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COLLEGE OF PARAMEDICAL

Detailed Notes

Care and Maintenance of Laboratory Instruments in Microbiology

Subject: Microbiology
Course: BMLT – 1st Year
Language: English

Introduction

In a microbiology laboratory, the use of accurate, clean, and well-maintained instruments is essential for:

- Obtaining reliable and reproducible results
- Maintaining sterile conditions
- Ensuring safety of laboratory personnel
- Prolonging the lifespan of expensive equipment

Microorganisms are microscopic and sensitive, so even a small contamination or incorrect reading can lead to false interpretations. That’s why proper handling, care, and regular maintenance of laboratory equipment are crucial.

General Guidelines for Instrument Care

Aspect	Description
Cleanliness	Instruments should be cleaned after every use with appropriate solutions.
Handling	Handle with care; avoid jerks, spills, or damage due to mishandling.
Calibration	🔷 General Guidelines for Instrument Care
Storage	🔷 General Guidelines for Instrument Care
Record Keeping	Maintain logs for servicing, calibration, and breakdowns.

1. Microscope

🔸 Function: Observes microbes (bacteria, fungi, protozoa) at high magnification.

🔸 Types: Simple, Compound, Phase-contrast, Electron

🔸 Care and Maintenance:

- Clean the eyepiece and objective lenses only with lens paper and lens cleaning fluid.
- Avoid touching lenses with fingers; it causes oil and moisture smudges.
- Use immersion oil only with 100x objective, and wipe immediately after use.
- Always keep the microscope covered with a dust-proof cover when not in use.
- Handle with both hands—base and arm—to avoid falls.
- Store in a dry place to prevent fungal growth on lenses.
- Use a soft brush or blower to remove dust from the objective turret.

🔹 Example: After viewing a Gram-stained slide under 100x oil immersion, clean the lens with lens paper dipped in xylene or lens cleaner.

2. Autoclave

🔸 Function: Sterilizes media, glassware, and biohazard waste using high-pressure steam (121°C at 15 psi for 15–30 min).

🔸 Care and Maintenance:

- Check water level before every cycle to avoid dry heating or damage.
- Drain and clean the water reservoir weekly to prevent scaling.
- Periodically check and clean the safety valve, pressure gauge, and door gasket.
- Do not overfill or place plastic items not meant for autoclaving.
- Use autoclave indicator tape for verification.
- Allow pressure to return to zero before opening to avoid steam burns.

🔹 Example: After autoclaving nutrient agar bottles, allow them to cool inside to avoid temperature shock that might crack glassware.

3. Hot Air Oven

🔸 Function: Used for dry heat sterilization of glassware (160°C for 2 hours or 180°C for 1 hour).

🔸 Care and Maintenance:

- Preheat the oven before loading.
- Place items in a way that allows free air circulation.
- Clean inside and shelves with damp cloth and mild detergent.
- Avoid spilling liquids inside.
- Check thermostat calibration with a separate thermometer occasionally.

Do not place plastic, rubber, or paper materials inside.

🔹 Example: Use oven to sterilize pipettes and Petri dishes, ensuring all are heat-resistant and dry before placing them in.

4. Incubator

- Function: Maintains optimal temperature (usually 37°C) for microbial growth.
- Care and Maintenance:

Wipe the interior walls and shelves with 70% alcohol or disinfectant weekly.
Avoid frequent opening as it may lead to temperature fluctuations.
Use a digital or manual thermometer to monitor accuracy.
Clean any spilled cultures immediately to avoid cross-contamination.
Leave door slightly open after use to prevent moisture buildup and mold formation.

- Example: After incubating blood agar for 24 hours, disinfect shelves before placing new culture plates.

5. Laminar Air Flow Cabinet

🔸 Function: Provides a sterile environment for culture inoculation and transfers.

🔸 Care and Maintenance:

- Turn ON UV light for 15–30 minutes before starting work (keep cabinet closed).
- Wipe down the surface with 70% alcohol before and after use.
- Avoid blocking airflow with large objects or crowding.
- Replace HEPA filter every 6–12 months depending on usage.
- Keep hands and materials inside the working zone for uninterrupted laminar flow.

🔹 Example: Use laminar flow hood while transferring colonies from agar plates to slants to ensure aseptic technique.

6. Centrifuge

🔸 Function: Separates components based on density using rapid spinning (RPM).

- 🔸 Care and Maintenance:
- Always ensure tubes are balanced by volume and weight.
- Use sealed tubes for hazardous samples.
- Clean the rotor and chamber with alcohol to prevent corrosion.
- Inspect tubes and holders for cracks or damage.
- Allow rotor to come to a complete stop naturally (don’t use hand brake unless necessary).

🔹 Example: While spinning blood samples for serum, use balanced tubes and clean rotor of any blood spills immediately.

7. Water Bath

🔸 Function: Maintains constant temperature (typically 37°C or 56°C) for incubating liquids.

🔸 Care and Maintenance:

- Use distilled water to reduce mineral deposits.
- Change water weekly or if contaminated.
- Add mild disinfectant (e.g., sodium azide) to prevent microbial growth.
- Check thermostat and temperature settings regularly.
- Clean heating coils to prevent scaling.

🔹 Example: During Coagulase test, maintain 37°C in water bath and wipe container after test.

8. pH Meter

🔸 Function: Measures hydrogen ion concentration (pH) of solutions and media.

🔸 Care and Maintenance:

- Calibrate daily using buffer solutions (pH 4.0, 7.0, and 10.0).
- Rinse electrode with distilled water before and after use.
- Store the electrode in appropriate storage solution, not distilled water.
- Blot the electrode dry with tissue – never rub.
- Replace electrode if sluggish response or damage is observed.

🔹 Example: Before pouring nutrient broth, check its pH using pH meter and adjust with HCl or NaOH as needed.

9. Refrigerator / Deep Freezer

🔸 Function: Preserves media, reagents, culture stocks, and vaccines.

🔸 Care and Maintenance:

- Set correct temperature:
- Refrigerator: 2–8°C
- Freezer: -20°C
- Keep items well-labeled and in proper containers.
- Avoid overcrowding to ensure air circulation.
- Defrost regularly and clean shelves with disinfectant.
- Monitor temperature with thermometer or data logger.

🔹 Example: Store blood agar plates at 4°C and allow them to come to room temp before use.

Conclusion

Proper care and maintenance of instruments in microbiology labs are fundamental to achieving accuracy, safety, and efficiency. By following standard protocols and cleaning schedules, students and technicians can maintain a professional, contamination-free, and productive environment.