

## THERAPEUTIC DRUG MONITORING PROCESS

### Considerations for Using Therapeutic Drug Monitoring

Providers may order drug levels on tuberculosis patients not responding to adequate therapy, or those with risk factors for poor absorption. Testing is performed at the University of Florida’s Infectious Disease Pharmacokinetics Laboratory (IDPL). DSHS will cover the cost of drug levels based on below criteria. Programs may draw drug levels using funds outside of the TB and Hansen’s Disease Unit if requests fall outside this criteria.

Note: Only rifamycin and isoniazid levels will be covered, unless patient is on second-line medications or a consultation from a DSHS-recognized TB medical consultant recommends otherwise.



Bacteriological Criteria (consider at 8 weeks of therapy)	Medical Criteria (consider at 2-4 weeks of therapy)	Clinical Criteria (consider at 8 weeks of therapy)	Criteria based on TB Diagnosis**
<p>Slow response to adequate therapy at <b>8 weeks</b> of treatment, evidenced by the following:</p> <ul style="list-style-type: none"> <li>• Patient remains AFB sputum smear positive 2+ or greater (unless easily explained)</li> </ul> <p>And/or</p> <ul style="list-style-type: none"> <li>• Sputum smear results not decreasing as expected (4+ to 3+, 2+, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• TB/poorly controlled diabetes comorbidity</li> <li>• Mal-absorption due to chronic or acute co-morbidity</li> <li>• Chronic or excessive vomiting or diarrhea</li> <li>• HIV infection and CD-4 count &lt;100**</li> <li>• Low or high body mass index (&gt;10% above or below ideal body weight)</li> </ul>	<ul style="list-style-type: none"> <li>• No improvement of TB symptoms (i.e., no weight gain, no reduction in cough, etc.) at 8 weeks</li> <li>• Worsening CXR anytime during course of adequate therapy</li> <li>• New clinical deterioration, likely related to TB (i.e., new evaluation for TB relapse or concern for drug resistance**)</li> </ul>	<ul style="list-style-type: none"> <li>• Patient Relapse: When signs and symptoms of TB return within two years of a prior episode of disease and there was a good possibility that relapse was due to low drug levels (exclude previous poor adherence, missed doses, or N/V)</li> <li>• When second line drugs need monitoring, as per consult recommendations</li> <li>• TB meningitis</li> </ul>

\* **Therapeutic Drug Monitoring should be reserved for patients who are not responding to adequate therapy**, and not necessarily for patients who meet some of the stated criteria and are otherwise doing well.

\*\* Consultation recommended by a DSHS-recognized TB medical consultant, see list here: [dshs.texas.gov/idcu/disease/tb/consultants/](https://dshs.texas.gov/idcu/disease/tb/consultants/)

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### Supplies Needed

TB programs may need to purchase additional supplies for collecting and shipping.



- ❑ **Plain red top tubes:** These cannot be used from the DSHS state laboratory, as the state lab does not process the test.



- ❑ **Pipettes:** For aliquoting serum from the red top tubes into polypropylene tubes.



- ❑ **Polypropylene tubes:** Used for the aliquoted serum that will be frozen and shipped.



- ❑ **Dry Ice:** Must be purchased locally; typically found at local grocery stores. Five pounds (5lbs) is required for shipping.



- ❑ **Cold Boxes:** A vaccine-size cold box is recommended.



- ❑ **Labels:** Biological Substances Category B Label UN 3373 and Dry Ice Label UN 1845



- ❑ **IDPL Laboratory Requisition:** See page 6 for details

## THERAPEUTIC DRUG MONITORING PROCESS

### Prepare for Specimen Collection

Review IDPL requisition for specimen collection times:  
[IDPL-UFHealth-v-9.23A.pdf \(ufl.edu\)](#)

Review specimen shipping and collection details: [Infectious Disease Pharmacokinetics Laboratory \(IDPL\) Serum and Plasma Collection, Handling and Shipping \(ufl.edu\)](#)

### Step 1

**Perform Directly Observed Therapy (DOT) of TB medications being tested, ensuring that the blood draw can occur at the indicated time *after* the dose of medication is observed.**

The number of hours after the dose to draw the samples are shown in parentheses after each drug on the IDPL requisition. It shows the peak time of absorption first and then 4 hours post peak, which may help indicate if there is delayed absorption.

Consult with the ordering physician first to determine if just peak, or both peak and post-peak drug levels are needed. Post-peak levels are generally not required. IDPL staff may serve as a resource for drug specific questions by phone (352) 273-6710 or email [peloquinlab@cop.ufl.edu](mailto:peloquinlab@cop.ufl.edu).

