Table 13d. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Hematologic Effects  (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>
</table>
| Anemia* | ZDV | Onset:  
Variable, weeks to months | Newborns Exposed to HIV:  
• Severe anemia is uncommon, but may be seen coincident with physiologic Hgb nadir.  
Children Living with HIV on ARVs:  
• 2–3 times more common with ZDV-containing regimens | Newborns Exposed to HIV:  
• Premature birth  
• *In utero* exposure to ARVs  
• Advanced maternal HIV  
• Neonatal blood loss  
• Combination ARV prophylaxis, particularly with ZDV plus 3TC  
Children Living with HIV on ARVs:  
• Underlying hemoglobinopathy (e.g., sickle cell disease, G6PD deficiency)  
• Myelosuppressive drugs (e.g., TMP-SMX, rifabutin)  
• Iron deficiency  
• Advanced or poorly controlled HIV disease  
• Malnutrition | Newborns Exposed to HIV:  
• Obtain CBC at birth.  
• Consider repeat CBC at 4 weeks for neonates who are at higher risk (e.g., those born prematurely or known to have low birth Hgb).  
Children Living with HIV on ARVs:  
• Avoid ZDV in children with moderate to severe anemia when alternative agents are available.  
• Obtain CBC as part of routine care. | Newborns Exposed to HIV:  
• Rarely requires intervention unless Hgb is <7.0 g/dL or is associated with symptoms.  
• Consider discontinuing ZDV if 4 weeks or more of prophylaxis has been completed (see the *Perinatal Guidelines*).  
Children Living with HIV on ARVs:  
• Discontinue non-ARV, marrow-toxic drugs, if feasible.  
• Treat coexisting iron deficiency, OIs, malignancies.  
• For persistent severe anemia thought to be associated with ARVs, change to a non-ZDV-containing regimen |
| Macrocytosis | ZDV; also d4T | Onset:  
Within days to weeks of starting therapy  
• MCV often >100 fL | >90% to 95%, all ages | None | Obtain CBC as part of routine care (see *Laboratory and Clinical Monitoring* section). | None required unless associated with anemia. D4T is no longer recommended and should be discontinued. |
Table 13d. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Hematologic Effects  *(Last updated April 27, 2017; last reviewed April 27, 2017)* (page 2 of 2)

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Neutropeniaa</td>
<td>ZDV</td>
<td>Onset: Variable Presentation:</td>
<td>Newborns Exposed to HIV:</td>
<td>Children Living with HIV on ARVs:</td>
<td>Newborns Exposed to HIV:</td>
<td>Newborns Exposed to HIV:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Most commonly asymptomatic.</td>
<td>Rare</td>
<td>In utero exposure to ARVs</td>
<td>Obtain CBC as part of routine care.</td>
<td>• No established threshold for intervention; some experts would consider using an alternative NRTI for prophylaxis if ANC &lt;500 cells/mm³, or discontinue prophylaxis if ≥4 weeks of ZDV have been completed (see the <em>Perinatal ARV Guidelines</em>).</td>
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<td></td>
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<td></td>
<td>Children Living with HIV on ARVs:</td>
<td>Combination ARV prophylaxis, particularly with ZDV plus 3TC</td>
<td></td>
<td>Children Living with HIV on ARVs:</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>2.2% to 26.8% of children on ARVs, depending upon the ARV regimen.</td>
<td>Advanced or poorly controlled HIV infection</td>
<td>• Obtain CBC as part of routine care.</td>
<td>• Discontinue non-ARV marrow-toxic drugs, if feasible.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2.2% for ZDV/3TC</td>
<td>Myelosuppressive drugs (e.g., TMP-SMX, ganciclovir, hydroxyurea, rifabutin)</td>
<td></td>
<td>• Treat coexisting OIs and malignancies.</td>
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<td></td>
<td>Highest rates with ZDV-containing regimens.</td>
<td></td>
<td></td>
<td>• For persistent severe neutropenia thought to be associated with ARVs, change to a non-ZDV-containing regimen.</td>
</tr>
</tbody>
</table>

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a HIV infection itself, OIs, and medications used to prevent OIs, such as TMP-SMX, may all contribute to anemia, neutropenia, and thrombocytopenia.

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

**Key to Acronyms:** 3TC = lamivudine; ANC = absolute neutrophil count; ARV = antiretroviral; CBC = complete blood count; d4t = stavudine; dL = decliliter; fL = femtoliter; G6PD = glucose-6-phosphate dehydrogenase; Hgb = hemoglobin; MCV = mean cell volume; NRTI = nucleoside reverse transcriptase inhibitor; OI = opportunistic infection; TMP-SMX = trimethoprime-sulfamethoxazole; ZDV = zidovudine
References


17. Kibaru EG, Nduati R, Wamalwa D, Kariuki N. Impact of highly active antiretroviral therapy on hematological indices among HIV-1 infected children at Kenyatta