CHAPTER 11

COLLECTION, STORAGE AND TRANSPORT OF SPECIMENS

11.1 General

While many medical diagnostic laboratory tests can be done at the patient's bedside, at small clinics, or in the field, there may be occasions that require more elaborate or extensive tests. This potential need can be met in several ways. The patient can be transported to a central medical facility, or specimens obtained from the patient can be sent to a laboratory for analysis. The latter is usually more convenient and cost-effective.

For specimens to be stored and transported it is essential that:

- the appropriate specimen is taken and correctly labelled;
- a suitable container, with transport medium where necessary, is used;
- appropriate storage temperatures are used;
- an effective system of transport from the field is established;
- appropriate safety precautions are taken;
- specimens to be transported to another country are packed correctly, according to current IATA regulations.

TABLE 11.1 **Specimen transport: purposes, methods, and conditions**

Specimen	Purpose	Container/ preservative	Specimen amount	Holding temperature	Storage time
Bacteria	**Blood culture**	**Tube/sodium polyanethol sulfonate**	**8.3 mL**	**RT[1]**	**24 hours**
	Serology	**Filter paper/ dried**	**1-2 drops**	**RT**	**3 weeks**
CSF	**Culture, bacteria**	**Bottle/Transgrow medium**	**1-2 mL**	**RT to 37°C**	**4 days**
		Tube, Cary-Blair medium or Amies medium	**1-2 mL**	**RT**	**2 days**
	Serodiagnostic test	**Tube/sterile**	**1 mL**	**4°C to RT**	**1 week**
Vaginal, urethral secretion	**Culture, gonococcus**	**Bottle/Transgrow medium**	**Swab**	**RT to 37°C**	**4 days**
		Tube/Cary-Blair Medium or Amies Medium	**Swab**	**RT**	**2 days**

TABLE 11.1 Specimen transport: purposes, methods, and conditions (*continued*)

Specimen	Purpose	Container/ preservative	Specimen amount	Holding temperature	Storage time
Faeces	Culture bacteria	Tube/Cary-Blair medium or Amies medium	Swab	RT	2 weeks
	Microscopy, protozoa, worm eggs	Tube/MIF preservative (5mL)	1-2 g	RT	Indefinite
Hair, nails, skin scraping	Microscopy, fungus	Envelope or screw-cap tube/ none	Several pieces	RT	1 week
Pus	Culture, bacteria	Tube/sterile	1 mL	4°C to RT	1 day
		Tube/Cary-Blair medium or Amies medium	Swab	RT	3 days
Serum	Biochemistry	Tube/sterile	5-7 mL	4°C to RT	2 days
	Serology test	Tube/sterile, merthiolate 1:5000 or sodium azide 1 g/L	5-7 mL	4°C to RT	2-3 days
Sputum	Culture, tuberculosis	Bottle/0.6 % *cetylpyridinium* bromide (25 mL)	5-10 mL	RT	10 days
Throat	Culture, *C.diphtheria*	Tube/*silica gel*	Swab	RT	3 days
		Tube/Loeffler's medium	Swab	RT to 37°C	24 hours
	Culture, *Streptococcus*	Tube/silica gel	Swab	RT	3 days
	Serodiagnostic test	Tube or envelope /none	Swab	RT	3 days
Urine	Culture, bacteria	Bottle or tube/ sterile	10 mL	4°C to RT	1 hour
	Culture, bacteria or chemistry	Tube/boric acid 1 %	10 mL	4°C	2 days
	Count, *Schistosoma* eggs	Tube/commercial bleach, 0.2 mL (4 drops); hydrochloric acid, 0.1 mL (2 drops)	10 mL	RT	Indefinite

[1] Room temperature (RT) is 20°C, storage time will be less if RT is higher than this.

Several systems for specimen transport are described. Preservatives are included in some of these. The following containers can be used:

- envelope
- screw-cap tube, clean
- screw-cap tube, sterile
- wide-mouth screw-cap jar
- syringe
- bottle
- plastic bag, sterile, 'Whirl-Top'
- plastic bag, zip-lock
- double screw-cap cylinder (for international transport and high risk specimens).

