



**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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Guidelines Development Process

Table 1. Outline of the Guidelines Development Process

Topic	Comment
Goal of the Guidelines	Provide guidance to HIV care practitioners on the optimal use of antiretroviral (ARV) agents in pregnant women living with HIV for treatment of HIV infection and for prevention of perinatal transmission of HIV and management of HIV-exposed infants in the United States.
Panel Members	The Panel is composed of approximately 30 voting members who have expertise in managing the care of pregnant women living with HIV (e.g., training in obstetrics/gynecology, infectious diseases, or women's health), pharmacology of ARV drugs during pregnancy, and interventions for prevention of perinatal transmission (e.g., specialized training in pediatric HIV infection), as well as community representatives with knowledge of HIV infection in pregnant women and interventions for prevention of perinatal transmission. The U.S. government representatives, appointed by their agencies, include at least one representative from each of the following Department of Health and Human Services agencies: the Centers for Disease Control and Prevention, the Food and Drug Administration (FDA), the Health Resources and Services Administration (HRSA), and the National Institutes of Health (NIH). Members who do not represent U.S. government agencies are selected by Panel members after an open announcement to call for nominations. Each member serves on the Panel for a 3-year period, with an option for re-appointment. The Panel may also include liaison members from the Perinatal HIV Hotline, the American Academy of Pediatrics' Committee on Pediatric AIDS, and the American College of Obstetricians and Gynecologists. A list of all Panel members can be found on Page IV of the guidelines.
Financial Disclosures	All members of the Panel submit a written financial disclosure annually reporting any association with manufacturers of ARV drugs or diagnostics used for management of HIV infections. A list of the latest disclosures is available on the <i>AIDSinfo</i> website (http://aidsinfo.nih.gov).
Users of the Guidelines	Providers of care to HIV-infected pregnant women and to HIV-exposed infants
Developer	The Panel on Treatment of Pregnant Women with HIV Infection and Prevention of Perinatal Transmission—a working group of the Office of AIDS Research Advisory Council (OARAC)
Funding Source	Office of AIDS Research, NIH
Evidence for Recommendations	The recommendations in these guidelines are generally based on studies published in peer-reviewed journals. On some occasions, particularly when new information may affect patient safety, unpublished data presented at major conferences or prepared by the FDA and/or manufacturers as warnings to the public may be used as evidence to revise the guidelines.
Recommendation Grading	See Table 2 .
Method of Synthesizing Data	Each section of the Guidelines is assigned to a small group of Panel members with expertise in the area of interest. A structured literature search is conducted by a technical assistance consultant and provided to the Panel working group. The members review and synthesize the available data and propose recommendations to the entire Panel. The Panel discusses all proposals during monthly teleconferences. Proposals are modified based on Panel discussion and then distributed, with ballots, to all Panel members for concurrence and additional comments. If there are substantive comments or votes against approval, the recommended changes and areas of disagreement are brought back to the full Panel (via email or teleconference) for additional review, discussion, and further modification to reach a final version acceptable to all Panel members. The recommendations in these final versions represent endorsement from a consensus of members and are included in the guidelines as official Panel recommendations.
Other Guidelines	These Guidelines focus on pregnant women living with HIV and their infants. Other Guidelines (all available on the <i>AIDSinfo</i> website http://www.aidsinfo.nih.gov) outline the use of ARV agents in non-pregnant adults and adolescents with HIV; use of ARV agents in infants and children with HIV; treatment and prevention of opportunistic infections (OIs) in adults and adolescents with HIV, including pregnant women; treatment and prevention of OIs in children exposed to HIV or with HIV infection; and treatment of people who experience occupational or non-occupational exposure to HIV. Preconception management for non-pregnant women of reproductive age is briefly discussed in this document. However, for more detailed discussion on issues of treatment of non-pregnant adults, the Working Group defers to the designated expertise offered by Panels that have developed those guidelines.

Guidelines Development Process

Table 1. Outline of the Guidelines Development Process, cont'd

Topic	Comment
Update Plan	The Panel meets monthly by teleconference to review data that may warrant modification of the guidelines. Updates may be prompted by new drug approvals (or new indications, new dosing formulations, and/or changes in dosing frequency), significant new safety or efficacy data, or other information that may have a significant impact on the clinical care of patients. In the event of significant new data that may affect patient safety, the Panel may issue a warning announcement and accompanying recommendations on the <i>AIDSinfo</i> website until the guidelines can be updated with appropriate changes. Updated guidelines are available on the <i>AIDSinfo</i> website (http://www.aidsinfo.nih.gov).
Public Comments	A 2-week public comment period follows release of the updated guidelines on the <i>AIDSinfo</i> website. The Panel reviews comments received to determine whether additional revisions to the guidelines are indicated. The public may also submit comments to the Panel at any time at contactus@aidinfo.nih.gov .

Table 2. Rating Scheme for Recommendations

Strength of Recommendation	Quality of Evidence for Recommendation
A: Strong recommendation for the statement	I: One or more randomized trials with clinical outcomes and/or validated laboratory endpoints
B: Moderate recommendation for the statement	II: One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes
C: Optional recommendation for the statement	III: Expert opinion

Note: All recommendations in the following table are based on consensus expert opinion. More details can be found in the CDC's [U.S. Medical Eligibility Criteria for Contraceptive Use](#), 2016.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 1 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment for POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
NNRTIs							
EFV	<p>COC:</p> <ul style="list-style-type: none"> No effect on EE concentrations ↓ active metabolites of norgestimate LN AUC ↓ 83%; norelgestromin AUC ↓ 64%²⁸ Etonogestrel (in COC) C24 ↓ 61%³⁴ <p>DMPA:</p> <ul style="list-style-type: none"> No effect on DMPA levels^{25,27} <p>Etonogestrel Implant:</p> <ul style="list-style-type: none"> Etonogestrel AUC ↓ 63% to 82%^{44,45} <p>LN Implant:</p> <ul style="list-style-type: none"> LN AUC ↓ 47%³⁹ LN (emergency contraception) AUC ↓ 58%²³ <p>Changes in ARV Levels and/or Effects on HIV:</p> <p>COC:</p> <ul style="list-style-type: none"> No effect on EFV concentrations²⁸ EFV C12 ↓ 22%; was under therapeutic threshold in 3/16 subjects³⁴ <p>DMPA:</p> <ul style="list-style-type: none"> No effect on HIV disease progression^{25,46,47} No effect on EFV concentrations²⁵ <p>LN Implant:</p> <ul style="list-style-type: none"> No effect on HIV disease progression³⁹ 	<p>COC:</p> <ul style="list-style-type: none"> Pregnancy rates no difference⁴⁰ Pregnancy rate higher (13%) in women using COCs and EFV than COCs alone^{42,48} Progesterone >3 (a surrogate for ovulation) in 3/16⁴⁹ No ovulations²⁸ <p>DMPA:</p> <ul style="list-style-type: none"> No increase in pregnancy^{25,40,42,47} Low progesterone^{25,27,47} <p>Etonogestrel Implant:</p> <ul style="list-style-type: none"> Pregnancy rate higher with EFV compared with no ART, but still lower than other hormonal methods⁴² Presumptive ovulation in 5%⁴⁴ <p>LN Implant:</p> <ul style="list-style-type: none"> 12% pregnancy rate³⁵ 15% pregnancy rate³⁹ Pregnancy rate higher with EFV compared with no ART, but still lower than other hormonal methods⁴² No increase in pregnancy rate⁴⁰ 	Consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	<p>For COCs, some studies suggest higher pregnancy rate and ovulation and decreased progesterin levels. EFV may decrease, but clinical significance unclear.</p> <p>For DMPA, evidence does not show effects on pregnancy rate, ovulation, or DMPA levels. Also, no effect on HIV disease progression or EFV levels.</p> <p>For implants, some studies suggest higher pregnancy rate and decreased hormone levels.</p>

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 2 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/Clinical Comment for COC/P/R	Dosing Recommendation/Clinical Comment POPs	Dosing Recommendation/Clinical Comment for DMPA ^a	Dosing Recommendation/Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
NNRTIs, continued							
ETR	EE AUC ↑ 22% ⁵⁰ <u>NE:</u> • No significant effect ⁵⁰	<u>COC:</u> • No ovulations ⁵⁰	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, 1 study found no ovulations and no significant change in progestin levels. No evidence on POPs.
NVP	EE AUC ↓ 29%; ⁵¹ EE AUC no change ⁵² NE AUC ↓ 18% ⁵¹ Etonogestrel (in COC) C24 decreased 22% ³⁴ <u>DMPA:</u> • No significant change ²⁵ <u>LN Implant:</u> • LN AUC ↑ 35% ³⁹ <u>Changes in ARV Levels and/or Effects on HIV</u> <u>COC:</u> • NVP no significant effect ^{49,51,53} <u>DMPA:</u> • No effect on HIV disease progression ^{25,46,47,54} <u>LN Implant:</u> • No effect on HIV disease progression ^{39,55}	<u>COC:</u> • No increase in pregnancy rate ^{40,42,48,56,57} • No ovulations ^{49,52,57} <u>DMPA:</u> • No increase in pregnancy rate ^{40,42,47,56} • No ovulations ²⁵ <u>Etonogestrel Implant:</u> • No increase in pregnancy rate ⁴² <u>LN Implant:</u> • No increase in pregnancy rate ^{35,39,40,42,55}	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, evidence does not show effects on pregnancy rate or ovulations and demonstrated small decrease in progestin levels. Also, no effect on NVP levels. For DMPA, evidence does not show effects on pregnancy rate, ovulation, or DMPA levels. Also, no effect on HIV disease progression. For implants, evidence does not show effects on pregnancy rate or HIV disease progression.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 3 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
NNRTIs, continued							
RPV	EE AUC ↑ 14% ³³ <u>NE:</u> • No significant change ³³ <u>Changes in ARV Levels and/or Effects on HIV</u> <u>COC:</u> • No change in RPV levels compared to historical controls ³³	<u>COC:</u> • No change in progesterone ³³	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, evidence does not show effects on ovulation or progestin levels. Also, no change in RPV levels. No evidence on POPs.
RTV-Boosted PIs							
ATV/r	EE AUC ↓ 19% ⁵⁸ Norgestimate AUC ↑ 85% ⁵⁸ <u>POP:</u> • NE AUC ↑ 50% ⁵⁹	N/A	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, increase in progestin levels but only 1 study. For POPs, increase in progestin levels but only 1 study. RTV inhibits CYP3A4 which may increase contraceptive hormone levels.
DRV/r	EE AUC ↓ 44% ⁶⁰ NE AUC ↓ 14% ⁶⁰	N/A	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	For COCs, small decrease in progestin levels. No evidence on POPs.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 4 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment for POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
RTV-Boosted PIs, continued							
FPV/r	EE AUC ↓ 37% ⁶¹ NE AUC ↓ 34% ⁶¹ FPV/r level: no change ⁶¹	N/A	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	For COCs, decrease in progestin levels. No evidence on POPs.
LPV/r	EE AUC ↓ 55% ²⁴ NE AUC ↓ 17% <u>Patch:</u> • EE AUC ↓ 45% ²⁴ • Norelgestromin AUC ↑ 83% ²⁴ <u>DMPA:</u> • DMPA AUC ↑ 46% ³⁷ <u>Etonogestrel Implant:</u> • Etonogestrel AUC ↑ 52% ⁴⁴ <u>Changes in ARV Levels and/or Effects on HIV</u> <u>Patch:</u> • LPV/r level ↓ 19% ²⁴ <u>DMPA:</u> • No effect on HIV disease progression ³⁷ • LPV/r no change ³⁷	<u>COC:</u> • Increased pregnancy rate, but CIs overlap ⁴² <u>Patch:</u> • No ovulations ²⁴ <u>DMPA:</u> • No pregnancies, no ovulations ³⁷ • Increased pregnancy rate, but CIs overlap ⁴² <u>Etonogestrel Implant:</u> • No increase in pregnancy rate ⁴² <u>LN Implant:</u> • No increase in pregnancy rate. ^{35,42}	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, nonsignificant increase in pregnancy rate. Small decrease in progestin level. For patch, no ovulations and progestin levels increase. For DMPA, evidence shows no effect on pregnancy rate or ovulations and progestin levels increased. For implants, evidence shows no effect on pregnancy rate and progestin levels increased.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 5 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment for POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
RTV-Boosted PIs, continued							
SQV/r	<p>↓ EE⁶²</p> <p><u>Changes in ARV Levels and/or Effects on HIV:</u></p> <p><u>COC:</u></p> <ul style="list-style-type: none"> • SQV/r no change⁶³ 	N/A	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	<p>No information on progestin levels for CHCs or POPs.</p> <p>RTV inhibits CYP3A4 which may increase contraceptive hormone levels. However, some PI/r cause decreases in progestin levels, so there are theoretical concerns about contraceptive effectiveness.</p>
TPV/r	<p>EE AUC ↓ 48%⁶⁴</p> <p><u>NE:</u></p> <ul style="list-style-type: none"> • No significant change⁶⁴ <p><u>Changes in ARV Levels and/or Effects on HIV</u></p> <ul style="list-style-type: none"> • TPV no change⁶⁴ 	N/A	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	<p>For COCs, no significant change in progestin levels but only from product label.</p> <p>No evidence on POPs.</p> <p>RTV inhibits CYP3A4 which may increase contraceptive hormone levels. However, some PI/r cause decreases in progestin levels, so there are theoretical concerns about contraceptive effectiveness.</p>

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 6 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
PIs without RTV							
ATV	COC: • EE AUC ↑ 48% ⁶⁵ • NE AUC ↑ 110% ⁶⁵	N/A	Prescribe oral contraceptive that contains no more than 30 mcg of EE, or recommend alternative contraceptive method.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, increased concentrations of estrogen and progestin, but only data available are from the product label. No evidence on POPs.
ATV/c	Drospirenone AUC ↑ 2.3-fold; EE AUC ↓ 22% ⁶⁶	N/A	Contraindicated with drospirenone-containing hormonal contraceptive due to potential for hyperkalemia. Consider alternative or additional contraceptive method.	Can consider an alternative method based on safety concerns.	Can consider an alternative method based on safety concerns.	Can consider an alternative method based on safety concerns.	No evidence on POPs.
DRV/c	Drospirenone AUC ↑ 1.6-fold; EE AUC ↓ 30% ⁶⁶	N/A	In combination with drospirenone containing COCs, clinical monitoring is recommended due to the potential for hyperkalemia. Consider alternative or additional contraceptive method.	Can consider an alternative method based on safety concerns.	Can consider an alternative method based on safety concerns.	Can consider an alternative method based on safety concerns.	No evidence on POPs.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 7 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
PIs without RTV, continued							
FPV	<p><u>COC:</u> APV: • EE AUC no change, C_{min} ↑ 32% • NE AUC ↑ 18%, C_{min} ↑ 45%⁶¹</p> <p><u>FPV with EE/Norethindrone:</u> • ↓ APV (AUC 22%, C_{min} 20%)⁶¹</p>	N/A	Use alternative contraceptive method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Use of FPV alone with ethinyl estradiol/norethindrone may lead to loss of virologic response. No evidence on POPs.
IDV	<p><u>COC:</u> • EE AUC ↑ 22% • NE AUC ↑ 26%⁶⁷</p>	<p><u>COCs:</u> • No pregnancies among women taking IDV and COCs⁴⁸</p>	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, small increases in EE and progestin, and 1 clinical study did not suggest any efficacy concerns. No evidence on POPs.
NFV	<p><u>COC:</u> • EE AUC ↓ 47% • NE AUC ↓ 18%⁶⁸</p> <p><u>DMPA:</u> • No change²⁵</p> <p><u>NFV:</u> • AUC ↓ 18%</p>	<p><u>COCs:</u> • 1 small study suggested that women using COCs and NFV may have had higher pregnancy rates than those using COCs alone⁴⁸</p> <p><u>DMPA:</u> • No pregnancies, no ovulations^{25,47} • CD4 count/HIV RNA: no change^{25,47}</p>	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	No additional contraceptive protection is needed.	Can consider an alternative method (or a reliable method of barrier contraception) in addition to this method.	For COCs, small decrease in progestin and decrease in estrogen; 1 small clinical study suggests possible higher pregnancy rate with COC and NFV use. DMPA, PK, and clinical data demonstrate no change. However, NFV AUC slightly decreased. No evidence on POPs or implants.
CCR5 Antagonist							
MVC	<p><u>COC:</u> • No significant effect on EE or LN⁶⁹</p>	N/A	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, no change in EE or progestin. No clinical data. No evidence on POPs.

