March 31, 2026.
[\[HIV.gov\]](#) -
21. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for the Use of Antiretroviral Drugs During Pregnancy. Antiretroviral Drug Regimens and Pregnancy Outcomes. June 12, 2025.
[\[HIV.gov\]](#) -
22. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Overview. March 31, 2026.
[\[HIV.gov\]](#) -

23. Ioannidis JP, Abrams EJ, Ammann A, et al. Perinatal transmission of human immunodeficiency virus type 1 by pregnant women with RNA virus loads Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Antiretroviral Drug Resistance and Resistance Testing in Pregnancy. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy. March 31, 2026. Lockman S, Brummel SS, Ziemba L, et al. Efficacy and safety of dolutegravir with emtricitabine and tenofovir alafenamide fumarate or tenofovir disoproxil fumarate, and efavirenz, emtricitabine, and tenofovir disoproxil fumarate HIV antiretroviral therapy regimens started in pregnancy (IMPAACT 2010/VESTED): a multicentre, open-label, randomised, controlled, phase 3 trial. *Lancet*. 2021;397:1276-92. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Recommendations for Use of Antiretroviral Drugs During Pregnancy. When Antiretroviral Therapy Is Being Taken When Pregnancy Occurs. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Recommendations for use of antiretroviral drugs during pregnancy. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs During Pregnancy and When Trying to Conceive. March 31, 2026. Momper JD, Best BM, Wang J, et al. Elvitegravir/cobicistat pharmacokinetics in pregnant and postpartum women with HIV. *AIDS*. 2018;32:2507-16. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Appendix C: Antiretroviral Counseling Guide for Health Care Providers. June 12, 2025. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Previous Experience With Antiretroviral Medications but Not Currently on Antiretroviral Therapy During Current Pregnancy. March 31, 2026. Rahangdale L, Cates J, Potter J, et al. Integrase inhibitors in late pregnancy and rapid HIV viral load reduction. *Am J Obstet Gynecol*. 2016;214:385.e1-7. Westling K, Petterson K, Kaldma A, Navér L. Rapid decline in HIV viral load when introducing raltegravir-containing antiretroviral treatment late in pregnancy. *AIDS Patient Care STDS*. 2012;26:714-7. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Initial Evaluation and Continued Monitoring of HIV During Pregnancy. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Therapy During Pregnancy. Lack of Viral Suppression While on Antiretroviral Therapy in Pregnancy. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Intrapartum HIV Care. June 12, 2025. Briand N, Warszawski J, Mandelbrot L, et al. Is intrapartum intravenous zidovudine for prevention of mother-to-child HIV-1 transmission still useful in the combination antiretroviral therapy era? *Clin Infect Dis*. 2013;57:903-14. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Appendix B: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy. Table 14. Antiretroviral Drug Use in Pregnancy: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of

Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Special Populations. Hepatitis B Virus/HIV Coinfection. March 31, 2026. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Special Populations. Hepatitis C Virus/HIV Coinfection. March 31, 2026. Cotter AM, Brookfield KF, Duthely LM, Gonzalez Quintero VH, Potter JE, O'Sullivan MJ. Duration of membrane rupture and risk of perinatal transmission of HIV-1 in the era of combination antiretroviral therapy. *Am J Obstet Gynecol.* 2012;207:482.e1-5. Eppes C. Is it time to leave the avoidance of rupture of membranes for women infected with HIV and receiving cART in the past? *BJOG.* 2016 May;123:982. Peters H, Byrne L, De Ruiter A, et al. Duration of ruptured membranes and mother-to-child HIV transmission: a prospective population-based surveillance study. *BJOG.* 2016;123:975-81. Drake AL, Wagner A, Richardson B, John-Stewart G. Incident HIV during pregnancy and postpartum and risk of mother-to-child HIV transmission: a systematic review and meta-analysis. *PLoS Med.* 2014;11:e1001608. Thomson KA, Hughes J, Baeten JM, et al. Increased Risk of HIV Acquisition Among Women Throughout Pregnancy and During the Postpartum Period: A Prospective Per-Coital-Act Analysis Among Women With HIV-Infected Partners. *J Infect Dis.* 2018;218:16-25. Birkhead GS, Pulver WP, Warren BL, Hackel S, Rodríguez D, Smith L. Acquiring human immunodeficiency virus during pregnancy and mother-to-child transmission in New York: 2002-2006. *Obstet Gynecol.* 2010;115:1247-55. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV. Department of Health and Human Services. Considerations for Antiretroviral Therapy Use in Special Populations. Early (Acute and Recent) HIV Infection. September 12, 2024. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV. Department of Health and Human Services. What to Start. Initial Combination Antiretroviral Regimens for People With HIV. September 12, 2024. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Care of infants with perinatal exposure to HIV. Antiretroviral management of infants with Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Care of Infants With Perinatal Exposure to HIV. Initial Postnatal Management of the Neonate Exposed to HIV. June 12, 2025. Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV. Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection. Diagnosis of HIV infection in infants and children. December 19, 2024. Panel on Opportunistic Infections in Children with and Exposed to HIV. Guidelines for the prevention and treatment of opportunistic infections in children with and exposed to HIV. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the use of antiretroviral drugs during pregnancy and interventions to reduce perinatal HIV transmission in the United States. Preventing HIV transmission during infant feeding. December 19, 2024. Flynn PM, Taha TE, Cababasay M, et al. Prevention of HIV-1 Transmission Through Breastfeeding: Efficacy and Safety of Maternal Antiretroviral Therapy Versus Infant Nevirapine Prophylaxis for Duration of Breastfeeding in HIV-1-Infected Women With High CD4 Cell Count (IMPAACT PROMISE): A Randomized, Open-Label, Clinical Trial. *J Acquir Immune Defic Syndr.* 2018;77:383-92. Behrens GMN, Aebi-Popp K, Babiker A. Close to Zero, but Not Zero: What Is an Acceptable HIV Transmission Risk Through Breastfeeding? *J Acquir Immune Defic Syndr.* 2022;89:e42. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Postpartum HIV Management and Follow-Up. March 31, 2026. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med.* 2011;365:493-505. Adams JW, Brady KA, Michael YL, Yehia BR, Momplaisir FM. Postpartum Engagement in HIV Care: An Important Predictor of Long-term Retention in Care and Viral Suppression. *Clin Infect Dis.* 2015;61:1880-7. Rubin LH, Cook JA, Grey DD, et al. Perinatal depressive symptoms in HIV-infected versus HIV-uninfected women: a prospective study from preconception to postpartum. *J Womens Health (Larchmt).* 2011;20:1287-95. Mellins CA, Chu C, Malee K, et al. Adherence to antiretroviral treatment among pregnant and postpartum HIV-infected women. *AIDS*

