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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**Emtricitabine (Emtriva, FTC)**

*(Last updated December 24, 2019; last reviewed December 24, 2019)*

**Animal Studies**

**Carcinogenicity**

Emtricitabine (FTC) was neither mutagenic nor clastogenic in a series of *in vitro* and animal *in vivo* screening tests. In long-term carcinogenicity studies of oral FTC, no drug-related increases in tumor incidence were found at doses up to 26 times (in mice) or 31 times (in rats) the exposures seen in humans who received the therapeutic dose.¹

**Reproduction/Fertility**

FTC had no observable effect on reproduction or fertility at doses that produced systemic drug exposures (as measured by area under the curve [AUC]) that were approximately 60-fold higher in female and male mice and 140-fold higher in male rats than human exposure at the recommended therapeutic dose.¹

**Teratogenicity/Adverse Pregnancy Outcomes**

No fetal variations or malformations were observed following maternal FTC doses that produced systemic drug exposures that were 60-fold higher (in mice) or 120-fold higher (in rabbits) than those observed in humans who received the recommended dose.¹

**Placental and Breast Milk Passage**

FTC has been shown to cross the placenta in mice and rabbits; the average fetal/maternal drug concentration ratio was 0.4 in mice and 0.5 in rabbits.²

**Human Studies in Pregnancy**

**Pharmacokinetics**

In the IMPAACT P1026s study, FTC exposure was modestly lower during the third trimester (geometric mean 8.0 mcg·h/mL; 90% confidence interval [CI], 7.1–8.9 mcg·h/mL) than during the postpartum period (9.7 mcg·h/mL; 90% CI, 8.6–10.9 mcg·h/mL). Fifty-eight percent of pregnant women (15 of 26 women) met the AUC target (≤30% reduction from typical exposure for nonpregnant historical controls) compared to 95% of postpartum women (21 of 22 women). Trough FTC levels were also lower during pregnancy (C₂₄₉ geometric mean concentration [GMC] 58 ng/mL; 90% CI, 37–63 ng/mL) than during the postpartum period (C₂₄₉ GMC 85 ng/mL; 90% CI, 70–100 ng/mL).³ Similar differences in pharmacokinetic parameters of FTC were found among women during pregnancy or after delivery in the PACTG 394 study⁴ and in a European study.⁵,⁶ The increase in FTC clearance during pregnancy correlated with the normal pregnancy-related increase in glomerular filtration rate.⁶ These changes are not believed to be large enough to warrant a dose adjustment during pregnancy.

**Placental and Breast Milk Passage**

FTC has been shown to have high placental transfer in pregnant women. In a study of 15 women who received FTC during pregnancy, the mean cord blood-to-maternal-plasma ratio was 1.2 (90% CI, 1.0–1.5).³ In eight women who were given a single dose of FTC 600 mg with tenofovir disoproxil fumarate (TDF) 900 mg, the median cord blood FTC concentration was 717 ng/mL (range 21–1,072 ng/mL), and the median cord blood-to-maternal-plasma ratio was 0.85 (range 0.46–1.07).⁴

FTC is excreted into human milk. Among women in Uganda and Nigeria who were taking first-line antiretroviral therapy that contained FTC 200 mg, FTC concentrations in breast milk peaked later than they did in maternal plasma (at 4–8 hours compared with 2–4 hours) and were three-fold higher than maternal plasma concentrations. FTC was detectable in three infants (19%).⁵ In a study in the Ivory Coast, five women with HIV who exclusively breastfed their newborn infants were given FTC 400 mg, TDF 600 mg,
and nevirapine 200 mg at onset of labor, followed by FTC 200 mg and TDF 300 mg once daily for 7 days postpartum. The median minimal and maximal concentrations of FTC in breast milk were 177 ng/mL and 679 ng/mL, respectively (interquartile ranges [IQR] 105–254 ng/mL and 658–743 ng/mL, respectively), well above the estimated FTC IC50 for HIV-1.8 In a study of 50 women without HIV who received daily oral FTC 200 mg and TDF 300 mg as pre-exposure prophylaxis (PrEP), median peak and trough breast milk concentrations of FTC were 212.5 ng/mL (IQR 140.0–405.0 ng/mL) and 183.0 ng/mL (IQR 113.0–250.0 ng/mL), respectively. FTC was detectable in 47 of 49 infants at a median concentration of 13.2 ng/mL (IQR 9.3–16.7 ng/mL), corresponding to estimated daily infant ingestion of a 31.9-mcg/kg dose (IQR 21.0–60.8 mcg/kg) of FTC, or 0.5% of the daily dose for treating infants.9

**Teratogenicity/Adverse Pregnancy Outcomes**

A study of pregnancies conducted during an HIV PrEP trial randomized participants without HIV to receive placebo, TDF, or TDF plus FTC. No increase in the incidence of congenital anomalies was observed in the TDF plus FTC arm.10 There was no overall difference between the rate of pregnancy loss in the TDF plus FTC arm and the rate of pregnancy loss in the TDF arm of this PrEP study.