Information regarding the transport of various specimens is given in **Table 11.1.**

11.2 Collection and storage

11.2.1 Microorganisms

Various transportation systems and preservatives are used to maintain the viability of microorganisms while suppressing their growth in specimens. Preservatives will also suppress the growth of contaminating organisms in the specimen while keeping the pathogenic bacteria alive. Any clinical specimen should be transported to the reference laboratory as soon as possible. The fresher the specimen, the greater the likelihood of a successful laboratory analysis.

Specimens thought to contain dangerous pathogens must be handled and transported with great caution. Examples of such specimens and diseases suspected are outlined in **Table 11.2.** These specimens should be sealed in containers with tightly fitting lids or in sealed double plastic bags.

TABLE 11.2 **High risk specimens**[1]

Specimen	Disease suspected
Blood	**AIDS, hepatitis, plague, viralhaemorrhagic fever**
Faeces	**Typhoid or paratyphoid fever, cholera**
Sputum	**Tuberculosis, plague, anthrax**
Ulcer or pustule fluid	**Anthrax, treponematosis**
Urine	**Viral haemorrhagic fevers**[1]

[1] Specimens from viral haemorrhagic fever cases are a serious infectious biohazard. Minimize handling of these specimens in the field. Wear protective gloves, clothing and respirators when handling specimens and caring for patients.

Preservation methods for microorganisms and other substances in clinical specimens vary widely. Some methods work with moisture while others require the dry state. Optimal preserving temperatures also cover a wide range. While refrigeration may be best for many specimens, it is bad for others. During transportation the infecting pathogenic microorganisms should be kept alive while limiting or eliminating growth of non-pathogenic commensals that may be present in the specimen and that may overgrow and mask the presence of pathogens. For specimens intended for chemical or serological analysis, complete suppression of bacterial or fungal growth is a prerequisite. Any specimens for microbiological analysis should be collected prior to antimicrobial therapy.

For some specimens, like skin scraping, nail clippings or hair, no special preservation methods are needed. Pus can be kept in a plain sterile tube for 1 day, preferably at 4°C. Organisms requiring moisture survive but do not grow in transport media such as Cary-Blair medium and Aimes medium, which are designed to support the life of bacteria. They maintain the viability of enteric bacteria, including *V. cholerae*, *Yersinia pestis* and the plague bacillus. These media also preserve meningococci and gonococci in specimens over short periods at room temperature. Less fragile bacteria remain alive in these transport media for several days.

Drying is a good way to preserve certain bacteria on swab specimens. These bacteria include *C. diphtheriae, S. pyogenes, and Staphylococcus aureus.* Throat swab specimens can be preserved by drying in silica gel.

Mycobacteria in sputum specimens are preserved in a solution of cetylpyridinium bromide or chloride. The solution tends to kill commensal bacteria in the specimen, liquefies the sputum in 24 hours, and preserves the viability of *M. tuberculosis* for at least one week.

Bacteria remain viable and chemicals can be preserved in urine treated with boric acid (1 % *V/V*). The urine specimen should also be refrigerated.

Transgrow medium, an enriched medium containing antibiotic, is the best to maintain the viability of *N. gonorrhoeae* and *N. meningitidis*. Once inoculated, the bottles or tubes should be kept at 35-37°C.

Loeffler's medium (Loeffler serum agar) is a good medium for transporting throat swab specimens at low temperature for diphtheria diagnosis. If kept at 35-37°C, diphtheria bacilli will grow. It also has the advantage that *C. diphtheriae* grown on this medium will show typical volutin granules when stained by the Albert method.

Complete suppression of bacterial growth is advisable for specimens destined for chemical or serological tests. Collecting and storing the specimens under sterile conditions may be difficult under field conditions. Chemicals can be added to these specimens to suppress bacterial and fungal growth. It is also helpful to store these specimens at 4°C or below.