References

- Khan S, Tsang KK, Brophy J, et al. Canadian Pediatric & Perinatal HIV/AIDS Research Group consensus recommendations for infant feeding in the HIV context. *J Assoc Med Microbiol Infect Dis Can.* 2023;8:7-17.
[\[PubMed Abstract\]](#) -
- Kreitchmann R, Best BM, Wang J, et al. Pharmacokinetics of an increased atazanavir dose with and without tenofovir during the third trimester of pregnancy. *J Acquir Immune Defic Syndr.* 2013;63:59-66.
[\[PubMed Abstract\]](#) -
- Lampe MA, Nesheim SR, Oladapo KL, Ewing AC, Wiener J, Kourtis AP. Achieving Elimination of Perinatal HIV in the United States. *Pediatrics.* 2023;151:e2022059604.
[\[PubMed Abstract\]](#) -
- Malaba TR, Nakatudde I, Kintu K, et al. 72 weeks post-partum follow-up of dolutegravir versus efavirenz initiated in late pregnancy (DoIPHIN-2): an open-label, randomised controlled study. *Lancet HIV.* 2022;9:e534-e543.
[\[PubMed Abstract\]](#) -
- Mofenson LM, Baggaley RC, Mameletzis I. Tenofovir disoproxil fumarate safety for women and their infants during pregnancy and breastfeeding. *AIDS.* 2017;31:213-232.
[\[PubMed Abstract\]](#) -
- Nesheim SR, FitzHarris LF, Lampe MA, Gray KM. Reconsidering the Number of Women With HIV Infection Who Give Birth Annually in the United States. *Public Health Rep.* 2018;133:637-643.
[\[PubMed Abstract\]](#) -
- Nesheim SR, Wiener J, Fitz Harris LF, Lampe MA, Weidle PJ. Brief Report: Estimated Incidence of Perinatally Acquired HIV Infection in the United States, 1978-2013. *J Acquir Immune Defic Syndr.* 2017;76:461-4.
[\[PubMed Abstract\]](#) -
- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Drugs During Pregnancy. *Antiretroviral Therapy When Trying to Conceive.* June 12, 2025.
[\[HIV.gov\]](#) -
- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Drugs During Pregnancy. *Teratogenicity.* March 31, 2026.
[\[HIV.gov\]](#) -
- Pinnetti C, Baroncelli S, Villani P, et al. Rapid HIV-RNA decline following addition of raltegravir and tenofovir to ongoing highly active antiretroviral therapy in a woman presenting with high-level HIV viraemia at week 38 of pregnancy. *J Antimicrob Chemother.* 2010;65:2050-2.
[\[PubMed Abstract\]](#) -
- Siberry GK, Jacobson DL, Kalkwarf HJ, et al. Lower Newborn Bone Mineral Content Associated With

Maternal Use of Tenofovir Disoproxil Fumarate During Pregnancy. Clin Infect Dis. 2015;61:996-1003.
[\[PubMed Abstract\]](#) -

- Stek A, Best BM, Wang J, et al. Pharmacokinetics of Once Versus Twice Daily Darunavir in Pregnant HIV-Infected Women. J Acquir Immune Defic Syndr. 2015;70:33-41.
[\[PubMed Abstract\]](#) -
- The European Mode of Delivery Collaboration. Elective caesarean-section versus vaginal delivery in prevention of vertical HIV-1 transmission: a randomised clinical trial. Lancet. 1999;353:1035-9.
[\[PubMed Abstract\]](#) -
- The mode of delivery and the risk of vertical transmission of human immunodeficiency virus type 1--a meta-analysis of 15 prospective cohort studies. The International Perinatal HIV Group. N Engl J Med. 1999;340:977-87.
[\[PubMed Abstract\]](#) -
- Tubiana R, Le Chenadec J, Rouzioux C, et al. Factors associated with mother-to-child transmission of HIV-1 despite a maternal viral load Watts DH, Huang S, Culnane M, et al. Birth defects among a cohort of infants born to HIV-infected women on antiretroviral medication. J Perinat Med. 2011;39:163-70. Zash R, Holmes L, Diseko M, et al. Neural-Tube Defects and Antiretroviral Treatment Regimens in Botswana. N Engl J Med. 2019;381:827-40.

Figures

Figure 1 Perinatally-Acquired HIV Among Persons Born in the United States, 2018-2022

Source: Centers for Disease Control and Prevention. Monitoring Selected National HIV Prevention and Care Objectives by Using HIV Surveillance Data—United States and 6 Dependent Areas, 2022. HIV Surveillance Supplemental Report. 2024;29(No. 2). Published May 2024.

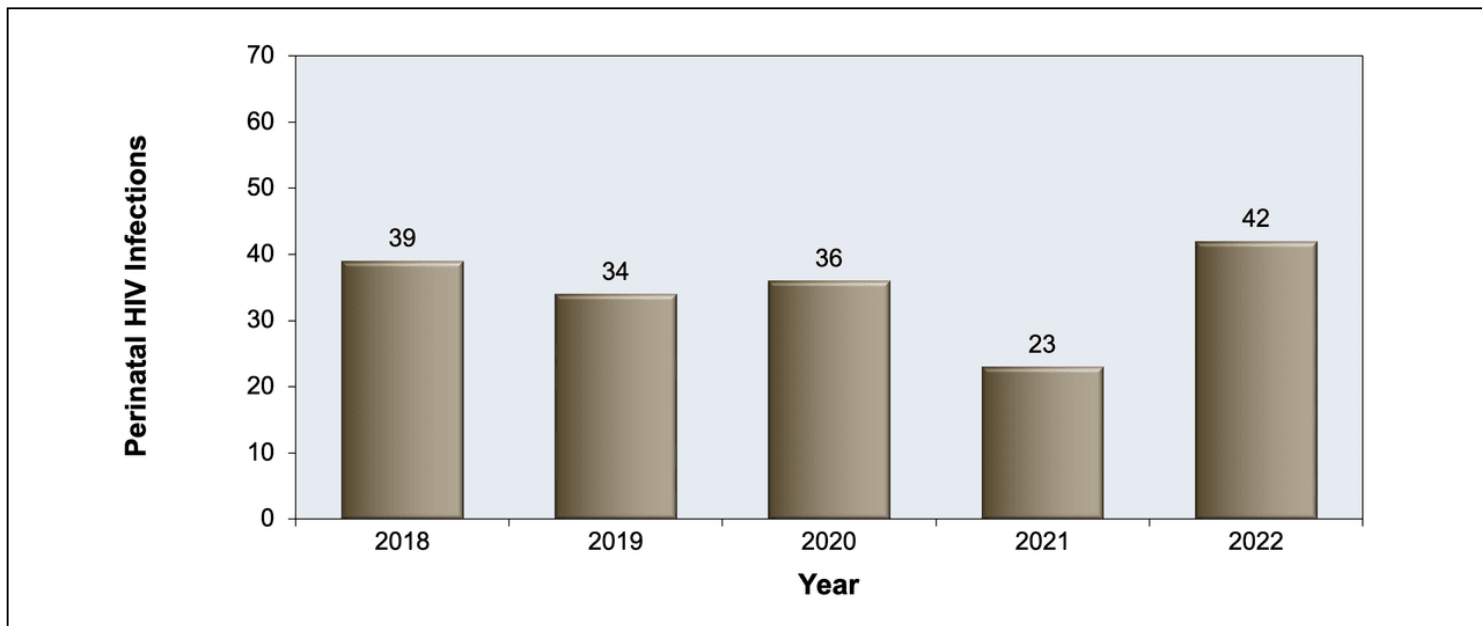


Figure 2 Pediatric AIDS Clinical Trials Group Protocol 076

Source: Connor EM, Sperling RS, Gelber R, et al. Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. Pediatric AIDS Clinical Trials Group Protocol 076 Study Group. N Engl J Med. 1994;331:1173-80.

