Recommendations for Use of Antiretroviral Drugs in Pregnant HIV-1-Infected Women for Maternal Health and Interventions to Reduce Perinatal HIV Transmission in the United States

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Antiretroviral Drug Resistance and Resistance Testing in Pregnancy  
(Last updated October 26, 2016; last reviewed October 26, 2016)

Panel's Recommendations

- HIV drug-resistance studies should be performed before starting antiretroviral (ARV) regimens in all ARV-naive pregnant women whose HIV RNA levels are above the threshold for resistance testing (i.e., >500 to 1,000 copies/mL) unless they have already been tested for ARV resistance (AII).
- Antiretroviral therapy (ART) should be initiated in pregnant women prior to receiving results of ARV-resistance studies. ART should be modified, if necessary, based on the results of the resistance assay (BIII).
- HIV drug-resistance studies should be performed before modifying ART regimens for those entering pregnancy with detectable HIV RNA levels that are above the threshold for resistance testing (i.e., >500 to 1,000 copies/mL) while receiving ARV drugs or who have suboptimal virologic response to ARV drugs started during pregnancy (AII).
- Documented zidovudine resistance does not affect the indications for use of intrapartum zidovudine (BIII).
- The optimal prophylactic regimen for newborns of women with ARV resistance is unknown. Therefore, ARV prophylaxis for an infant born to a woman with known or suspected drug resistance should be determined in consultation with a pediatric HIV specialist, preferably before delivery (see Infant Antiretroviral Prophylaxis) (AII).
- HIV-infected pregnant women should be given ART to maximally suppress viral replication, which is the most effective strategy for preventing development of resistance and minimizing risk of perinatal transmission (AII).
- All pregnant and postpartum women should be counseled about the importance of adherence to prescribed ARV medications to reduce the potential for development of resistance (AII).

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

Indications for Antiretroviral Drug-Resistance Testing in HIV-Infected Pregnant Women

Because identification of baseline resistance mutations allows for the selection of more effective and durable antiretroviral (ARV) regimens, genotypic resistance testing (in addition to a comprehensive history of ARV drug use) is recommended:

- Before initiating antiretroviral therapy (ART) in ARV-naive, HIV-infected pregnant women with HIV RNA levels above the threshold for resistance testing (i.e., >500 to 1,000 copies/mL) who have not been previously tested for ARV resistance,
- Before initiating ART in HIV-infected pregnant women who have received ARV drugs for prevention of perinatal transmission in prior pregnancies if HIV RNA levels are above the threshold for resistance testing (i.e., >500 to 1,000 copies/mL), and
- Before modifying ARV regimens in HIV-infected pregnant women entering pregnancy with detectable HIV RNA levels that are above the threshold for resistance testing (i.e., >500 to 1,000 copies/mL) while receiving ART or who have suboptimal virologic response to ARV drugs started during pregnancy

In most settings, the results of resistance testing guide selection of the initial ART regimen. However, given the association of earlier viral suppression with lower risk of perinatal transmission, in ARV-naive pregnant women, ART should be initiated without waiting for the results of resistance testing, with modification of the regimen, if required, when test results return (see HIV-Infected Pregnant Women Who Have Never Received Antiretroviral Drugs (Antiretroviral Naive) section).

Incidence and Significance of Antiretroviral Drug Resistance in Pregnancy

The development of ARV drug resistance is one of the major factors leading to therapeutic failure in HIV-infected individuals. In addition, pre-existing resistance to a drug in an ART regimen may diminish the
regimen’s efficacy in preventing perinatal transmission. Infant treatment options also may be limited if maternal drug resistance is present or develops and resistant virus is transmitted to the fetus.

Several factors unique to pregnancy may increase the risk of development of resistance. Issues relating to discontinuation of non-nucleoside reverse transcriptase inhibitor (NNRTI)-based ART are discussed in *Prevention of Antiretroviral Drug Resistance*. Problems such as nausea and vomiting in early pregnancy may compromise adherence and increase the risk of resistance in women receiving ARV drugs. Pharmacokinetic changes during pregnancy, such as increased plasma volume and renal clearance, may lead to sub-therapeutic drug levels, increasing the risk that resistance will develop.