Table 3. Drug Interactions Between Antiretroviral Agents and Hormonal Contraceptives (page 8 of 8)

ARV Drug	Effect on Contraceptive Drug Levels and Contraceptive's Effects on ART and HIV	Clinical Studies	Dosing Recommendation/ Clinical Comment for COC/P/R	Dosing Recommendation/ Clinical Comment POPs	Dosing Recommendation/ Clinical Comment for DMPA ^a	Dosing Recommendation/ Clinical Comment for Etonogestrel Implants	Justification/Evidence for Recommendation
Integrase Inhibitors							
RAL	<u>COC:</u> • EE no change • Norgestimate AUC ↑ 14% ⁷⁰	N/A	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	For COCs, no change in EE and small increase in progestin. No clinical data. No evidence on POPs.
DTG	<u>COC:</u> • No significant effect on norgestimate or EE • DTG AUC no change ³⁸	N/A	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	COCs, no change in EE or progestin. No clinical data No evidence on POPs.
EVG/c	<u>EVG/COBI/FTC/TDF</u> <u>COC:</u> • Norgestimate AUC ↑ 126% EE AUC ↓ 25% ⁷¹	N/A	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	No additional contraceptive protection is needed.	When administered as the 4-drug regimen EVG/COBI/FTC/TDF, increases in P and small decrease in EE were observed. No clinical data. No evidence on POPs.

^a Because the hormonal levels achieved with DMPA are substantially higher than are required for contraception, any small reduction in hormonal level due to ARVs is unlikely to reduce contraceptive effectiveness.

Key to Acronyms: ART = antiretroviral therapy; ARV = antiretroviral; ATV = atazanavir; **ATV/c = atazanavir/cobicistat**; ATV/r = atazanavir/ritonavir; AUC = area under the curve; CHC = combination hormonal contraceptives; **CI = confidence interval**; C_{min} = minimum plasma concentration; COBI = cobicistat; **COC/P/R = combined oral contraceptives/patch/ring**; DMPA = depot medroxyprogesterone acetate; **DRV/c = darunavir/cobicistat**; DRV/r = darunavir/ritonavir; DTG = dolutegravir; e = estrogen; EE = ethinyl estradiol; EFV = efavirenz; ETR = etravirine; EVG = elvitegravir; **EVG/c = elvitegravir/cobicistat**; FPV = fosamprenavir; FPV/r = fosamprenavir/ritonavir; IDV = indinavir; LN = levonorgestrel; LPV/r = lopinavir/ritonavir; MVC = maraviroc; **NE = norethindrone**; NFV = nelfinavir; NVP = nevirapine; P = progestin; PI = protease inhibitor; PI/r = ritonavir boosted-protease inhibitor; **PK = pharmacokinetic**; POP = progesterone-only oral contraceptive pills; RAL = raltegravir; RPV = rilpivirine; RTV = ritonavir; SQV/r = saquinavir/ritonavir; **TDF = tenofovir disoproxil fumarate**; TPV/r = tipranavir/ritonavir

Source: Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents Living with HIV. Department of Health and Human Services. Tables 15a, 15b, and 15d. Available at <http://aidsinfo.nih.gov/contentfiles/lvguidelines/AdultandAdolescentGL.pdf>.

Table 4. Clinical Trials of Pre-Exposure Prophylaxis

Trial	Study Population	Location	Intervention	Outcome	Comments
TDF2	1,219 sexually active adults; 55% male, 45% female; 94% unmarried; approximately 90% aged 21–29	Botswana	Daily oral TDF/FTC	63% protection	>30% did not complete study; cannot draw definitive conclusions for women and men separately.
PIP	4,758 serodiscordant heterosexual couples; 38% HIV-negative female, 68% HIV-negative male partner; 98% married; median age 33	Botswana, Kenya, Rwanda, South Africa, Tanzania, Uganda, Zambia	Daily oral TDF or TDF/FTC	67% protection with TDF alone; 75% protection with TDF/FTC	Serodiscordant couples may be a distinct, unique population.
FEM-PrEP	1,951 heterosexual women aged 18–35 at high risk of infection	Kenya, South Africa, Tanzania	Daily oral TDF/FTC	Trial discontinued for futility in April 2011.	Adherence assessment with monthly clinical samples to measure drug concentration is pending.
VOICE MTN-003	5,029 heterosexual women aged 18–45 in high-prevalence areas	Uganda, South Africa, Zimbabwe	Daily oral TDF or daily oral TDF/FTC or daily topical TFV gel	No study drug significantly reduced the risk of HIV acquisition. Estimates of effectiveness were less than 0 for TDF and TDF/FTC daily oral dosing (negative 48.8% and negative 4.2% TDF/FTC respectively), and reduced risk of HIV infection of 14.7% for TDF gel.	Adherence to study drugs was low; TFV was detected in 30% of the oral TDF arm, 29% in the oral TDF/FTC arm, and 25% in the TDF gel arm.

Key to Acronyms: FTC = emtricitabine; TDF = tenofovir disoproxil fumarate; TFV = tenofovir

Source: Adapted from: Kashuba et al., Pre-exposure prophylaxis for HIV prevention: how to predict success: Table Antiretroviral-based HIV prevention studies. *Lancet*. 2012;379(9835): 2409-2411.

Table 5. Results of Studies Assessing the Association Between Antiretroviral Regimens and Preterm Delivery (page 1 of 5)

Study Location(s); Dates of Study	Total Number of Pregnancies/ Total on ARV Drugs	Types of ARV Regimens Compared (Numbers)	Association Noted Between ARV Regimens and Preterm Delivery	Notes
European Collaborative Study and Swiss Mother and Child HIV Cohort Study; 1986–2000 ¹	3,920/896	<ul style="list-style-type: none"> • Mono (573) • Multi, no PI (215) • Multi-PI (108) 	<ul style="list-style-type: none"> • YES (compared with no ARV) • Multi: 1.82 (1.13–2.92) • Multi-PI: 2.60 (1.43–4.7) 	<ul style="list-style-type: none"> • Increase in preterm delivery if ARV begun before pregnancy versus in third trimester
United States; 1990–1998 ²⁴	3,266/2,123	<ul style="list-style-type: none"> • Mono (1,590) • Multi (396) • Multi-PI (137) 	<ul style="list-style-type: none"> • NO (compared with mono) • Multi: 0.95 (0.60–1.48) • Multi-PI: 1.45 (0.81–2.50) 	<ul style="list-style-type: none"> • 7 prospective clinical studies
European Collaborative Study; 1986–2004 ⁴⁵	4,372/2,033	<ul style="list-style-type: none"> • Mono (704) • Dual (254) • Multi (1,075) 	<ul style="list-style-type: none"> • YES (compared with mono/dual) • Multi in pregnancy: 1.88 (1.34–2.65) • Multi pre-pregnancy: 2.05 (1.43–2.95) 	N/A
United States; 1990–2002 ³⁴	2,543/Not given	<p><u>Early (<25 Weeks):</u></p> <ul style="list-style-type: none"> • Mono (621) • Multi, ≥ 2 without PI or NNRTI, (198) • Multi, with PI or NNRTI (357) <p><u>Late (≥ 32 Weeks):</u></p> <ul style="list-style-type: none"> • Mono (932) • Multi, ≥ 2 without PI or NNRTI (258) • Multi, with PI or NNRTI (588) 	<ul style="list-style-type: none"> • NO (compared with mono) • No association between any ARV and preterm delivery 	<ul style="list-style-type: none"> • Preterm delivery decreased with ARV compared with no ARV.
United States; 1990–2002 ³	1,337/999	<ul style="list-style-type: none"> • Mono (492) • Multi (373) • Multi-PI (134) 	<ul style="list-style-type: none"> • YES (compared with other multi) • Multi-PI: 1.8 (1.1–3.03) 	<ul style="list-style-type: none"> • Multi-PI reserved for advanced disease, those who failed other multi-ARV regimens.
Brazil, Argentina, Mexico, Bahamas; 2002–2005 ³⁰	681/681	<ul style="list-style-type: none"> • Mono/dual NRTI (94) • Multi-NNRTI (257) • Multi-PI (330) 	<ul style="list-style-type: none"> • NO (compared with mono/dual NRTI) • No association between any ARV regimen and preterm delivery 	<ul style="list-style-type: none"> • All on ARV for at least 28 days during pregnancy • Preeclampsia/eclampsia, cesarean delivery, diabetes, low BMI associated with preterm delivery
Meta-Analysis, Europe and United States; 1986–2004 ⁴	11,224/Not given	<ul style="list-style-type: none"> • Multi-no PI (including dual) or multi-PI (2,556) 	<ul style="list-style-type: none"> • YES (only comparing PI with multi) • PI versus multi-no PI: 1.35 (1.08–1.70) 	<ul style="list-style-type: none"> • 14 studies, 5 in preterm-delivery-ARV comparison • No overall increase in preterm delivery with antepartum ARV • Preterm delivery increased in those on ARV pre-pregnancy and in first trimester compared with later use.

Table 5. Results of Studies Assessing the Association Between Antiretroviral Regimens and Preterm Delivery (page 2 of 5)

Study Location(s); Dates of Study	Total Number of Pregnancies/ Total on ARV Drugs	Types of ARV Regimens Compared (Numbers)	Association Noted Between ARV Regimens and Preterm Delivery	Notes
Italy; 2001–2006 ⁵	419/366	<ul style="list-style-type: none"> • Multi-PI second trimester (97) • Multi-PI third trimester (146) 	<ul style="list-style-type: none"> • YES • Multi-PI second trimester: 2.24 (1.22–4.12) • Multi-PI third trimester: 2.81 (1.46–5.39) 	<ul style="list-style-type: none"> • Multivariate association also with hepatitis C
United States; 1989–2004 ⁶	8,793/6,228	<ul style="list-style-type: none"> • Mono (2,621) • Dual (1,044) • Multi-no-PI (1,781) • Multi-PI (782) 	<ul style="list-style-type: none"> • YES (compared with dual) • Multi-PI associated with preterm delivery: 1.21 (1.04–1.40) 	<ul style="list-style-type: none"> • Lack of antepartum ARV also associated with preterm delivery • Preterm delivery and LBW decreased over time.
United Kingdom, Ireland; 1990–2005 ⁷	5,009/4,445	<ul style="list-style-type: none"> • Mono/dual (1,061) • Multi-NNRTI or multi-PI (3,384) 	<ul style="list-style-type: none"> • YES (compared with mono/dual) • Multi: 1.51 (1.19–1.93) 	<ul style="list-style-type: none"> • Similar increased risk with PI or no-PI multi • No association with duration of use
Germany, Austria; 1995–2001 ⁸	183/183	<ul style="list-style-type: none"> • Mono (77) • Dual (31) • Multi-PI (21) • Multi-NNRTI (54) 	<ul style="list-style-type: none"> • YES (compared with mono) • Multi-PI: 3.40 (1.13–10.2) 	N/A
United States; 2002–2007 ²²	777/777	<ul style="list-style-type: none"> • Mono (6) • Dual (11) • Multi-no-PI (202) • Multi-PI (558) 	<ul style="list-style-type: none"> • NO (compared PI with all non-PI) • Multi-PI: 1.22 (0.70–2.12) 	<ul style="list-style-type: none"> • All started ARV during pregnancy. • Analyzed only spontaneous preterm delivery
Swiss Mother and Child HIV Cohort Study; 1985–2007 ⁹	1,180/941	<ul style="list-style-type: none"> • Mono (94) • Dual (53) • Multi, PI or no PI, (409) • Multi-PI (385) 	<ul style="list-style-type: none"> • YES (compared with no ARV) • Multi: 2.5 (1.4–4.3) 	<ul style="list-style-type: none"> • No association of mono/dual with preterm delivery compared with no ARV • No confounding by duration of ARV or maternal risk factors
Botswana; 2006–2008 ¹⁰	530/530	<ul style="list-style-type: none"> • LPV/r plus ZDV plus 3TC (267) • ABC plus ZDV plus 3TC (263) 	<ul style="list-style-type: none"> • YES • Multi-PI versus multi-NRTI: 2.03 (1.26–3.27) 	<ul style="list-style-type: none"> • Secondary analysis of data from randomized, controlled clinical trial of ARV begun at 26–34 weeks for prevention of perinatal transmission • All CD4 cell counts >200 cells/mm³
Botswana; 2007–2010 ³⁷	4,347/3,659	<ul style="list-style-type: none"> • ARV, regimen unspecified (70) • Mono (2,473) • Multi, 91% NNRTI (1,116) 	<ul style="list-style-type: none"> • NO • No association between multi-ART and very preterm delivery (<32 weeks' gestation) 	<ul style="list-style-type: none"> • Observational; multi-ART before conception associated with very-small-for-gestational-age and maternal hypertension during pregnancy
Spain; 1986–2010 ²³	519/371	<ul style="list-style-type: none"> • Mono/dual NRTI (73) • All multi (298) • Multi-PI (178) 	<ul style="list-style-type: none"> • NO (compared with no ARV plus mono/dual) • Spontaneous preterm delivery not associated with multi-ARV or multi-PI before or during pregnancy 	<ul style="list-style-type: none"> • Preterm delivery associated with multi-ARV given in second half of pregnancy and with prior preterm delivery

Table 5. Results of Studies Assessing the Association Between Antiretroviral Regimens and Preterm Delivery (page 3 of 5)

Study Location(s); Dates of Study	Total Number of Pregnancies/ Total on ARV Drugs	Types of ARV Regimens Compared (Numbers)	Association Noted Between ARV Regimens and Preterm Delivery	Notes
Botswana; 2009–2011¹¹	9,504/7,915	<ul style="list-style-type: none"> • Mono (4,625) • All multi (3,290) • Multi-PI (312) 	<ul style="list-style-type: none"> • YES (multi-ARV before and during pregnancy compared with mono): 1.2 (1.1–1.4) and 1.4 (1.2–1.8) • YES (multi-PI compared with multi-no PI before pregnancy): 2.0 (1.1–3.6) 	<ul style="list-style-type: none"> • ART group classified by initiation before and during pregnancy
France; ANRS French Perinatal Cohort 1990–2009¹²	8,696/8,491	<ul style="list-style-type: none"> • Mono (950) • Dual (590) • Multi-PI (2,414) 	<ul style="list-style-type: none"> • YES (multi-ARV compared to mono): 1.69 (1.38–2.07) • YES (before conception compared to during pregnancy): 1.31 (1.11–1.55) 	<ul style="list-style-type: none"> • Patients on ART before and during pregnancy had increased rates of preterm delivery
United States; 2000–2011³⁶	183/183	<ul style="list-style-type: none"> • Multi-PI (183) 	<ul style="list-style-type: none"> • NO (no control group without ART) • Rate of preterm delivery: 18.6% 	<ul style="list-style-type: none"> • SGA rate: 31.2% • NNRTI-based ART less likely to have SGA: 0.28 (0.1–0.75)
United States; 2007–2010¹³	1,869/1,810	<ul style="list-style-type: none"> • Mono/dual (138) • Multi-NRTI (193) • Multi-NNRTI (160) • Multi-PI (1,319) 	<ul style="list-style-type: none"> • YES (compared with no ARV in first trimester) • Multi-PI in first trimester vs. none in first trimester • Preterm delivery 1.55 (1.16–2.07); spontaneous preterm delivery 1.59 (1.10–2.30) 	N/A
Latin America; 2002–2012¹⁴	1,512/1,446	<ul style="list-style-type: none"> • Multi-PI (907) • Multi-non-PI (409) • Mono/dual (130) • No ART or ART <28 days (66) 	<ul style="list-style-type: none"> • YES (when on ARVs at conception): preterm delivery 1.53 (1.11–2.09) 	<ul style="list-style-type: none"> • ART for treatment rather than prophylaxis associated with increased rates of LBW (<2,500 g) infants: LBW 1.8 (1.26–2.56) • Multi-non-PI associated with decreased risk of LBW (0.33 [0.14–0.74]) and stillbirth (0.11 [0.04–0.34]) • Multi-PI associated with decreased risk of stillbirth: 0.14 (0.05–0.34)
Uganda; 2009–2012⁴⁶	356/356	<ul style="list-style-type: none"> • Multi-PI, LPV/r (179) • Multi-non-PI, EFV (177) 	<ul style="list-style-type: none"> • NO (no control group without ART) 	<ul style="list-style-type: none"> • Trend in increased preterm delivery among women starting ART 24–28 week GA was NS: aOR 1.76 (0.96–3.23)
Italy; 1997–2013⁴⁷	158/158	<ul style="list-style-type: none"> • Mono/dual (27) • Multi-PI (114) • Multi-non-PI (17) 	<ul style="list-style-type: none"> • NO (no control group without ART) 	<ul style="list-style-type: none"> • Preterm delivery rate was 17% for this cohort, trend towards association with longer duration of ART: 2.82 (0.35–8.09)
Canada; 1988–2011¹⁵	589/530	<ul style="list-style-type: none"> • Multi-non-boosted PI (220) • Multi-boosted PI with RTV (144) • Multi-non-PI (166) • Mono (77) • No ART (59) 	<ul style="list-style-type: none"> • YES (compared to multi-non-boosted PI): 2.01 (1.02–3.97) • NO (non-PI compared to non-boosted PI): 0.81 (0.4–1.66) 	<ul style="list-style-type: none"> • Highest risk of preterm delivery among women not taking ART compared to non-boosted PI group: 2.7 (1.2–6.09)