Parasites in specimens to be transported to a reference laboratory or base of operations are usually completely preserved. The merthiolate-iodine-formaldehyde (MIF) preservation method is easy to use and is effective. Faecal specimens can be preserved in MIF and will last

for an indefinite period.

Schistosoma haematobium eggs in urine can be preserved indefinitely with commercial household bleach (2 mL per 100 mL urine) or hydrochloric acid 0.1 molar.

11.2.2 Blood

For the collection of blood specimens (see **Figure 11.1**), patients may come to the laboratory, or blood films can be taken directly onto slides during surveys in the field. Blood specimens for bacteriological culture can be preserved using liquoid (sodium polyanethol sulfonate) in normal saline solution. The tube and preservative must be sterile. Liquoid is an anticoagulant and also neutralizes bactericidal substances in fresh blood. It can be autoclaved in the collection tube for sterilization. For approximately 8.3 mL of blood sample, 1.7 mL of 0.35 % liquoid is used.

Blood specimens can also be preserved for subsequent serology tests. Materials needed are lancets, Whatman No.1 filter paper (4 cm x 3 cm strips) and small plastic bags (see Annex 17). Capillary blood is obtained by the standard fingerstick method. A large drop or several drops of blood are placed in the middle of a filter paper strip. The filter paper absorbs the blood and is left to dry completely in the air.

The edge of the paper is labelled with the patient's name or number. The dried filter paper blood sample is transferred into the small plastic bag. Other storage methods can also be used for large surveys. The dried blood can be used for such things as serology tests for syphilis, yaws, and protozoan diseases.

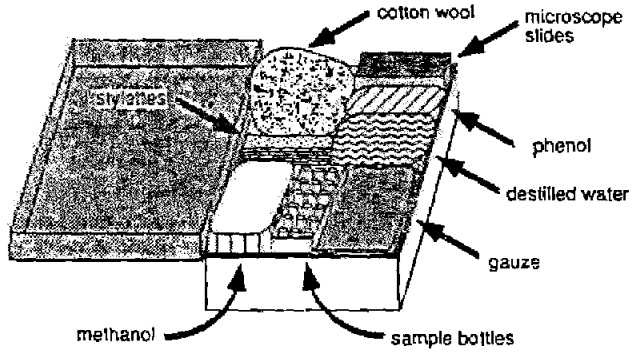

Figure 11.1 Blood collecting box

11.2.3 Cerebrospinal fluid (CSF)

Specific aetiologic diagnosis of meningitis cases requires culture of CSF or serodiagnostic tests on CSF, e.g. coagglutination or latex agglutination. The bacteria that cause meningitis tend to die quickly in specimens, especially *N. meningitidis.* The preferred medium for transport of meningococci is Transgrow medium, in which the bacteria will grow at 35-37°C, but a transport medium that maintains viability without growth, like Cary-Blair medium or Amies medium, can also be used. These transport media also help preserve the viability of other bacteria that commonly cause meningitis such as *Haemophilus influenzae* and *Streptococcus pneumoniae.* Specimens should be kept at 35-37°C if possible, never in the refrigerator.

The antigens of bacteria that commonly cause meningitis are quite stable and will not deteriorate over long periods of time, even at high (40°C) or low (freezing) temperatures. The CSF specimen should be kept in a sterile tube to avoid overgrowth by other bacteria. CSF itself is a good culture medium, and antigen concentration of the infecting bacteria may be enhanced at incubation temperatures. Preservatives such as merthiolate 1:10000 (0.01%*V/V*) or sodium azide 1:1000 (0.1% *V/V*) can also be used to suppress microbial growth.

11.2.4 Exudate

Diagnosis of acute gonorrhea in the male can often be made from a Gram-stained direct smear of exudate from the urethra. However, culture is usually necessary to diagnose gonorrhea in the female and to diagnose chronic gonorrhea. Transport of specimens is done on Transgrow medium, at 35-37°C if possible. The specimen is taken and streaked on the surface of the medium with a swab or bacteriological loop. A non-growth transport medium such as Cary-Blair medium or Amies medium can also be used, the sampling swab being thrust into the tube of medium and broken off at the tube lip before capping the tube. This method is a second choice for exudate specimen transport.