*For example: If testing both rifampin and isoniazid peak levels, DOT would be provided, and a peak level would be drawn 2 hours after DOT.*

INH	Isoniazid (1-2 H & 6 H)
RZAM	Rythazamide (2 H & 6 H)
RBN	Rifabutin (3 H & 7 H)
RIFM	Rifampin (2 H & 6 H)
RILP	Rilpivirine (trough & 4-5H)
VORL	Voriconazole (trough & 2 H)

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### Step 2

**Perform phlebotomy and collect *at least* 1 mL of blood per drug to be tested in a plain Red Top tube.**

- Required volume of serum once blood is centrifuged is *at least* 0.5 mL.
- Document timing of the blood draw on the requisition; include time DOT was provided.
- Use a separate tube for each test. (*Consider drawing an extra tube to freeze serum and save if needed.*)

### Step 3

**Centrifuge blood and aliquot the separated serum into a labeled polypropylene or similar plastic tube, using one tube per test; or, coordinate processing with a local laboratory.**

- Draw blood, allow 20 minutes to clot, and then centrifuge. Centrifuging should occur within 2 hours of collection. If blood will be processed in a local laboratory and not by collector, it can be kept on ice while in transport. Coordinate with the lab to ensure timely processing.
- A pipette can be used to harvest out the separated serum and aliquot into the polypropylene tube.
- Label the tube with patient name, date of birth, date/time of collection, and drugs to be tested.

### Step 4

**Keep separated serum frozen (or refrigerated until it can be frozen) to prepare for shipping.**

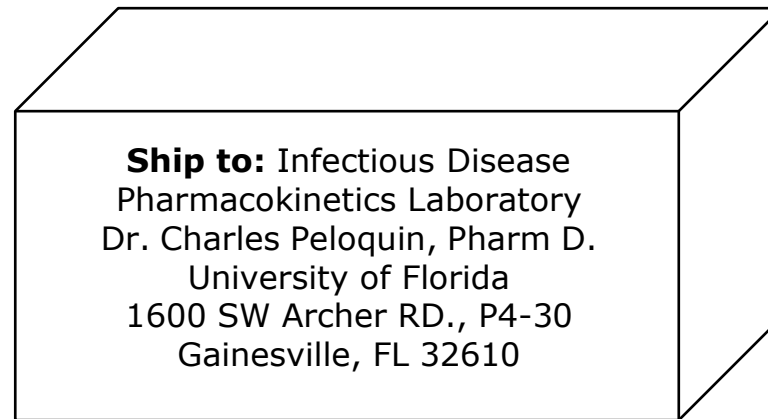
- Freeze at -70C if possible, but at minimum -20C. Serum that is frozen above -20C is stable for 31 days.
- If an ultralow freezer is unavailable, the serum can be frozen in a regular freezer; do not allow it to go through a defrost cycle.
- Alternately, the tube with decanted serum can be placed on a rack and stored on dry ice (the rack should prevent direct contact between the tube and the ice; the serum will slowly freeze without being shocked by contact with the dry ice).

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### **Shipping Details**

- Place samples in zip-lock plastic bags and pack upright in Styrofoam boxes with 5 lbs. of dry ice.
  - Pack properly for Biological B specimen and dry ice shipping
- Refer to DSHS *Tuberculosis Specimen Shipping Guide* for details:  
[Tuberculosis Specimen Shipping Guide \(texas.gov\)](https://www.dshs.texas.gov/tuberculosis-specimen-shipping-guide)

**Ship to:**



- Severe hemolysis
- Thawed samples for greater than 6-24 hours, depending on drug being tested
- Incomplete laboratory requisition

### **Results and Interpretations**

Test results will be returned to submitters. Although IDPL will provide written interpretation and at times may provide recommendations directly by Dr. Charles Peloquin, Pharm D, only the licensed healthcare provider (LHP) can determine adequate dosage adjustments based on each unique patient. [Heartland National TB Center](#) may be consulted if needed.



Texas Department of State Health Services

# THERAPEUTIC DRUG MONITORING PROCESS

## INFECTIOUS DISEASE PHARMACOKINETICS LABORATORY

1600 SW Archer Rd., P4-30  
Gainesville, FL 32610  
Phone: 352-273-6710 Fax: 352-273-6804  
E-mail: [pelequinlab@cop.ufl.edu](mailto:pelequinlab@cop.ufl.edu)  
Website: <http://fdpl.pharmacy.ufl.edu>



Patient Last, First Name, M.I. (Required)		<input type="checkbox"/> Male <input type="checkbox"/> Female	Facility Name & Address (Required)	
Date of Birth:	Patient ID:			
Referring Physician (Required):		Physician Phone #		
Fax #	Facility Phone #			
Please note: We do not bill 3 <sup>rd</sup> party payers. The laboratory or office shipping the samples accepts responsibility for payment.				
Bill to / Contact Name:				
Billing				
City Austin	State TX	Zip 78756		
Telephone # 512-423-2915	Email address: <a href="mailto:invoices@dshs.texas.gov">Email invoice preferred. invoices@dshs.texas.gov</a> Yvonne.Monagas@dshs.texas.gov			

Fill out entire top portion with patient and TB clinic details.

