Module 9: Microscope Maintenance

Purpose

To provide participants with instructions and knowledge on how to care and maintain microscope in a good running condition for an error free AFB microscopy

Pre-requisite Modules

Module 7

Module Time

1 hour 35 minutes

Learning Objectives

At the end of the module, participants will be able to

- Store the microscope properly
- Clean the microscope including the eye pieces and objective lenses
- Replace the microscope bulb
- Troubleshoot the common problems associated with use of microscope

Module Overview

Step	Time	Activity/Method	Content	Resources needed
1	5 min	Presentation	Introduction to Module	Slides 1–4
2	20 min	Presentation	Cleaning the Microscope	Slides 5–15
3	30 min	Presentation and Demonstration	Replacing the Microscope Bulb	Slides 16–19, Microscope, Microscope bulb
5	30 min	Presentation	Troubleshooting	Slides 20–26
6	10 min	Discussion	Summary	Slide 27

Material and Equipment Checklists

- Powerpoint slides
- Overhead projector or computer with LCD projector
- Microscope, Microscope bulb
- Lint free Cotton swabs and Gauze pads, Tissue paper
- Alcohol, Soap solution, Lens cleaner solution

Teaching Guide

Slide Number	Teaching Points
1	**<u>Module 9: Microscope Maintenance</u>** DISPLAY this slide before you begin the module. Make sure participants are aware of the transition into a new module.
2	**<u>Learning Objectives</u>** STATE the objectives on the slide.
3 **Flipchart** 	**<u>Content Overview</u>** (Suggested format) WRITE the content outline before beginning this session. EXPLAIN that these are the topics that will be covered in this module. REFER to flipchart frequently to orient participants to where they are in the module.
4	**<u>Microscope Storage</u>** EXPLAIN the importance of proper storage conditions for the microscope. EMPHASIZE that proper storage will prevent problems with the microscope caused by fungus growth on the optical surfaces. To discourage fungal growth, the microscope should be stored in a dry heated box or cupboard at least 5^{o}C warmer than the environment.
5 	**<u>Cleaning Solutions/Solvents</u>** STATE the message on the slide. EXPLAIN that mild soap solutions, rather than organic solvents, can be used to remove oil and dirt on exterior painted surfaces, including the stage, to reduce the chance that paint will be stripped off.

Slide Number	Teaching Points
6 	**<u>Cleaning Solutions</u>** EXPLAIN that only certain cleaning solutions are appropriate for frequent (long term) use. Other cleaning solutions may be used on an infrequent basis. EMPHASIZE that Xylol (Xylene) must never be used since it will attack the cement used to mount the lenses in place in objectives and eyepieces.
7	**<u>Cleaning Materials</u>** EXPLAIN that only certain materials are appropriate for cleaning the microscope. EXPLAIN that if lens paper is not available, high quality tissue paper, including toilet paper, could be used.
8	**<u>Microscope Cleaning Process</u>** PROVIDE an overview of the key steps of cleaning a microscope by STATING the steps on the slide. EXPLAIN that each of the steps will be discussed in detail.
9	**<u>Step 1: Cleaning the Eyepieces</u>** STATE the message on the slide. EXPLAIN that when cleaning the microscope, it is best to work from the top down. Start by cleaning the eyepieces first. Moisten the tip of a cotton swap with 70% alcohol or lens cleaning solution and wipe the eyepieces with the swab.
10	**<u>Step 2: Cleaning the Eyepiece</u>** STATE the message on the slide. Wipe the eyepieces dry with lens paper. Repeat cleaning and drying if required.

Slide Number	Teaching Points
11	**<u>Step 3: Cleaning the Objectives</u>** STATE the message on the slide. Objectives are cleaned while attached to microscope • Moisten the lens paper with the cleaning solution • Wipe gently the objective in circular motion from inside out • Repeat above steps at least twice and then wipe with dry tissue or lens cleaning paper • Repeat above steps separately for each objective EMPHASIZE that objectives should never be removed from the nosepiece.
12	**<u>Step 4: Cleaning the Microscope Stage</u>** STATE the message on the slide.
13	**<u>Step 5: Cleaning the Microscope Body</u>** STATE the message on the slide. EMPHASIZE the importance of unplugging the microscope from the power source before cleaning the body.
14	**<u>Step 6: Cleaning the condenser and auxiliary lens</u>** STATE the message on the slide. EMPHASIZE the importance of unplugging the microscope from the power source before cleaning the body. STATE the condenser lens and auxiliary lens are located below the stage. They can be reached by lowering the stage by using the stage controls. **Note: New microscopes have Abbe condensers and have no auxiliary lens.**

Slide Number	Teaching Points
15	**Replacing the microscope bulb** STATE the message on the slide. EMPHASIZE the importance of unplugging the microscope from the power source before cleaning the body. EXPLAIN that you must first find the location of the bulb. In most models of microscopes they are located in the base of the scope and are accessible by turning the scope on its side, being careful to remove any loose lens or mirrors. EMPHASIZE the importance of following the manufacturer's instructions to remove the bulb
16	**Replacing the microscope bulb (Cont.)** STATE the message on the slide. HIGHLIGHT the following points: • Using tissue paper or an appropriate device specifically to remove bulbs, remove the bulb and check its model number. • The correct bulb model and wattage can usually be found on the rim of the bulb. It is important to use the correct bulb to obtain the correct amount of light. • Obtain a new bulb and use tissue paper to replace the bulb. EMPHASIZE never to touch the bulb with bare fingers. Use lens paper or gloves. Oil from fingerprints on the bulb can cause bulb to explode, prematurely burnout, or reduce the light output. • Replace the bulb by holding it with lens paper or an appropriate device.
17	**Microscope Repair** EMPHASIZE the microscope should never be disassembled, except by a service expert. Opening up the microscope can cause the optics to become contaminated by dust and fungus.

