### Table 13b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia

(Last updated April 27, 2017; last reviewed April 27, 2017)  (page 1 of 2)

<table>
<thead>
<tr>
<th>Adverse Effects</th>
<th>Associated ARVs</th>
<th>Onset/Clinical Manifestations</th>
<th>Estimated Frequency</th>
<th>Risk Factors</th>
<th>Prevention/Monitoring</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslipidemia</td>
<td>PIs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• All PIs,</td>
<td></td>
<td>Reported frequency</td>
<td>Advanced-stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>especially RTV-</td>
<td></td>
<td>varies with specific</td>
<td>HIV disease</td>
<td>Prevention:</td>
<td>Assessment of additional CVD</td>
</tr>
<tr>
<td></td>
<td>boosted PIs;</td>
<td></td>
<td>ARV regimen, duration</td>
<td>High-fat, high-</td>
<td>• Low-fat diet</td>
<td>risk factors should be done in all</td>
</tr>
<tr>
<td></td>
<td>lower incidence</td>
<td></td>
<td>of ART and specific</td>
<td>cholesterol diet</td>
<td>• Exercise</td>
<td>patients. Patients living with HIV</td>
</tr>
<tr>
<td></td>
<td>reported with</td>
<td></td>
<td>laboratory parameters</td>
<td>Lack of exercise</td>
<td>• Smoking-prevention</td>
<td>are considered to be at moderate</td>
</tr>
<tr>
<td></td>
<td>DRV/r and ATV</td>
<td></td>
<td>used to diagnose lipid</td>
<td>Obesity</td>
<td>counseling</td>
<td>risk of CVD.³</td>
</tr>
</tbody>
</table>
### Table 13b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia

(Last updated April 27, 2017; last reviewed April 27, 2017)  (page 2 of 2)

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<tr>
<td>Dyslipidemia, continued</td>
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Given the burden of collecting fasting blood samples, some practitioners routinely measure cholesterol and triglycerides from non-fasting blood samples and follow up abnormal values with a test done in the fasted state.


The risks of new treatment-related toxicities and virologic failure that could occur with changes in therapy must be weighed against the potential risk of drug interactions and toxicities associated with the use of lipid-lowering agents.

Statins (HMG-CoA reductase inhibitors) are contraindicated in pregnancy (potentially teratogenic) and should not be used in patients who may become pregnant. Multiple drug interactions exist between ARV drugs and statins (exception pravastatin, which is not dependent on CYP3A4 for metabolism). Pravastatin, atorvastatin, rosuvastatin (Crestor®), fluvastatin, and ezetimibe (Zetia®) are approved for use in children aged ≥10 years. For additional information, see the PI, NNRTI, NRTI, and INSTI Drug Interactions Tables in the Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents.

**Key to Acronyms:**
- ALT = alanine aminotransferase;
- ART = antiretroviral therapy;
- ARV = antiretroviral;
- AST = aspartate aminotransferase;
- ATV = atazanavir;
- CK = creatine kinase;
- CVD = cardiovascular disease;
- CYP3A4 = cytochrome P450 3A4;
- d4T = stavudine;
- DRV = darunavir;
- DRV/r = ritonavir-boosted darunavir;
- EFV = efavirenz;
- ETR = etravirine;
- FLP = fasting lipid profile;
- HDL-C = high-density lipoprotein cholesterol;
- LDL-C = low-density lipoprotein cholesterol;
- LFT = liver function test;
- LPV = lopinavir;
- NHLBI = National Heart, Lung, and Blood Institute;
- NRTI = non-nucleoside reverse transcriptase inhibitor;
- NNRTI = nucleoside reverse transcriptase inhibitor;
- NVP = nevirapine;
- PI = protease inhibitor;
- PUFA = polyunsaturated fatty acid;
- RPV = rilpivirine;
- RTV = ritonavir;
- TC = total cholesterol;
- TG = triglyceride;

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* Statins such as pravastatin, atorvastatin, or rosuvastatin can be considered. Statin-induced lipid lowering effect appears more pronounced than ARV substitution.
* Statin-related toxicities include liver enzyme elevation and myopathy, and risk may be increased by drug interactions with ART, particularly PIs. Statins may also increase the risk of insulin resistance and diabetes mellitus. Risks must be weighed against potential benefits.
* Cholesterol absorption inhibitors (e.g., ezetimibe) can be considered as alternative.
* Drug therapy for severe hypertriglyceridemia (TG ≥ 500 mg/dL) can be considered.
* Fibrates (gemfibrozil and fenofibrate) and N-3 PUFAs derived from fish oils may be used.
* The long-term risks of lipid abnormalities in children receiving ART are unclear. However, persistent dyslipidemia in children may lead to premature CVD.

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* Statins (HMG-CoA reductase inhibitors) are contraindicated in pregnancy (potentially teratogenic) and should not be used in patients who may become pregnant. Multiple drug interactions exist between ARV drugs and statins (exception pravastatin, which is not dependent on CYP3A4 for metabolism). Pravastatin, atorvastatin, rosuvastatin (Crestor®), fluvastatin, and ezetimibe (Zetia®) are approved for use in children aged ≥10 years. For additional information, see the PI, NNRTI, NRTI, and INSTI Drug Interactions Tables in the Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents.
References