Table 5. Results of Studies Assessing the Association Between Antiretroviral Regimens and Preterm Delivery (page 4 of 5)

Study Location(s); Dates of Study	Total Number of Pregnancies/ Total on ARV Drugs	Types of ARV Regimens Compared (Numbers)	Association Noted Between ARV Regimens and Preterm Delivery	Notes
United Kingdom; 2007–2012 ²⁵	493/493	<ul style="list-style-type: none"> Multi-PI, LPV/r Multi-PI, ATV/r 	<ul style="list-style-type: none"> NO (comparing two PI-based regimens): aOR 1.87 (0.93–3.75) 	<ul style="list-style-type: none"> Rate of preterm delivery 13% among women who conceived on ART and 14% among women who started ART during pregnancy. In multivariate analysis, a history of preterm delivery was associated with recurrent preterm delivery: aOR 5.23 (1.91–14.34)
Republic of the Congo; 2007–2012 ³¹	188/188	<ul style="list-style-type: none"> Multi-non-PI, EFV-based (31) Multi-non-PI, NVP-based (146) 	<ul style="list-style-type: none"> NO (comparing EFV 13% vs NPV 10%) 	<ul style="list-style-type: none"> Rate of preterm delivery 11%, no difference between study groups LBW increased in EFV group (33% vs 16%, $P = 0.04$). Stillbirth rate 4% (8/188)
Tanzania; 2004–2011 ¹⁶	3,314/2,862	<ul style="list-style-type: none"> Multi (1,094) Mono (1,768) No ART (452-excluded) 	<ul style="list-style-type: none"> YES (Multi before pregnancy vs Mono): 1.24 (1.05–1.47) Very preterm delivery, YES (Multi before pregnancy vs Mono): 1.42 (1.02–1.99) NO (Multi during pregnancy compared to Mono): 0.85 (0.7–1.02) 	<ul style="list-style-type: none"> Rate of preterm delivery 29%; women who conceived on ART more likely to have preterm delivery compared to women on ZDV monotherapy. Pregnancy-induced hypertension associated with preterm delivery: 1.25 (1.03–1.51)
67 Countries and US Territories; APR 1989-2013 ³³	14,684/12,780 (ZDV), 1,904 (non-ZDV)	<ul style="list-style-type: none"> Multi^a ARV with ZDV ARV without ZDV 	<ul style="list-style-type: none"> NO (any ZDV-ARV vs non-ZDV-ARV exposure): 1.0 (0.9–1.2) 	<ul style="list-style-type: none"> Preterm delivery rate 12% LBW rate 16%, RR of LBW with ZDV-ART vs non-ZDV ART RR: 1.2 (1.0–1.3), $P = 0.02$ Stillbirth rate: 1.5%, RR 0.8 (0.5–1.1)
Texas, United States; 1984–2014 ²⁶	1,004/792	<ul style="list-style-type: none"> Multi, PI ART (597); non-PI ART (230) No ART (177) 	<ul style="list-style-type: none"> NO (non-PI ART vs PI-ART): 0.9 (0.5–1.5) 	<ul style="list-style-type: none"> Rate of preterm delivery: 13% to 21% Rate of SGA: 19% to 23%, OR 1.3 (0.8–1.9)
India, Malawi, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, PROMISE Trial; 2011–2014 ³²	3,490/3,096	<ul style="list-style-type: none"> Mono (1,386) All Multi (2,710) ZDV-based (1385) TDF-based (325) 	<ul style="list-style-type: none"> YES (Multi after 14 weeks vs mono) 	<ul style="list-style-type: none"> Rate of preterm delivery: 21% on ZDV-based ART compared to ZDV-mono ($P < 0.001$). Rate very preterm delivery: 6% in TDF-based ART and 3% in ZDV-based ART ($P = 0.04$) LBW was more common in ZDV-based ART (23% vs. 12%) in ZDV-alone ($P < 0.001$) and TDF-based ART (17% vs 9%) in ZDV-alone, ($P = 0.004$)

Table 5. Results of Studies Assessing the Association Between Antiretroviral Regimens and Preterm Delivery (page 5 of 5)

Study Location(s); Dates of Study	Total Number of Pregnancies/ Total on ARV Drugs	Types of ARV Regimens Compared (Numbers)	Association Noted Between ARV Regimens and Preterm Delivery	Notes
United States and Puerto Rico; SMARTT 2007–2016 ¹⁷	1,864/1,491	• Multi (1,491)	• YES: 1.59 (1.2–2.1)	• PI-based ART exposure in 1st trimester was associated with increased risk of spontaneous preterm delivery compared with no first-trimester ART
South Africa; 2011–2014 ²¹	3,723/3,547	• Dual (974) • Multi (2,573)	• NO • Dual: 0.2 (0.08–0.5) • Multi: 0.3 (0.1–0.9)	• Preterm delivery rate regardless of ART: 22% to 23% • LBW rate on ART: 9% to 15%. Risk of LBW: Dual 0.06 (0.02–0.2) and multi 0.12 (0.04–0.4) • SGA rate on ART: 7% to 9%. Risk of SGA: Dual 0.37 (0.1 to 1.5) and multi 0.3 (0.07 to 0.9) • Stillbirth rate on dual (1.2%) and multi (2.2%). Risk of stillbirth: Dual 0.08 (0.04–0.2) and multi 0.2 (0.1–0.3)
Botswana; 2012–2014 ¹⁸	11,932/10,592	• Multi, PI-based (398) • Multi, NNRTI-based (4,597)	• YES • Multi PI-based: 1.36 (1.06–1.75) • Multi NNRTI-based: 1.14 (1.01–1.29)	• SGA rates were significantly higher in multi PI-based ART (27.7% and 20.4%) and NVP-based ART (24.9% and 28.2%) compared to EFV-based ART (16.9%). • Stillbirth rates were higher in nevirapine-based ART: 2.31 (1.64–3.26).
19 Countries, 5 Continents; 2002–2013 ²⁷	23,490 (meta-analysis 10 studies)	• Multi, PI-based • Multi, PI-sparing	• YES • Multi-PI based ART: 1.3 (1.04–1.6), I ² =47%	• 6 of 10 studies demonstrated increased risk of preterm delivery: aOR (1.2–4.14)

Note: The data presented in the column Association Noted between ARV Regimens and Preterm Delivery represent the published results of the study in the corresponding row. Depending on the study designs, these are adjusted and unadjusted odds ratios and relative risks.

Key to Acronyms: 3TC = lamivudine; ABC = abacavir; aOR = adjusted odds ratio; ART = antiretroviral therapy; ARV = antiretroviral; BMI = body mass index; CD4 = CD4 T lymphocyte; dual = two ARV drugs; EFV = efavirenz; GA = gestational age; LBW = low birth weight; mono = single ARV drug; multi = three or more ARV drugs; multi-PI = combination ARV with PI; LPV/r = lopinavir/ritonavir; NNRTI = non-nucleoside reverse transcriptase inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; NS = non-significant; OR = odds ratio; PI = protease inhibitor; RR = relative risk; SGA = small for gestational age; TDF = tenofovir disoproxil fumarate; ZDV = zidovudine

Table 6. What to Start: Initial Combination Regimens for Antiretroviral-Naive Pregnant Women (page 1 of 3)

These recommendations are for pregnant women **who have never received antiretroviral therapy (ART) previously (i.e., antiretroviral-naive)** and who have no evidence of significant resistance to regimen components. See [Table 9](#) for more information on specific drugs and dosing in pregnancy.

Within each drug class and recommendation category, regimens are listed alphabetically, and the order does not indicate a ranking of preference. **In addition, The Panel on Treatment of Pregnant Women with HIV Infection and Prevention of Perinatal Transmission (the Panel) makes no recommendation of one agent or regimen over another within each category (Preferred or Alternative).**

It is recommended that **women who become pregnant while on a stable ART regimen with viral suppression** remain on that same regimen, with the exception of regimens containing didanosine, stavudine, or treatment-dose ritonavir, **and (until more data are available) elvitegravir/cobicistat.**

Drug	Comments
Preferred Initial Regimens in Pregnancy:	
<ul style="list-style-type: none"> Drugs or drug combinations are designated as Preferred for initiating ART in ARV-naive pregnant women when clinical trial data in adults have demonstrated optimal efficacy and durability with acceptable toxicity and ease of use; pregnancy-specific PK data are available to guide dosing; in addition, there have been no established associations with teratogenic effects (from animal and/or human studies), and no clinically significant adverse outcomes for mothers, fetuses, or newborns have been reported. 	
Preferred Two-NRTI Backbones	
ABC/3TC	Available as FDC. Can be administered once daily. ABC should not be used in patients who test positive for HLA-B*5701 because of risk of hypersensitivity reaction. ABC/3TC with ATV/r or with EFV is not recommended if pretreatment HIV RNA is >100,000 copies/mL.
TDF/FTC or TDF/3TC	TDF/FTC available as FDC. Either TDF/FTC (coformulated) or TDF with separate 3TC can be administered once daily. TDF has potential renal toxicity, thus TDF-based dual NRTI combinations should be used with caution in patients with renal insufficiency.
Preferred PI Regimens	
ATV/r plus a Preferred Two-NRTI Backbone	Once-daily administration. Extensive experience in pregnancy. Maternal hyperbilirubinemia; no clinically significant neonatal hyperbilirubinemia or kernicterus reported, but neonatal bilirubin monitoring recommended. Cannot be administered with proton-pump inhibitors; specific timing recommended for dosing with H2 blockers (see Table 9).
DRV/r plus a Preferred Two-NRTI Backbone	Better tolerated than LPV/r. PK data available. Increasing experience with use in pregnancy. Must be used twice daily in pregnancy.
Preferred Integrase Inhibitor Regimen(s)	
RAL plus a Preferred Two-NRTI Backbone	PK data available and increasing experience in pregnancy. Rapid viral load reduction (potential role for women who present for initial therapy late in pregnancy). Useful when drug interactions with PI regimens are a concern. Twice-daily dosing required.
Alternative Initial Regimens in Pregnancy:	
<ul style="list-style-type: none"> Regimens with clinical trial data demonstrating efficacy in adults and adequate serum drug levels in pregnancy, but one or more of the following apply: experience in pregnancy is limited, data are lacking or incomplete on teratogenicity, or regimen is associated with dosing, formulation, toxicity, or interaction issues 	
Alternative Two-NRTI Backbones	
ZDV/3TC	Available as FDC. NRTI combination with most experience for use in pregnancy but has disadvantages of requirement for twice-daily administration and increased potential for hematologic toxicities.
Alternative PI Regimens	
LPV/r plus a Preferred Two-NRTI Backbone	Abundant experience and established PK in pregnancy. More nausea than with preferred agents. Twice-daily administration. Dose increase recommended in third trimester (see Table 9). Once-daily LPV/r is not recommended for use in pregnant women.

Table 6. What to Start: Initial Combination Regimens for Antiretroviral-Naive Pregnant Women (page 2 of 3)

Drug	Comments
Alternative Integrase Inhibitor Regimens	
DTG plus a Preferred Two-NRTI Backbone	PK data available only in abstract form. No safety problems identified in limited but increasing experience in pregnancy. Available as FDC (with ABC, requiring HLA B5701 testing). Administered once daily. Useful when drug interactions with a PI are a concern. In non-pregnant adults, associated with lower rates of INSTI resistance than RAL, and therefore suggested for women with acute infection in pregnancy. Specific timing and/or fasting recommendations if taken with calcium or iron (e.g., in prenatal vitamins; Table 9).
Alternative NNRTI Regimens	
EFV plus a Preferred Two-NRTI Backbone	Concern because of birth defects seen in primate studies, but data not borne out in human studies and extensive experience in pregnancy ; cautionary text remains in package insert (see Teratogenicity and Table 9). Preferred regimen in women who require co-administration of drugs with significant interactions with preferred agents, or who need the convenience of a coformulated, single-tablet, once-daily regimen and are not eligible for RPV . Screening for antenatal and postpartum depression is recommended. Higher rate of adverse events than drugs in Preferred category
RPV/TDF/FTC (or RPV plus a Preferred Two-NRTI Backbone)	RPV not recommended with pretreatment HIV RNA >100,000 copies/mL or CD4 cell count <200 cells/mm ³ . Do not use with PPIs. PK data available in pregnancy but relatively little experience with use in pregnancy. Available in coformulated single-pill, once-daily regimen.
Insufficient Data in Pregnancy to Recommend Routine Use in Initial Regimens for ART-Naive Women:	
<ul style="list-style-type: none"> • Drugs that are approved for use in adults but lack adequate pregnancy-specific PK or safety data 	
TAF/FTC Fixed Drug Combination	No data on use of TAF in pregnancy.
RPV/TAF/FTC Fixed Drug Combination	No data on use of TAF in pregnancy.
Not Recommended for Initial ART in Pregnancy:	
<ul style="list-style-type: none"> • Drugs whose use is not recommended as part of initial regimens in pregnancy because of toxicity, lower rate of viral suppression, or pharmacologic data suggesting insufficient serum drug levels in pregnancy, or because these drugs are not recommended in ART-naive populations. <p>Note: Drugs not recommended for initial use because of toxicity (stavudine [d4T], didanosine [ddI], treatment-dose ritonavir [RTV], marked below with *) should also be stopped in women who present during pregnancy while taking these medications. For women who present on drugs not recommended for initial use because of concerns about viral breakthrough (EVG/COBI/TDF/FTC or EVG/COBI/TAF/FTC, marked below with **), providers should consider switching to more effective, recommended regimens. If an EVG/COBI regimen is continued, viral load should be monitored frequently, and therapeutic drug monitoring (if available) may be useful.</p> <p>Other medications listed below may be continued in women who present during pregnancy, as long as they are well tolerated and result in sustained virologic suppression.</p>	
EVG/COBI/TDF/FTC** Fixed Drug Combination	Limited data on use of EVG/COBI component in pregnancy. Inadequate levels of both EVG and COBI in 2nd and 3rd trimester, as well as viral breakthroughs, have been reported. Specific timing and/or fasting recommendations, especially if taken with calcium or iron (e.g., in prenatal vitamins; see Table 9).
EVG/COBI/TAF/FTC** Fixed Drug Combination	Limited data on use of EVG/COBI as above; additionally, no data on use of TAF in pregnancy. Inadequate levels of both EVG and COBI in 2nd and 3rd trimester, as well as viral breakthroughs, have been reported. Specific timing and/or fasting recommendations, especially if taken with calcium or iron (e.g., in prenatal vitamins; see Table 9).
ABC/3TC/ZDV As a complete regimen, in absence of other antiretroviral medications	Generally not recommended due to inferior virologic efficacy.
COBI	Limited data on use of COBI (including coformulations with ATV or DRV) in pregnancy.
d4T*	Not recommended due to toxicity.
ddI*	Not recommended due to toxicity.