11.2.5 Faeces

For some investigations of diarrhoea, culture of enteric pathogens at a laboratory will be necessary. Transport media such as Cary-Blair medium or Amies medium are excellent for preserving the viability of enteric bacteria, including cholera vibrios. A swab with a sample of faeces is thrust into a tube of transport medium and is kept at room temperature until it can be cultured.

In field surveys for parasites, faecal specimens can be collected and brought to a laboratory for examination. A good fixative for this purpose is MIF. It is both a preservative and a stain. One or two grams of faeces are emulsified in 5 mL of MIF solution. Protozoa trophozoites and cysts both become stained and can be identified in wet mounts.

For many specimens, filter paper techniques can be used for specimen transport

(**Figure 11.2**), particularly for cholera and haemorrhagic fever investigations. Liquid stools can also be absorbed on a filter paper for transport. This simple procedure is reliable for confirmatory tests (culture, agglutinations, etc.). For the materials required see Module 19: Stool specimen transport module. The procedure is as follows.

1. Soak one disc in the liquid stool using forceps.
2. Place it in a small tube (2 mL) and attach a self-adhesive label with patient's details, date and site.
3. Add a few drops of saline 0.9% to the tube.
4. Close the tube tightly with the screw-cap.
5. Attach a form with the relevant information and place it in a proper shipping container.

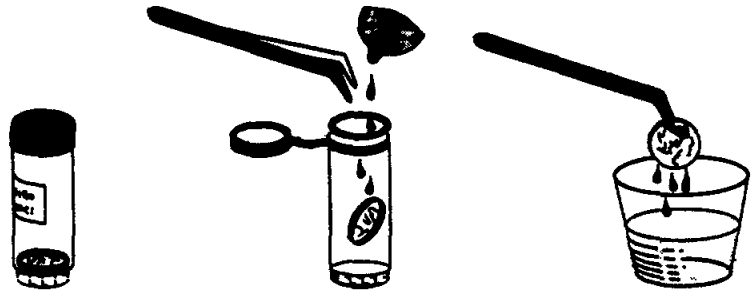

Figure 11.2 Filter paper for transport of liquid stool

11.2.6 Hair, nail clippings, skin scrapings

Specimens for diagnosis of superficial fungus infections are easy to transport. They can be placed in an envelope or a clean screw-cap tube, and can be kept for at least one week at room temperature.

11.2.7 Pus

Samples taken from the periphery of ulcers or from infected wounds can be sent to the laboratory for bacterial culture to detect and identify the infecting bacteria and for antimicrobial susceptibility tests. The specimen material, preferably on a Dacron swab, can be transported in a plain sterile tube. Enough specimen should be collected to prevent drying. The swab can also be thrust into a tube of transport medium. Since the infecting bacterium will probably not be known, the specimen should be kept cool at room temperature and transported to the laboratory as soon as possible, preferably within one day.

11.2.8 Serum

Blood chemistry tests are preferably done on serum rather than on whole blood. The serum specimen should be sterile and should be transported in a sterile tube. It should be kept refrigerated if possible. Transport time should be a maximum of 2 days.

11.2.9 Sputum

Culture may be necessary to diagnose tuberculosis. Sputum specimens for *M. tuberculosis* culture can be preserved and transported quite easily. The patient expectorates the sputum into a screw-cap bottle or cup containing 25 mL of 0.6 % cetylpyridinium bromide (or chloride). The specimen and viable tubercle bacilli will be preserved for at least 10 days. Precautions should be taken to prevent bottle breakage in transport because positive specimens are extremely infectious. Ensure that the bottle cap is securely fastened and then place the bottle in a sturdy container, preferably a double cylinder specimen shipping container.

