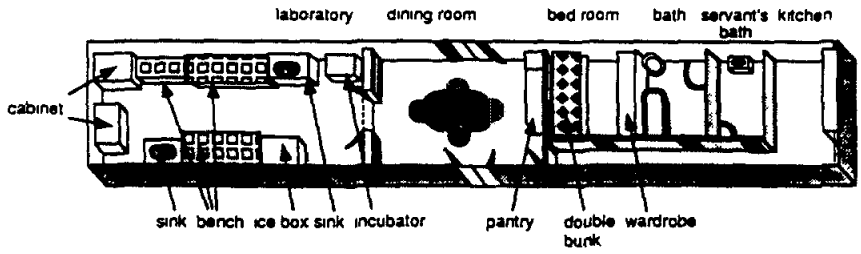
CHAPTER 3

TYPES OF LABORATORY FACILITY

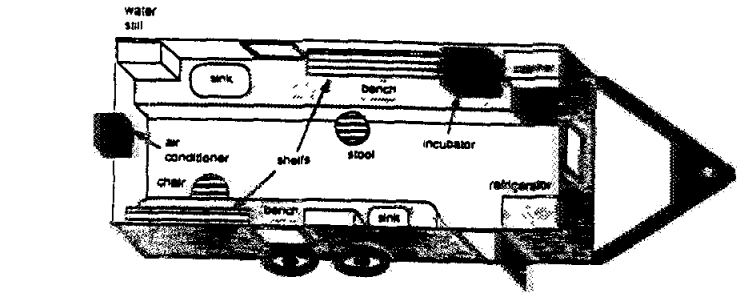
3.1 General

There are five types of laboratory facility:

- existing laboratory facilities
- temporary stationary laboratory facilities
- mobile laboratories
- portable laboratories
- reference laboratories.



Laboratory Railroad Car



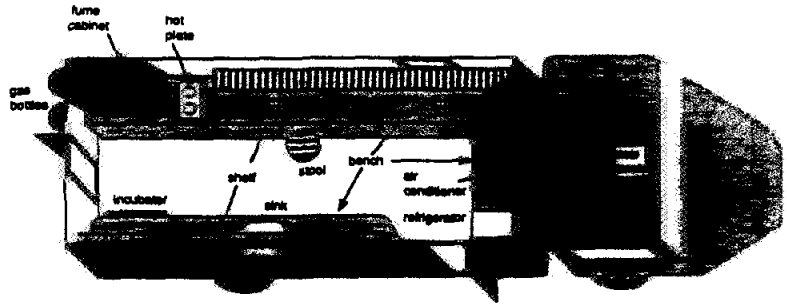


Figure 3.1 Transportable rigid structures

3.2 Existing laboratory facilities

Existing laboratory facilities should be prepared to provide emergency services wherever possible, particularly in situations such as epidemics not associated with disaster. Review of central and local laboratory facilities must be included in the preliminary assessment of the situation. It may be necessary to provide supplementary support to local laboratories in the management of specific diseases.

Figure 3.2 A temporary laboratory

3.3 Temporary stationary laboratory facilities

Where there are no existing laboratory services, laboratories may be established in temporary facilities. There are three types of temporary laboratory:

a) existing building;
b) transportable rigid structure, e.g. caravan, truck (**Figure 3.1**);
c) tent or shelter constructed with available material, e.g. bamboo, straw mats, plastic, poles and canvas (**Figure 3.2**).

A temporary laboratory can be set up in an existing room, a tent, or a specially constructed shelter using locally available materials. The long axis of the laboratory should run from east to west so that the laboratory faces south and obtains maximum sunlight (for microscope use). It should be near the health centre. A storeroom should be situated on the cooler, shady side of the laboratory (see **Figure 3.3**). A system for safe disposal of specimens should be prepared (see Chapter 6). If possible, there should be a separate room for collecting samples. Basic items of furniture and equipment that may be purchased locally are listed in **Table 3.1**.

