



**Recommendations for the Use of Antiretroviral Drugs in  
Pregnant Women with HIV Infection and Interventions to Reduce  
Perinatal HIV Transmission in the United States**

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## Monitoring of the Woman and Fetus During Pregnancy (Last updated December 7, 2018; last reviewed December 7, 2018)

### Panel's Recommendations

- Plasma HIV RNA levels of pregnant women with HIV should be monitored at the initial antenatal visit (AI); 2 to 4 weeks after initiating (or changing) antiretroviral (ARV) drug regimens (BI); monthly until RNA levels are undetectable (BIII); and then at least every 3 months during pregnancy (BIII). HIV RNA levels also should be assessed at approximately 34 to 36 weeks' gestation to inform decisions about mode of delivery (see [Transmission and Mode of Delivery](#)) and to inform decisions about optimal treatment for the newborn (see [Antiretroviral Management of Newborns](#)) (AIII).
- CD4 T lymphocyte (CD4) cell count should be monitored at the initial antenatal visit (AI). For patients who have been on antiretroviral therapy (ART) for  $\geq 2$  years and who have had consistent viral suppression and CD4 cell counts that are consistently  $>300$  cells/mm<sup>3</sup>, CD4 cell count should be monitored at the initial antenatal visit; CD4 cell counts do not have to be repeated for these patients during this pregnancy, per the [Adult and Adolescent Antiretroviral Guidelines](#) (CIII). Women who have been on ART for  $<2$  years, women with CD4 cell counts  $<300$  cells/mm<sup>3</sup>, and women with inconsistent adherence and/or detectable viral loads should have CD4 cell counts monitored every 3 to 6 months during pregnancy (CIII).
- HIV drug-resistance testing should be performed in women whose HIV RNA levels are above the threshold for resistance testing (i.e.,  $>500$  copies/mL to 1,000 copies/mL) before:
  - Initiating ART in ARV-naïve pregnant women who have not been previously tested for ARV resistance (AII);
  - Initiating ART in ARV-experienced pregnant women (AIII); or
  - Modifying ART regimens for women entering pregnancy while receiving ARV drugs or women who have suboptimal virologic response to ARV drugs started during pregnancy (AII).
- ART should be initiated in pregnant women prior to receiving results of ARV-resistance tests. ART should be modified, if necessary, based on the results of the resistance assay (BIII).
- Monitoring for complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs a woman is receiving (AIII).
- Women taking ART during pregnancy should undergo standard glucose screening at 24 to 28 weeks' gestation (AIII). Some experts suggest glucose screening early in pregnancy for women who are receiving protease inhibitor (PI)-based regimens initiated before pregnancy, in accordance with recommendations for women who are at risk for glucose intolerance (BIII). For more information on PIs, see [Combination Antiretroviral Drug Regimens and Maternal and Neonatal Outcomes](#).
- An ultrasound, performed as soon as possible, is recommended to confirm gestational age and, if scheduled cesarean delivery is necessary, to guide the timing of the procedure (see [Transmission and Mode of Delivery](#)) (AII).
- Amniocentesis, if clinically indicated, should be performed on women with HIV only after initiation of an effective ART regimen and, ideally, when HIV RNA levels are undetectable (BIII). In women with detectable HIV RNA levels in whom amniocentesis is deemed necessary, consultation with an expert in the management of HIV in pregnancy should be considered (BIII).

**Rating of Recommendations:** A = Strong; B = Moderate; C = Optional

**Rating of Evidence:** I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Viral loads should be monitored more frequently in pregnant individuals than in nonpregnant individuals because of the importance of rapid and sustained viral suppression in preventing perinatal HIV transmission. Individuals who are adherent to their antiretroviral (ARV) regimen and who do not harbor resistance mutations to the prescribed drugs should achieve viral suppression within 12 to 24 weeks. Individuals with higher viral loads and lower CD4 T lymphocyte (CD4) cell counts are more likely to take more time to achieve viral suppression during this time period,<sup>1,2</sup> whereas those with lower viral loads and higher CD4 counts and those using integrase strand transfer inhibitors (INSTIs) are more likely to achieve suppression in much shorter time frames. Most patients with adequate viral response at 24 weeks of treatment have had at least a 1 log viral load decrease within 1 to 4 weeks after starting therapy.<sup>3,4</sup> Viral load should be monitored in pregnant women who are living with HIV at the initial clinic visit, 2 to 4 weeks after initiating or changing ARV regimens, monthly until undetectable, and at least every 3 months thereafter. If adherence is a concern, especially during early pregnancy, more frequent monitoring is recommended because of the potential increased risk of perinatal HIV transmission associated with detectable HIV viremia during pregnancy.<sup>5-7</sup>

Similarly, pregnancy may affect the drug exposure levels or efficacy of some drugs; women who are taking these drugs may require a change in therapy or more frequent viral load monitoring (see [Table 6](#) and [Table 7](#)).

Viral load also should be assessed at approximately 34 to 36 weeks' gestation to inform decisions about mode of infant delivery and optimal treatment for newborns (see [Transmission and Mode of Delivery](#)).