11.2.10 Throat swab specimens

Culture is necessary to confirm a diagnosis of diphtheria. Throat swab specimens for *C. diphtheriae* can be transported in Loeffler's medium or on coagulated serum in a screw-cap tube, or in silica gel in a tube. The freshly obtained throat swab is streaked on the slant of the coagulated serum in a screw-cap test tube, or is thrust into the Loeffler's medium. The specimen should be transported at room temperature within 24 hours. However, it is preferable to transport freshly obtained throat swab specimens to the laboratory for culturing *C. diphthheriae* and *S. pyogenes*, and also for serodiagnostic tests, in sterile silica gel. *C. diphtheriae* and *S. pyogenes* remain alive on throat swabs in silica gel for at least 3 days at room temperature. Dacron swabs are preferable to cotton swabs. The transport tube contains 3-5 g of dry silica gel sterilized at 170°C for 2-3 hours. If plastic tubes are used, they must be sterilized separately by autoclaving before adding the oven-sterilized silica gel. The gel and tubes can be resterilized and used again to reduce expense.

Throat specimens can also be used for serodiagnostic testing for streptococcal pharyngitis. In serodiagnostic tests, the streptococcal antigens are extracted from the swab and are then tested with coagglutination (COAG) or latex (LA) reagents. The extract can also be used in spot tests. The antigens are quite stable, so swab specimens for these tests can be stored dry in a clean test tube or envelope.

11.2.11 Urine

Urine specimens for bacteriological culture are collected in a sterile bottle or tube. A midstream specimen should be obtained. The 30 mL tubes are good for this purpose. The urine specimen should be cultured as soon as possible, preferably within one hour after collection. Boric acid at a 1 % concentration in urine will maintain viability of bacteria but suppress growth and multiplication. If any delay in testing is expected, urine specimens should be refrigerated.

Urine specimens can be collected in field surveys for *S. haematobium* infections and stored indefinitely at room temperature. The urine is easily preserved by adding 0.1 mL (2 drops) of 0.1 molar concentrated hydrochloric acid or 0.2 mL (4 drops) of commercial bleach to 10 mL of urine.

11.3 Shipment of samples

Packing must be in three layers as detailed below.

a) *Primary container*
This contains the specimen. The primary container must be leakproof with a screw-cap. To avoid cracking or bending this container, never use mechanical devices to tighten the cap. Make sure that the specimen is correctly labelled.

b) *Secondary container*
This must be a durable waterproof container, made of metal or polycarbonate plastic with a screw-cap. It must be large enough to hold the primary container and sufficient absorbent material (absorptive paper, cotton, or cloth) to absorb all the fluid in the primary container should it be accidentally broken.

Several primary containers can be enclosed in the secondary container under the following conditions.

- The total volume in the primary containers should not exceed 50 mL.
- Each primary container must be individually protected to reduce shock, prevent breakage, and provide absorption.
- Enough space must be left between the inner side of the secondary container and the primary containers for sufficient absorbent material to absorb fluid from all the containers in case of accidental leakage or breakage.

Tape one copy of the specimen data form and information about the specimen on the outside of each secondary container.

c) *Outer (tertiary) container*
The outer package is the outer shipping container. It should be of corrugated fibreboard, cardboard, wood, or other material strong enough to withstand the weight and shock commonly associated with handling and shipment. An example of the arrangement of a shipping container to transport dangerous or potentially dangerous specimens is shown in **Figure 11.3.**

When packing specimen volumes of 50 mL or more, a shock-absorbent material should be added (a volume equal to the sample volume) between the outer sides of the secondary container and the outer shipping container.

If dry ice is used for shipping frozen and refrigerated specimens the following should be remembered.

- Dry ice must be placed between the secondary container and the outer shipping container.
- Shock absorbent material should be placed so as not to permit the secondary container to become loose inside the outer container as dry ice sublimates and disappears.
- The outer container must permit the release of carbon dioxide gas in order to prevent the built-up of pressure leading to rupture of the container.