Table 6. What to Start: Initial Combination Regimens for Antiretroviral-Naive Pregnant Women (page 3 of 3)

Drug	Comments
FPV	Limited data on use in pregnancy. Not recommended in ART-naive populations.
IDV/r	Nephrolithiasis, maternal hyperbilirubinemia.
MVC	MVC requires tropism testing before use. Few case reports of use in pregnancy. Not recommended in ART-naive populations.
NFV	Lower rate of viral suppression with NFV compared to LPV/r or EFV in adult trials.
RTV*	RTV as a single PI is not recommended because of inferior efficacy and increased toxicity.
SQV/r	Not recommended based on potential toxicity and dosing disadvantages. Baseline ECG is recommended before initiation of SQV/r because of potential PR and QT prolongation; contraindicated with preexisting cardiac conduction system disease. Limited data in pregnancy. Large pill burden. Twice-daily dosing required.
ETR	Not recommended in ART-naive populations.
NVP	Not recommended because of greater potential for adverse events, complex lead-in dosing, and low barrier to resistance. NVP should be used with caution when initiating ART in women with CD4 cell count >250 cells/mm ³ . Use NVP and ABC together with caution; both can cause hypersensitivity reactions within the first few weeks after initiation.
T20	Not recommended in ART-naive populations.
TPV/r	Not recommended in ART-naive populations.

Key to Acronyms: 3TC = lamivudine; ABC = abacavir; ART = antiretroviral therapy; ARV = antiretroviral; ATV = atazanavir; ATV/r = atazanavir/ritonavir; CD4 = CD4 T lymphocyte cell; COBI = cobicistat; d4T = stavudine; ddi = didanosine; DRV/r = darunavir/ritonavir; DTG = dolutegravir; ECG = electrocardiogram; EFV = efavirenz; ETR = etravirine; EVG = elvitegravir; FDC = fixed-drug combination; FPV = fosamprenavir; FTC = emtricitabine; IDV/r = indinavir/ritonavir; LPV/r = lopinavir/ritonavir; MVC = maraviroc; NFV = nelfinavir; NNRTI = non-nucleoside reverse transcriptase inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; NVP = nevirapine; PI = protease inhibitor; PK = pharmacokinetic; PPI = proton pump inhibitor; RAL = raltegravir; RPV = rilpivirine; RTV = ritonavir; SQV/r = saquinavir/ritonavir; T20 = enfuvirtide; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; TPV = tipranavir; TPV/r = tipranavir/ritonavir; ZDV = zidovudine

Table 7. Newborn Antiretroviral Management According to Risk of HIV Infection in the Newborn

Drug selection and dosing considerations are related to the age and gestational age of the newborn. Consultation is available through the National Perinatal HIV Hotline (888-448-8765).

Category	Description	Neonatal ARV Management
Low Risk of Perinatal HIV Transmission	Mothers received standard ART during pregnancy with sustained viral suppression near delivery and no concerns related to adherence	4 weeks of ZDV
Higher Risk of Perinatal HIV Transmission^{a,b}	<ul style="list-style-type: none"> • Mothers who received neither antepartum nor intrapartum ARV drugs • Mothers who received only intrapartum ARV drugs • Mothers who received antepartum and intrapartum ARV drugs but who have detectable viral load near delivery, particularly if delivery was vaginal • Mothers with acute or primary HIV infection during pregnancy or breastfeeding^c 	Combination ARV prophylaxis with 6 weeks ZDV and 3 doses of NVP (prophylaxis dosage) or Empiric HIV therapy consisting of ZDV, 3TC, and NVP (treatment dosage) ^d
Presumed Newborn HIV Exposure	Mothers with unknown HIV status who test positive at delivery or postpartum or whose newborns have a positive HIV antibody test	ARV management as above (for higher risk of perinatal HIV transmission). ARV management should be discontinued immediately if supplemental testing confirms that mother does not have HIV.
Newborn with Confirmed HIV^e	Confirmed positive newborn HIV virologic test/NAT	3 drug combination ARV regimen at treatment dosage

^a See text for evidence supporting combination ARV prophylaxis and empiric HIV therapy.

^b See the [Intrapartum Care](#) section for guidance on indications for scheduled cesarean delivery and intrapartum IV ZDV to reduce the risk of perinatal HIV transmission for mothers with elevated viral load at delivery.

^c Most experts would opt to administer empiric HIV therapy to infants with acute HIV during pregnancy because of the high risk for *in utero* infection. If acute HIV is diagnosed during breastfeeding, mother should stop breastfeeding.

^d The optimal duration of empiric HIV therapy in newborns at higher risk of perinatal HIV transmission is unknown. Many experts administer 6 weeks of combination therapy; others opt to discontinue NVP and/or 3TC after the return of negative newborn testing. ZDV should be continued for 6 weeks.

^e Most experts do not recommend delaying the initiation of ART while waiting for the results of the confirmatory HIV NAT, given low likelihood of false-positive HIV NAT testing.

Note: ARV drugs should be initiated as close to the time of birth as possible, preferably within 6 to 12 hours of delivery. See [Table 8](#) for dosing specifics.

Key to Acronyms: 3TC = lamivudine; ART = antiretroviral therapy; ARV = antiretroviral; IV = intravenous; NAT = nucleic acid test; NVP = nevirapine; ZDV = zidovudine

Table 8. Newborn Antiretroviral Dosing Recommendations

Drug	Dosing								
<p>ZDV Treatment and Prophylaxis Dosage</p> <p>Note: For newborns unable to tolerate oral agents, the IV dose is 75% of the oral dose while maintaining the same dosing interval.</p>	<p><u>≥35 Weeks' Gestation at Birth</u> <i>Birth to Age 4–6 Weeks:</i></p> <ul style="list-style-type: none"> • 4 mg/kg/dose orally twice daily <p>Simplified Weight-Band Dosing for Newborns ≥35 Weeks:</p> <table border="1" data-bbox="769 394 1409 632"> <thead> <tr> <th data-bbox="769 394 1032 506">Weight Band (kg)</th> <th data-bbox="1032 394 1409 506">*Volume (mL) ZDV 10 mg/mL Oral Syrup Twice Daily</th> </tr> </thead> <tbody> <tr> <td data-bbox="769 506 1032 548">2 to <3 kg</td> <td data-bbox="1032 506 1409 548">1 mL</td> </tr> <tr> <td data-bbox="769 548 1032 590">3 to <4 kg</td> <td data-bbox="1032 548 1409 590">1.5 mL</td> </tr> <tr> <td data-bbox="769 590 1032 632">4 to <5 kg</td> <td data-bbox="1032 590 1409 632">2 mL</td> </tr> </tbody> </table> <p><u>≥30 to <35 Weeks' Gestation at Birth</u> <i>Birth–Age 2 Weeks:</i></p> <ul style="list-style-type: none"> • 2 mg/kg/dose orally twice daily <p><i>Age 2 Weeks to 4–6 Weeks:</i></p> <ul style="list-style-type: none"> • 3 mg/kg/dose orally twice daily <p><u><30 weeks' Gestation at Birth</u> <i>Birth–Age 4 Weeks:</i></p> <ul style="list-style-type: none"> • 2 mg/kg/dose orally twice daily <p><i>Age 4–6 Weeks:</i></p> <ul style="list-style-type: none"> • 3 mg/kg/dose orally twice daily 	Weight Band (kg)	*Volume (mL) ZDV 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 (kg)	*Volume (mL) ZDV 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								
<p>3TC Treatment and Prophylaxis Dosage</p>	<p><u>≥32 Weeks' Gestation at Birth:</u> <i>Birth–Age 4 Weeks:</i></p> <ul style="list-style-type: none"> • 2 mg/kg/dose orally twice daily <p><i>Age 4–6 Weeks:</i></p> <ul style="list-style-type: none"> • 4 mg/kg/dose orally twice daily 								
<p>NVP Prophylaxis Dosage</p>	<p><u>Birth Weight 1.5–2 kg:</u></p> <ul style="list-style-type: none"> • 8-mg dose orally once daily • Note: No calculation is required for this dose; this is the actual dose, not a mg/kg dose. <p><u>Birth Weight >2 kg:</u></p> <ul style="list-style-type: none"> • 12-mg dose orally once daily • Note: No calculation is required for this dose; this is the actual dose, not a mg/kg dose. 								
<p>NVP Treatment Dosage</p>	<p><u>≥37 Weeks' Gestation at Birth</u> <i>Birth–Age 6 Weeks:</i></p> <ul style="list-style-type: none"> • 6 mg/kg/dose orally twice daily <p><u>34 to <37 Weeks' Gestation at Birth</u> <i>Birth–Age 1 Week:</i></p> <ul style="list-style-type: none"> • 4 mg/kg/dose orally twice daily <p><i>Age 1–6 Weeks:</i></p> <ul style="list-style-type: none"> • 6 mg/kg/dose orally twice daily 								

Key to Acronyms: 3TC=lamivudine; IV= intravenous; NVP = nevirapine; ZDV = zidovudine

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 1 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
NRTIs				
NRTIs are recommended for use as part of combination regimens, usually including two NRTIs with either an NNRTI or one or more PIs. Use of single or dual NRTIs alone is not recommended for treatment of HIV infection. See text for discussion of potential maternal and infant mitochondrial toxicity.				
Abacavir (ABC) <i>Ziagen</i> (ABC/3TC) <i>Epzicom</i> (ABC/3TC/ZDV) <i>Trizivir</i> (ABC/3TC/DTG) <i>Triumeq</i>	<u>ABC (Ziagen):^a</u> <i>Tablet:</i> • 300 mg <i>Solution:</i> • 20 mg/mL <u>Epzicom:^a</u> • ABC 600 mg plus 3TC 300 mg tablet <u>Trizivir:^a</u> • ABC 300 mg plus 3TC 150 mg plus ZDV 300 mg tablet <u>Triumeq:</u> • ABC 600 mg plus 3TC 300 mg plus DTG 50 mg tablet	<u>Standard Adult Doses:</u> <i>ABC (Ziagen):</i> • 300 mg twice daily or 600 mg once daily, without regard to food <i>Epzicom:</i> • 1 tablet once daily without regard to food <i>Trizivir:</i> • 1 tablet twice daily without regard to food <i>Triumeq:</i> • 1 tablet daily without regard to food <u>PK in Pregnancy:</u> • PK not significantly altered in pregnancy. <u>Dosing in Pregnancy:</u> • No change in dose indicated.	High placental transfer to fetus. ^b No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects). Hypersensitivity reactions occur in approximately 5% to 8% of non-pregnant individuals; a much smaller percentage are fatal and are usually associated with re-challenge. Rate in pregnancy is unknown. Testing for HLA-B*5701 identifies patients at risk of reactions and should be done and documented as negative before starting ABC. Patients should be educated regarding symptoms of hypersensitivity reaction.	November 14, 2017
Didanosine (ddl) <i>Videx</i> <i>Videx EC</i>	<u>ddl (Videx)</u> <i>Buffered Tablets (Non-EC):</i> • No longer available <i>Solution:</i> • 10 mg/mL oral solution <u>Videx EC (EC Beadlets) Capsules:</u> • 125 mg • 200 mg • 250 mg • 400 mg <u>Generic Delayed-Release Capsules:</u> • 200 mg • 250 mg • 400 mg	<u>Standard Adult Doses</u> <i>Body Weight ≥60 kg:</i> • 400 mg once daily <u>With TDF:</u> • 250 mg once daily; take 1/2 hour before or 2 hours after a meal. <i>Body Weight <60kg:</i> • 250 mg once daily <u>With TDF:</u> • 200 mg once daily; take 1/2 hour before or 2 hours after a meal. Note: Preferred dosing with oral solution is twice daily (total daily dose divided into 2 doses); take 1/2 hour before or 2 hours after a meal.	Low-moderate placental transfer to fetus. ^b In the Antiretroviral Pregnancy Registry, an increased rate of birth defects with ddl compared to general population was noted after both first-trimester (20/423, 4.7%; 95% CI, 2.9% to 7.2%) and later exposure (20/461, 4.3%; 95% CI 2.7% to 6.6%). No specific pattern of defects was noted and clinical relevance is uncertain. ddl should not be used with d4T. Lactic acidosis, sometimes fatal, has been reported in pregnant women receiving ddl and d4T together.	November 14, 2017

