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# LABORATORY HANDBOOK



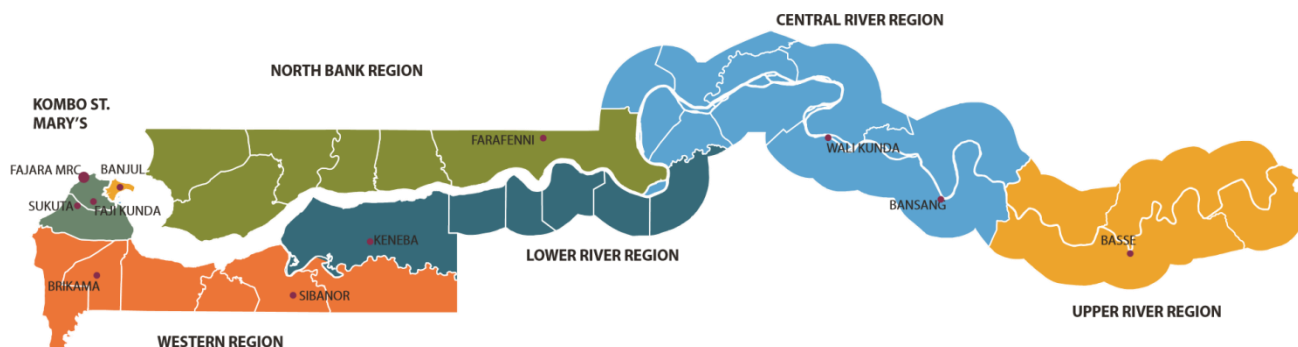
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## 1. GENERAL INFORMATION

### 1.1. Where to find us



The Medical Research Council Unit The Gambia (MRCG) has its headquarters at Fajara, two major field stations in the provinces at Basse and Keneba, and a small site for entomological studies at Walikunda. Work at the field stations is mainly research but each station provides minimal clinical service to the staff as well as a small number from the community. Where there is a government health facility nearby, as in Basse, MRCG doctors run clinics in these facilities so that they contribute to national health care delivery whilst screening for subjects to participate in MRCG projects. The unit also operates from Sukuta Health Centre, Faji Kunda Health Centre and Sibanor Health Centre, Serekunda Health centre, Jammeh Foundation for Peace Hospital, and Edward Francis Small Teaching Hospital, in partnership with the Department of State for Health and Social Welfare.

Where research in the field stations is usually limited to one or two disease categories, the headquarters in Fajara is much larger and its research portfolio covers three themes, namely: Disease Control and Elimination, Vaccines and Immunity, and Nutrition. There is also a much larger clinical service department consisting of a ward, out-patients and diagnostic laboratory facilities.

The Fajara site is easily accessible from all nearby towns on public transport. There are two main gates: the one on Atlantic Boulevard can be used by staff and the general public who have normal business at the site; and the other, a new gate accessed from the Bakau Newtown Highway. This new gate can be used by staff but particularly by those attending the out-patients clinics. Both gates are controlled by security personnel who will be able to direct you appropriately.

### 1.2. Physical Address

Medical Research Council Unit The Gambia  
Atlantic Boulevard  
Fajara  
The Gambia

### 1.3. Postal Address

Medical Research Council Unit  
P.O.Box 273, Banjul  
The Gambia

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#### 1.4. Telephone (Switchboard)

**Tel:** +220 4495442/6 or 4494072/ 9

**Fax:** (Administration) +220 4495919

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#### 1.5. Email Enquiries

**General:** communications@mrc.gm

**Human Resource Office:** hr@mrc.gm

**Clinical Laboratories:** clinicallab@mrc.gm

**Serology Laboratory:** serologylab@mrc.gm

**TB Laboratory:** tbdiagnostics@mrc.gm

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#### 1.6. Opening Hours

Mondays to Thursdays: 08:00 to 16:15

Fridays: 08:00 to 12:30

Saturdays and Public Holidays: 09:00 to 12:00 noon (Not applicable to Serology and TB diagnostics laboratory)

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#### 1.7. Routine Clinical Service

The Clinical Laboratories, TB Diagnostics and Serology laboratory provide diagnostic services for the daily management of patients seen at the clinical service departments (TB clinic, Ward, Out Patients Department and Gate Clinic). The ward has a forty-eight bed capacity (20 children, 12 adult male, 12 adult female, 2 isolated rooms and 2 cots).