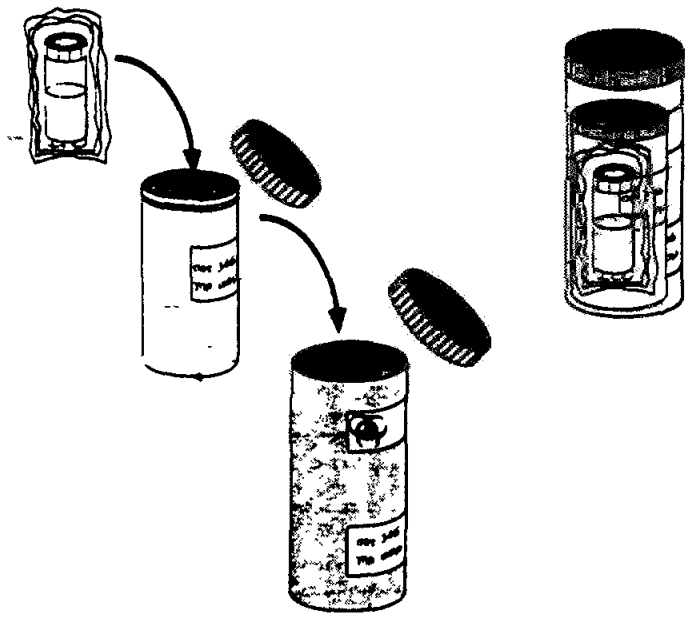

Figure 11.3 Arrangement of a shipping container

In emergency situations, all specimens should be considered potentially dangerous. All packages shipped must bear biohazard labels (**Figure 11.4**).

Under certain provisions, infectious substances may be sent by air. The International Air Transport Association (IATA) Dangerous Goods Regulations 1992 [2] must be followed. Briefing on the subject may be obtained from local airline or forwarding agents. Proper packing of infectious material should follow the procedure outlined above.

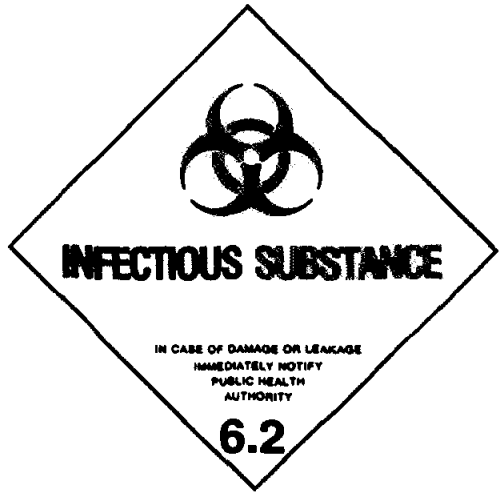

Figure 11.4 Biohazard labels

Every package containing potentially infectious material must have its contents marked on it, durably and legibly, both on the outside of the primary container and on the secondary and outer containers. Every outer container must bear an infectious substances label and an address label indicating:

- the address and telephone number of the consignee;
- the 'proper shipping name(s)' (that portion of the entry most accurately describing the contents), supplemented by technical names if appropriate;
- the corresponding 'UN numbers' (as listed in the IATA Dangerous Goods Regulations, 1992);
- the name and address of the shipper (consigner) and the name and telephone number of a responsible person.

The recommended storage conditions should also be indicated.

The shipper is responsible for the completion and signature of two copies of the 'Shipper's Declaration for Dangerous Goods'. The declaration must be completed in the English language. If required by the country of origin and/or destination, the wording in English may be accompanied by an accurate translation in another language. The forwarding agent may assist and provide guidance to the shipper but is not entitled to complete the declaration. The forwarding agent may **only** enter the airwaybill (AWB) number and the airports of departure and destination on the declaration. The shipper must enter all other items. Any correction must be countersigned by the same signatory.

A packing list (proforma invoice) is required for nearly all categories of consignment and must include: the consignee's address, number of containers, detail of contents, gross weight (optional) and value (for customs), together with a short statement stating that the items are supplied free of charge. Even for medical samples a symbolic value must be entered.

The forwarding agent or an airline representative usually completes the airwaybill. The airwaybill is the airfreight document made out by or on behalf of the shipper, which determines the contract for carriage of goods over routes of the carrier(s).