Slide Number	Teaching Points
18	**<u>Demonstration</u>** DEMONSTRATE the replacement of bulb to all the participants before moving to the next slide **Step-by-step demonstration** should be done in a <u>small-group setting</u> so everyone can see the steps clearly. • Consider setting up multiple demonstration stations if you have enough instructors and microscopes. • An alternative is to repeat demonstration in a small-group setting several times. In this case, you need to consider alternate activity for participants who are not watching the demonstration.
 ***TIPS***	**Tips for Demonstration** • Make sure everyone can see you • Show each step slowly and methodically. Move slowly enough so participants can follow what you are doing – this is slower than normal. • Talk out loud as you perform each step, but keep explanation brief and clear. Describe every step at the same time that you do it. • Refer to job aids, if available • Point out commonly made mistakes and teach participants how to avoid them. • Repeat steps as necessary • If you repeat the procedure, do exactly the same thing each time.
19	**<u>Troubleshooting Problems</u>** STATE the message on the slide. EMPHASIZE the need to critically evaluate when problems must be referred to professionals. Attempted self-repair of problems that cannot be corrected by routine cleaning and adjustments can cause more damage to the microscope.

Slide Number	Teaching Points
20	**<u>Problem: Eye Strain/Headaches</u>** STATE the problem and EXPLAIN the possible causes and solutions. • Adjust interpupillary distance until the left and right images merge. • Adjust eyepiece diopter setting by focusing the image with the right eye looking into the right eyepiece and then adjusting the diopter ring to focus the image with the left eye looking into the left eyepiece. EXPLAIN that these procedures will be discussed in the practical session
21	**<u>Problem: Poor Image Quality</u>** STATE the message on the slide. The most common problem is a dirty microscope. Check to be sure the smear is not upside down. This is often the case when using slides that do not have a frosted end. In these cases it can be difficult to orient the slide based on the labeling. Poor quality glass slides can also be a problem but this would be constant. Poor quality oil is also a common problem. Oil should be a 50/50 mix of high and low viscosity. An aplanar lens will not give a clear image at the periphery of the field. To get a fully focused field you will need a planar lens. This is a cost trade off. You can resolve the problem by simply moving your image to the center of the field, especially at low magnifications. At higher magnifications, this is less successful. You may need to purchase a planar lens to resolve this problem. If oil leaks into the objective a poor image quality will be the result. In this case, the only solution is to replace the objective. Other damage to the objective or even the condenser can occur. If KOH or other liquids touch the lens etching will occur if it is not cleaned off the scope. If this problem is not resolved with routine cleaning methods previously described there is the possibility of fungal growth in the microscope. Please refer to the text document for additional information.

Slide Number	Teaching Points
22	**Problem: Uneven Illumination** STATE the message on the slide HIGHLIGHT that If the condenser is not properly centered you will have uneven illumination. Check your scope for optimum illumination. If you have installed a bulb which "fits" but is not the correct size, you may not have the light properly placed for the light path of the scope. Know what bulb your scope takes. Keep an extra on hand. REMIND participants that fingerprints on the bulb (or even silvering of a tungsten bulb) can result in dark spots. Never touch a light bulb with your fingers. Oil from your skin will "cook" on the bulb causing darkened areas. EXPLAIN that these procedures will be discussed in the practical session.
23	**Problem: Constant Refocusing** STATE the message on the slide. HIGHLIGHT the most common problem is the slide is not seated flat on the stage. Often this is because specimen has leaked from the slide and is causing the slide to stick when moved and it "pops" off the stage. If there is not a problem with the slide you may need to have the slide holder arm adjusted. If you can press down on the slide and solve the problem, this is most likely the cause. If this doesn't work, you may need to have your scope recolumnized.
24	**Problem: Surging or Flickering Light** STATE the message on the slide. HIGHLIGHT many scopes flicker because the operator has leaned on the cord where it enters the base of the scope and damaged the wiring. If the wiring, rheostat or potentiometer switches are bad, this is a professional level repair. Another reason for this problem could be power surges.
25	**Microscope Maintenance-1** STATE the items that should be checked on a daily basis REMIND the audience that some problems require professional repair and that professional service should be performed routinely on at least an annual basis.

Slide Number	Teaching Points
26	**<u>Microscope Maintenance-2</u>** STATE the message on the slide
27	**<u>Summary</u>** ASK the participants to answer the questions. ANSWER any questions the participants may have

Demonstration: Replacing the microscope bulb

1. FOLLOW the manufacturer's instructions to remove the bulb

2. UNPLUG the microscope from the power source before cleaning the body

Important: If microscope was in use, leave it to cool down for at least 30 minutes before replacing the bulb.

3. SHOW to find the location of the bulb (In most models of microscopes they are located in the base of the scope and are accessible by turning the scope on its side)

4. REMOVE any loose lens or mirrors

5. OPEN the bulb compartment

6. REMOVE bulb from the bulb compartment by using tissue paper

7. CHECK the bulb model number

   (The correct bulb model and wattage can usually be found on the rim of the bulb. It is important to use the correct bulb to obtain the correct amount of light.)

8. OBTAIN a new bulb and use tissue paper to replace the bulb.

9. EMPHASIZE not to touch the bulb with bare fingers. Oil from fingerprints on the bulb can cause bulb to explode, prematurely burnout, or reduce the light output.

10. REPLACE the bulb by holding it with lens paper or an appropriate device

11. CLOSE the bulb compartment

12. BRING the microscope in standing position

13. PLUG in the microscope

14. SWITCH ON the microscope and look for the bulb to glow.