#### 1.8. Project Based Service

The Clinical Laboratories, TB Diagnostics and Serology laboratory receive samples from projects/ clinical trials for baseline laboratory data. These samples are collected either in the clinics within the Fajara site or in the field. A robust sample management system is in place to ensure the proper transport of these samples to the laboratory with minimal delay.

#### 1.9. Private Service

The Clinical Laboratories, TB Diagnostics and Serology laboratory receive samples from a number of private, non-governmental organizations, and public health institution like Edward Francis Small Teaching Hospital.

## 2. USE OF THE LABORATORIES

### 2.1. Specimen Containers

All specimen containers must have leak-proof caps, preferably screw caps that do not require a liner.

## Microbiology



Pots used for the collection of faeces and sputum samples. These have a wide mouth.



These are sterile containers for the collection of **urine, pus** and other **fluids from sterile sites** such as joints and spinal cords.



Sterile swabs used for the collection of exudates from wounds



BD BACTEC Plus Aerobic/F and Plus Anaerobic/F media are used in a qualitative procedure for the aerobic and anaerobic culture and recovery of microorganisms (bacteria and yeasts) from blood.



BACTEC culture vials type PÈDS PLUS/F are for aerobic cultures and are used in a qualitative procedure for the culture and recovery of aerobic microorganisms (mainly bacteria and yeasts) from paediatric and other blood specimens which are generally less than 3ml in volume.

## Serology



This plain vacutainer is used for HIV and Syphilis serology



This serum separator vacutainer is used for HBV profiling

## TB Diagnostics



Mycobacteria Growth Indicator Tube (MGIT) 7ml for the culture of mycobacteria. The BACTEC MGIT Growth Supplement is added to each MGIT tube to provide substances essential for the growth of mycobacteria.



#### Gastric Lavage Container



Sterile container with 100 mg of Sodium carbonate for Gastric lavage samples

#### Biochemistry



This vacutainer (serum separator tube) is used mostly for clinical chemistry and immunochemistry tests



Only used for CSF and Blood Glucose analysis (Sodium fluoride tube)



This Sterile tube is Used for Urine and other Body fluids; chemistry analysis



This Ethylenediaminetetraacetic Acid (EDTA) vacutainer tube is used only for HbA1C – Immunochemistry

## Haematology



This Ethylenediaminetetraacetic Acid (EDTA) vacutainer tube is used for full blood counts and other haematological investigations



This vacutainer is used for coagulation studies such as Prothrombin Time (PT) & Partial Thromboplastin Time (PTT)



This Ethylenediaminetetraacetic Acid (EDTA) microtainer tube is used for full blood counts and other haematological investigations when only small volume of blood is collected Other Special Requests



This vacutainer is used for protein analysis and cross match or compatibility tests.



This Sodium citrated tube is used for Erythrocyte sedimentation rate (ESR)

#### ORDER OF DRAW

1. Blood Cultures tubes
2. Citrated tubes for coagulation studies
3. Serum separator tubes
4. EDTA tubes
5. ESR tubes

#### 2.2. Completing the Request Form

The request form which serves as the service agreement between the lab and the client, is an authorization that a lab requires to perform testing. Just as a clinician needs specific and critical information from a patient's history to formulate a diagnosis, the lab needs specific and critical information from the physician regarding the patient. The provision of this information is the purpose of the laboratory request form. Everything the laboratory does in order to analyse the specimen depends on the information included on the request form. The less information there is on the form regarding the patient and the specimen, the more difficult it is to accurately interpret; especially microbiology cultures results, and relate the results to patient's care and treatment. The request form, therefore, is the direct means of communication between the clinician requesting for the investigations and the laboratory personnel. The request form must be completed legibly with all relevant information including (please see the laboratory request form for more details):

- Full Name of Patient (Note: not required for clinical trial or project samples)
- Patient Date of Birth (or Age) and Sex
- MRCG/Study Number
- Charge Code (if applicable)

- Date & Time sample taken
- Nature of Specimen
- Tests Requested (individually identified in the boxes provided)
- Suspected Diagnosis
- Requesting Doctor's Name, Signature, Extension Number
- Origin/Source of Request (Ward/OPD/Special Clinics/Private Clinics)

The specimen must bear some information about the patient, exactly similar to those on the request form:

- Full Name of Patient (Note: not required for clinical trial and project samples)
- Date of Birth (or Age)
- \* MRC/Study Number
- \* Date & Time sample taken
- Nature of specimen

In addition, for Microbiology requests, it is essential to state antimicrobials used, date of onset of infection, and date of hospital admission for enteric investigations. All of these are necessary to ensure appropriate tests are carried out and that staff are protected.