The shipper should complete the 'Export Declaration'. However, the export declaration may be prepared by the agent or airline representative who then presents it for signature.

It is recommended that an advisory telex/telegram be sent to the consignee 48 hours before arrival of the shipment. The telex/telegram should include the following information: place of departure, place of arrival, number of containers, flight arrival details (avoid, if possible, arrival of the consignment over the weekend), airwaybill number, and recommended storage temperature.

CHAPTER 12

FIELD LABORATORY RECORD KEEPING AND REPORTS

12.1 General

Data collected by the laboratory is an important component of a disease surveillance system. Systematic reporting, daily, weekly and monthly, provides information contributing to the assessment of the health status of the affected population, a disease notification system, and early detection of disease outbreaks.

12.2 The role of the laboratory in the investigation of disease outbreaks and epidemics

While laboratory surveillance data may sometimes give an early warning of a disease outbreak, most disease outbreaks or epidemics first become apparent through an increase in cases with a common pattern of symptoms. Detailed methods for investigation of disease outbreaks are available in the WHO publication *Public Health Action in Emergencies Caused by Epidemics* [5]. For some diseases, such as measles, the clinical picture is sufficiently diagnostic that laboratory tests are not required. For other outbreak diseases, the laboratory plays a number of important roles.

a) *Confirmation of aetiology*

Appropriate specimens should be taken from a sample of clinical cases. Depending on the suspected disease, as indicated in **Table 4.1**, tests may be performed in the field, or appropriate specimens (**Table 11.1**) despatched to a referral laboratory.

A laboratory request form should be filled in and sent to the laboratory with each specimen for required investigations (**Figure 12.1**).

b) *Case confirmation*

If the clinical diagnosis is not sufficiently specific for case definition, laboratory confirmation of cases may be required. It is, however, usually inappropriate to attempt to obtain specimens of all suspected cases.

c) *Contribution to the epidemic investigation*

Laboratory investigations may be required to investigate asymptomatic carriers of the disease and environmental samples, and to confirm when no new cases exist.

Name of patient ——— **Age** ——— **Sex** ———
Address/Site/Location ———
Ward/OPD ——— **Registration No.** ———
Brief clinical history (please indicate medication, if any)

Specimen and investigation required

Ordered by (name) ——— **Signed** ——— **Date** ———
For laboratory use only
Laboratory reference No. ———
Laboratory results

Examined by (name) ———
Signed ———
Date ———

Note. Laboratory request forms can be printed, or prepared using a stencil and duplicator or a rubber stamp

Figure 12.1 Laboratory request form

12.3 Recording test results

The assessment of the epidemiological situation in a population will be facilitated by a proper recording system.

In field laboratories, record keeping using books is still the best method. The fewer books and the simpler the specimen entry system the better. Use a large hard-back book each, for example, for malaria parasites, faecal specimens and miscellaneous tests.

Some numbering systems start with the date, followed by the specimen number. For example on the 28th of the month, the first specimen would be 'Lab. no. 28-1', the second specimen '28-2', and so on. **Figure 12.2** gives an example of a page for a 'malaria book'.

It is recommended that the inside back cover of the malaria book be kept for recording a sample of the doctors' signatures. Doctors should also be asked to provide specimen

MALARIA BOOK					
Lab. no.	**Patient's name**	**Age**	**Sex**	**Village & zone /house no.**	**Result**
28-1					
28-2					
28-3					

Figure 12.2 Example of a page in a malaria book

handwriting of 'Blood smear' and 'Malaria smear'. Local health workers approved to request malaria smears should do the same. In this way it is possible to check who has requested malaria smears.

The back of the book may also be used for keeping daily statistics, as shown in **Figure 12.3**, starting from the last page and working backwards.