In the U.S. PHACS/SMARTT cohort study, FTC exposure was not associated with an increase in specific or overall birth defect risk.11 In a large French cohort, FTC exposure in the first trimester was associated with lower risk of birth defects.12 In the Antiretroviral Pregnancy Registry, sufficient numbers of first-trimester exposures to FTC have been monitored to be able to detect at least a 1.5-fold increased risk of overall birth defects and a two-fold increase in cardiovascular and genitourinary defects. No such increase in birth defects has been observed with FTC. Among the cases of first-trimester FTC exposure that have been reported to the Antiretroviral Pregnancy Registry, the prevalence of birth defects was 2.44% (77 of 3,158 births; 95% CI, 1.93% to 3.04%), compared with a total prevalence of 2.72% in the U.S. population, based on Centers for Disease Control and Prevention surveillance.13

**Other Safety Information**

In the U.S. PHACS/SMARTT cohort study, after adjusting for birth cohort and other factors, maternal use of FTC led to no increase in the likelihood of adverse metabolic, growth and development, cardiac, neurological, or neurodevelopmental outcomes.14
Excerpt from Table 8

Note: When using FDC tablets, refer to other sections in Appendix B and Table 8 for information about the dosing and safety of individual drug components of the FDC tablet during pregnancy.

<table>
<thead>
<tr>
<th>Generic Name (Abbreviation)</th>
<th>Trade Name</th>
<th>Formulation</th>
<th>Dosing Recommendationsa</th>
<th>Use in Pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emtricitabine (FTC)</td>
<td>Emtriva</td>
<td>Capsule: 200 mg</td>
<td>Standard Adult Doses FTC (Emtriva) Capsule: FTC 200 mg once daily without regard to food</td>
<td>High placental transfer to fetus. b</td>
</tr>
<tr>
<td>(FTC/EFV/TDF)</td>
<td>Atripla</td>
<td>Oral Solution: 10 mg/mL</td>
<td>FTC/EFV/TDF (Atripla): FTC 240 mg (24 mL) once daily without regard to food</td>
<td>No evidence of human teratogenicity (can rule out 1.5-fold increase in overall birth defects).</td>
</tr>
<tr>
<td>(FTC/BIC/TAF)</td>
<td>Biktarvy</td>
<td>FTC 200 mg/EFV 600 mg/TDF 300 mg tablet</td>
<td>FTC/BIC/TAF (Biktarvy): FTC 200 mg/BIC 50 mg/TAF 25 mg tablet</td>
<td>If patient has HBV/HIV coinfection, it is possible that a HBV flare may occur if the drug is stopped; see Hepatitis B Virus/HIV Coinfection.</td>
</tr>
<tr>
<td>(FTC/TAF)</td>
<td>Complera</td>
<td>FTC 200 mg/RPV 25 mg/TDF 300 mg tablet</td>
<td>FTC/RPV/TDF (Complera): FTC 200 mg/RPV 25 mg/TDF 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/EVG/c/TAF)</td>
<td>Descovy</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/TAF (Descovy): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/RPV/TAF)</td>
<td>Odefsey</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/EVG/c/TAF (Descovy): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/EVG/c/TDF)</td>
<td>Symtuza</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/RPV/TAF (Odefsey): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/TDF)</td>
<td>Stribild</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/EVG/c/TDF (Stribild): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/DRV/c/TAF)</td>
<td>Taf inviting</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/DRV/c/TAF (Symtuza): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
<tr>
<td>(FTC/TDF)</td>
<td>Truvada</td>
<td>FTC 200 mg/FTC 25 mg tablet</td>
<td>FTC/TDF (Truvada): FTC 200 mg/FTC 25 mg tablet</td>
<td></td>
</tr>
</tbody>
</table>

a Individual ARV drug doses may need to be adjusted in patients with renal or hepatic insufficiency (for details, see the Adult and Adolescent Antiretroviral Guidelines, Appendix B, Table 10).

b Placental transfer categories are determined by mean or median cord blood/maternal delivery plasma drug ratio:
High: >0.6 Moderate: 0.3–0.6 Low: <0.3
d Generic product is available.

Key: BIC = bictegravir; COBI = cobicistat; DRV/c = darunavir/cobicistat; EFV = efavirenz; EVG/c = elvitegravir/cobicistat; FDC = fixed-dose combination; FTC = emtricitabine; HBV = hepatitis B virus; PK = pharmacokinetic; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.
References


