



Module 4

Managing Supplies for Sputum Smear Microscopy

Purpose	To provide you with an understanding of inventory and to help you calculate your laboratory supplies for a given period.
Prerequisite Modules	None
Learning Objectives	<p>At the end of this module, the participant will be able to</p> <ul style="list-style-type: none">▪ List supplies required to perform smear microscopy▪ Explain ordering of supplies▪ Maintain proper records▪ Explain use of stock book▪ Calculate supplies required▪ Inspect and verify supplies received▪ Explain storage of supplies.
Content Outline	<ul style="list-style-type: none">▪ Supply list for smear microscopy▪ Supply storage▪ Stock management▪ Recordkeeping: Stock book use and importance▪ Calculating supplies required▪ Placing, receiving, and storing supply orders
Handout and Exercises	<p>Stock Book</p> <p>AFB laboratory performance and stocks form</p> <p>Exercise 1: Calculation of quarterly supply requirements for a microscopy centre that receives prepared staining reagents</p> <p>Exercise 2: Calculation of quarterly supply requirements for a microscopy centre that prepares its own staining reagents</p>
Appendix	None

How to Present this Module

Does your lab receive:	Does your laboratory place its own orders?	
	Yes	No
Prepared Staining Reagents?	Present Core curriculum* and Exercise 1	Present Core curriculum*
Individual Reagents for Preparing Staining Reagents?	Present Core curriculum* and Exercise 2	Present Core curriculum*

The Core curriculum consists of the text on supplies, the PowerPoint presentation, the stock book form, and the AFB Laboratory Performance and Stock form for recording workload and inventory. All laboratories should complete the AFB Laboratory Performance and Stock form at the end of each quarter. For laboratories that do not place their own orders, the information recorded on the AFB Laboratory Performance and Stock is reported to the level where order amounts are determined and disbursed. For laboratories that place their own orders, the information recorded on the AFB Laboratory Performance and Stock is used by that laboratory to calculate the quantities of supply items they require, based on their actual workload and inventory. Laboratories that place their own orders for prepared staining reagents, conduct Exercise 1. Laboratories that place their own orders for reagent components and use them to prepare their own staining reagents, conduct Exercise 2.

Module 4: Managing Supplies for Sputum Smear Microscopy

LABORATORY SUPPLY SYSTEMS

Laboratory supply systems vary among countries. Factors that effect how an AFB microscopy laboratory receives its supplies include whether the health care system is integrated or vertical, whether the laboratory calculates its own needs and places its own orders or whether the laboratory receives orders based on calculations performed at another level in the health care system. AFB microscopy laboratory must be aware of the supplies required to perform orders, how to ensure that required supplies are always available for testing, and how to store such supplies.

SUPPLY LIST FOR SMEAR MICROSCOPY

The following is a list of supplies required for the operation of an AFB microscopy centre.

Items	Quantity
Sputum containers and slides	1 per examination
Immersion oil	one bottle of 100 mL per 2000 smears or per 60 smear-positive cases detected
Burning spirit	1–2 mL per smear
Marker pens or grease pencils to label sputum containers	1 per 2 months
Tissue paper to clean microscope lens either: lens paper soft toilet paper	20 sheets per month 1 roll per month
Filter paper to filter carbol fuchsin solution	6 disks (e.g. Whatman #1) per week
Forceps	1 per 5 years

- Filter paper to filter carbol fuchsin solution: 6 disks (e.g. Whatman #1) per week
- Forceps: 1 per 5 years
- Funnel for filtering carbol fuchsin solution: 2 per 5 years
- Staining rack: 1 per 5 years
- Drying rack: 1 per 5 years
- Safety glasses (if handling concentrated acids): one pair per 5 years
- Spirit lamp or Bunsen burner: 1 per 10 years
- Slide holding boxes (100 slides): 1–15 per 5 years (need to have enough to store one quarter's worth of all smears)