\* Minimum information required on the request form

### 2.3. Specimen Types, Collection & Labelling

Blood is almost the exclusive specimen collected for investigations in Haematology, Serology and Biochemistry laboratories; as whole blood either in anticoagulants to prevent blood from clotting or in plain/serum separator vacutainer tubes from which serum is collected after centrifugation. Specimens for Microbiology investigations are many, as other types can be collected from various anatomical sites such as urine, faeces, sputum, swabs, fluids such as ascitic, synovial and cerebrospinal fluid.

Most times, it is usually impracticable to transport patient on admission or research subject to the laboratory. So, specimens are collected from the patient in the ward or from study sites and sent to the laboratory. Obtaining the specimen is the clinician's or nurse's responsibility but when a patient is asked to collect a specimen (e.g. of urine or sputum), clear instructions must be given. It is of fundamental importance to recognise that a laboratory diagnosis is only as reliable as the quality and integrity of the specimen on which it is based.

Whether data are to be used for diagnosis, management, and screening or for any other purpose, it is essential that they are appropriate, reliable, and available on time to be of use and interpreted correctly. The achievement of this goal requires careful attention to every step in the process from the ordering of the investigation, through collection of the specimen(s) required, their transport to the laboratory and analysis, to the delivery of a report to the clinician.

#### 2.3.1. Blood Specimens

Blood constitutes the main specimen analysed in Biochemistry, Serology and Haematology, either whole or separated (serum/plasma). The Microbiology laboratory examines blood as well as many other different specimens. Blood must be collected with care and adequate safety precautions observed to ensure test results are reliable, contamination of the sample is avoided and infection from blood transmissible pathogens is prevented. Personnel Protective Equipment (PPE) should be worn when collecting and handling blood samples. Lancets, needles, and syringes must be sterile, and dry, and blood collecting materials must be discarded safely to avoid injury from needles and lancets.

Venous blood should ONLY be collected by professional who have been adequately trained in the procedure.

##### 2.3.1.a. Capillary blood

Capillary blood is mainly collected when the patient is an infant or young child and the volume of blood required is small, e.g. Packed Cell Volume (PCV) measurement and to make thick and thin blood films. Thick films for malaria parasites are best made from capillary blood (anticoagulated blood is more easily washed from slides during staining).

Capillary blood can be collected from the 'ring' finger of a child or adult or the heel of an infant up to one year old.

### **2.3.1.b. Venous blood**

Venous blood is collected when more than 100µl of blood is required or when serum from a clotted sample is needed. Venous blood is preferable to capillary blood when the patient is an adult and several tests are required.

#### **2.3.1.1. Blood cultures**

The specimen must be collected using sterile techniques to reduce the chances of contamination. The recommended specimen volume for the BACTEC Plus Aerobic/F and Plus Anaerobic/F vials is **8 – 10ml**. It is recommended that the specimen be inoculated into the BACTEC vials at the bedside. Sample volumes as low as 3ml can be used, however, recovery will not be as great as with larger volumes. The range of blood volume which can be cultured with the BACTEC PÈDS PLUS/F vials is **0.5 – 5.0ml**. The inoculated BACTEC vials should be transported to the laboratory at room temperature as quickly as possible and if this is not possible, it is recommended that vials are placed in a 37°C incubator.

It may be best to take blood at times when the patient's temperature is rising, as this is the time at which the number of bacteria in the blood is likely to be high.

#### **2.3.1.2. Anti-Coagulated Blood**

Anticoagulated blood is collected for most haematology investigations. Whole blood is collected into vacutainer vials containing an anticoagulant.

EDTA anticoagulated blood can be used for most haematology tests but is not recommended for coagulation tests. The correct amount of blood must be added to EDTA to prevent blood cell changes. Excess EDTA causes shrinkage and degenerative changes.

Trisodium citrate is used with samples for measuring Erythrocyte Sedimentation Rate (ESR) and in coagulation tests.

Heparin anticoagulant is mainly used for clinical chemistry tests when plasma is required. It is not recommended for routine haematological tests because it causes cells to clump and heparin gives a blue background to blood films.