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 2 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
		<p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • PK not significantly altered in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in dose indicated. 		
<p>Emtricitabine (FTC) <i>Emtriva</i></p> <p>(FTC/TDF) <i>Truvada</i></p> <p>(FTC/TDF/EFV) <i>Atripla</i></p> <p>(FTC/TDF/RPV) <i>Complera</i></p> <p>(FTC/TDF/EVG/ COBI) <i>Stribild</i></p> <p>(FTC/TAF) Descovy</p> <p>(FTC/TAF/RPV) <i>Odefsey</i></p> <p>(FTC/TAF/EVG/ COBI) <i>Genvoya</i></p>	<p><u>Emtriva (FTC)</u> <i>Capsules:</i></p> <ul style="list-style-type: none"> • 200 mg <p><i>Oral Solution:</i></p> <ul style="list-style-type: none"> • 10 mg/mL <p><u>Truvada:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TDF 300-mg tablet <p><u>Atripla:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TDF 300-mg plus EFV^c 600-mg tablet <p><u>Complera:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TDF 300 mg plus RPV 25-mg tablet <p><u>Stribild:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TDF 300 mg plus EVG 150 mg plus COBI 150-mg tablet <p>Descovy:</p> <ul style="list-style-type: none"> • FTC 200 mg plus TAF 25 mg <p><u>Odefsey:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TAF 25 mg plus RPV 25-mg tablet <p><u>Genvoya:</u></p> <ul style="list-style-type: none"> • FTC 200 mg plus TAF 10 mg plus EVG 150 mg plus COBI 150-mg tablet 	<p><u>Standard Adult Dose(s) Emtriva (FTC)</u> <i>Capsule:</i></p> <ul style="list-style-type: none"> • 200 mg once daily without regard to food <p><i>Oral Solution:</i></p> <ul style="list-style-type: none"> • 240 mg (24 mL) once daily without regard to food <p><u>Truvada:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily without regard to food <p><u>Atripla:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily at or before bedtime. Take on an empty stomach to reduce side effects. <p><u>Complera:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p><u>Stribild:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p>Descovy:</p> <ul style="list-style-type: none"> • 1 tablet once daily with or without food <p><u>Odefsey:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p><u>Genvoya:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • PK of FTC not significantly altered in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in FTC dose indicated. <p>• For guidance about use of combination products in pregnancy, please see sections on other components (ie, TDF, TAF, EFV, RPV, EVG/COBI)</p>	<p>High placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>If HBV-coinfected, it is possible that a HBV flare may occur if the drug is stopped; see HIV/Hepatitis B Virus Coinfection.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 3 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Lamivudine (3TC) <i>EpiVir</i></p> <p>(3TC/ZDV) <i>Combivir</i></p> <p>(3TC/ABC) <i>Epzicom</i></p> <p>(3TC/ZDV/ABC) <i>Trizivir</i></p> <p>(3TC/ABC/DTG) <i>Triumeq</i></p>	<p><u>3TC (EpiVir)</u></p> <p><u>Tablets:</u></p> <ul style="list-style-type: none"> • 150 mg^e • 300 mg^e <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • 10 mg/mL^e <p><u>Combivir:</u></p> <ul style="list-style-type: none"> • 3TC 150 mg plus ZDV 300-mg tablet^e <p><u>Epzicom:</u></p> <ul style="list-style-type: none"> • 3TC 300 mg plus ABC 600-mg tablet^e <p><u>Trizivir:</u></p> <ul style="list-style-type: none"> • 3TC 150 mg plus ZDV 300 mg plus ABC 300-mg tablet^e <p><u>Triumeq:</u></p> <ul style="list-style-type: none"> • 3TC 300 mg plus ABC 600 mg plus DTG 50-mg tablet 	<p><u>Standard Adult Dose(s)</u></p> <p><u>3TC (EpiVir):</u></p> <ul style="list-style-type: none"> • 150 mg twice daily or 300 mg once daily, without regard to food <p><u>Combivir:</u></p> <ul style="list-style-type: none"> • 1 tablet twice daily without regard to food <p><u>Epzicom:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily without regard to food <p><u>Trizivir:</u></p> <ul style="list-style-type: none"> • 1 tablet twice daily without regard to food <p><u>Triumeq:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily without regard to food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • PK not significantly altered in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>High placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>If HBV-coinfected, it is possible that an HBV flare may occur if the drug is stopped; see HIV/Hepatitis B Virus Coinfection.</p>	<p>November 14, 2017</p>
<p>Stavudine (d4T) <i>Zerit</i></p> <p>Generic products available for all formulations.</p>	<p><u>d4T (Zerit)</u></p> <p><u>Capsules:</u></p> <ul style="list-style-type: none"> • 15 mg • 20 mg • 30 mg • 40 mg <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • 1 mg/mL following reconstitution 	<p><u>Standard Adult Dose(s)^f</u></p> <p><u>Body Weight ≥60 kg:</u></p> <ul style="list-style-type: none"> • 40 mg twice daily without regard to meals <p><u>Body Weight <60 kg:</u></p> <ul style="list-style-type: none"> • 30 mg twice daily without regard to meals <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • PK not significantly altered in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>High placental transfer.^b</p> <p>No evidence of human teratogenicity (can rule out 2-fold increase in overall birth defects).</p> <p>d4T is not recommended for pregnant women.</p> <p>Lactic acidosis, sometimes fatal, has been reported in pregnant women receiving ddI and d4T together.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 4 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Tenofovir Alafenamide (TAF) Vemlidy^d (TAF/FTC/EVG/COBI) <i>Genvoya</i> (TAF/FTC/RPV) <i>Odefsey</i> (TAF/FTC) <i>Descovy</i>	Vemlidy TAF 25-mg tablet <i>Genvoya</i> : • TAF 10 mg plus FTC 200 mg plus EVG 150 mg plus COBI 150-mg tablet <i>Odefsey</i> : • TAF 25 mg plus FTC 200 mg plus RPV 25-mg tablet <i>Descovy</i> : • TAF 25 mg plus FTC 200-mg tablet	<u>Standard Adult Dose</u> <i>Vemlidy</i> : • 1 tablet once daily with food <i>Genvoya, Odefsey</i> : • 1 tablet once daily with food <i>Descovy</i> : • 1 tablet once daily with or without food • Same dose (TAF 25 mg) can be used with or without pharmacoenhancers <u>PK in Pregnancy</u> : • No PK studies in human pregnancy <u>Dosing in Pregnancy</u> : • Insufficient data to make dosing recommendation	No data are available on placental transfer of TAF. Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats. Renal function should be monitored because of potential for renal toxicity.	November 14, 2017
Tenofovir Disoproxil Fumarate (TDF) <i>Viread</i> (TDF/FTC) <i>Truvada</i> (TDF/FTC/EFV) <i>Atripla</i> (TDF/FTC/RPV) <i>Complera</i> (TDF/FTC/EVG/COBI) <i>Stribild</i>	<u>TDF (Viread)</u> <i>Tablet</i> : • 300 mg <i>Powder</i> : • 40 mg/1 g oral powder <u>Truvada</u> : • TDF 300 mg plus FTC 200-mg tablet <u>Atripla</u> : • TDF 300 mg plus FTC 200 mg plus EFV ^c 600-mg tablet <u>Complera</u> : • TDF 300 mg plus FTC 200 mg plus RPV 25-mg tablet <u>Stribild</u> : • TDF 300 mg plus FTC 200 mg plus EVG 150 mg plus COBI 150-mg tablet	<u>Standard Adult Dose</u> <u>TDF (Viread)</u> <i>Tablet</i> : • 300 mg once daily without regard to food <i>Powder</i> : • 8 mg/kg (up to maximum 300 mg), take with food <i>Truvada</i> : • 1 tablet once daily without regard to food <i>Atripla</i> : • 1 tablet once daily at or before bedtime. Take on an empty stomach to reduce side effects. <i>Complera</i> : • 1 tablet once daily with food <i>Stribild</i> : • 1 tablet once daily with food <u>PK in Pregnancy</u> : • AUC lower in third trimester than postpartum but trough levels adequate <u>Dosing in Pregnancy</u> : • No change in dose indicated.	High placental transfer to fetus. ^b No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects). Studies in monkeys (at doses approximately 2-fold higher than that for human therapeutic use) show decreased fetal growth and reduction in fetal bone porosity within 2 months of starting maternal therapy. Human studies demonstrate no consistent link to low birth weight , but data are conflicting about potential effects on growth outcomes later in infancy. If HBV-coinfected, it is possible that an HBV flare may occur if TDF is stopped; see HIV/Hepatitis B Virus Coinfection . Renal function should be monitored because of potential for renal toxicity.	October 19, 2017

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

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 5 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Zidovudine (ZDV, AZT) <i>Retrovir</i></p> <p>(ZDV/3TC) <i>Combivir</i></p> <p>(ZDV/3TC/ABC) <i>Trizivir</i></p> <p>Note: Generics are approved for all formulations</p>	<p><u>ZDV (Retrovir)</u></p> <p><u>Capsule:</u></p> <ul style="list-style-type: none"> • 100 mg <p><u>Tablet:</u></p> <ul style="list-style-type: none"> • 300 mg <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • 10 mg/mL <p><u>Intravenous Solution:</u></p> <ul style="list-style-type: none"> • 10 mg/mL <p><u>Combivir:</u></p> <ul style="list-style-type: none"> • ZDV 300 mg plus 3TC 150-mg tablet <p><u>Trizivir:</u></p> <ul style="list-style-type: none"> • ZDV 300 mg plus 3TC 150 mg plus ABC 300-mg tablet 	<p><u>Standard Adult Dose(s)</u></p> <p><u>ZDV (Retrovir):</u></p> <ul style="list-style-type: none"> • 300 mg BID or 200 mg TID, without regard to food <p><u>Active Labor:</u></p> <ul style="list-style-type: none"> • 2 mg/kg IV loading dose, followed by 1 mg/kg/hour continuous infusion from beginning of active labor until delivery <p><u>Combivir:</u></p> <ul style="list-style-type: none"> • One tablet twice daily, without regard to food <p><u>Trizivir:</u></p> <ul style="list-style-type: none"> • One tablet twice daily, without regard to food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • PK not significantly altered in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>High placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 6 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>NNRTI NNRTIs are recommended for use in combination regimens with 2 NRTI drugs. Hypersensitivity reactions, including hepatic toxicity and rash, more common in women; unclear if increased in pregnancy.</p>				
<p>Efavirenz (EFV) <i>Sustiva</i> (EFV/TDF/FTC) <i>Atripla</i></p>	<p><u>EFV (Sustiva):^e</u> <i>Capsules:</i> • 50 mg • 200 mg <i>Tablet:</i> • 600 mg <u>Atripla:</u> • EFV 600 mg plus TDF 300 mg plus FTC 200-mg tablet</p>	<p><u>Standard Adult Dose</u> <i>EFV (Sustiva):</i> • 600 mg once daily at or before bedtime, on empty stomach to reduce side effects <i>Atripla:</i> • 1 tablet once daily at or before bedtime, on empty stomach to reduce side effects <u>PK in Pregnancy:</u> • AUC decreased during third trimester, compared with postpartum, but nearly all third-trimester participants exceeded target exposure. <u>Dosing in Pregnancy:</u> • No change in dose indicated.</p>	<p>Moderate placental transfer to fetus.^b Potential fetal safety concern: The FDA advises women to avoid becoming pregnant while taking EFV and advises health care providers to avoid administration in the first trimester of pregnancy as fetal harm may occur. Although the limited data on first-trimester EFV exposure cannot rule out a 2- or 3-fold increased incidence of a rare outcome, such as neural tube defects, the available data from a meta-analysis on more than 2,000 births suggest that there is not a large increase (e.g., a 10-fold increase to a rate of 1%) in the risk of neural tube defects with first-trimester exposure. As a result, the current Perinatal Guidelines do not include a restriction of use of EFV in pregnant women or in women planning to become pregnant, consistent with both the British HIV Association and WHO guidelines for use of ARV drugs in pregnancy. EFV should be continued in pregnant women receiving a virologically suppressive EFV-based regimen, because ARV drug changes during pregnancy may be associated with loss of viral control and increased risk of perinatal transmission (see HIV-Infected Pregnant Women Who are Currently Receiving Antiretroviral Therapy).</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 7 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Etravirine (ETR) <i>Intence</i>	<u>Tablets:</u> <ul style="list-style-type: none"> • 25 mg • 100 mg • 200 mg <p>For patients unable to swallow tablets whole, the tablets may be dispersed in a glass of water.</p>	<u>Standard Adult Dose(s):</u> <ul style="list-style-type: none"> • 200 mg twice daily with food <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • PK data in pregnancy (n = 26) suggest 1.2–1.6-fold increased etravirine exposure during pregnancy. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>Variable placental transfer, usually in the moderate to high categories, ranging from 0.19–4.25 (data from 19 mother-infant pairs).^b</p> <p>Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats or rabbits.</p>	<p>November 14, 2017</p>
Nevirapine (NVP) <i>Viramune</i> <i>Viramune XR</i> (Extended Release) Note: Generic available for all formulations	<u>NVP (Viramune)</u> <u>Tablets:</u> <ul style="list-style-type: none"> • 200 mg <u>Oral Suspension:</u> <ul style="list-style-type: none"> • 50 mg/5 mL <u>Viramune XR Tablets:</u> <ul style="list-style-type: none"> • 100 mg • 400 mg 	<u>Standard Adult Dose:</u> <ul style="list-style-type: none"> • 200 mg once daily Viramune immediate release for 14 days (lead-in period); thereafter, 200 mg twice daily or 400 mg (Viramune XR tablet) once daily, without regard to food. • Repeat lead-in period if therapy is discontinued for >7 days. • In patients who develop mild-to-moderate rash without constitutional symptoms during lead-in, continue lead-in dosing until rash resolves, but ≤28 days total. <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • PK of immediate release tablets not significantly altered in pregnancy. • No data are available on extended release formulations in pregnancy. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>High placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects and 2-fold increase in risk of birth defects in more common classes, cardiovascular and genitourinary).</p> <p>Increased risk of symptomatic, often rash-associated, and potentially fatal liver toxicity among women with CD4 cell counts ≥250/mm³ when first initiating therapy; pregnancy does not appear to increase risk.</p> <p>NVP should be initiated in pregnant women with CD4 cell counts ≥250 cells/mm³ only if benefit clearly outweighs risk because of potential increased risk of life-threatening hepatotoxicity in women with high CD4 cell counts. Elevated transaminase levels at baseline may increase the risk of NVP toxicity.</p> <p>Women who become pregnant while taking NVP-containing regimens and are tolerating them well can continue therapy, regardless of CD4 cell count.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 8 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Rilpivirine (RPV) <i>Edurant</i></p> <p>(RPV/TDF/FTC) <i>Complera</i></p> <p>(RPV/TAF/FTC) <i>Odefsey</i></p>	<p><u>RPV (Edurant)</u></p> <p><u>Tablets:</u></p> <ul style="list-style-type: none"> • 25 mg <p><u>Complera:</u></p> <ul style="list-style-type: none"> • RPV 25 mg plus TDF 300 mg plus FTC 200-mg tablet <p><u>Odefsey:</u></p> <ul style="list-style-type: none"> • RPV 25 mg plus TAF 25 mg plus FTC 200-mg tablet 	<p><u>Standard Adult Dose</u></p> <p><u>RPV (Edurant):</u></p> <ul style="list-style-type: none"> • 25 mg once daily with food <p><u>Complera:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p><u>Odefsey:</u></p> <ul style="list-style-type: none"> • 1 tablet once daily with food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • RPV PK highly variable during pregnancy. RPV AUC and trough concentration reduced 20% to 50% in pregnancy compared with postpartum. While most pregnant women exceeded target exposure, those with detectable viral loads had lower RPV troughs. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • While RPV plasma concentration is reduced during pregnancy, higher-than-standard doses have not been studied. Insufficient data are available to recommend a dosing change in pregnancy. With standard dosing, viral loads should be monitored more frequently. 	<p>Moderate to high placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 2-fold increase in overall birth defects).</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 9 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>PIs PIs are recommended for use in combination regimens with 2 NRTI drugs. Hyperglycemia, new onset or exacerbation of diabetes mellitus, and diabetic ketoacidosis reported with PI use; unclear if pregnancy increases risk. Conflicting data regarding preterm delivery in women receiving PIs (see Combination Antiretroviral Drug Regimens and Pregnancy Outcomes).</p>				
<p>Atazanavir (ATV) <i>Reyataz</i></p> <p>Note: Must be combined with low-dose RTV boosting in pregnancy</p> <p>Atazanavir/ Cobicistat (ATV/COBI) <i>Evotaz</i></p>	<p><u>Atazanavir (Reyataz)</u> <i>Capsules:</i></p> <ul style="list-style-type: none"> • 150 mg • 200 mg • 300 mg <p><i>Oral Powder:</i></p> <ul style="list-style-type: none"> • 50-mg packet <p><u>Evotaz:</u></p> <ul style="list-style-type: none"> • ATV 300 mg plus COBI 150-mg tablet 	<p>Standard Adult Dose</p> <p><u>Atazanavir (Reyataz)</u> <i>ARV-Naive Patients</i></p> <p><u>Without RTV Boosting:</u></p> <ul style="list-style-type: none"> • ATV 400 mg once daily with food; ATV without RTV boosting is not recommended when used with TDF, H₂-receptor antagonists, or PPIs, or during pregnancy. <p><u>With RTV Boosting:</u></p> <ul style="list-style-type: none"> • ATV 300 mg plus RTV 100 mg once daily with food • When combined with EFV in ARV-naive patients: ATV 400 mg plus RTV 100 mg once daily with food <p><i>ARV-Experienced Patients:</i></p> <ul style="list-style-type: none"> • ATV 300 mg plus RTV 100 mg once daily with food • Do not use with PPIs or EFV. • If combined with an H₂-receptor antagonist: ATV 300 mg plus RTV 100 mg once daily with food • If combined with an H₂-receptor antagonist and TDF: ATV 400 mg plus RTV 100 mg once daily with food <p><u>Powder Formulation:</u></p> <ul style="list-style-type: none"> • Oral powder is taken once daily with food at the same recommended adult dosage as the capsules along with ritonavir. <p><u>Atazanavir/Cobicistat (Evotaz):</u></p> <ul style="list-style-type: none"> • One tablet once daily with food. <p><u>PK in Pregnancy</u></p> <p><u>Atazanavir (Reyataz):</u></p> <ul style="list-style-type: none"> • ATV concentrations reduced during pregnancy; further reduced when given concomitantly with TDF or H₂-receptor antagonist. <p><u>Atazanavir/Cobicistat (Evotaz):</u></p> <ul style="list-style-type: none"> • No PK studies in human pregnancy. 	<p>Low placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>Must be given as low-dose RTV-boosted regimen in pregnancy.</p> <p>Effect of <i>in utero</i> ATV exposure on infant indirect bilirubin levels is unclear. Non-pathologic elevations of neonatal hyperbilirubinemia have been observed in some but not all clinical trials to date.</p> <p>Oral powder (but not capsules) contains phenylalanine, which can be harmful to patients with phenylketonuria.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 10 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
		<p><u>Dosing in Pregnancy</u> <i>Atazanavir [Reyataz]:</i></p> <ul style="list-style-type: none"> • Use of unboosted ATV is not recommended during pregnancy. • Use of ATV not recommended for treatment-experienced pregnant women taking TDF and an H₂-receptor antagonist. • Use of an increased dose (400 mg ATV plus 100 mg RTV once daily with food) during the second and third trimesters results in plasma concentrations equivalent to those in non-pregnant adults on standard dosing. Although some experts recommend increased ATV dosing in all women during the second and third trimesters, the package insert recommends increased ATV dosing only for ARV-experienced pregnant women in the second and third trimesters also receiving either TDF or an H₂-receptor antagonist. <p><i>Atazanavir/Cobicistat (Evotaz):</i></p> <ul style="list-style-type: none"> • Insufficient data to make dosing recommendation in pregnancy (see Cobicistat section). 		November 14, 2017
<p>Darunavir (DRV) <i>Prezista</i></p> <p>Note: Must be combined with low-dose RTV or COBI boosting</p> <p>Darunavir/ Cobicistat (DRV/COBI) <i>Prezcobix</i></p>	<p><u>DRV Tablets:</u></p> <ul style="list-style-type: none"> • 75 mg • 150 mg • 600 mg • 800 mg <p><u>DRV Oral Suspension:</u></p> <ul style="list-style-type: none"> • 100 mg/mL <p><u>Prezcobix Tablet (Co-Formulated):</u></p> <ul style="list-style-type: none"> • DRV 800 mg plus COBI 150 mg 	<p><u>Standard Adult Dose</u> <i>ARV-Naive Patients:</i></p> <ul style="list-style-type: none"> • DRV 800 mg plus RTV 100 mg once daily with food • DRV 800 mg plus COBI 150 mg once daily with food <p><i>ARV-Experienced Patients:</i></p> <p><u>If No DRV Resistance Mutations:</u></p> <ul style="list-style-type: none"> • DRV 800 mg plus RTV 100 mg once daily with food • DRV 800 mg plus COBI 150 mg once daily with food <p><u>If Any DRV Resistance Mutations:</u></p> <ul style="list-style-type: none"> • DRV 600 mg plus RTV 100 mg twice daily with food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • Decreased exposure in pregnancy with use of DRV/r. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • The Panel does not recommend once-daily dosing with DRV/r during pregnancy. • Twice-daily DRV/r dosing (DRV 600 mg plus RTV 100 mg with food) recommended for all pregnant women. • Increased twice-daily DRV dose (DRV 800 mg plus RTV 100 mg with food) during pregnancy does not result in an increase in darunavir exposure and is not recommended. • No pregnancy PK/safety data for DRV/c co-formulation, so not recommended for use in pregnancy. 	<p>Low placental transfer to fetus.^b</p> <p>No evidence of teratogenicity in mice, rats, or rabbits. No evidence of human teratogenicity.</p> <p>Must be boosted with low-dose RTV.</p>	November 14, 2017