- Microscope spare mirror, eyepiece, and oil immersion objective: 1 per microscope for 10 years
- Microscope spare bulb: 1 per microscope for 1 year
- Absorbent paper used to remove oil from slides, e.g. newsprint or toilet paper
- Disinfectant to clean benchtop: 100 ml per month
- The following items depend on whether the AFB Microscopy laboratory uses prepared staining reagents or prepares its own staining reagents from component reagents:
 1. For laboratories using prepared staining reagents
 - a. Carbol fuchsin and Methylene blue reagents: one liter each per 330 smear examined
 - b. Acid destaining reagent: one liter per 200 smears examined
 2. For laboratories preparing staining reagents from component reagents
 - a. To make one liter each of carbol fuchsin reagent and methylene blue reagent required for 330 smears examined:
 - i. Basic fuchsin: 3 grams (for 0.3% concentration) or 10 grams (for a 1% concentration)
 - ii. Phenol, 50 grams
 - iii. Methanol or 95% ethanol, 100 mL
 - iv. Methylene blue, 3 grams (for 0.3% concentration)
 - b. To make one liter of acid destaining reagent required for 200 smears examined:
 - i. If 25% sulphuric acid is used: 250 mL concentrated sulphuric acid
 - ii. If 3% acid alcohol is used: 30 mL hydrochloric acid 37% (i.e., fuming) and 970 mL methanol or 95% ethanol

Supplies requiring NTP specification

Certain supply items require a NTP policy choice. These include:

- Concentration of basic fuchsin in stain (0.3% versus 1.0%)
- Device used to make smear: metal wire or wooden applicators
 - For metal wire loop:
 - Nichrome wire: 1 meter per year
 - Wire loop holder: 1 per 5 years
 - Sand bath: 1 per 5 years
 - Spirit lamp: 1 per 10 years
 - For wooden applicators: disposable bamboo, coconut, or wooden sticks: 1 piece of 10-12 cm in length per smear
- Glass slides: 1 slide per smear
 - For unfrosted slides: high-quality diamond stylus 1 per technician for 10 years.

- For frosted slides: lead pencils of HB grade are sufficient.
- Lens cleaning solutions: Refer to microscope manual for specific cleaning solution.

SUPPLY STORAGE

Keep staining reagents in well-closed bottles and out of direct sunlight. Keep stock bottles inside a cabinet, unless they are made of dark glass or plastic. Label all stock bottles containing staining reagents with name and date of preparation. Well-prepared staining reagents have a shelf life of at least 6–12 months if they are kept in the dark. Old reagents deteriorate and may not work effectively. This is especially important for carbol fuchsin which precipitates and loses potency over time.

When storing new microscope slides, make sure they are as dry as possible to prevent fungus growth. Keep new sputum containers in closed cartons or bags. Store microscopes and their spare parts in a well-ventilated, dry, dark and safe place.

Spare bulbs should always be available at the microscopy centre itself, while objectives, eyepieces, and other less-frequently required parts can be stored at an intermediate level. Optical parts must be kept in a dry place to prevent damage from fungus.

STOCK MANAGEMENT

Stock management means properly maintaining adequate supplies to ensure uninterrupted service. It involves performing a stock count (physical inventory), maintaining proper inventory records, determining how much to order, when to order, placing orders properly, inspecting and verifying supplies received, and ensuring proper storage of stock.

Stock management at a microscopy centre ensures the availability of staining reagents and materials, avoids the use of old reagents, and minimizes waste. The availability of high-quality microscopy testing services depends on the uninterrupted availability of supplies required for testing.

It is important not to under stock or over stock supplies at the testing site. Under stocking, have several negative effects. Under stocking will result in insufficient supplies while you are testing clients, which will interrupt the testing process. The site's entire testing system could be seriously compromised until further supplies are present.

Over stocking presents different problems. Laboratories have limited space that excessive stock can overwhelm, compromising safety and security. Excessive stock also requires additional management, which takes up laboratorians' valuable time. Overstocking can lead to deteriorated reagents and waste; the use of old reagents could compromise test results. For all these reasons, proper management of your stocks is very important, and will ensure that only adequate supplies are on hand.

RECORDKEEPING: AFB LABORATORY PERFORMANCE AND STOCKS FORM AND STOCK BOOK

A stock count is performed to know exactly what and how much stock is on hand. It means the physical counting of each item in the stock, and it should be performed at the end of each quarter. A designated person is responsible for performing this count. The quantities of items on hand can be recorded on a form such the "AFB Laboratory Performance and Stocks" form, found at the end of this module. This form is also useful to record the work performed (number of smears examined) by a microscopy centre. Determine the work performed at the end of each quarter. This can be done by reviewing the TB register and counting the number of smears resulted as positive, negative, or scanty (1–9 AFB/100 fields) from both TB suspect patients and follow-up patients and recording these numbers on the "AFB Laboratory Performance and Stocks" form.