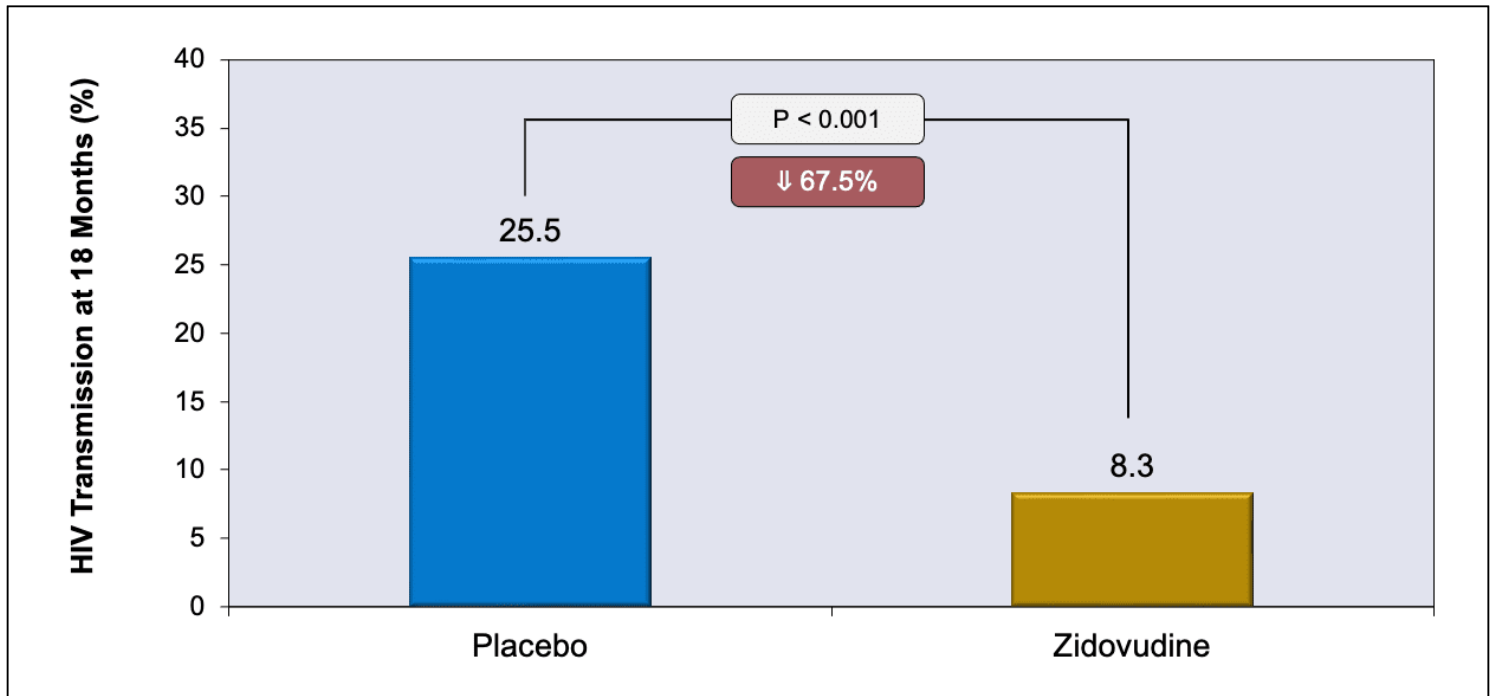


Figure 3 Timing of Abbreviated Regimens of Zidovudine and Risk of Perinatal HIV Transmission

Source: Wade NA, Birkhead GS, Warren BL, et al. Abbreviated regimens of zidovudine prophylaxis and perinatal transmission of the human immunodeficiency virus. N Engl J Med. 1998;339:1409-14.

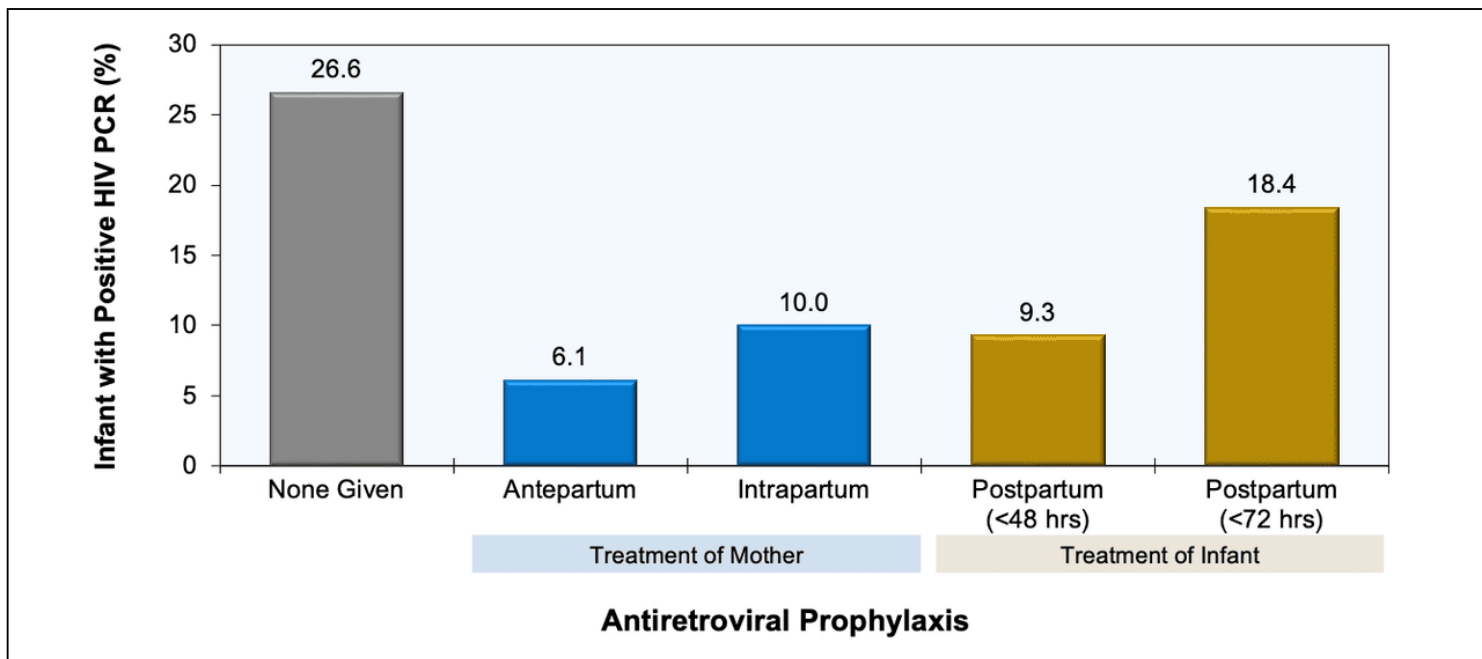


Figure 4 Antenatal Antiretroviral Therapy and Impact on Perinatal HIV Transmission

Source: Cooper ER, Charurat M, Mofenson L, et al. Combination antiretroviral strategies for the treatment of pregnant HIV-1-infected women and prevention of perinatal HIV-1 transmission. J Acquir Immune Defic Syndr. 2002;29:484-94.