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 11 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Fosamprenavir (FPV) <i>Lexiva (a prodrug of amprenavir)</i></p> <p>Note: Must be combined with low-dose RTV boosting in pregnancy</p>	<p><u>Tablets:</u></p> <ul style="list-style-type: none"> • 700 mg <p><u>Oral Suspension:</u></p> <ul style="list-style-type: none"> • 50 mg/mL 	<p><u>Standard Adult Dose</u></p> <p><i>ARV-Naive Patients:</i></p> <ul style="list-style-type: none"> • FPV 1400 mg twice daily without food, <i>or</i> • FPV 1400 mg plus RTV 100 or 200 mg once daily without food, <i>or</i> • FPV 700 mg plus RTV 100 mg twice daily without food <p><i>PI-Experienced Patients</i></p> <ul style="list-style-type: none"> • Once-daily dosing not recommended • FPV 700 mg plus RTV 100 mg twice daily without food <p><i>Co-Administered with EFV:</i></p> <ul style="list-style-type: none"> • FPV 700 mg plus RTV 100 mg twice daily without food; <i>or</i> • FPV 1400 mg plus RTV 300 mg once daily without food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • With RTV boosting, AUC is reduced during the third trimester. However, exposure is greater during the third trimester with boosting than in non-pregnant adults without boosting, and trough concentrations achieved during the third trimester were adequate for patients without PI resistance mutations. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • Use of unboosted FPV or once-daily FPV with RTV boosting is not recommended during pregnancy. No change is indicated in standard boosted twice-daily dose (FPV 700 mg plus RTV 100 mg twice daily without food). 	<p>Low placental transfer to fetus.^b</p> <p>Insufficient data to assess for teratogenicity in humans. Increased fetal loss in rabbits but no increase in defects in rats and rabbits.</p> <p>Must be given as low-dose RTV-boosted regimen in pregnancy.</p>	<p>November 14, 2017</p>
<p>Indinavir (IDV) <i>Crixivan</i></p> <p>Note: Must be combined with low-dose RTV boosting in pregnancy</p>	<p><u>Capsules:</u></p> <ul style="list-style-type: none"> • 200 mg • 400 mg 	<p><u>Standard Adult Dose</u></p> <p><i>Without RTV Boosting:</i></p> <ul style="list-style-type: none"> • IDV 800 mg every 8 hours, taken 1 hour before or 2 hours after meals; may take with skim milk or low-fat meal. <p><i>With RTV Boosting:</i></p> <ul style="list-style-type: none"> • IDV 800 mg plus RTV 100 mg twice daily without regard to meals <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • IDV exposure markedly reduced when administered without RTV boosting during pregnancy. IDV exposure low with IDV 400 mg/RTV 100 mg dosing during pregnancy; no PK data available on alternative boosted dosing regimens in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • Use of unboosted IDV is not recommended during pregnancy. 	<p>Minimal placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity in cases reported to the APR (can rule out 2-fold increase in overall birth defects).</p> <p>Must be given as low-dose, RTV-boosted regimen in pregnancy.</p> <p>Theoretical concern regarding increased indirect bilirubin levels, which may exacerbate physiologic hyperbilirubinemia in neonates. Minimal placental passage mitigates this concern.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 12 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Lopinavir/ Ritonavir (LPV/r) <i>Kaletra</i></p> <p>Note: Generic available for some formulations</p>	<p><u>Tablets (Co-Formulated):</u></p> <ul style="list-style-type: none"> • LPV 200 mg plus RTV 50 mg • LPV 100 mg plus RTV 25 mg <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • LPV 400 mg plus RTV 100 mg/5 mL 	<p><u>Standard Adult Dose:</u></p> <ul style="list-style-type: none"> • LPV 400 mg plus RTV 100 mg twice daily, <i>or</i> • LPV 800 mg plus RTV 200 mg once daily <p><u>Tablets:</u></p> <ul style="list-style-type: none"> • Take without regard to food. <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • Take with food. <p><u>With EFV or NVP (PI-Naive or PI-Experienced Patients):</u></p> <ul style="list-style-type: none"> • LPV 500 mg plus RTV 125-mg tablets twice daily without regard to meals (use a combination of two LPV 200 mg plus RTV 50-mg tablets and one LPV 100 mg plus RTV 25-mg tablet), <i>or</i> • LPV 520 mg plus RTV 130 mg oral solution (6.5 mL) twice daily with food <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • With twice-daily dosing, LPV exposure is reduced in pregnant women receiving standard adult doses; increasing the dose by 50% results in exposure equivalent to that seen in non-pregnant adults receiving standard doses. • No PK data are available for once-daily dosing in pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • Once daily dosing is not recommended during pregnancy. • Some experts recommend that an increased dose (i.e., LPV 600 mg plus RTV 150 mg twice daily without regard to meals or LPV 500 mg plus RTV 125 mg twice daily without regard to meals) should be used in the second and third trimesters, especially in PI-experienced pregnant women and women who start treatment during pregnancy with a baseline viral load >50 copies/mL. • If standard dosing is used, monitor virologic response and LPV drug levels, if available.. 	<p>Low placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>Oral solution contains 42% alcohol and 15% propylene glycol and is not recommended for use in pregnancy.</p> <p>Once-daily LPV/r dosing is not recommended during pregnancy</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 13 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Nelfinavir (NFV) <i>Viracept</i>	<u>Tablets:</u> <ul style="list-style-type: none"> • 250 mg • 625 mg (tablets can be dissolved in small amount of water) <u>Powder for Oral Suspension:</u> <ul style="list-style-type: none"> • 50 mg/g 	<u>Standard Adult Dose:</u> <ul style="list-style-type: none"> • 1250 mg twice daily or 750 mg three times daily with food <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • Lower NFV exposure in third trimester than postpartum in women receiving NFV 1250 mg twice daily; however, generally adequate drug levels are achieved during pregnancy, although levels are variable in late pregnancy. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • Three-times-daily dosing with 750 mg with food not recommended during pregnancy. No change in standard dose (1250 mg twice daily with food) indicated. 	Minimal to low placental transfer to fetus. ^b No evidence of human teratogenicity; can rule out 1.5-fold increase in overall birth defects and 2-fold increase in risk of birth defects in more common classes, cardiovascular, and genitourinary. Contains aspartame; should not be used in individuals with phenylketonuria.	November 14, 2017
Saquinavir (SQV) <i>Invirase</i> Note: Must be combined with low-dose RTV for PK boosting	<u>Tablet:</u> <ul style="list-style-type: none"> • 500 mg <u>Capsule:</u> <ul style="list-style-type: none"> • 200 mg 	<u>Standard Adult Dose:</u> <ul style="list-style-type: none"> • SQV 1000 mg plus RTV 100 mg twice a day with food or within 2 hours after a meal <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • Based on limited data, SQV exposure may be reduced in pregnancy but not sufficient to warrant a dose change. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • No change in dose indicated. 	Low placental transfer to fetus. ^b Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats or rabbits. Must be boosted with low-dose RTV. Baseline ECG recommended before starting because PR and/or QT interval prolongations have been observed. Contraindicated in patients with preexisting cardiac conduction system disease.	November 14, 2017

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 14 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Tipranavir (TPV) <i>Aptivus</i></p> <p>Note: Must be combined with RTV for PK boosting</p>	<p><u>Capsules:</u></p> <ul style="list-style-type: none"> • 250 mg <p><u>Oral Solution:</u></p> <ul style="list-style-type: none"> • 100 mg/mL 	<p><u>Standard Adult Dose:</u></p> <ul style="list-style-type: none"> • TPV 500 mg plus RTV 200 mg twice daily <p><u>With RTV Tablets:</u></p> <ul style="list-style-type: none"> • Take with food. <p><u>With RTV Capsules or Solution:</u></p> <ul style="list-style-type: none"> • Take without regard to food; however, administering with food may help make the dose more tolerable. <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • Limited PK data in human pregnancy <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • Insufficient data to make dosing recommendation 	<p>Moderate placental transfer to fetus reported in one patient.^b</p> <p>Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats or rabbits.</p> <p>Must be given as low-dose RTV-boosted regimen.</p>	<p>November 14, 2017</p>
Entry Inhibitors				
<p>Enfuvirtide (T-20) <i>Fuzeon</i></p>	<p><u>Injectable:</u></p> <ul style="list-style-type: none"> • Supplied as lyophilized powder. Each vial contains 108 mg of T-20; reconstitute with 1.1 mL of sterile water for injection for SQ delivery of approximately 90 mg/1 mL. 	<p>T-20 is indicated for advanced HIV disease and must be used in combination with other ARV drugs to which the patient's virus is susceptible by resistance testing.</p> <p><u>Standard Adult Dose:</u></p> <ul style="list-style-type: none"> • 90 mg (1 mL) twice daily without regard to meals <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • No PK data in human pregnancy. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • Insufficient data to make dosing recommendation. 	<p>Minimal to low placental transfer to fetus.^b</p> <p>No data on human teratogenicity.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 15 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Maraviroc (MVC) Selzentry	<u>Tablets:</u> <ul style="list-style-type: none"> • 150 mg • 300 mg 	<u>Standard Adult Dose:</u> <ul style="list-style-type: none"> • 300 mg twice daily with or without food • Maraviroc should only be used for patients with CCR5-tropic virus (and no X4-tropic virus). <u>Dose Adjustments:</u> <ul style="list-style-type: none"> • Increase to 600 mg BID when used with potent CYP3A inducers: EFV, ETR, and rifampin. • Decrease to 150 mg BID when used with CYP3A inhibitors: all PIs except TPV/r and itraconazole. <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • A PK study in human pregnancy demonstrated a 20% to 30% overall decrease in AUC, but C_{trough} exceeded the recommended minimal concentration of 50 ng/mL. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • Standard adult dosing adjusted for concomitant ARV use appears appropriate. 	No evidence of teratogenicity in rats or rabbits; insufficient data to assess for teratogenicity in humans. MVC placental passage category should be moderate. ^b	November 14, 2017

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 16 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Integrase Inhibitors				
<p>Dolutegravir (DTG) <i>Tivicay</i></p> <p>(DTG/ABC/3TC) <i>Triumeq</i></p>	<p><u>Tablets:</u></p> <ul style="list-style-type: none"> • 50 mg <p><u>Triumeq:</u></p> <ul style="list-style-type: none"> • ABC 600 mg plus DTG 50 mg plus 3TC 300-mg tablet 	<p><u>Standard Adult Dose</u> <i>ARV-Naive or ARV-Experienced (but Integrase Inhibitor-Naive Patients)</i></p> <p><u>DTG (Tivicay):</u></p> <ul style="list-style-type: none"> • 1 tablet once daily, without regard to food. <p><u>DTG/ABC/3TC (Triumeq):</u></p> <ul style="list-style-type: none"> • 1 tablet once daily, without regard to food. <p><i>ARV-Naive or ARV-Experienced (but Integrase Inhibitor-Naive) if Given with EFV, FPV/r, TPV/r, or Rifampin; or Integrase Inhibitor-Experienced</i></p> <p><u>DTG (Tivicay):</u></p> <ul style="list-style-type: none"> • 1 tablet twice daily, without regard to food. <p><u>PK in Pregnancy:</u></p> <ul style="list-style-type: none"> • AUC may be decreased during the third trimester compared with postpartum, but good viral suppression in third trimester recipients. <p><u>Dosing in Pregnancy:</u></p> <ul style="list-style-type: none"> • No change in dose indicated. 	<p>High placental transfer to fetus.</p> <p>No evidence of teratogenicity in mice, rats, or rabbits. Preliminary data suggest no increased risk of teratogenicity in humans.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 17 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
<p>Elvitegravir (EVG) <i>Vitekta</i></p> <p>Note: As of October 2017, <i>Vitekta</i> (i.e., EVG as a single-entity formulation) is no longer available</p> <p>Elvitegravir/ Cobicistat/ Emtricitabine/ Tenofovir Disoproxil Fumarate (EVG/COBI/ FTC/TDF) <i>Stribild</i></p> <p>Elvitegravir/ Cobicistat/ Emtricitabine/ Tenofovir Alafenamide (EVG/COBI/FTC/TAF) <i>Genvoya</i></p>	<p>Tablet (<i>Stribild</i>):</p> <ul style="list-style-type: none"> • EVG 150 mg plus COBI 150 mg plus FTC 200 mg plus TDF 300 mg <p>Tablet (<i>Genvoya</i>):</p> <ul style="list-style-type: none"> • EVG 150 mg plus COBI 150 mg plus FTC 200 mg plus TAF 10 mg 	<p>Standard Adult Dose (<i>Stribild</i> and <i>Genvoya</i>):</p> <ul style="list-style-type: none"> • One tablet once daily with food. <p>PK in Pregnancy:</p> <ul style="list-style-type: none"> • PK studies in women who received EVG/c demonstrated significant reduction in EVG plasma exposure during pregnancy. <p>Dosing in Pregnancy:</p> <ul style="list-style-type: none"> • Insufficient data to make dosing recommendation. 	<p>Evidence of high placental transfer of EVG and low transfer of COBI.</p> <p>Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats or rabbits.</p> <p>EVG/c is not recommended for initial use in pregnancy. For women who become pregnant while taking EVG/c, consider switching to a more effective, recommended regimen. If an EVG/c regimen is continued, viral load should be monitored frequently, and TDM (if available) may be useful.</p>	<p>November 14, 2017</p>
<p>Raltegravir (RAL) <i>Isentress</i> <i>Isentress HD</i></p>	<p><i>Isentress</i></p> <p><i>Film-Coated Tablets:</i></p> <ul style="list-style-type: none"> • 400 mg <p><i>Chewable Tablets:</i></p> <ul style="list-style-type: none"> • 25 mg • 100 mg <p><i>Isentress HD</i></p> <p><i>Film-Coated Tablets:</i></p> <ul style="list-style-type: none"> • 600 mg 	<p>Standard Adult Dose:</p> <ul style="list-style-type: none"> • 400-mg film-coated tablets twice daily without regard to food. • Two 600-mg film-coated (1200 mg) once daily for treatment-naïve patients or patients already virologically suppressed on initial regimen of RAL 400 mg BID) without regard to food • Chewable and oral suspension doses are not interchangeable to either film-coated tablets or to each other. <p>With Rifampin:</p> <ul style="list-style-type: none"> • Two 400-mg film-coated tablets (800 mg) twice daily without regard to food. <p>PK in Pregnancy:</p> <ul style="list-style-type: none"> • Decreased levels in third trimester not of sufficient magnitude to warrant change in dosing. <p>Dosing in Pregnancy:</p> <ul style="list-style-type: none"> • No change in dose indicated. • Once-daily dosing (i.e., two 600-mg film-coated tablets) should not be used in pregnant women until more information is available. 	<p>High placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>Case report of markedly elevated liver transaminases with use in late pregnancy. Severe, potentially life-threatening and fatal skin and hypersensitivity reactions have been reported in non-pregnant adults.</p> <p>Chewable tablets contain phenylalanine.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 18 of 19)

