This chart contains information regarding potential side effects and toxicity associated with second-line medications used to treat certain types of tuberculosis (TB), including drug-resistant TB. It also outlines general recommended assessments and monitoring specific to each medication. Consult a trusted drug book for full descriptions of medications and recommended assessments. This chart should be used as a guide, along with recommendations by the treating and consulting physicians.

<table>
<thead>
<tr>
<th>Medication (Abbreviations)</th>
<th>Side Effects and Symptoms of Medication Toxicity</th>
<th>Recommended Assessments and Monitoring</th>
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<td><strong>Aminoglycosides/Injectable agents:</strong></td>
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| • Amikacin (AK) | General- Rash or swelling of the face, shortness of breath (SOB), decreased urination, renal toxicity, electrolyte imbalance, muscle twitching or weakness, pain at injection site. **Ototoxicity**- Hearing loss, tinnitus. **Vestibular Disturbance**- Dizziness, loss of balance. | Baseline, monthly:  
- Medication Assessments*  
  o Monthly toxicity assessment  
  o Audiometry testing  
  o Vestibular testing  
- Measurement of creatinine and electrolytes to include potassium, sodium, chloride, carbon dioxide, calcium and magnesium. Other:  
  - Adjust dose and/or interval for renal insufficiency.  
  - Rule out pregnancy prior to administering drug.  
  - Aminoglycosides can cause permanent hearing loss; early intervention is crucial. |
| **Bedaquiline (BDQ)** | General- Hepatotoxicity, headaches, arthralgias, rash. **Cardiac** – QTc prolongation; chest pain, SOB, fainting/near fainting, sudden fatigue, change in heart rhythm, tachycardia, syncope. | Baseline, monthly:  
- Medication Assessments  
  o Monthly toxicity assessment  
  o Cardiac monitoring  
- Measurement of TSH levels and electrolytes to include potassium, calcium, magnesium. Baseline, at 2 weeks, monthly  
  - ECG Other:  
  - Monitor for signs and symptoms of prolonged QTc interval.  
  - Swallow tablet whole, take with food. |
| **Clofazimine (CFZ)** | General- bloody or black stools or diarrhea, jaundice; retinopathy, photosensitivity, acne. Rare instance-depression or thoughts of hurting self. **Skin Discoloration**- Clofazimine is a dye, it may cause skin discoloration, ichthyosis, xerosis. Hyperpigmentation resolves 1-2 years after discontinuation. | Baseline, monthly:  
- Medication Assessments  
  o Monthly toxicity assessment  
  o Mental health assessment Every three-months:  
  - Follow up assessment with prescribing physician  
  - Clofazimine monitoring form |
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| Clofazimine (CFZ), continued | **GI Intolerance**- Severe abdominal symptoms, bleeding, and bowel obstruction. **Cardiac**- Can cause prolongation of QTc. | **Every three-months:**  
- Follow up assessment with prescribing physician  
- Clofazimine monitoring form  
**Other:**  
- *Prescriber must be enrolled in the Institutional Review Board (IRB) program to prescribe CFZ.*  
- Ensure use of sunscreens, lotion.  
- Rule out pregnancy prior to administering drug. |
| Cycloserine (CS) | **General**- rash/hives, headaches, seizures, insomnia. **Depression and Suicidal Ideation**- Mental status/mood changes, aggression, depression, disorientation, hallucinations, inability to concentrate, lethargy, nightmares, slurred speech, suicidal thoughts, psychosis. | **Baseline, monthly:**  
- Medication Assessments  
  - Monthly toxicity assessment  
  - Mental health assessment  
**Other:**  
- Adjust with renal failure.  
- **Vitamin B6** should be used when giving Cycloserine. |
| Ethionamide (ETA) | **General**- change in vision, headaches, photosensitivity, neuropathy, GI upset, hepatotoxicity, dizziness, hypoglycemia, peripheral neuropathy, hypersensitivity, hypotension, mental disturbance. **Hypothyroidism**- Unusual bruising or bleeding, ↑ tiredness, hair loss, skin changes, trouble concentrating, irritable, depression, irregular menses, metallic taste, salivation, gynecomastia, impotence. | **Baseline:**  
- Monthly toxicity assessment  
- Measurement of TSH levels  
**Monthly:**  
- Monthly toxicity assessment  
**Every three months:**  
- Measurement of TSH levels |
| Fluoroquinolones:  
  - *Levofloxacin (LFX)*  
  - *Moxifloxacin (MFX)* | **General**- GI upset, hepatotoxicity, hypersensitivity, dizziness, headaches, changes in heart rhythm, hypo- and hyperglycemia, photosensitivity, headaches, arthralgias, insomnia, agitation, psychosis, paranoia, depression, peripheral neuropathy, thrush, seizures. | **Baseline, monthly:**  
- Monthly toxicity assessment  
  - Ask about tendon pain  
**Other:**  
- *Do not take with milk-based products, antacids, mineral supplements (iron or magnesium) within 2 hours of medication; avoid caffeinated foods and beverages.*  
- Ensure use of sunscreens. |
### Overview of Second-Line Tuberculosis Medications: Side Effects and Monitoring