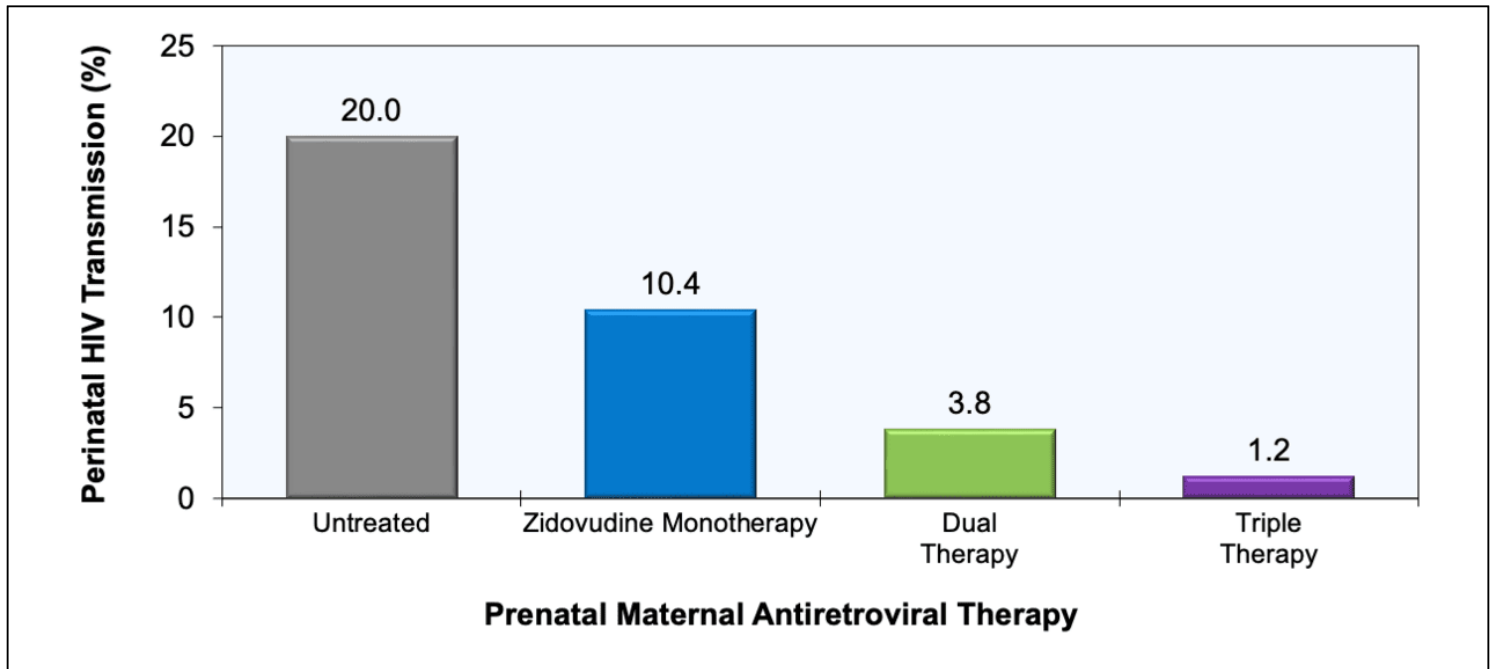


Figure 5 Perinatal HIV-1 Transmission Rates According to HIV RNA Level at Delivery: The ANRS French Perinatal Cohort (1997-2004)

In the ANRS French Perinatal Cohort study, investigators evaluated the risk of mother-to-child HIV transmission in 5,271 mothers who received antiretroviral therapy during pregnancy. This graph shows the HIV transmission rate based on the HIV RNA level of the mother at delivery and the time of gestation when the baby was born.

Source: Warszawski J, Tubiana R, Le Chenadec J, et al. Mother-to-child HIV transmission despite antiretroviral therapy in the ANRS French Perinatal Cohort. AIDS. 2008;22:289-99.

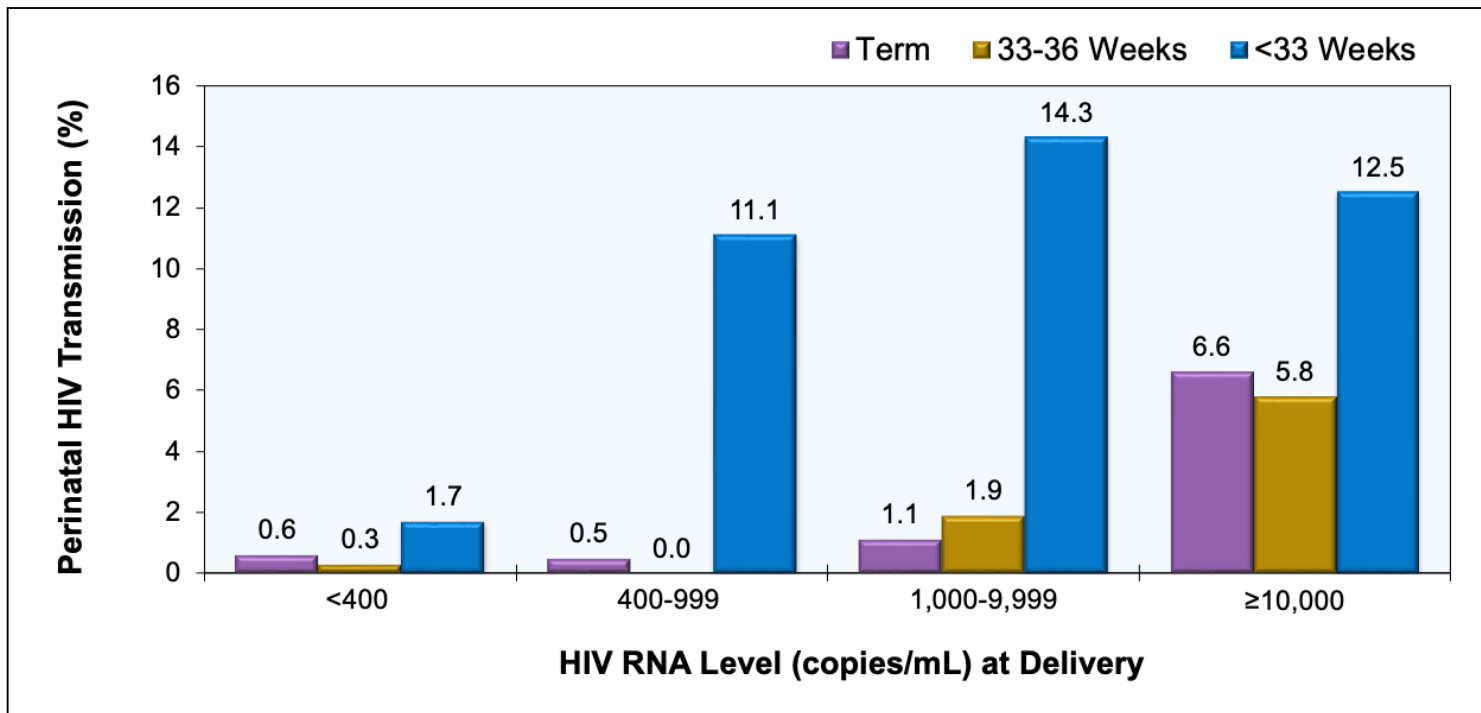


Figure 6 Recommended Virologic Testing Schedules for Infants Exposed to HIV by Perinatal HIV Transmission Risk

Abbreviations: NAT = nucleic acid test

*High-risk=infants with mothers who had viremia (HIV RNA ≥ 50 copies/mL) in the 4 weeks prior to delivery, early (acute or recent) HIV during pregnancy, or HIV diagnosed in labor or postpartum. †Low Risk= infants with mothers who had sustained viral suppression (HIV RNA < 50 copies/mL from 20 weeks of gestation through delivery). ‡Not necessary for infants at low risk of HIV acquisition unless there are concerns that the newborn could be lost to follow-up without further testing.

Source: Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV. Guidelines for the use of antiretroviral agents in pediatric HIV infection. Diagnosis of HIV infection in Infants and Children. May 19, 2025.

	Age at HIV NAT Testing				
	Birth	14-21 days	1-2 months	2-3 months	4-6 months
High Risk*	NAT	NAT	NAT	NAT	NAT
Low Risk† (no breastfeeding)	NAT‡	NAT	NAT		NAT
Low Risk† (breastfeeding)	NAT	NAT	NAT		NAT

Table 1. Preferred Initial Regimens in Pregnancy

Perinatal HIV Clinical Guidelines

Preferred Initial Regimens in Pregnancy

Drugs or drug combinations are designated as *Preferred* for therapy during pregnancy when clinical trial data in adults have demonstrated efficacy and durability with acceptable toxicity and ease of use, and pregnancy-specific pharmacokinetic data are available to guide dosing. In addition, the available data must suggest a favorable risk-benefit balance for the drug or drug combination compared to other antiretroviral drug options; the assessment of risks and benefits should incorporate outcomes for maternal, pregnancy, fetal, and infant outcomes. Some *Preferred* drugs or regimens may have minimal toxicity or teratogenicity risks that are offset by other advantages during pregnancy or when trying to conceive. Therefore, it is important to read all the information on each drug in the *Perinatal Guidelines* before administering any of these medications to patients.