**Impact of Resistance on the Risk of Perinatal Transmission of HIV and Maternal Response to Subsequent Therapy**

**Perinatal Transmission**

Perinatal transmission of resistant virus has been reported but appears to be unusual. There is little evidence that the presence of resistance mutations increases the risk of transmission when current recommendations for ARV management in pregnancy are followed. A sub-study of the Women and Infants Transmission Study followed pregnant women receiving zidovudine alone for treatment of HIV infection in the early 1990s. In this study, detection of zidovudine resistance conferred an increased risk of transmission when analysis was adjusted for duration of membrane rupture and total lymphocyte count; however, women in this cohort had characteristics that would indicate a need for ART under the current Department of Health and Human Services recommendations for maternal health and for prevention of perinatal transmission. When transmitting mothers had mixed viral populations of wild-type virus and virus with low-level zidovudine resistance, only wild-type virus was detected in their infants, and other studies have suggested that drug-resistance mutations may diminish viral fitness, possibly leading to a decrease in transmissibility. In another study, prevalence of ARV drug resistance among HIV-infected newborns in New York State was examined. Eleven of 91 infants (12.1%) born between 1989 and 1999 and 8 of 42 (19%) infants born between 2001 and 2002 had mutations associated with decreased drug susceptibility. However, perinatal exposure to ARV drugs was not found to be a significant risk factor for the presence of resistance during either time period. Neither resistance to NNRTI drugs that develops as a result of exposure to single-dose nevirapine nor exposure to single-dose nevirapine in a prior pregnancy has been shown to affect perinatal transmission rates.

**Maternal Response to Subsequent Treatment Regimens**

The French Perinatal Cohort evaluated the association between exposure to ARV drugs to prevent perinatal transmission during a previous pregnancy and presence of a detectable viral load with exposure to ARV drugs during the current pregnancy in women followed between 2005 and 2009. In 1,166 women not receiving ARV drugs at the time of conception, 869 were ARV-naive and 247 had received ARV drugs to prevent perinatal transmission during a previous pregnancy. Previous ARV prophylaxis was protease inhibitor (PI)-based in 48%, non-PI-based in 4%, nucleoside reverse transcriptase inhibitor (NRTI) in 29%, and zidovudine as a single ARV drug in 19%. A PI-based ART regimen was initiated in 90% of the women during the current pregnancy; in multivariate analysis, previous ARV exposure in a prior pregnancy was not associated with detectable viral load in the current pregnancy. A separate study (ACTG A5227) evaluated viral suppression in 52 women with prior combination ARV exposure to prevent perinatal transmission who had stopped ARV drugs at least 24 weeks before study entry and were now initiating ART (efavirenz, tenofovir disoproxil fumarate, and emtricitabine) for treatment. None of the women had prior or recent resistance detected on standard bulk genotyping. Viral suppression was observed in 81% of women after 24 weeks of follow-up, with no difference in response by number of prior ARV drug exposures to prevent perinatal transmission or the drug class of prior exposure. Recent clinical series have confirmed this observation.

**Management of Antiretroviral Drug Resistance during Pregnancy**

For women who have documented zidovudine resistance and whose antepartum regimen does not include zidovudine, intravenous (IV) zidovudine still should be given during labor when indicated (i.e., HIV RNA
>1,000 copies/mL near delivery; see Intrapartum Antiretroviral Drug Therapy/Prophylaxis). Other ARVs should be continued orally during labor to the extent possible. The rationale for including zidovudine intrapartum when a woman is known to harbor virus with zidovudine resistance is based on several factors. Data thus far have suggested that only wild-type virus appears to be transmitted to infants by mothers who have mixed populations of wild-type virus and virus with low-level zidovudine resistance.2 Other studies have suggested that drug-resistance mutations may diminish viral fitness and possibly decrease transmissibility.3 The efficacy of the zidovudine prophylaxis appears to be based not only on a reduction in maternal HIV viral load but also on pre- and post-exposure prophylaxis in the infant.11-13 Zidovudine crosses the placenta readily and has a high cord-to-maternal blood ratio. In addition, zidovudine is metabolized to the active triphosphate within the placenta,14,15 which may provide additional protection against transmission. Metabolism to the active triphosphate, which is required for activity of all nucleoside analogue agents, has not been observed within the placenta with other nucleoside analogues that have been evaluated (didanosine and zalcitabine). Zidovudine penetrates the central nervous system (CNS) better than other nucleoside analogues except stavudine, which has similar CNS penetration; this may help eliminate a potential reservoir for transmitted HIV in the infant.16,17 Thus, intrapartum IV administration of zidovudine, when indicated, currently is recommended even in the presence of known resistance because of the drug’s unique characteristics and its proven record in reducing perinatal transmission.

The optimal prophylactic regimen for newborns of women with ARV drug-resistant virus is unknown. Therefore, ARV prophylaxis for infants born to women with known or suspected drug-resistant virus should be determined with a pediatric HIV specialist, preferably before delivery (see Infant Antiretroviral Prophylaxis). There is no evidence that neonatal prophylaxis regimens customized based on the presence of maternal drug resistance are more effective than standard neonatal prophylaxis regimens.

**Prevention of Antiretroviral Drug Resistance**

The most effective way to prevent development of ARV drug resistance in pregnancy is to use and adhere to an effective ARV regimen to achieve maximal viral suppression.

Several studies have demonstrated that women’s adherence to ART may worsen in the postpartum period.18-23 Clinicians caring for postpartum women receiving ART should specifically address adherence, including evaluating specific factors that facilitate or impede adherence. A systematic review has identified viral load monitoring as a means of enhancing adherence.24

References


21. Rana AI, Gillani FS, Flanigan TP, Nash BT, Beckwith CG. Follow-up care among HIV-infected pregnant women

Recommen...
