Lab 1:

Introduction to Practical Virology

The following laboratory-acquired viral infections had been reported:

1. Hepatitis A, B, and C.
2. Influenza and mumps viruses.
3. HIV.
4. Rabies.

Infections had occurred in widely different kinds of laboratories. Some of the organisms are handled only in research establishments whilst others are encountered daily in diagnostic and clinical laboratories. The vast majority of reported infections occur in research institutes although a wider population is at risk in a routine diagnostic laboratory. Laboratory-acquired infections are far more likely to occur in untrained workers. Routes of infection reported are;-

1. **Oral** - eating, drinking, and smoking in the laboratory, mouth pipetting, transfer of microorganisms to mouth by contaminated fingers or articles.
2. **Through the skin** - injuries by needles, sharp instruments, or glass. Animal bites and scratches.
3. **Through the conjunctiva** - splashes of infectious material into the eye, transfer of microorganisms to eyes by contaminated fingers
4. **Through the lungs** - inhalation of airborne microorganisms.

Classification of Viral Pathogens into Hazard Groups

Group 1. - An organism that is most unlikely to cause human disease.

Group 2. - An organism that may cause human disease and which may be a hazard to laboratory workers but is unlikely to spread to the community. Laboratory exposure rarely produces infection and effective treatment is usually available. Examples include herpes viruses.

Group 3. - An organism that may cause severe human disease and presents a serious hazard to laboratory workers. It may present a risk of spread to the community but there is usually effective treatment available. Examples: Yellow Fever, rabies.

Group 4. - An organism that causes severe human disease and is a serious hazard to laboratory workers. It may present a high risk of spread to the community and there is usually no effective treatment. Examples include Lassa fever.

The Safe Working Environment

Basic Levels 1 and 2 laboratories

Levels 1 and 2 laboratories are considered to be adequate with microorganisms which offer minimal risk to the worker. In the interest of safety, floors should be slip resistant, be impermeable to liquids and resistant to most. The surfaces of walls and partitions should be smooth, and easily cleaned. Windows should be sealable and fitted with blinds. Doors should be fire resistant and fitted with vision panels. Bench surfaces should be impervious to liquids, and not easily corroded or stained by chemicals. Electricity and gas supplies to the benches are needed, water and waste plumbing is optional. Each laboratory should have a hand basin and disposable paper towels provided.

Level 3 laboratories

The object of level 3 laboratories is to confine, or contain the organisms so that only a minimum number of people are exposed to them. All the design features advocated for Level 2 laboratories apply. Although Level 3 laboratories may open off non-public corridors, it is best if access is from other laboratories of a lower Containment Level. Access to Level 3 laboratories should be strictly limited and controlled and the doors should be locked when the rooms are not in use. Microbiological safety cabinets are essential features of these laboratories. Care is needed in siting those in relation to airflows and staff movements. An incubator room could open directly from a Level 3 laboratory and there should be enough storage space e.g. refrigerators and deep-freezers.

Level 4 laboratories

Work with Hazard Group 4 agents is usually severely restricted in most countries by government decree. Therefore, a great deal of consultation and supervision is necessary in the planning and building of these laboratories. The laboratory should be isolated or physically separated from other parts of the same building so that access is difficult. The ventilation system should be completely controlled so that air flows via air locks into the laboratory. Class III safety cabinets should be maintained. Ensure that nothing passes outside the room without being sterilized.

Microbiological Safety Cabinets

Microbiological safety cabinets are designed to capture and retain infected airborne particles released in the course of work and to protect the laboratory worker from inhaling them. There are three classes of safety cabinets:

1. **Class I-** Air is drawn from the room through the open front, and over the working area. It is then passed through high efficiency particulate air (HEPA) filters, which remove infectious particles, and is ducted to outside air. Filters must be changed when the airflow falls below this level.

Class II - air is filtered and most of it is recirculated through the cabinet. This cabinet protects the work as well as the worker. About 70% of the air is recirculated through filters so that the working area is bathed in clean (almost sterile) air.

Class III - cabinets are totally enclosed and leak-proof. The operator works with gloves which are sealed into the front of the cabinet by removable gaskets.

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