

Pharmaceutical Microbiology and Basic Rules of Laboratory

Pharmaceutical Microbiology

Microbiology is a branch of biology which deals with the study of very minute living organisms such as bacteria, protozoa, fungi and similar organisms that can't be seen with the naked eye. Pharmaceutical microbiology is an applied branch of microbiology which is responsible for the production of antibiotics, enzymes, vaccines, vitamins and other pharmaceutical substances. It also deals with microorganisms which contaminate pharmaceutical products, minimizing the number of microorganisms in a process environment, excluding microorganisms and microbial by-products like exotoxin and endotoxin from water and other starting materials. It ensures that medications do not contain harmful levels of microbes- such as bacteria, yeast and molds. It mainly focuses on the manufacturing techniques, process controls, and finished product attributes that limit the harmful effects of microorganisms on the drug product. Pharmaceutical products can save lives and bring back the health of patients, but what if these products are contaminated? The presence of a microbial contaminant in pharmaceutical products can reduce or even inactivate the therapeutic activity of the products and has the potential to adversely affect patients taking the medicines. The contaminating microorganisms may cause spoilage of the product with loss of its therapeutic properties and, if they are pathogenic, serious infections can arise. Furthermore, the presence of bad bugs in pharmaceutical products can lead to costly product recalls resulting in financial and image losses, loss of product sales, decreased customer confidence, and in many cases, legal proceedings.

Thus, it is important to know the microbial content of all drugs and medicines, whether they are sterile or non-sterile and to implement strict

microbial controls to ensure that the final products are consistent, safe, effective and predictable.

A. Microbiology Lab Practices and Safety Rules

1. Leave your footwear in the rack provided before entering microbiology lab and wear lab footwear available at the entrance of the lab.
2. Familiarize yourself with the location of instruments and safety equipment in the lab (e.g., eye-wash station, first aid kit etc)
3. Wash your hands with disinfectant soap when you arrive at the lab and wear lab coat available inside the rack provided at the entrance of the lab.
4. Absolutely do not eat drinks or smoke in the laboratory. Even do not put anything in mouth such as pencils, pens, labels, or fingers. Do not store food in areas where microorganisms are stored.
5. Disinfect work areas before and after use with 70% ethanol or propanol.
6. Ensure that all the instruments viz. refrigerator, incubator, oven, laminar air flow, autoclave are in proper working conditions. And also check for availability of chemicals before starting the work.
7. Long hair should be tied back to minimize contamination of cultures and fire hazards
8. Protect yourself from exposure to eyes and skin to UV light by wearing goggles and clothing respectively.
9. All cultures and prepared solutions should be labeled or marked clearly with the date of preparation.
10. Before using any microbial culture ensure that you are using the right culture.
11. Wear gloves and mask when working with pathogenic microbial cultures.
12. Aseptic conditions should be strictly followed at all times to avoid contamination.
13. If any culture has to be used, please check for purity and see that further stock of culture is available for future work.

14. Never pipette out broth cultures or bacterial suspensions in saline, with the mouth.
15. Always keep culture tubes in upright position in a rack or basket
16. If live culture is spilled, cover the area with a disinfectant for 15min and then clean with 70% isopropyl alcohol or ethanol.
17. Label all the culture plates, tubes properly before starting an experiment.
18. Inoculating loops and needles should be flame sterilized in a Bunsen burner before you laying them down after inoculation.
19. Wear disposable gloves when working with potentially infectious microbes or samples. If you are working with a sample that may contain a pathogen, then be extremely careful to use a good bacteriological technique.
20. Turn off Bunsen burners when not in use. Long hair must be restrained if Bunsen burners are in use.
21. Dispose off all used agar and broth cultures after incubation period in a biohazard bag and autoclave it before discarding in the regular trash. Do not pour anything down the sink.
22. In the event of personal injuries such as cuts or burns inform your instructor immediately as bacteria enter open wounds
23. Dispose of broken glass in the broken glass container.
24. Replace caps on reagents, solution bottles, and bacterial cultures. Do not open Petri dishes with cultures in the lab unless absolutely necessary.
25. Always clean microscope before and after use. Clean lenses with lens paper.
26. Decontaminate laboratory equipment and work surfaces with an appropriate disinfectant on a routine basis, and especially after spills, splashes, or other contamination.
27. Wash your hands and place the apron and footwear at the place provided before leaving the lab.

Basic Requirements of Microbiology Laboratory

A. Instruments

1. Microscope
2. Autoclave
3. Hot air oven
4. Incubator
5. BOD Incubator
6. Digital balance
7. pH meter
8. Laminar air flow
9. Inoculation loops
10. Inoculation needles
11. Bunsen burner
12. Refrigerator
13. Centrifuge
14. Water bath
15. Distillation unit
16. Colony counter
17. Centrifuge
18. Cyclomixer
19. Spectrophotometer

B. Glassware

1. Petri plates
2. Test tubes/culture tubes
3. Glass rods
4. Pasteur pipette
5. Erlenmeyer conical flasks
6. Measuring cylinders
7. Spreader
8. Micropipette
9. Burettes

C. Miscellaneous

1. Test tube rack
2. Stains and staining racks
3. Cotton/ Cotton plugs
4. Glass markers
5. Scissors
6. Rubber bands
7. Forceps