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<tr>
<td>• Moxifloxacin (MFX), <strong>continued</strong></td>
<td><strong>Cardiac</strong>- MFX can cause prolongation of QTC.</td>
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| **High Dose Isoniazid (INH)** (Adults 15mg/kg) | **General**- Anemia, agranulocytosis, vasculitis, decreased platelets, fever, chills, rash. | **Baseline, monthly:**  
  • Medication Assessments  
    o Monthly toxicity assessment  
    o Peripheral neuropathy monitoring  
  • Measurement of LFTs  
**Other:**  
• Add Vitamin B6 to regimen.  
• May interact with other drugs and foods. Monitor for serotonin syndrome. |
| **Linezolid (LZD)**        | **Hepatotoxicity**- GI upset, N/V, clay color stools, dark urine, yellow eyes, jaundice. | **Peripheral Neuropathy**- may cause numbness/tingling in extremities  
**Optic Neuropathy**- pain, blurred vision, trouble seeing to the side, loss of color vision, flashing lights.  
**Baseline, monthly:**  
  • Medication Assessments  
    o Monthly toxicity assessment  
    o Peripheral neuropathy monitoring  
  • Measurement of LFTs  
**Other:**  
• Add Vitamin B6 to regimen.  
• May interact with other drugs and foods. Monitor for serotonin syndrome. |
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| **Para-amino Salicylic Acid (PAS)** | **General** - GI upset, diarrhea, hepatotoxicity, rash, severe itching or hives, hypokalemia. **Hypothyroidism** - Unusual bruising or bleeding, ↑ tiredness, hair loss, skin changes, trouble concentrating, irritable, depression, irregular menses, metallic taste, salivation, gynecomastia, impotence. | **Baseline:**  
  • Monthly toxicity assessment  
  • Measurement of TSH levels and electrolytes  
**Monthly:**  
  • Monthly toxicity assessment  
  • Measurement of electrolytes **Every three months:**  
  • Measurement of TSH levels **Other:**  
  • Sprinkle over applesauce or yogurt; or mix with acidic juice.  
  • Do not chew granules.  
  • Refrigerate. |

*see TB 702 located at: dshs.texas.gov/idcu/disease/tb/forms/

### Table and Recommendation References:

- **Curry International Tuberculosis Center, Drug-Resistant Tuberculosis: A Survival Guide for Clinicians 3rd Edition:** currytbcenter.ucsf.edu/products/view/drug-resistant-tuberculosis-survival-guide-clinicians-3rd-edition; and


- **Heartland National Tuberculosis Center - Characteristics of Second-line Drugs for MDR-TB, February 2020:** heartlandntbc.org/assets/products/card1_side_effects_drug_interactions.pdf