Preferred Dual-NRTI Backbones	Advantages	Disadvantages
Tenofovir alafenamide-emtricitabine <i>or</i> Tenofovir alafenamide plus lamivudine	<ul style="list-style-type: none"> • Once-daily dosing • Available as a fixed-dose combination • Reassuring PK data and extensive use during pregnancy; no dose adjustment required in pregnancy • Both NRTI combinations active against HBV • Minimal toxicity compared with zidovudine-lamivudine • When combined with dolutegravir, the efficacy and toxicity of tenofovir alafenamide-emtricitabine and tenofovir DF-emtricitabine for treatment of pregnant women are similar, but tenofovir alafenamide-emtricitabine is associated with fewer adverse birth outcomes and less risk of insufficient weight gain in pregnancy. 	<ul style="list-style-type: none"> • When combined with dolutegravir, tenofovir alafenamide-emtricitabine is associated with more treatment-emergent obesity in nonpregnant adult women compared to tenofovir DF-emtricitabine. Notably, the impact on weight gain in pregnancy may be beneficial, as noted in the Advantages column.
Tenofovir DF-emtricitabine <i>or</i> Tenofovir DF-lamivudine	<ul style="list-style-type: none"> • Once-daily dosing • Available as a fixed-dose combination • Reassuring PK data and extensive use during pregnancy; no dose adjustment required in pregnancy • Both NRTI combinations active against HBV • When combined with dolutegravir, the efficacy and toxicity of tenofovir alafenamide-emtricitabine and tenofovir DF-emtricitabine in pregnancy are similar. 	<ul style="list-style-type: none"> • Potential concerns about fetal bone and early-life growth abnormalities with tenofovir DF,

Preferred INSTI Regimens	Advantages	Disadvantages
Bictegravir-tenofovir alafenamide-emtricitabine	<ul style="list-style-type: none"> • Coformulated as a single, once-daily pill; for this reason, may be preferred over dolutegravir to support adherence • High barrier to resistance • No food requirement • No dose adjustment required in pregnancy • No safety concerns observed • High rates of viral suppression • Covers HBV • Bictegravir-tenofovir alafenamide-emtricitabine is a <i>Preferred</i> regimen for initial treatment in people with HIV without a history of cabotegravir exposure for HIV PrEP 	<p>although clinical findings are reassuring to date</p> <ul style="list-style-type: none"> • Tenofovir DF has potential renal toxicity; thus, tenofovir DF-based, dual-NRTI combinations should be used with caution in patients with renal insufficiency. <ul style="list-style-type: none"> • PK and safety data in pregnancy suggest sufficient efficacy of bictegravir for its use as a <i>Preferred</i> initial agent in pregnancy when there has been no prior antiretroviral experience. Drug levels are lower in the second and third trimester of pregnancy than in nonpregnant or postpartum women and are reduced in later pregnancy to a greater degree for bictegravir than for dolutegravir, but bictegravir levels remained above the protein-adjusted EC₉₅ during pregnancy; therefore, despite lower levels, high rates of viral suppression are seen. • Potential concerns about excess weight gain. • Specific timing and/or fasting recommendations apply if bictegravir is taken with calcium or iron (e.g., in prenatal vitamins). • Bictegravir-tenofovir alafenamide-emtricitabine is not <i>Preferred</i> for initial treatment of people with a history of cabotegravir exposure for HIV PrEP due to concerns about INSTI resistance mutations, unless genotype testing has demonstrated an absence of INSTI resistance mutations; darunavir boosted with ritonavir is <i>Preferred</i> in this situation.
Dolutegravir plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> • Once-daily dosing • Sufficient data about PK, efficacy, and safety of dolutegravir in pregnancy • High rates of viral suppression • Dose adjustments during pregnancy 	<ul style="list-style-type: none"> • Potential concerns about excess weight gain. • Do not use dolutegravir-lamivudine in the setting of HBV coinfection without another HBV agent.

	<p>are not needed.</p> <ul style="list-style-type: none"> • May be particularly useful when drug interactions or the potential for preterm delivery with a PI-based regimen are a concern. • Dolutegravir has been shown to rapidly decrease viral load in pregnancy when presentation to care is late in pregnancy and there is no prior experience with antiretroviral therapy. In nonpregnant adults, dolutegravir is associated with lower rates of INSTI resistance than raltegravir, and dolutegravir allows for once-daily dosing; for these reasons, dolutegravir is particularly useful in scenarios of presentation to care late in pregnancy. • Dolutegravir with a NRTI backbone of (tenofovir alafenamide or tenofovir DF) with (lamivudine or emtricitabine) is a <i>Preferred</i> regimen for initial treatment in people with HIV without a history of cabotegravir exposure for HIV PrEP. 	<ul style="list-style-type: none"> • Specific timing and/or fasting recommendations apply if dolutegravir is taken with calcium or iron (e.g., in prenatal vitamins). • Dolutegravir is not <i>Preferred</i> for initial treatment in people with HIV with a history of cabotegravir exposure for HIV PrEP due to concerns about INSTI resistance mutations, unless genotype testing has demonstrated an absence of INSTI resistance mutations; darunavir boosted with ritonavir is <i>Preferred</i> in this situation. • In the United States, not available as a fixed-dose combination except as a two-drug regimen.
Preferred PI Regimens	Advantages	Disadvantages
Darunavir boosted with ritonavir plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> • Darunavir boosted with ritonavir is a <i>Preferred</i> protease inhibitor for initial therapy only in certain circumstances (e.g., exposure to cabotegravir when genotype resistance testing is unavailable. See darunavir boosted with ritonavir in the Alternative Regimens table). 	See darunavir boosted with ritonavir in the Alternative Regimens table.
<p>Abbreviations: NRTI = nucleoside reverse transcriptase inhibitor; INSTI = integrase strand transfer inhibitor; PI = protease inhibitor; ARV = antiretroviral; PK = pharmacokinetics; PrEP = preexposure prophylaxis</p>		

Source:

- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy. March 31, 2026. [[HIV.gov](https://www.hiv.gov)]

Table 2. *Alternative* Initial Regimens in Pregnancy

Perinatal HIV Clinical Guidelines		
Alternative Initial Regimens in Pregnancy		
<p>Drugs or drug combinations are designated as <i>Alternative</i> options for therapy during pregnancy when clinical trial data in adults show efficacy and the data in pregnancy are generally favorable, but limited. Most <i>Alternative</i> drugs or regimens are associated with more PK, dosing, tolerability, formulation, administration, or interaction concerns than those in the <i>Preferred</i> category, but they are acceptable for use in pregnancy. Some <i>Alternative</i> drugs or regimens may have known toxicity or teratogenicity risks that are offset by other advantages during pregnancy or when trying to conceive. Therefore, it is important to read all the information on each drug in the <i>Perinatal Guidelines</i> before administering any of these medications to patients.</p>		
Alternative INSTI Regimens	Advantages	Disadvantages
Dolutegravir-lamivudine	<ul style="list-style-type: none"> Once-daily dosing Dolutegravir-lamivudine is available as a fixed-dose combination. Component drugs have well-described PK that are adequate in pregnancy and no safety concerns. See <i>Preferred</i> INSTI Regimens above for other details about dolutegravir and lamivudine. 	<ul style="list-style-type: none"> Not recommended if availability of HBV genotype test. This is classified as <i>Alternative</i> therapy initiation waiting for these results. Dolutegravir-lamivudine setting of early (a pregnancy, as pro RNA levels are off settings. Viral decay and v to standard three adults, although c Consider close vir individuals. Dolut recommended if t Do not use dolute HBV coinfection w against HBV. See <i>Preferred</i> Init for regarding prio
Dolutegravir-abacavir-lamivudine	<ul style="list-style-type: none"> Once-daily dosing Dolutegravir-abacavir-lamivudine is available as a fixed-dose combination. See <i>Preferred</i> Initial Regimens in Pregnancy table for other details on dolutegravir. 	<ul style="list-style-type: none"> Dolutegravir-abac B*5701 testing be lamivudine below Do not use dolute dolutegravir-lami coinfection witho Potential concern dolutegravir. See <i>Preferred</i> Init for other details c
Raltegravir plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> No safety concerns observed. Like dolutegravir, raltegravir may be particularly useful when drug interactions or the potential for preterm birth with PI-based regimens are a 	<ul style="list-style-type: none"> Twice-daily dosing due to low drug le during pregnancy Not available as a