Date	Total	No. positive	Details
16.8.85	22	7	4 *P. falciparum* 2 *P. vivax*
17.8.85	17	10	6 *P. falciparum* 4 *P. vivax*

Figure 12.3 Example of a statistics page in a malaria book

The pages of a 'faeces book' may be set out as shown in **Figure 12.4.** The same numbering system may be used as for the malaria book; so for the first faeces specimen the number would be 28-1. Statistics for faecal specimens can be recorded daily in the back of the book, starting from the last page and working backwards.

FAECES BOOK					
Lab. no.	**Patient's name**	**Age**	**Sex**	**Village & zone /house no.**	**Result**
28-1					
28-2					
28-3					

Figure 12.4 Example of a page in faeces book

A third hard-back foolscap book can be prepared to record the results of haemoglobin tests, urinalysis, CSF analysis and Gram stains. A different section of the book should be used for each type of test.

Each patient has a medical card. Alongside the test requested, write the test number (obtained from the laboratory report book). To avoid confusion, put a circle around all laboratory numbers (Lab. no.) on patients' cards. Next day the patient will return for the result. This can be found by linking the circled number on the medical card to the same number in the report book and the result with it. Only trained laboratory staff should write results on patients' medical cards.

12.4 Laboratory procedure book

If the laboratory is to continue operating after the departure of the laboratory technologist who initiated the activity, a set of notes giving the methods used in the laboratory, together with the addresses of local and national laboratory suppliers and a map showing their location, should be prepared. For reordering of basic stains and reagents, a record should be kept of usage rate of, for example, Field's or Giemsa's stains (e.g. 300-400 malaria smears a month required 1000 mL of Field's A and 1000 mL of Field's B).

It is important for epidemiological assessment that monthly statistics are compiled. **Figures 12.5, 12.6** and **12.7** show how specific and summary monthly reports may be presented.

LABORATORY MONTHLY REPORT

Date: 31.12.80 **From: 29.11.80** **To: 28.12.80**

Bacteriology specimens

Camp	Urine	Gram stain	TB sputum (positive)	Faeces (parasite)
Kok Tahan	7	3	4 (1)	NIL
Phnom Chat	NIL	NIL	NIL	NIL
Samet	13	25	29 (5)	48 (2)
NW 9	NIL	NIL	NIL	NIL
Nong Chan	1	8	34 (4)	28
Nong Pru	1	NIL	NIL	NIL
Taprik	7	2	1 (1)	1

Figure 12.5 Example of a page from a laboratory monthly report

MALARIA MONTHLY REPORT

Malaria

Camp	Total	Positive	*P.falciparum*	*P.vivax*	Mixed
Kok Tahan	447	198	8	183	7
Ban Sa Ngae	346	187	34	133	20
Phnom Chat	93	37	4	32	1
NW 9	211	51	7	43	1
Samet	583	288	11	265	12
Nong Chan	538	233	18	195	20
Nong Pru	1584	1135	221	447	467
Taprik	4710	3649	1007	1927	715
Malu Kalui	917	121	96	18	7
Grand total	9429	5899	1406	3243	1250
Positive	5899	Negative	3530	62.6%	Positive
P. falciparum	1406				
P. vivax	3243				
Mixed	1250				

Figure 12.6 Example of a page from a malaria monthly report

LABORATORY REPORT NOVEMBER 1985

1. Malaria	
Total number of smears	**484**
Number positive	**170**
Number of *P. vivax*	**45**
Number of *P. falciparum*	**101**
Number of *P. falciparum* plus *P. vivax*	**24**
2. Faecal specimens	
Total number of faecal specimens	**74**
Number of bacillary dysentery	**37**
Number of amoebic dysentery	**7**
Number of *Ascaris*	**2**
Number of hookworm	**4**
Number of *giardia*	**4**
Number of others	**5**
Number negative	**15**
3. Haemoglobin	
Total number of tests	**333**

RESULT

Age	Hb 20 g/L	20-40 g/L	40-80 g/L	80-100 g/L	>100 g/L
0-2 years	-	21	72	27	10
2-5 years	-	12	60	33	2
5-10 years	1	2	26	16	15
+ 10 years	1	4	25	11	6

Figure 12.7 Example of a monthly summary sheet for laboratory tests