Generic Name (Abbreviation) Trade Name	Formulation	Dosing Recommendations	Use in Pregnancy	Last Reviewed
Pharmacoenhancers				
Cobicistat (COBI) <i>Tybost</i> Elvitegravir/Cobicistat/Tenofovir Disoproxil Fumarate/Emtricitabine (EVG/COBI/ TDF/FTC) <i>Stribild</i> Elvitegravir/Cobicistat/Tenofovir Alafenamide/Emtricitabine (EVG/COBI/TAF/FTC) <i>Genvoya</i> Atazanavir/Cobicistat (ATV/COBI) <i>Evotaz</i> Darunavir/Cobicistat (DRV/COBI) <i>Prezcobix</i>	<u>Tablet (Tybost):</u> <ul style="list-style-type: none"> • 150mg <u>Tablet (Stribild):</u> <ul style="list-style-type: none"> • EVG 150 mg plus COBI 150 mg plus TDF 300 mg plus FTC 200 mg <u>Tablet (Genvoya):</u> <ul style="list-style-type: none"> • EVG 150 mg plus COBI 150 mg plus TAF 10 mg plus FTC 200 mg <u>Tablet (Evotaz):</u> <ul style="list-style-type: none"> • ATV 300 mg plus COBI 150 mg <u>Tablet (Prezcobix):</u> <ul style="list-style-type: none"> • DRV 800 mg plus COBI 150 mg 	<u>Standard Adult Dose</u> <i>Tybost:</i> <ul style="list-style-type: none"> • As an alternative PK booster with ATV or DRV/r: 1 tablet (150 mg) once daily with food. <i>Stribild, Genvoya, Evotaz, Prezcobix:</i> <ul style="list-style-type: none"> • 1 tablet once daily with food. <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • Based on limited data, cobicistat exposure and pharmacoenhancing effect are markedly reduced in pregnancy. <u>Dosing in Pregnancy:</u> <ul style="list-style-type: none"> • While COBI exposure is markedly reduced during pregnancy, higher than standard doses have not been studied. The Panel recommends the use of RTV as the preferred pharmacoenhancer during pregnancy until more data are available on COBI activity during pregnancy. 	<p>Low placental transfer to fetus.^b</p> <p>Insufficient data to assess for teratogenicity in humans. No evidence of teratogenicity in rats or rabbits.</p>	<p>November 14, 2017</p>
Ritonavir (RTV) <i>Norvir</i>	<u>Capsules:</u> <ul style="list-style-type: none"> • 100 mg <u>Tablets:</u> <ul style="list-style-type: none"> • 100 mg <u>Oral Solution:</u> <ul style="list-style-type: none"> • 80 mg/mL <u>Powder:</u> <ul style="list-style-type: none"> • 100 mg/sachet 	<u>Standard Adult Dose as PK Booster for Other PIs:</u> <ul style="list-style-type: none"> • 100–400 mg per day in 1–2 divided doses (refer to other PIs for specific dosing recommendations.) <u>Tablet:</u> <ul style="list-style-type: none"> • Take with food. <u>Capsule or Oral Solution:</u> <ul style="list-style-type: none"> • To improve tolerability, recommended to take with food if possible. <u>PK in Pregnancy:</u> <ul style="list-style-type: none"> • Lower levels during pregnancy compared with postpartum. <u>Dosing in Pregnancy:</u> No dosage adjustment necessary when used as booster.	<p>Low placental transfer to fetus.^b</p> <p>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</p> <p>Should only be used as low-dose booster for other PIs.</p> <p>Oral solution contains 43% alcohol and is therefore not recommended during pregnancy, because there is no known safe level of alcohol exposure during pregnancy.</p>	<p>November 14, 2017</p>

Table 9. Antiretroviral Drug Use in Pregnant HIV-Infected Women: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy^a (page 19 of 19)

^a Individual antiretroviral drug dosages may need to be adjusted in renal or hepatic insufficiency (for details, see [Adult Guidelines, Appendix B, Table 7](#)).

^b Placental transfer categories—Mean or median cord blood/maternal delivery plasma drug ratio:

High: >0.6

Moderate: 0.3–0.6

Low: <0.3

^c See [Teratogenicity](#) for discussion of EFV and risks in pregnancy.

^d Only indicated for use in chronic hepatitis B virus infection in adults.

^e Generic formulation available

^f WHO recommends maximum dose or 30 mg twice daily regardless of weight.

Key to Acronyms: 3TC = lamivudine; ABC = abacavir; ARV = antiretroviral; ATV = atazanavir; AUC = area under the curve; AZT = zidovudine; BID = twice daily; CD4 = CD4 T lymphocyte; CI = confidence interval; CNS = central nervous system; COBI = cobicistat; d4T = stavudine; ddI = didanosine; DTG = dolutegravir; DRV = darunavir; EC = enteric coated; ECG = electrocardiogram; EFV = efavirenz; ETR = etravirine; EVG = elvitegravir; FDA = Food and Drug Administration; FPV/r = fosamprenavir/ritonavir; FTC = emtricitabine; HBV = hepatitis B virus; IDV = indinavir; IV = intravenous; LPV = lopinavir; LPV/r = lopinavir/ritonavir; MVC = maraviroc; NFV = nelfinavir; NNRTI = non-nucleoside reverse transcriptase inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; NVP = nevirapine; PI = protease inhibitor; PK = pharmacokinetic; RAL = raltegravir; RPV = rilpivirine; RTV = ritonavir; SQ = subcutaneous; SQV = saquinavir; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; TID = three times a day; TPV = tipranavir; TPV/r = tipranavir/ritonavir; T20 = enfuvirtide; WHO = World Health Organization; ZDV = zidovudine

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 1 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
Pediatric AIDS Clinical Trials Group (PACTG) 076; United States, France;¹ Formula feeding	ZDV vs. placebo	Long (from 14 weeks) IV IP	Long (6 weeks); infant only	Perinatal transmission at 18 months was 8.3% in ZDV arm vs. 25.5% in placebo arm (68% efficacy).
CDC Short-Course ZDV Trial; Thailand;¹² Formula feeding	ZDV vs. placebo	Short (from 36 weeks) Oral IP	None	Perinatal transmission at 6 months was 9.4% in ZDV arm vs. 18.9% in placebo arm (50% efficacy).
DITRAME (ANRS 049a) Trial; Ivory Coast, Burkina Faso;^{11,38} Breastfeeding	ZDV vs. placebo	Short (from 36 weeks) Oral IP	Short (1 week); mother only	Perinatal transmission was 18.0% in ZDV arm vs. 27.5% in placebo arm at 6 months (38% efficacy) and 21.5% vs. 30.6%, respectively, at 15 months (30% efficacy). Perinatal transmission was 22.5% in ZDV arm vs. 30.2% in placebo arm in pooled analysis at 24 months (26% efficacy).
CDC Short-Course ZDV Trial; Ivory Coast;^{10,11} Breastfeeding	ZDV vs. placebo	Short (from 36 weeks) Oral IP	None	Perinatal transmission was 16.5% in ZDV arm vs. 26.1% in placebo arm at 3 months (37% efficacy). Perinatal transmission was 22.5% in ZDV arm vs. 30.2% in placebo arm in pooled analysis at 24 months (26% efficacy).
PETRA Trial; South Africa, Tanzania, Uganda;⁵ Breastfeeding and formula feeding	AP/IP/PP ZDV plus 3TC vs. IP/PP ZDV plus 3TC vs. IP-only ZDV plus 3TC vs. Placebo	Short (from 36 weeks) Oral IP	Short (1 week); mother and infant	Perinatal transmission was 5.7% at 6 weeks for AP/IP/PP ZDV plus 3TC, 8.9% for IP/PP ZDV plus 3TC, 14.2% for IP-only ZDV plus 3TC, and 15.3% for placebo (efficacy compared with placebo: 63%, 42%, and 0%, respectively). Perinatal transmission was 14.9% at 18 months for AP/IP/PP ZDV plus 3TC, 18.1% for IP/PP ZDV plus 3TC, 20.0% for IP-only ZDV plus 3TC, and 22.2% for placebo (efficacy compared with placebo: 34%, 18%, and 0%, respectively).

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 2 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
HIVNET 012 Trial; Uganda; ⁴ Breastfeeding	SD NVP vs. ZDV	No AP ARV <u>Oral IP:</u> • SD NVP vs. oral ZDV	SD NVP within 72 hours of birth, infant only vs. ZDV (1 week); infant only	Perinatal transmission was 11.8% in NVP arm vs. 20.0% in ZDV arm at 6–8 weeks (42% efficacy) and 15.7% in NVP arm vs. 25.8% in ZDV arm at 18 months (41% efficacy).
SAINT Trial; South Africa; ⁶ Breastfeeding and formula feeding	SD NVP vs. ZDV plus 3TC	No AP ARV <u>Oral IP:</u> • SD NVP vs. ZDV plus 3TC	SD NVP within 48 hours of birth; mother and infant vs. ZDV plus 3TC (1 week); mother and infant	Perinatal transmission was 12.3% in SD NVP arm vs. 9.3% in ZDV plus 3TC arm at 8 weeks (difference not statistically significant, $P = 0.11$).
Perinatal HIV Prevention Trial (PHPT-1); Thailand; ¹³ Formula feeding	4 ZDV regimens with different durations of AP and infant PP administration; no placebo	Long (from 28 weeks), short (from 36 weeks) <u>Oral IP</u>	Long (6 weeks), short (3 days); infant only	Short-short arm was stopped at interim analysis (10.5%). Perinatal transmission was 6.5% in long-long arm vs. 4.7% in long-short arm and 8.6% in short-long arm at 6 months (no statistical difference). <i>In utero</i> transmission was significantly higher with short vs. long maternal therapy regimens (5.1% vs. 1.6%).
PACTG 316 Trial; Bahamas, Belgium, Brazil, France, Germany, Italy, Spain, Sweden, Switzerland, United Kingdom, United States; ²¹ Formula feeding	SD NVP vs. placebo among women already receiving ZDV alone (23%) or ZDV plus other ARV drugs (77% combination therapy)	Non-study ARV regimen <u>Oral IP:</u> • Placebo vs. SD NVP plus IV ZDV	Placebo vs. SD NVP within 72 hours of birth plus non-study ARV drugs (ZDV); infant only	77% of women received dual- or triple-combination ARV regimens during pregnancy. Trial stopped early because of very low perinatal transmission in both arms: 1.4% in SD NVP arm vs. 1.6% in placebo arm (53% of perinatal transmission was <i>in utero</i>).
Perinatal HIV Prevention Trial (PHPT-2); Thailand; ³⁹ Formula feeding	ZDV alone vs. ZDV plus maternal and infant SD NVP vs. ZDV plus maternal SD NVP	ZDV from 28 weeks <u>Oral IP:</u> • ZDV alone, or • ZDV plus SD NVP	ZDV for 1 week with or without SD NVP; infant only	ZDV-alone arm was stopped because of higher perinatal transmission than the ZDV/NVP arm (6.3% vs. 1.1%, respectively). In arms in which the mother received SD NVP, the perinatal transmission rate did not differ significantly between the infant receiving or not receiving SD NVP (2.0% vs. 2.8%, respectively).
DITRAME Plus (ANRS 1201.0) Trial; Ivory Coast; ¹⁵ Breastfeeding and formula feeding	Open label, ZDV plus SD NVP	ZDV from 36 weeks <u>Oral IP:</u> • ZDV plus SD NVP	SD NVP plus ZDV for 1 week; infant only	Perinatal transmission was 6.5% (95% CI, 3.9% to 9.1%) at 6 weeks; perinatal transmission for historical control group receiving short ZDV (98% breastfed) was 12.8%.
DITRAME Plus (ANRS 1201.1) Trial; Ivory Coast; ¹⁵ Breastfeeding and formula feeding	Open label, ZDV plus 3TC plus SD NVP	ZDV plus 3TC from 32 weeks (stopped at 3 days PP) <u>Oral IP:</u> • ZDV plus 3TC plus SD NVP	SD NVP plus ZDV for 1 week; infant only	Perinatal transmission was 4.7% (95% CI, 2.4% to 7.0%) at 6 weeks; perinatal transmission for historical control group receiving short ZDV (98% breastfed) was 12.8%.