	<p>concern.</p> <ul style="list-style-type: none"> • PK data are available for raltegravir in pregnancy when using the twice-daily formulation (400 mg twice daily). • Like dolutegravir, raltegravir has been shown to rapidly decrease viral load in pregnancy when presentation to care is late in pregnancy and there is no prior experience with antiretroviral therapy or antiretrovirals (ARV-naive). In nonpregnant adults, dolutegravir is associated with lower rates of INSTI resistance than raltegravir, and dolutegravir permits once-daily dosing; for these reasons, dolutegravir is <i>Preferred</i> and raltegravir is <i>Alternative</i> for use during pregnancy. 	<ul style="list-style-type: none"> • Lower barrier to raltegravir use for this reason, raltegravir is an <i>Alternative</i> for use during pregnancy. • Population PK data for raltegravir at a daily 1,200 mg (2 tablets) twice-daily formulation (raltegravir) are available. • Specific timing and dosing may not apply if raltegravir is used during pregnancy (e.g., in prenatal care).
Alternative PI Regimens	Advantages	Disadvantages
Atazanavir boosted with ritonavir plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> • Once-daily dosing • Extensive experience during pregnancy 	<ul style="list-style-type: none"> • Not available as a <i>Preferred</i> regimen • Associated with increased bilirubin levels, with the risk of neonatal jaundice and clinically significant kernicterus reported; bilirubin monitoring is recommended • Requires increased monitoring in the third trimester. • Has been associated with reductions in language skills and late language development • PIs may increase the risk of gestational diabetes • Cannot be used with proton pump inhibitors • Requires consideration of H2 blockers, which may be used during pregnancy.
Darunavir boosted with ritonavir plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> • When a protease inhibitor-based regimen is indicated, darunavir boosted with ritonavir is recommended over atazanavir. However, darunavir boosted with ritonavir requires twice-daily dosing in pregnancy, and dosing frequency affects adherence. For that reason, when use of a PI-based regimen is indicated during pregnancy, some Panel members would use atazanavir boosted with ritonavir rather than darunavir boosted with ritonavir for antiretroviral therapy. • Darunavir boosted with ritonavir with a NRTI backbone of (tenofovir alafenamide or tenofovir DF) with (lamivudine or emtricitabine) is the <i>Preferred</i> regimen for initial treatment in women with early (acute or recent) HIV infection and a history of cabotegravir exposure for HIV PrEP. 	<ul style="list-style-type: none"> • Not available as a <i>Preferred</i> regimen • Requires twice-daily dosing • Requires administration with food • PIs may increase the risk of gestational diabetes

Alternative NRTI Regimens	Advantages	Disadvantages
Abacavir-lamivudine	<ul style="list-style-type: none"> • Once-daily dosing • Available as a fixed-dose combination • Well-tolerated during pregnancy • Reassuring PK data during pregnancy 	<ul style="list-style-type: none"> • Requires HLA-B*57:01 testing. Abacavir should not be used in patients who are positive for HLA-B*57:01 due to the risk of developing a hypersensitivity reaction. Education about HLA testing is important. • Now classified as a Category B drug due to inability to conduct large-scale studies and concerns over potential for cardiac toxicity. • Abacavir is not approved for use in children. • Abacavir-lamivudine (boosted with raltegravir) is recommended if viral load >100,000 copies/mL. • Abacavir is not recommended for initial treatment if the patient previously had a positive HLA-B*57:01 gene variant. If a patient has a positive HLA-B*57:01 gene variant, avoid delays in initiating treatment while awaiting HLA testing.
Zidovudine-lamivudine	<ul style="list-style-type: none"> • Available as a fixed-dose combination • Significant experience during pregnancy 	<ul style="list-style-type: none"> • Requires twice-daily dosing • Associated with hematologic toxicity, including neutropenia, anemia, and leukopenia, as well as maternal and neonatal toxicity. • Other regimens have demonstrated greater efficacy and tolerability.
Alternative NNRTI Regimens	Advantages	Disadvantages
Efavirenz-tenofovir DF-emtricitabine <i>or</i> Efavirenz-tenofovir DF-lamivudine <i>or</i> Efavirenz plus a Preferred Dual-NRTI Backbone	<ul style="list-style-type: none"> • Once-daily dosing • Available as a fixed-dose combination • Extensive experience in pregnancy • Not associated with increased risk of neural tube defect or other congenital anomalies in human studies (although cautionary text based on animal studies remains in the package insert). • No dose changes are required during pregnancy. • Useful for patients who require treatment with drugs that have significant interactions 	<ul style="list-style-type: none"> • Overall higher rates of adverse effects than some Preferred dual-NRTI regimens. • Requires enhanced monitoring for neuropsychiatric toxicity and suicidality. • Increased risk of rash observed with efavirenz compared to efavirenz plus lamivudine or efavirenz plus emtricitabine. • Increased risk of fatigue, hepatotoxicity, and hyperlipidemia.

	with <i>Preferred</i> agents or who need the convenience of a coformulated, single-tablet, once-daily regimen and are not eligible for dolutegravir.	
Rilpivirine-tenofovir DF-emtricitabine <i>or</i> Rilpivirine-tenofovir alafenamide-emtricitabine <i>or</i> Rilpivirine (oral) plus a <i>Preferred</i> Dual-NRTI Backbone	<ul style="list-style-type: none"> • Once-daily dosing • Available as a fixed-dose combination • Useful for patients who require treatment with drugs that have significant interactions with <i>Preferred</i> agents or who need the convenience of a coformulated, single-tablet, once-daily regimen and are not eligible for dolutegravir 	<ul style="list-style-type: none"> • Limited use for in HIV RNA. Rilpivirine patients with pret copies/mL or CD4 • Requires close vir trimesters because levels. Insufficient • Requires consider H2 blockers or pr commonly used d • Requires adminis

Abbreviations: ARV = antiretroviral; HBV = hepatitis B virus; INSTI = integrase strand transfer inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; PI = protease inhibitor; PK = pharmacokinetics; PrEP = preexposure prophylaxis

Source:

- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Antepartum Care. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy. March 31, 2026. [[HIV.gov](https://www.hiv.gov)]

Table 3. Types of Antiretroviral Management of Newborns with Perinatal HIV Exposure

Perinatal HIV Clinical Guidelines	
Types of Antiretroviral Management of Newborns with Perinatal HIV Exposure	
Category	Definition
Antiretroviral Therapy Prophylaxis	The administration of antiretroviral drugs to a newborn without HIV infection to reduce the risk of HIV acquisition.
Presumptive HIV Therapy	The administration of a three-drug antiretroviral regimen to newborns at elevated risk of HIV acquisition. Presumptive HIV therapy is intended to be early treatment for a newborn who has already acquired HIV but doesn't have documentation of infection; it also serves as enhanced antiretroviral prophylaxis against HIV acquisition among infants at high risk but not yet infected.
HIV Therapy	The administration of a three-drug antiretroviral regimen to infants and children with documented HIV infection.