Include clinic address and fax number to receive results.

Request the most current laboratory requisition pre-populated with DSHS billing information:

[tb.feedback@dshs.texas.gov](mailto:tb.feedback@dshs.texas.gov)  
Phone: (737) 255-4300

(Please submit a separate requisition for each sample collection time) All results are reported within 7 days of receiving specimen.

REQUIRED	Drug 1	Drug 2	Drug 3	Drug 4
Drug name to be Assayed				
Drug Dose (mg) (Specify: PO, IV, IM)				
# Doses per week				
Date of last dose				
Time of last dose (For IV: Start/End)				
Date blood drawn				
Time blood drawn				

### Test Catalog (Recommended Drawn Times)

The number of hours after the dose to collect concentrations are shown in parentheses after each drug name below. To test for delayed drug absorption, a second sample should be collected 4 hours after the "peak". Trough concentrations (prior to next dose) are recommended for some drugs: Rifapentine, beta-lactams, anti-HIV, anti-fungal drugs.

Code	Drug Name (Dose & Frequency)	Abbreviation	Recommended Time	Notes	
AZL	Azithromycin (2-3 H & 6-7 H)	INH	Isoniazid (1-2 H & 6 H)	PZAH Pyrazinamide (2 H & 6 H)	Intravenous Drugs (intravenous doses) (30-60 min. post infusion & trough)
BQD	Bedaquiline (trough, 2 & 5-6 H)	ISA	Isavuconazole (trough&2-3H)	RBN Rifabutin (3 H & 7 H)	
BIC	Bictegravir (trough & 2 H)	TTRL	Itraconazole (trough & 3-4 H)	RIFH Rifampin (2 H & 6 H)	PIPE Piperacillin
CIPH	Ciprofloxacin (2 H & 6 H)	LDV	Ledipasvir (trough & 4 H)	RPNT Rifapentine (trough & 5-6H)	AMOX Amoxicillin
CLART	Clarithromycin (2-3 H & 6-7 H)	LFHL	Levofloxacin (2 H & 6 H)	RILP Rilpivirine (trough & 4-5H)	AMPI Ampicillin
CFH	Clofazimine (2-3 H & 6-7 H)	LNZL	Linezolid (trough, 2 & 5-6 H)	SOF Sofosbuvir (trough & 1 H)	AZTRE Aztreonam
CSH	Cycloserine (2-3 H & 6-7 H)	LOPV	Lopinavir (trough & 4-6H)	VORL Voriconazole (trough&2 H)	CFSAZ Cefazolin
DARU	Darunavir (trough & 2-4 H)	MINO	Minocycline (2 H & 6 H)		CEFE Cefepime
DTG	Dolutegravir (trough & 2 H)	MXFL	Moxifloxacin (2 H & 6 H)		CEFT Ceftriaxone
DOXY	Doxycycline (2-3 H & 6-7 H)	OMADA	Ornithine (2-3 H & 6-7 H)		IMIP Imipenem
EFVL	Efavirenz (trough & 5 H)	PASH	p-Aminosalicylic acid (6 H)		MERO Meropenem
EMBH	Ethambutol (2-3 H & 6-7 H)	PMD	Pretomanid (trough, 2 & 5-6 H)	CTL Ceftazidime	NAFC Nafticillin
ETAH	Ethionamide (2 H & 6 H)	POSA	Posaconazole (trough&3H)	DAPTO Daptomycin	OXA Oxacillin

Complete all fields for each drug to be tested.

Circle which level was collected (i.e., 2H or 6H).

**Sample preparation and shipment:** Collect in a plain red top, 5 ml tube. Allow the sample to clot and separate serum from cells by centrifugation and aliquot into a labeled polypropylene or similar plastic tube. Use a separate tube for each test ordered. *Provide 1 ml per test.* Allow room for expansion of sample inside tube. Freeze at -70°C if possible (otherwise -20°C.) Ship for overnight delivery on 2.5 lbs. dry ice. **SHIP SAMPLES TO BE RECEIVED MONDAY THROUGH FRIDAY. DO NOT SHIP ON FRIDAY OR SATURDAY.**

**For UFL Use Only**

Date Received: \_\_\_\_\_  
Time Received: \_\_\_\_\_  
Condition: (circle one)  
Frozen Partially Frozen Thawed

(Revised 8.23)  
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