#### **2.3.1.3. Clotted blood**

Clotted venous blood is collected when serum is needed, e.g. for compatibility tests, antibody tests or in most clinical biochemistry and immunochemistry investigations.

**NOTE:** Refer to Section 2.1 (Specimen Containers) for a guide to selecting the right container for the right type of blood sample.

### **2.3.2. Urine Collection**

All urine specimens are normally collected in a sterile universal container except for 24-hour urine which is collected in a large, 2.5 litres tinted Winchester container. After collection of the urine specimen into the container, the lid must be secured tightly.

#### ***Urine for mycobacterial culture***

Container: Sterile tube or container, no preservative

Early morning urine is collected from patients with suspected TB renal disease for 3 days in a row. 24 hour urine collections are not recommended. Unless processed immediately, urine specimens should be refrigerated.

#### **2.3.2.1. Random Urine**

Random collection of urine taken at any time of the day with no precautions regarding contamination may be hypotonic, isotonic, or hypertonic and may contain white cells, bacteria and squamous epithelium cells as contaminants. In females, the specimen may contain vaginal contaminants such as trichomonas, yeasts, and during menses, red cells.

#### **2.3.2.2. Early Morning Urine (EMU)**

Early morning collection of urine before ingestion of any fluid is usually hypertonic and reflects the ability of the kidney to concentrate urine during dehydration, which occurs overnight. If all fluid ingestion has been avoided since 6 p.m. the previous day, the specific gravity usually exceeds 1.022 in healthy individuals. This is the appropriate sample when investigating extra-pulmonary tuberculosis.

#### **2.3.2.3. Clean-Catch or Mid-Stream Urine (MSU)**

Clean-catch, midstream urine specimen is collected after cleansing the external urethral meatus. A midstream urine is one in which the first half of the bladder urine is discarded and the container is introduced into the urinary stream to catch the last half. The first half of the stream serves to flush contaminating cells and microbes from the outer urethra prior to collection.

#### **2.3.2.4. 24- Hour Urine**

08:00 am – Empty bladder and discard urine. Using a 2.5litre container, start the 24-hour collection (save every drop of urine). Finish the 24-hour collection at 08:00 am the next morning by emptying bladder into the container.

### **2.3.3. Body Fluids**

All body fluids like aspirates, high vaginal or endocervical swabs, Cerebro-Spinal Fluid are perishable and immediate delivery to the laboratory is recommended. Always use aseptic technique for collection of aliquots.

### **2.3.4. Swabs**

Swabs are used to collect material for microbiological examinations; at wound sites, genital areas, ears, eyes, throat, etc. Whenever pus is present in sufficient amount, it should be collected in a universal container using a syringe and needle. Swabs are not recommended for TB diagnosis.

### **2.3.5. Faecal Specimens**

Faeces are collected into a screw-capped, watertight container and it is important not to over fill as this is hazardous to both the nurses doing the collection as well as laboratory attendants and laboratory staff involved in handling the specimen. From young children and other patients from whom there is difficulty in obtaining a faecal specimen uncontaminated with urine, a swab inserted into the rectum may be adequate.

### **2.3.6. Sputum**

Sputum is the commonest specimen obtained from the lower respiratory tract. Ideally it is coughed up from far down the bronchial tree, expectorated immediately with minimal contamination from the throat and mouth, and delivered to the laboratory without delay.

### **2.3.7. Seminal Fluid**

A semen analysis evaluates certain characteristics of a male's semen and the sperm contained in the semen. It is the initial step in investigating infertility. Abnormalities of sperm and semen can result in infertility.

Note: Patient should abstain from sex for at least 5 days prior to sample collection and to avoid excess alcohol intake.

Refer patients to microbiology laboratory for further instructions.

The table below summarizes the required specimen type and tests for each of the laboratories.