Source:

- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Care of infants with perinatal exposure to HIV. Antiretroviral management of infants with *in utero*, intrapartum, or breastfeeding exposure to HIV. December 19, 2024. [[HIV.gov](https://www.hiv.gov)]

Table 4. Neonatal Antiretroviral Management According to Risk of HIV Acquisition

Perinatal Guidelines: Management of Infants Born to Women with HIV Infection			
Antiretroviral Management for Infants With <i>In Utero</i> or Intrapartum Exposure to HIV			
Clinical Setting	Risk of Acquisition		Neonatal ARV Management ^{a,b}
	<i>In Utero</i>	Intrapartum	
High Risk of HIV Acquisition			
<p>HIV RNA ≥ 50 copies/mL in the 4 weeks prior to delivery</p> <p>Viremia can be documented by lab or presumed by other clinical factors (e.g., new diagnosis, ART adherence problems, reports of having stopped ART prior to delivery).</p>	High	High	<p>Presumptive HIV therapy using a three-drug regimen:</p> <ul style="list-style-type: none"> • Zidovudine and lamivudine plus nevirapine (treatment dose) <i>or</i> • Zidovudine and lamivudine plus raltegravir <p>Duration is from birth for 2–6 weeks.^c</p> <p>If the duration of a three-drug regimen is < 6 weeks, and the birth NAT is negative, zidovudine should be continued alone to complete a total of 6 weeks of prophylaxis.</p> <p>HIV NAT obtained before or immediately after starting presumptive therapy with three drugs.^d</p>
Low Risk of Acquisition			
<p>HIV RNA < 50 copies/mL from 20 weeks' gestation through delivery</p> <p>Ideally documented by at least two consecutive tests at least four weeks apart with HIV RNA < 50 copies/mL, but can be based on clinical judgment of providers.</p>	Low	Low	<p>Zidovudine for 2 weeks</p>
Other Clinical Scenarios			
<p>HIV RNA ≥ 50 copies/mL at > 20 weeks' gestation, but HIV RNA < 50 copies/mL in the 4 weeks prior to delivery</p>	Low to Moderate	Low	<p>HIV NAT at Birth^{d,e}</p> <p><i>Two Options for ARV Management</i></p> <ul style="list-style-type: none"> • Presumptive HIV therapy with a three-drug regimen, as described above for infants at high risk. If at birth the HIV NAT

Clinical Setting	Risk of Acquisition		Neonatal ARV Management ^{a,b}	
	<i>In Utero</i>	Intrapartum		
			<p>is negative, de-escalate the prophylaxis regimen to zidovudine alone to complete 2–6 weeks total.^c</p> <ul style="list-style-type: none"> • ZDV prophylaxis for 2–6 weeks 	<p>memb poten treatm acquir <i>utero</i> HIV th</p> <p><i>Option</i> memb margin and ar freque <i>utero</i> the ad and po presur favor only.</p> <p>All inf minim zidovu up to when assess</p>
Early (acute or recent) HIV at any point during pregnancy	Moderate to High (depending on maternal HIV RNA levels and weeks' gestation)	High (if HIV RNA ≥ 50 copies/mL in the last 4 weeks of pregnancy)	<p>HIV NAT at birth^{d,e}</p> <p>Manage infant ARVs according to the level and timing of the maternal viremia as described in the rows above (just as for an infant exposed to established infection).</p>	<p>Early d at any is a un very h place HIV ac</p> <p>For inf expos infecti increa occurs Some manag presur where use it weeks</p>
<p>Unconfirmed maternal HIV status with at least one positive HIV test at delivery or postpartum</p> <p><i>or</i></p> <p>Newborn has a positive HIV antibody test</p>	High/Uncertain	High/Uncertain	<p>HIV NAT at birth^{d,e}</p> <p>Presumptive HIV therapy with a three-drug regimen as described above for newborns with a high risk of <i>in utero</i> or intrapartum HIV acquisition</p> <p>If supplemental testing confirms a</p>	<p>Supple testing the int determ and ne presur initiate</p>

Clinical Setting	Risk of Acquisition		Neonatal ARV Management ^{a,b}
	<i>In Utero</i>	Intrapartum	
			negative maternal HIV status, discontinue infant ARV drugs immediately.
<p>Abbreviations: ARV = antiretroviral; ART = antiretroviral therapy</p> <p>^a Infant ARVs should be initiated in the first 6 hours after delivery, especially for infants with a high risk of acquisition</p> <p>^b See Perinatal guidelines for management of HIV-2 Infection and Pregnancy</p> <p>^c The optimal duration of three-drug regimen in newborns who are at a high risk for HIV acquisition is unknown. Newborns at high risk for HIV acquisition should receive the zidovudine component for 6 weeks. The other two ARVs, (lamivudine and nevirapine) or (lamivudine and raltegravir), may be administered for 2 to 6 weeks; the recommended duration for the other two ARVs varies depending on infant HIV NAT results, maternal viral load at the time of delivery, and the additional risk of HIV transmission. Consultation with an expert in pediatric HIV is recommended when selecting a therapy duration because the duration should be based on case-specific risk factors and interim infant HIV NAT results.</p> <p>^d NAT test at birth should be obtained before or immediately after starting ARVs.</p> <p>^e When a newborn HIV NAT is positive, infant ART should be initiated without waiting for the results of confirmatory testing because of the low likelihood of a false-positive HIV NAT.</p>			

Source:

- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Care of infants with perinatal exposure to HIV. Antiretroviral management of infants with *in utero*, intrapartum, or breastfeeding exposure to HIV. December 19, 2024. [[HIV.gov](#)]

Table 5. Antiretroviral Dosing Recommendations for Newborns

Perinatal HIV Clinical Guidelines									
Antiretroviral Prophylaxis and Presumptive HIV Therapy in Infants With <i>In Utero</i> or Intrapartum Exposure to HIV^a									
Drug	Drug Doses by Gestation Age at Birth								
Zidovudine (ZDV) Note: For newborns unable to tolerate oral agents, the IV dose is 75% of the oral dose while maintaining the same dosing interval.	≥35 Weeks Gestation at Birth <i>Birth to Age ≤6 Weeks</i> <ul style="list-style-type: none"> Zidovudine 4 mg/kg per dose orally twice daily or alternative simplified weight-band dosing (see below) Simplified Weight-Band Dosing for Newborns Aged ≥35 Weeks Gestation from Birth to 4 Weeks <table border="1"> <thead> <tr> <th>Weight Band</th> <th>Volume of Zidovudine 10 mg/mL Oral Syrup Twice Daily</th> </tr> </thead> <tbody> <tr> <td>2 to <3 kg</td> <td>1 mL</td> </tr> <tr> <td>3 to <4 kg</td> <td>1.5 mL</td> </tr> <tr> <td>4 to <5 kg</td> <td>2 mL</td> </tr> </tbody> </table>	Weight Band	Volume of Zidovudine 10 mg/mL Oral Syrup Twice Daily	2 to <3 kg	1 mL	3 to <4 kg	1.5 mL	4 to <5 kg	2 mL
	Weight Band	Volume of Zidovudine 10 mg/mL Oral Syrup Twice Daily							
	2 to <3 kg	1 mL							
	3 to <4 kg	1.5 mL							
4 to <5 kg	2 mL								
≥30 to <35 Weeks Gestation at Birth <i>Birth to Age 2 Weeks</i> <ul style="list-style-type: none"> Zidovudine 2 mg/kg per dose orally twice daily <i>Age 2 Weeks to ≤6 Weeks</i> <ul style="list-style-type: none"> Zidovudine 3 mg/kg per dose orally twice daily 									
<30 Weeks Gestation at Birth <i>Birth to Age 4 Weeks</i> <ul style="list-style-type: none"> Zidovudine 2 mg/kg per dose orally twice daily <i>Age 4 Weeks to ≤6 Weeks</i> <ul style="list-style-type: none"> Zidovudine 3 mg/kg per dose orally twice daily 									
Lamivudine (3TC)	≥32 Weeks Gestation at Birth <i>Birth to Age <4 Weeks</i> <ul style="list-style-type: none"> Lamivudine 2 mg/kg/dose orally twice daily <i>Age ≥4 Weeks to ≤6 Weeks</i> <ul style="list-style-type: none"> Lamivudine 4 mg/kg per dose orally twice daily 								
Nevirapine (NVP)^b	≥37 Weeks Gestation at Birth: <i>Birth to Age ≤6 Weeks</i>								