Efficient stock management depends upon accurate recordkeeping. Keeping accurate records ultimately saves time. Proper inventory records help laboratorians determine and predict their pattern of consumption, and estimate supplies for a year for budgeting purposes. The stock book contains a list of all items in the store. It must be routinely updated when orders are placed and received. It also serves as a reference to track orders that have been placed and not received. The information recorded in the stock book regarding when orders are placed and when they arrive may help a site to adjust the reserve quantities of supplies that are kept on site to ensure uninterrupted testing.

CALCULATING SUPPLIES REQUIRED

Calculations for the supplies required for a microscopy centre can be based on the actual number of smears examined during a quarter and a stock count of supplies on hand. Alternatively, supply calculations can be based on the positivity rate among TB suspects examined. A supply calculation based on work performed and a stock count may be more accurate since it reflects the actual conditions at the microscopy centre, rather than an estimate of those conditions.

This actual supply calculation is typically performed with a spreadsheet (see example worksheet below). The number of smear exams performed at a

microscopy centre in a quarter and the amount of each item required for a single smear exam are determined. These two values are multiplied together to give the quantity of each item calculated for one quarter of operation. To this value, a reserve quantity of each item is added to ensure continuity of testing. The reserve quantity can be fixed at an amount equal to the quantity of each item required for one quarter of operation. Depending on how reliable the order system is and how quickly orders that placed are received, the reserve quantity can be increased or decreased. The quantity of each item calculated for one quarter of operation plus the reserve quantity gives an accurate estimate of supplies actually required for one quarter.

From that estimate, subtract the supplies you already have on hand (you should know these numbers from your physical inventory (i.e., stock count)). Your result should be the amount of items you must order to insure uninterrupted testing during the next quarter of operation.

Quarterly Supply Requirements for a Microscopy Center							
Region:				Supply quarter:			
District:				Year:			
Center:							
Total smears examined in previous quarter (A)= 500							
Items	Quantity needed per smear (B)	Calculated requirements for one quarter (C) = AxB	Reserve quantity for one month (D) = C	Stock on hand (E)	Calculated request (F) = C+D-E	Actual request (rounded*)	Indent unit
Sputum containers (pieces)	1	500	500	58	942	1	Bag (1000 count)
Slides (pieces)	1	500	500	50	950	14	Box (72 slides)
Carbolfuchsin (mL)	3.0	1500	1500	200	2800	3	Bottle (1 liter)
Destaining reagent (mL)	5.0	2500	2500	150	4850	5	Bottle (1 liter)
Methylene blue (mL)	3.0	1500	1500	3500	-500	0	Bottle (1 liter)
Immersion oil (mL)	0.05	25	25	10	40	2	Bottle (50 mL)
Burning spirit (mL)	1	500	500	100	900	1	Bottle (1 liter)

* Rounded to next indent unit

PLACING, RECEIVING, AND STORING SUPPLY ORDERS

To ensure proper delivery of supplies, you must place orders properly and follow country-specific instructions. It is important to understand what the contingency plans (both regional and national) are when stock is not available. Ordering supplies involves understanding the communications or feedback systems to the central level on what information should be given to central procurement or stores (e.g., updated seasonal consumption rates during winter or dry months).

When ordered items arrive at the laboratory, check to ensure that what you ordered was delivered, and that items are in good condition. Label each item with the date you received it (when you open and use it, be sure to mark those dates on the item also). Place items on shelves, where possible. Items should be stored in an orderly fashion, keeping like items together. Store new shipments behind existing shipments and make sure that the oldest items are stored in front so they will be used first. Store all stock items in a well-ventilated, clean, and tidy room. Store the chemicals, staining reagents, and reagents away from direct sunlight. Lastly, be sure to update the stock management records.

You must also become familiar with the correct answers to the following questions.

What are your country-specific policies to deal with following scenarios?