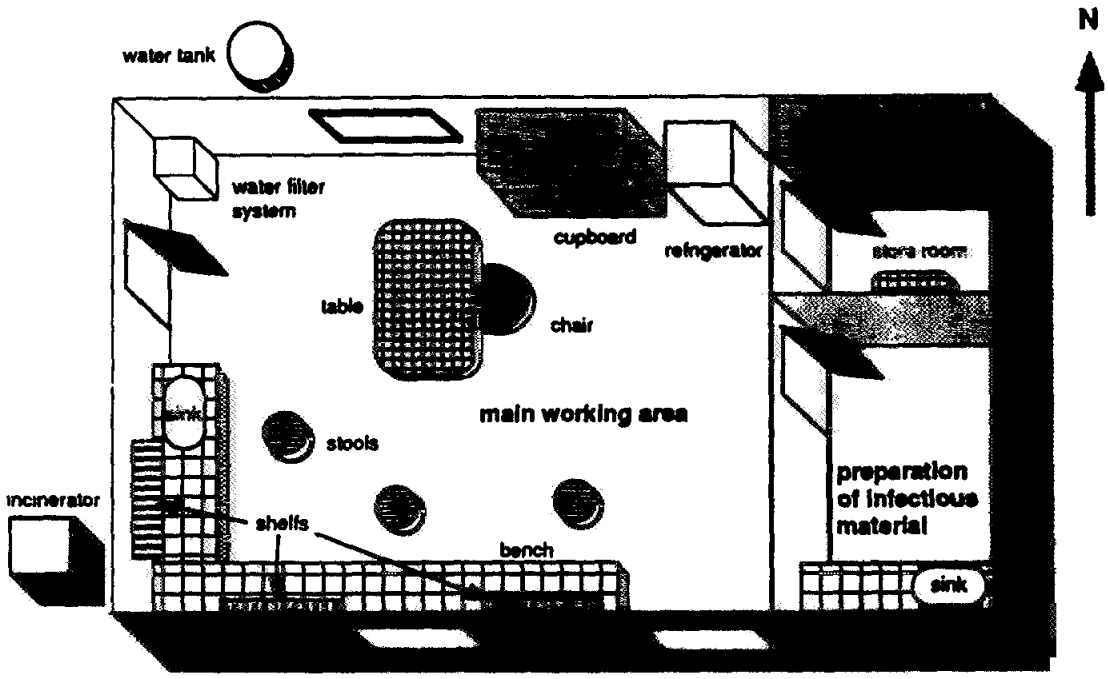


Figure 3.3 Plan for a temporary laboratory

TABLE 3.1 **Items to be purchased or prepared locally**

Item	Quantity[1]
Tables [2]	2
Chairs [2]	4
Matches	1 packet of six boxes
Soap powder, medium sized	1 packet/bag
Hand-washing soap	1 cake
Adhesive tape	1 roll
Cupboard, wood or metal, length150 cm, width 40 cm, height 120 cm, fitted with shelves (for storage of laboratory equipment and chemicals)	1
Padlocks and keys, for cupboard and laboratory doors	3 sets
Padlock catch for cupboard and doors	3
Basic first aid kit (for cuts and burns)	1
Bucket for use in case of fire (12 L)	1
Strong glue	1 tube
Quicklime (for burial of waste material)	1 sack

[1] Quantities required may vary according to the situation

[2] Alternatively, sufficient wood, nails and screws The following tools should be available

- pair of long nose pliers
- small hacksaw and spare blades
- screwdriver with interchangeable pieces
- adjustable 20 cm spanner wrench
- file
- set of vicegrip pliers
- saw
- hammer
- small spirit-level
- ruler
- tape measure (8 metres)

3.4 Mobile laboratories

A mobile laboratory is a laboratory mounted on or built into some form of transport. The transport might be a truck or van, a trailer, a railway carriage, a boat, or a large self-supporting container-like unit that can be conveyed by truck, boat, plane, or helicopter. All of these formats exist and have been used very successfully. Planning authorities should give serious consideration to including mobile laboratories in their emergency contingency plans.

A mobile laboratory has three advantages:

It can go almost anywhere, depending on the type of laboratory and the location of the disaster.

- It is self-contained, usually with its own sources of electrical power and utilities, such as water and gas.
- It is designed to be operable immediately upon arrival.

The disadvantages are:

- cost; and
- the fact that it may not be able to reach the emergency areas in some situations.

Mobile laboratories can be configured for almost any type of investigation, including, for example, medical diagnostic tests and environmental investigations. Mobile laboratories should be chosen according to the anticipated conditions e.g. ship, boat or canoe-transported systems for rivers and seas (**Figure 3.4**); vehicle or rail-mounted systems on land.

Preplanning is necessary to take advantage of the capabilities of mobile laboratories. They must be procured before the emergency situation has happened. This requires planning to decide and, perhaps, design what is needed for the area projected as a target. A list of manufacturers of mobile laboratories is given in Annex 3. Once the laboratory has been obtained, the personnel that are to use it should receive periodic hands-on training, working together so that they have the opportunity to form an efficiently functioning team. Actual work in the field is essential for solving potential problems in the system.