Drug	Drug Doses by Gestation Age at Birth																										
<p>Note: These are nevirapine treatment doses for a presumptive HIV therapy regimen.</p> <p>Note: Do not use nevirapine if HIV-2 infection (or HIV-2 co-infection with HIV-1) is present or suspected;</p>	<ul style="list-style-type: none"> • Nevirapine 6 mg/kg per dose orally twice daily <p>≥34 Weeks to <37 Weeks Gestation at Birth</p> <p><i>Birth to Age <1 Week</i></p> <ul style="list-style-type: none"> • Nevirapine 4 mg/kg per dose orally twice daily <p><i>Age ≥1 Week to ≤6 Weeks</i></p> <ul style="list-style-type: none"> • Nevirapine 6 mg/kg per dose orally twice daily <p>≥32 Weeks to <34 Weeks Gestation at Birth</p> <p><i>Birth to Age 2 Weeks</i></p> <ul style="list-style-type: none"> • Nevirapine 2 mg/kg per dose orally twice daily <p><i>Age ≥2 Weeks to 4 Weeks</i></p> <ul style="list-style-type: none"> • Nevirapine 4 mg/kg per dose orally twice daily <p><i>Age ≥4 to ≤6 Weeks</i></p> <ul style="list-style-type: none"> • Nevirapine 6 mg/kg per dose orally twice daily 																										
<p>Raltegravir (RAL)</p>	<p>≥37 Weeks Gestation at Birth and Weighing ≥2 kg^c</p> <p><i>Birth to Age 6 Weeks</i></p> <table border="0"> <tr> <td>Body Weight</td> <td>Volume (Dose) of Raltegravir 10 mg/mL Suspension</td> </tr> <tr> <td>Birth to 1 Week: Once Daily Dosing</td> <td>Approximately 1.5 mg/kg per dose</td> </tr> <tr> <td>2 to <3 kg</td> <td>0.4 mL (4 mg) once daily</td> </tr> <tr> <td>3 to <4 kg</td> <td>0.5 mL (5 mg) once daily</td> </tr> <tr> <td>4 to <5 kg</td> <td>0.7 mL (7 mg) once daily</td> </tr> <tr> <td>1 to 4 Weeks: Twice-Daily Dosing</td> <td>Approximately 3 mg/kg per dose</td> </tr> <tr> <td>2 to <3 kg</td> <td>0.8 mL (8 mg) twice daily</td> </tr> <tr> <td>3 to <4 kg</td> <td>1 mL (10 mg) twice daily</td> </tr> <tr> <td>4 to <5 kg</td> <td>1.5 mL (15 mg) twice daily</td> </tr> <tr> <td>4 to 6 Weeks: Twice Daily Dosing</td> <td>Approximately 6 mg/kg per dose</td> </tr> <tr> <td>3 to <4 kg</td> <td>2.5 mL (25 mg) twice daily</td> </tr> <tr> <td>4 to <6 kg</td> <td>3 mL (30 mg) twice daily</td> </tr> <tr> <td>6 to <8 kg</td> <td>4 mL (40 mg) twice daily</td> </tr> </table>	Body Weight	Volume (Dose) of Raltegravir 10 mg/mL Suspension	Birth to 1 Week: Once Daily Dosing	Approximately 1.5 mg/kg per dose	2 to <3 kg	0.4 mL (4 mg) once daily	3 to <4 kg	0.5 mL (5 mg) once daily	4 to <5 kg	0.7 mL (7 mg) once daily	1 to 4 Weeks: Twice-Daily Dosing	Approximately 3 mg/kg per dose	2 to <3 kg	0.8 mL (8 mg) twice daily	3 to <4 kg	1 mL (10 mg) twice daily	4 to <5 kg	1.5 mL (15 mg) twice daily	4 to 6 Weeks: Twice Daily Dosing	Approximately 6 mg/kg per dose	3 to <4 kg	2.5 mL (25 mg) twice daily	4 to <6 kg	3 mL (30 mg) twice daily	6 to <8 kg	4 mL (40 mg) twice daily
Body Weight	Volume (Dose) of Raltegravir 10 mg/mL Suspension																										
Birth to 1 Week: Once Daily Dosing	Approximately 1.5 mg/kg per dose																										
2 to <3 kg	0.4 mL (4 mg) once daily																										
3 to <4 kg	0.5 mL (5 mg) once daily																										
4 to <5 kg	0.7 mL (7 mg) once daily																										
1 to 4 Weeks: Twice-Daily Dosing	Approximately 3 mg/kg per dose																										
2 to <3 kg	0.8 mL (8 mg) twice daily																										
3 to <4 kg	1 mL (10 mg) twice daily																										
4 to <5 kg	1.5 mL (15 mg) twice daily																										
4 to 6 Weeks: Twice Daily Dosing	Approximately 6 mg/kg per dose																										
3 to <4 kg	2.5 mL (25 mg) twice daily																										
4 to <6 kg	3 mL (30 mg) twice daily																										
6 to <8 kg	4 mL (40 mg) twice daily																										
<p>Abacavir^d</p> <p>Note: Abacavir is NOT recommended as part of three-drug regimen for newborns with HIV exposure. However, in situations where zidovudine is not available, or the infant has zidovudine-associated toxicity,</p>	<p>≥37 Weeks Gestation at Birth</p> <p><i>Birth to ≤1 Month</i></p> <ul style="list-style-type: none"> • Abacavir 2 mg/kg per dose orally twice daily 																										

Drug	Drug Doses by Gestation Age at Birth
abacavir could be considered an alternative to zidovudine.	<p data-bbox="678 149 1065 184"><i>Age ≥1 Month to <3 Months</i></p> <ul data-bbox="737 218 1360 254" style="list-style-type: none"> • Abacavir 4 mg/kg per dose orally twice daily
<p data-bbox="68 254 1399 520">^aThe optimal duration of three-drug regimens for newborns at high risk of HIV acquisition is unknown; all infants should receive the ZDV component of the three-drug regimen for 6 weeks. The other two ARVs, (3TC and NVP) <i>or</i> (3TC and RAL), may be administered for 2 to 6 weeks; the recommended duration for these ARVs varies depending on infant HIV NAT results, maternal viral load of the birthing parent at the time of delivery, and additional risk factors for HIV transmission. Consultation with an expert in pediatric HIV is recommended when selecting a therapy duration because this decision should be based on case-specific risk factors and interim infant HIV NAT results.</p> <p data-bbox="68 554 1399 716">^bThe NVP doses for infants ≥32 to <37 weeks gestation at birth and infants ≥37 weeks gestation at birth are not yet approved by the FDA. The FDA also has not approved a dose of NVP for infants aged <1 month. The doses for infants ≥32 to <34 weeks gestation at birth are based on modeling and might underestimate potential toxicity in infants of 32 to <34 weeks gestational age because the doses used to develop the model were lower than the doses now recommended.</p> <p data-bbox="68 749 1399 947">^cRAL dosing is increased at 1 week and 4 weeks of age because metabolism by UGT1A1 is low at birth and increases rapidly during the next 4 to 6 weeks of life. No dosing information is available for preterm infants or infants weighing <2 kg at birth. The current dosing regimen with two dose changes in the first month of life may be challenging for some families. To minimize dosing changes, some experts increase to the 3-mg/kg twice-daily dose upon discharge on day 4 or 5 of life.</p> <p data-bbox="68 980 1399 1255">^dABC is approved by the FDA for use in children aged ≥3 months when administered as part of an ARV regimen. ABC also has been reported to be safe in infants and children ≥1 month of age. More recently, an ABC dosing recommendation using PK simulation models has been endorsed by the WHO using weight-band dosing for full-term infants from birth to 1 month of age. ABC substitution for ZDV should be considered in circumstances where increased risk of ZDV toxicity may exist, such as in infants with anemia or neutropenia. Because of ABC-associated hypersensitivity, negative testing for HLA-B*5701 allele should be confirmed prior to the administration of ABC.</p>	

Source:

- Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Care of infants with perinatal exposure to HIV. Antiretroviral management of infants with *in utero*, intrapartum, or breastfeeding exposure to HIV. December 19, 2024. [[HIV.gov](https://www.hiv.gov)]