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 3 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
NVAZ Trial; Malawi;⁷ Breastfeeding	Neonatal SD NVP vs. SD NVP plus ZDV	No AP or IP ARV (latecomers)	SD NVP with or without ZDV for 1 week; infant only	Perinatal transmission was 15.3% in SD NVP plus ZDV arm and 20.9% in SD NVP-only arm at 6–8 weeks. Perinatal transmission rates at 6–8 weeks among infants without HIV at birth were 7.7% and 12.1%, respectively (36% efficacy).
Postnatal NVP plus ZDV Trial; Malawi;⁸ Breastfeeding	Neonatal SD NVP vs. SD NVP plus ZDV	No AP ARV <u>Oral IP:</u> • SD NVP	SD NVP with or without ZDV for 1 week; infant only	Perinatal transmission was 16.3% in NVP plus ZDV arm and 14.1% in SD NVP-only arm at 6–8 weeks (difference not statistically significant). Perinatal transmission rates at 6–8 weeks among infants without HIV at birth were 6.5% and 16.9%, respectively.
Post-Exposure Infant Prophylaxis; South Africa;⁹ Breastfeeding and formula feeding	Neonatal SD NVP vs. ZDV for 6 weeks	No AP or IP ARV	SD NVP vs. ZDV for 6 weeks	For formula-fed infants only, perinatal transmission was 14.3% in SD NVP arm vs. 14.1% in ZDV arm at 6 weeks (not significant, $P = 0.30$). For breastfed infants only, perinatal transmission was 12.2% in SD NVP arm and 19.6% in ZDV arm ($P = 0.03$).
Mashi; Botswana;^{40,41} Breastfeeding and formula feeding	<u>Initial:</u> • Short-course ZDV with/without maternal and infant SD NVP and with/without breastfeeding <u>Revised:</u> • Short-course ZDV plus infant SD NVP with/without maternal SD NVP and with/without breastfeeding; women with CD4 counts <200 cells/mm ³ receive combination therapy.	<u>First Randomization:</u> • ZDV from 34 weeks <u>Oral IP:</u> • ZDV plus either SD NVP or placebo	<u>Second Randomization:</u> • Breastfeeding plus ZDV (infant) 6 months plus SD NVP; infant only, vs. • Formula feeding plus ZDV (infant) 4 weeks plus SD NVP; infant only	<u>Initial Design:</u> • In formula-feeding arm, perinatal transmission at 1 month was 2.4% in maternal and infant SD NVP arm and 8.3% in placebo arm ($P = 0.05$). • In breastfeeding plus infant ZDV arm, perinatal transmission at 1 month was 8.4% in SD NVP arm and 4.1% in placebo arm (difference not statistically significant). <u>Revised Design:</u> • Perinatal transmission at 1 month was 4.3% in maternal plus infant SD NVP arm and 3.7% in maternal placebo plus infant SD NVP arm (no significant difference; no interaction with mode of infant feeding). Perinatal transmission at 7 months was 9.1% in breastfeeding plus ZDV arm and 5.6% in formula-feeding arm; mortality at 7 months was 4.9% in breastfeeding plus ZDV arm vs. 9.3% in formula-feeding arm; HIV-free survival at 18 months was 15.6% in the breastfeeding plus ZDV arm vs. 14.2% in the formula-feeding arm.

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 4 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
SWEN; Uganda, Ethiopia, India;²⁴ Breastfeeding	SD NVP vs. NVP for 6 weeks	No AP ARV <u>Oral IP:</u> • SD NVP	Infant SD NVP vs. NVP for 6 weeks	<u>Postnatal Infection in Infants Without HIV at Birth:</u> • Perinatal transmission at 6 weeks was 5.3% in SD NVP arm vs. 2.5% in extended NVP arm (risk ratio 0.54, $P = 0.009$). • Perinatal transmission at 6 months was 9.0% in SD NVP arm vs. 6.9% in extended NVP arm (risk ratio 0.80, $P = 0.16$). HIV-free survival was significantly lower in extended NVP arm at both 6 weeks and 6 months of age.
PEPI-Malawi Trial; Malawi;²³ Breastfeeding	SD NVP plus ZDV for 1 week (control) vs. 2 extended infant regimens (NVP or NVP/ZDV) for 14 weeks	No AP ARV <u>Oral IP:</u> • SD NVP (if mother presents in time)	Infant SD NVP plus ZDV for 1 week (control) vs. Control plus NVP for 14 weeks vs. Control plus NVP/ZDV for 14 weeks	<u>Postnatal Infection in Infants Without HIV at Birth:</u> • Perinatal transmission at age 6 weeks was 5.1% in control vs. 1.7% in extended NVP (67% efficacy) and 1.6% in extended NVP/ZDV arms (69% efficacy). • Perinatal transmission at age 9 months was 10.6% in control vs. 5.2% in extended NVP (51% efficacy) and 6.4% in extended NVP/ZDV arms (40% efficacy). No significant difference in perinatal transmission between the extended prophylaxis arms; however, more hematologic toxicity with NVP/ZDV.
MITRA; Tanzania;²⁶ Breastfeeding	Infant 3TC for 6 months (observational)	ZDV/3TC from 36 weeks through labor	Maternal ZDV/3TC for 1 week; infant 3TC for 6 months	Perinatal transmission at age 6 months was 4.9% (postnatal perinatal transmission between ages 6 weeks and 6 months was 1.2%).
Kisumu Breastfeeding Study; Kenya;²⁹ Breastfeeding	Maternal triple-drug prophylaxis (observational)	ZDV/3TC/NVP (NFV if CD4 count >250 cells/mm ³) from 34 weeks through labor	Maternal ZDV/3TC/NVP (NFV if CD4 count >250 cells/mm ³) for 6 months, infant SD NVP	Perinatal transmission at age 6 months was 5.0% (postnatal perinatal transmission between ages 7 days and 6 months was 2.6%).
MITRA-PLUS; Tanzania;²⁵ Breastfeeding	Maternal triple-drug prophylaxis (observational)	ZDV/3TC/NVP (NFV if CD4 count >200 cells/mm ³) from 34 weeks through labor	Maternal ZDV/3TC/NVP (NFV if CD4 count >200 cells/mm ³) for 6 months, infant ZDV/3TC for 1 week	Perinatal transmission at age 6 months was 5.0% (postnatal perinatal transmission between ages 6 weeks and 6 months was 0.9%), not significantly different from 6-month infant prophylaxis in MITRA.

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 5 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
Kesho Bora; Multi-African;²⁸ Breastfeeding primarily	Antepartum ZDV/SD NVP with no postnatal prophylaxis vs. Maternal triple-drug prophylaxis in women with CD4 counts 200–500 cells/mm ³	<u>Arm 1:</u> • ZDV/3TC/LPV/r <u>Arm 2:</u> • ZDV plus SD NVP From 28 weeks through labor	<u>Arm 1:</u> • Maternal ZDV/3TC/LPV/r for 6 months, infant SD NVP plus ZDV for 1 week <u>Arm 2:</u> • Maternal ZDV/3TC for 1 week (no further postnatal prophylaxis), infant SD NVP plus ZDV for 1 week (no further postnatal prophylaxis)	Perinatal transmission at birth was 1.8% with maternal triple-drug prophylaxis (Arm 1) and 2.5% with ZDV/SD NVP (Arm 2), not significantly different. In women with CD4 counts 350–500 cells/mm ³ , perinatal transmission at birth was 1.7% in both arms. Perinatal transmission at age 12 months was 5.4% with maternal triple-drug prophylaxis (Arm 1) and 9.5% with ZDV/SD NVP (with no further postnatal prophylaxis after 1 week) (Arm 2) (<i>P</i> = 0.029).
Mma Bana; Botswana;² Breastfeeding	Maternal triple-drug prophylaxis (compares 2 regimens) in women with CD4 counts >200 cells/mm ³	<u>Arm 1:</u> • ZDV/3TC/ABC <u>Arm 2:</u> • ZDV/3TC/LPV/r From 26 weeks through labor	<u>Arm 1:</u> • Maternal ZDV/3TC/ABC for 6 months, infant SD NVP plus ZDV for 4 weeks <u>Arm 2:</u> • Maternal ZDV/3TC/LPV/r for 6 months, infant SD NVP plus ZDV for 4 weeks	Perinatal transmission at age 6 months overall was 1.3%: 2.1% in ZDV/3TC/ABC Arm 1 and 0.4% in ZDV/3TC/LPV/r Arm 2 (<i>P</i> = 0.53).
BAN; Malawi;^{27,42} Breastfeeding	Postpartum maternal triple-drug prophylaxis vs. infant NVP in women with CD4 counts ≥250 cells/mm ³	No AP drugs <u>IP Regimens</u> <u>Arm 1 (Control):</u> • ZDV/3TC plus SD NVP <u>Arm 2:</u> • ZDV/3TC plus SD NVP <u>Arm 3:</u> • ZDV/3TC plus SD NVP	<u>Arm 1 (Control):</u> • Maternal ZDV/3TC for 1 week; infant SD NVP plus ZDV/3TC for 1 week <u>Arm 2:</u> • Control as above, then maternal ZDV/3TC/LPV/r for 6 months <u>Arm 3:</u> • Control as above, then infant NVP for 6 months	<u>Postnatal Infection in Infants Without HIV at Age 2 Weeks:</u> • Perinatal transmission at age 28 weeks was 5.7% in control Arm 1, 2.9% in maternal triple-drug prophylaxis Arm 2 (<i>P</i> = 0.009 vs. control), and 1.7% in infant NVP Arm 3 (<i>P</i> < 0.001 vs. control). • Perinatal transmission at age 48 weeks was 7.0% in control Arm 1, 4.0% in maternal triple-drug prophylaxis Arm 2 (<i>P</i> = 0.0273 vs. control), and 4% in infant NVP Arm 3 (<i>P</i> = 0.0027 vs. control). No significant difference between maternal triple-drug prophylaxis (Arm 2) and infant NVP (Arm 3) (<i>P</i> = 0.12 at 28 weeks and <i>P</i> = 0.426 at 48 weeks).

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 6 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
<p>HPTN 046; South Africa, Tanzania, Uganda, Zimbabwe;^{37,43} Breastfeeding</p>	<p>Postpartum prophylaxis of breast milk transmission of HIV with 6 weeks vs. 6 months of infant NVP</p>	<p>AP drugs allowed if required for maternal health</p>	<p>All infants received daily NVP from birth through age 6 weeks.</p> <p><u>Arm 1:</u></p> <ul style="list-style-type: none"> Daily infant NVP from age 6 weeks through age 6 months <p><u>Arm 2:</u></p> <ul style="list-style-type: none"> Daily infant placebo from age 6 weeks through age 6 months 	<p>In infants without HIV at age 6 weeks, the 6-month infant HIV infection rate was 1.1% (0.3% to 1.8%) in the extended NVP Arm 1 and 2.4% (1.3% to 3.6%) in the placebo Arm 2 ($P = 0.048$).</p> <p>18-month postnatal infection rates were 2.2% (1.1% to 3.3%) in the extended NVP Arm 1 and 3.1% (1.9% to 4.4%) in the placebo Arm 2 ($P = 0.28$). HIV infection and mortality rates did not differ between arms at any age through 18 months.</p> <p>At infant randomization at age 6 weeks, 29% of mothers in each arm were receiving a triple-drug ARV regimen for the treatment of HIV.</p> <p>For mothers receiving triple-drug ARV regimens at the time of randomization, in infants without HIV at age 6 weeks, the 6-month infant HIV infection rate was 0.2% and not statistically different between the extended NVP Arm 1 (0.5%) and placebo Arm 2 (0%).</p> <p>For mothers with CD4 counts >350 cells/mm³ who were not receiving triple-drug ARV regimens, in infants without HIV at age 6 weeks, the 6-month infant HIV infection rate was 0.7% (0% to 1.5%) in the extended NVP Arm 1 and 2.8% (1.3% to 4.4%) in the placebo Arm 2 ($P = 0.014$).</p>
<p>NICHD-HPTN 040/PACTG 1043 Trial; Brazil, Argentina, South Africa, United States;⁴⁴ Formula feeding</p>	<p>Infant prophylaxis with 6 weeks ZDV vs.</p> <p>6 weeks infant ZDV plus 3 doses of NVP in first week of life vs.</p> <p>6 weeks infant ZDV plus 2 weeks 3TC/NFV</p>	<p>No AP drugs</p> <p>If mother presented early enough, IV ZDV during labor through delivery</p>	<p><u>Arm 1 (Control):</u></p> <ul style="list-style-type: none"> Infant ZDV for 6 weeks <p><u>Arm 2:</u></p> <ul style="list-style-type: none"> Control as above plus NVP with first dose within 48 hours of birth, second dose 48 hours later, and third dose 96 hours after the second dose <p><u>Arm 3:</u></p> <ul style="list-style-type: none"> Control as above, plus 3TC and NFV from birth through age 2 weeks 	<p>IP HIV transmission among infants with negative HIV test at birth: 4.8% (3.2% to 7.1%) with ZDV (Arm 1) vs. 2.2% (1.2% to 3.9%) with ZDV plus NVP (Arm 2) ($P = 0.046$ compared with Arm 1) vs. 2.4% (1.4% to 4.3%) with ZDV plus 3TC/NFV (Arm 3) ($P = 0.046$ compared with Arm 1).</p> <p>Overall HIV transmission rates, including <i>in utero</i> infection: 11.0% (8.7% to 14.0%) with ZDV (Arm 1) vs. 7.1% (5.2% to 9.6%) with ZDV plus NVP (Arm 2) ($P = 0.035$ compared with Arm 1) vs. 7.4% (5.4% to 9.9%) with ZDV plus 3TC/NFV (Arm 3) ($P = 0.035$ compared with Arm 1).</p> <p>Grade 3 or 4 neutropenia more frequent in ZDV/3TC/NFV Arm 3, 70 infants, compared with ZDV-alone Arm 1, 33 infants, or ZDV/NVP Arm 2, 32 infants ($P < 0.001$).</p>

Supplemental Table 1. Results of Major Studies on Antiretroviral Interventions to Prevent Perinatal HIV Transmission (page 7 of 7)

Study; Location(s); Mode of Infant Feeding	Antiretroviral Drugs	Antepartum and Intrapartum	Postpartum	Perinatal Transmission Rate and Efficacy
ANRS 12174 Trial; Burkina Faso, South Africa, Uganda, Zambia; ^{30,31} Breastfeeding	Compared 2 infant ARV prophylaxis regimens during breastfeeding; infants testing PCR-negative at birth, born to mothers with CD4 counts >350 cells/mm ³	As per standard of care	<u>Arm 1:</u> • Daily infant LPV/r from 1 week through 50 weeks of age <u>Arm 2:</u> • Daily infant 3TC from 1 week through 50 weeks of age	<u>Postnatal Infection in Infants Without HIV at Birth:</u> • Postnatal transmission at age 50 weeks was 1.4% (0.70–2.76) in Arm 1 and 1.5% (0.80–2.91) in Arm 2 (<i>P</i> = 0.83). • HIV-free survival was 96.5% (84.6–97.7) in Arm 1 and 96.3% (94.4–97.5) in Arm 2 (<i>P</i> = 0.85).
PROMOTE; Uganda; ⁴⁵ Breastfeeding	Compared 2 triple-ARV regimens; no CD4 restriction	<u>Arm 1:</u> • ZDV/3TC/LPV/r <u>Arm 2:</u> • ZDV/3TC/EFV • ARVs started at 12–28 weeks' gestation and continued through labor	Randomized regimen continued postpartum through 1 year of breastfeeding	HIV-free survival was 92.9% in the LPV/r arm vs. 97.2% in the EFV arm (<i>P</i> = 0.10). Only 2 of 374 liveborn infants acquired infection, both in the LPV/r arm.
PROMISE; India, Malawi, South Africa, Tanzania, Uganda, Zambia, Zimbabwe; ¹⁸ Breastfeeding and formula feeding (antepartum component)	Compared ZDV prophylaxis and 2 ART regimens during pregnancy among women >14 weeks gestation and CD4 counts ≥350 cells/mm ³	<u>Arm 1:</u> • ZDV during pregnancy plus SD NVP plus TDF plus FTC at delivery <u>Arm 2:</u> • ZDV plus 3TC plus LPV/r <u>Arm 3:</u> • TDF plus FTC plus LPV/r	<u>Arm 1:</u> • TDF/FTC tail continued for 6–14 days postpartum <u>Arms 2 and 3:</u> • ART regimen continued for 6–14 days postpartum Infants received once-daily NVP for 6 weeks.	<u>Infant HIV Infection Rates by Age 14 Days</u> <u>Arm 1:</u> • 1.8% (25/1,386) <u>Arm 2:</u> • 0.5% (7/1,385) <u>Arm 3:</u> • 0.6% (2/325) Combined ART arms vs. ZDV arm difference in perinatal transmission risk: -1.3% (95% CI, -2.1% to -0.4%)

Key to Acronyms: 3TC = lamivudine; ABC = abacavir; AP = antepartum; ARV = antiretroviral; ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; CDC = Centers for Disease Control and Prevention; CI = confidence interval; EFV = efavirenz; FTC = emtricitabine; IP = intrapartum; IV = intravenous; LPV/r = lopinavir/ritonavir; NFV = nelfinavir; NVP = nevirapine; PCR = polymerase chain reaction; PP = postpartum; SD = single-dose; TDF = tenofovir disoproxil fumarate; ZDV = zidovudine