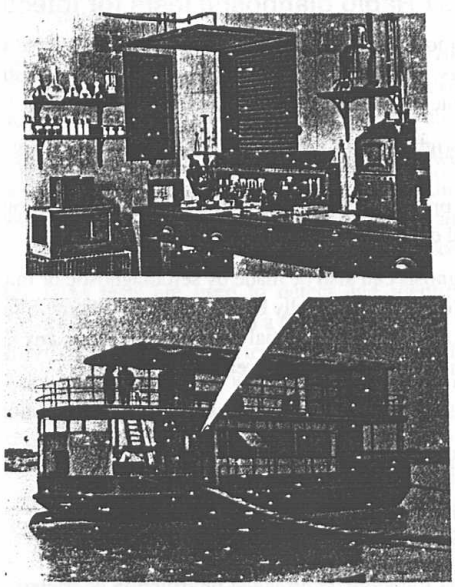


Figure 3.4 A boat- mounted laboratory

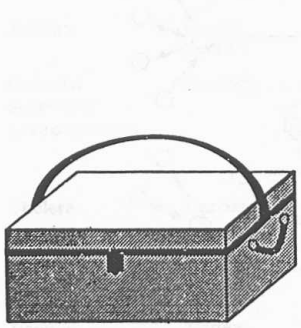
3.5 Portable laboratories

Portable laboratories are self-contained diagnostic systems that can be carried by hand. They are compact and relatively lightweight. Portable cases or plastic boxes containing laboratory materials may be used in combination with existing temporary or mobile laboratory facilities. They are particularly useful for epidemiological surveys in the field. However, there should be a critical evaluation of portable systems available, as some are extremely expensive and not well compiled. A list of manufacturers of portable systems is provided in Annex 3.

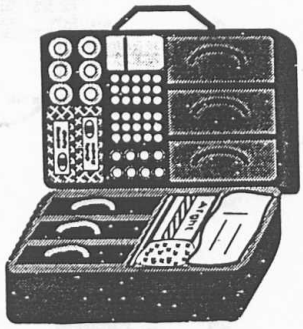
A heavy duty plastic box 60 cm x 40 cm x 30 cm can be used to transport laboratory materials (**Figure 3.5**). Rubber may be used for hinges and carrying straps. Diagnostic equipment and supplies can be put into another box or case for taking to the field. However, it is advisable to use a well-sealed case that will withstand environmental conditions such as rain, immersion in water, and dust. The case should also be sturdy enough to withstand the rigours of transport. Conditions in the field will not be known prior to the emergency situation, therefore a carrying case appropriate to any eventuality must be chosen.

The inside of the case should be designed so that the equipment and supplies are arranged for ease of use. Provision should be made to protect delicate equipment, either by securing it in position or by using shock-protective padding.

A portable laboratory should be modular, so that users can pick and choose the components needed for the particular emergency situation being addressed. At the same time, a portable laboratory should also be able to meet unexpected diagnostic requirements. Most of the diagnostic tests described in Chapter 6 can be carried in a portable laboratory. The amounts of reagents available for some tests will be limited by space, but a portable laboratory can carry sufficient supplies to obtain a good picture of disease prevalence in an emergency situation. By using micro-methods, a portable laboratory can provide a large number of certain diagnostic tests. Technical instructions must be included in a portable laboratory system, and the parts should be identified by name, illustration, and function.



a) Plastic box



B) Portable laboratory system

Figure 3.5 Portable laboratories in rural health care

An important component of a portable laboratory is specimen collection and transport. A sampling of appropriate specimens can be returned with the investigation team to their base for analysis. Test results from these specimens and from on-site tests, especially in the event of high endemicity or even an epidemic of disease, will help significantly in identifying the appropriate modules for a laboratory kit (described in Chaper 7).

After its use in the preliminary investigation, a portable laboratory can remain on site to provide continuing support until a more comprehensive laboratory system can be set up and to expand investigations into satellite areas. A portable laboratory is shown in **Figure 3.6.**

Military casualties resulting from war or armed conflict are usually the responsibility of military medical services, but there may also be civilian causalities and mobile or portable laboratories may be particularly useful in such circumstances.

The modules of a portable laboratory should include equipment and reagents to perform:

- specimen collection and transport
- basic haematology
- urinalysis
- blood and urine chemistry tests
- microscopic microbiology
- rapid serodiagnostic tests.

3.6 Referral of samples to reference laboratories

Where it is not possible or feasible to establish any kind of laboratory or where investigations are required that are beyond the scope of the local laboratory, samples may be collected and transported to reference laboratories.

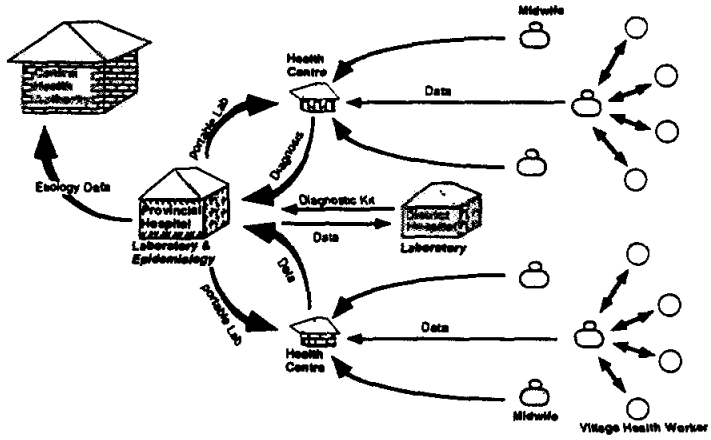


Figure 3.6 Applications of portable medical laboratories in rural health care and epidemic investigations