In pregnant women with HIV, CD4 cell count should be monitored at the initial clinic visit. For patients who have been on antiretroviral therapy (ART) for  $\geq 2$  years, who have had consistent viral suppression and CD4 cell counts that are consistently  $>300$  cells/mm<sup>3</sup>, and who are tolerating ART in pregnancy, CD4 cell count should be monitored only at the initial antenatal visit; CD4 cell counts do not need to be repeated for these patients during this pregnancy, as per the [Adult and Adolescent Antiretroviral Guidelines](#).<sup>3,8,9</sup> Women who have been on ART for  $<2$  years, women with CD4 cell counts of  $<300$  cells/mm<sup>3</sup>, or women with inconsistent adherence and/or detectable viral loads should have CD4 cell counts monitored every 3 to 6 months during pregnancy. The safety of this approach is supported by research that demonstrates that patients who are stable on ART (defined as viral load levels  $<50$  copies/mL and CD4 cell counts  $>500$  cells/mm<sup>3</sup> for 1 year) are highly unlikely to experience a CD4 cell count  $<350$  cells/mm<sup>3</sup> in the span of a year.<sup>10</sup>

HIV drug-resistance testing should be performed in women with HIV before starting or modifying ARV regimens if HIV RNA levels are above the threshold for resistance testing (i.e.,  $>500$  to 1,000 copies/mL). See [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#) for more information on resistance testing, including considerations regarding INSTI genotypic resistance testing. ART should not be delayed while waiting for resistance test results. If the results demonstrate resistance, then the regimen can be subsequently adjusted. ARV drug resistance testing should also be performed on women who are taking an ARV regimen but who have suboptimal viral suppression (i.e., failure to achieve undetectable levels of virus during an appropriate time frame, as noted above) or who have sustained viral rebound to detectable levels after prior viral suppression on an ARV regimen (see [Lack of Viral Suppression](#) and [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#)). Drug-resistance testing in the setting of virologic failure is most useful when it is performed while patients are receiving ARV drugs or within 4 weeks after discontinuation of drugs. Even if more than 4 weeks have elapsed since the ARV drugs were discontinued, resistance testing can still provide useful information to guide therapy, though it may not detect all resistance mutations that were selected by previous ART regimens.

Laboratory monitoring for potential complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs a woman is receiving. For example, routine hematologic monitoring is recommended for women who are receiving zidovudine-containing regimens, and routine renal monitoring is recommended for women on tenofovir disoproxil fumarate. Liver function should be monitored in all women who are receiving ARV drugs. Hepatic dysfunction has been observed in pregnant women on protease inhibitors (PIs), and hepatic steatosis and lactic acidosis in pregnancy have been related to the use of nucleoside reverse transcriptase inhibitors. Pregnant women in general are more likely to have elevated liver enzymes than their nonpregnant counterparts.<sup>11,12</sup>

Pregnancy increases the risk of glucose intolerance. PIs have been associated with increased risk of hyperglycemia, new-onset diabetes mellitus, exacerbation of existing diabetes mellitus, and diabetic ketoacidosis.<sup>13-16</sup> However, the majority of studies in pregnant women with HIV have not shown an increased risk of glucose intolerance with the use of PI-based regimens during pregnancy.<sup>17</sup> A prospective study reported that pregnant women with HIV who received PI-containing regimens did not have more glucose intolerance or insulin resistance than did women who received regimens that did not contain a PI.<sup>18</sup> In both groups, the rate of impaired glucose tolerance was high (38%), but that may be related to specific characteristics of the study participants, including high body mass index and race/ethnicity. Women with HIV who are on ART during pregnancy should receive the standard glucose screening at 24 to 28 weeks' gestation that is recommended for all pregnant women. Some experts would perform glucose screening early in pregnancy for women receiving PI-based ART that was initiated before pregnancy, similar to recommendations for women with risk factors for glucose intolerance.<sup>19</sup>

Accurate estimation of date of delivery is critical when planning scheduled cesarean deliveries at 38 weeks' gestation to prevent perinatal transmission in women with HIV who have elevated HIV RNA viral loads (or when scheduling cesarean delivery or induction for an obstetric indication). Therefore, a first-trimester ultrasound is recommended to confirm gestational age and to provide the most accurate estimation of gestational age at delivery (see [Transmission and Mode of Delivery](#)).<sup>20-22</sup> In patients who are not seen until later in gestation, a second-trimester ultrasound can be used for both an anatomical survey and for determining gestational age.

Noninvasive methods of aneuploidy screening should be offered, using tests with high sensitivity and low false-positive rates as recommended by American College of Obstetricians and Gynecologists. Screening can be accomplished using serum analyte screening alone or combined with nuchal translucency, cell-free DNA screening, or ultrasonographic screening alone.<sup>33,34</sup> Women with HIV who have indications for invasive testing during pregnancy (e.g., abnormal ultrasound or aneuploidy screening) should be counseled about the potential risk of HIV transmission along with other risks of the procedure so that they can make an informed decision about testing. Although data are still somewhat limited, the risk of HIV transmission does not appear to increase with the use of amniocentesis or other invasive diagnostic procedures in women who have virologic suppression on ART.<sup>23,24</sup> This is in contrast to the era before effective ART, during which invasive procedures such as amniocentesis and chorionic villus sampling (CVS) were associated with a two- to four-fold increase in risk of perinatal transmission of HIV.<sup>25-28</sup> Although no transmissions occurred among 159 reported cases of amniocentesis or other invasive diagnostic procedures performed in women who were on effective ART, a small increase in the risk of transmission cannot be ruled out.<sup>29-32</sup> Some experts consider CVS and cordocentesis too risky to offer to women with HIV, and they recommend limiting invasive procedures to amniocentesis. At a minimum, pregnant women with HIV should receive effective ART before undergoing any invasive prenatal testing. In addition, they should ideally have undetectable HIV RNA levels at the time of the procedure, and every effort should be made to avoid inserting the needle through, or very close to, the placenta. In women with detectable HIV RNA levels for whom amniocentesis is deemed necessary, consultation with an expert in the management of HIV in pregnancy should be considered, see [Other Intrapartum Management Considerations](#).

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