1) When your order does not arrive

2) When you receive a partial order

3) When a container is damaged during transportation

4) When you received a different order than you ordered

5) When central stores are out of stock



Key message

- Maintain an adequate inventory at all times to ensure uninterrupted service.
- Don not let any item run out.
- Never order more than you require in the next quarter.
- Record and account for all items in the inventory.
- Always inspect a new shipment before accepting it.



Module Review: Module 4

Find out how much you have learned by answering these questions.

What does inventory management mean?

What information is recorded in inventory record-keeping?

How do you determine reserve stock level?

How do you determine a proper re-order?

What procedure should you follow when receiving new chemicals and supplies?

How should chemicals and supplies be stored?

MODULE 4: STOCK BOOK

Item Name: _____

Unit _____

Physical count (Units)	Date physical count performed	Quantity (units) Requested	Date Requested	Quantity Received	Date Received	Total stock in hand

QUARTERLY REPORT

Quarter / Year _____

AFB LABORATORY PERFORMANCE AND STOCKS

CENTRE _____ DISTRICT _____ REGION _____

<u>Case detection</u>	Number of suspect patients examined during the quarter		Among those, number with at least 1 positive or scanty smear	
<u>Smears examined</u>	Positives	Negatives	1-9/100 fields	Total
Number of suspect smears examined during the quarter				
Number of follow-up smears examined during the quarter				
Total smears examined				

<u>Stocks left at the end of the quarter</u>			
Carbolfuchsin stain _____	millilitres	Sulphuric acid 25% _____	millilitres
Methylene blue stain _____	millilitres	Burning spirit _____	millilitres
Immersion oil _____	millilitres	Slides _____	pieces
_____		Sputumpots _____	pieces
_____		_____	

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EXERCISE 1: CALCULATION OF QUARTERLY SUPPLY REQUIREMENTS FOR A MICROSCOPY CENTRE

Quarterly Supply Requirements for a Microscopy Centre							
Region:				Supply quarter:			
District:				Year:			
Centre:							
Total smears examined in previous quarter (A)= 500							
Items	Quantity needed per smear (B)	Calculated requirements for one quarter (C) = AxB	Reserve quantity for one quarter (D) = C	Stock on hand (E)	Calculated request (F) = C+D-E	Actual request (rounded*)	Order unit**
Sputum containers (pieces)	1			58			Bag (1000 count)
Slides (pieces)	1			50			Box (72 slides)
Carbol fuchsin (mL)	3.0			200			Bottle (1 liter)
Destaining reagent (mL)	5.0			150			Bottle (1 liter)
Methylene blue (mL)	3.0			3500			Bottle (1 liter)
Immersion oil (mL)	0.05			10			Bottle (50 mL)
Burning spirit (mL)	1			100			Bottle (1 liter)

*Round up to the next indent unit

**Change to your country specific units

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EXERCISE 2: CALCULATION OF QUARTERLY SUPPLY REQUIREMENTS FOR A MICROSCOPY CENTRE

Quarterly Supply Requirements for a Microscopy Centre								
Region:				Supply quarter:				
District				Year:				
Centre								
Total smears examined in previous quarter (A)= 1200								
Items	Quantity needed per smear (B)	Reagent quantity per liter (C)	Calculated requirements for one quarter (D)= AxBxC	Reserve quantity for one quarter (E)=D	Stock on hand (F)	Calculated request (G) = D+E-F	Actual request (rounded)**	Order unit***
Sputum containers		N/A			500 pcs			Bag (1000 count)
Slides	1 pc	N/A			432 pcs			Case (1728 slides) [±]
Basic fuchsin*	0.003 Lt	3 g			0 g			Bottle (25g)
Phenol	0.003 Lt	50 g			100 g			Bottle (100 g)
Sulfuric acid	0.005 Lt	0.250 Lt			1 Lt			Bottle (1L)
Methylene blue	0.003 Lt	3 g			25 g			Bottle (25g)
Denatured alcohol	0.003 Lt	0.100 Lt			0.5 Lt			Bottle (500 mL)
Burning spirit	0.001 Lt	N/A			0.5 Lt			Canister (5 Lt)
Immersion oil	0.00005 Lt	N/A			.05 Lt			Bottle (50 mL)

* Consider carbol fuchsin concentration in use

**Round up to the next indent unit

*** Change to your country specific units

[±] Case = 24 boxes X 72 slides