Laboratory	Specimen type	Required Tests
Haematology	Capillary blood	Full Blood Count (FBC), PCV and malaria microscopy
	EDTA-anticoagulated blood	All routine tests except coagulation tests and ESR.
	Tri-sodium citrate anti-coagulated blood	ESR and coagulation tests
	Clotted venous blood	Compatibility tests and Venereal Disease Research Laboratories (VDRL) and Human Immunodeficiency Virus (HIV) screening for blood donors
Biochemistry	Clotted venous blood	Clinical chemistry and immunochemistry tests as indicated in sections 3.1 & 3.2 below
	Random urine	HCG or protein tests
	Unclogged venous blood (sodium fluoride sample)	Clinical Chemistry test (Glucose)
	24 hour urine	Protein test
	CSF	Protein & Glucose tests
	Pleural/ Ascitic fluids	Protein test
Serology	Venous blood	All serological tests as indicated in section 3.5
Microbiology	BACTEC blood culture bottles	Isolation of invasive bacteria/fungi
	Mid-stream urine	Isolation of bacteria/fungi and detection of parasites
	Body fluids like high vaginal or endocervical swabs, etc	Isolation of bacteria/fungi and detection of parasites.
	Stool	Detection of parasites and isolation of bacteria (Salmonella and Shigella and helminths like Strongyloides
	Seminal fluid	Semen analysis and isolation of bacteria
	CSF	Isolation of invasive bacteria/fungi
TB Diagnostics	Refer to section 3.6 for details	Isolation of Mycobacteria

### 2.3.8. Standard Precautions & Minimum Requirements

It is important that the person responsible for collecting the specimen ensures that all collection conditions are met. Of particular significance are those tests in relation to timing, fasting conditions and drug use, to mention but a few.

Note: Significant sources of analytical variation may be introduced by failing to adhere to recommended collection conditions. Such variation may not be apparent to the laboratory and can lead to the issuing of misleading result data. Also in order to obtain valid results, in addition to the above, your attention is drawn to the following:

- Observe the correct tube draw order

- Mix all blood tubes accordingly
- Always avoid prolonged venous stasis when drawing blood
- Always avoid contamination of the sample with IV fluids
- Never mix blood from one specimen container with another e.g. transferring blood from one container to another
- Ensure the appropriate sample is sent to the labs
- Ensure the sample volume is adequate (generally the more the better)
- Always dispatch the specimen to the laboratory or collection point promptly

**CAUTION!** Failure to adhere to the above conditions may lead to erroneous results that could cause patient harm.

First and foremost, for anyone handling biological samples is an absolute requirement to regard all biological samples as hazardous and strict guidelines must be followed:

- Do not contaminate the form with the sample, especially during sample collection
- Ensure that the container is securely sealed, that it is not broken/leaking
- Use the appropriate plastic specimen bag, sealing the top securely
- All specimens must be regarded as potentially infectious

Since laboratory personnel are at risk of hazards associated with handling chemicals and biological specimens, only request those tests which are really necessary. Please consult the laboratory supervisor for guidance.

## **2.4. Specimen Transport to the Laboratory**

Specimens should be transported to the laboratory within 2 hours of collection in an appropriate container, either at room temperature or at 2°C - 8°C. Some samples (e.g. urine, sputum) provide a good medium for growth of non-fastidious bacteria and fungi, so organisms may multiply during the time between collection and cultivation in the laboratory, giving falsely high results in quantitative cultures. In other specimens (e.g. throat swabs, urethral swabs) delicate organisms such as *Neisseria* species survive poorly. The laboratory receives specimens from a number of sources, both within the site as well as from private or NGO clinics.

### **2.4.1. Normal Specimens during Working Hours**

Between 08:00hrs and 15:00hrs, a laboratory attendant visits the ward and out-patients three times, Mondays to Thursdays, collects specimens at these sites and delivers them to the sample reception at clinical laboratory for processing.

The three collection times are (Monday – Thursday):

09:00 hrs, 12:00hrs and 14:00hrs

On Fridays, there are only two collections done by the laboratory attendants as follows: 09:00 hrs and 11:00hrs

2.4.1.1. Also during the whole of the day from Mondays to Fridays, ward attendants deliver specimens to the laboratories after the laboratory attendant has done the above timed collections. A window through which these samples can be delivered is provided in the sample reception. Specimens delivered here are received by a laboratory technician, checked for suitability for processing, logged and distributed to the respective laboratory.

2.4.1.2. The Gate Clinic requests for packed cell volume (PCV) analysis and malaria blood film (BF) examination as a screening for the large number of patients they see daily. These patients report to the phlebotomy room for a finger prick sample to be taken. The samples are transported to the Haematology laboratory by a laboratory technician.

### **2.4.2. Urgent Requests during Working Hours**

A ward attendant should bring all urgent samples from the ward or any of the clinics to the laboratory for processing, e.g. CSF, cross match blood sample, blood film or haemoglobin request, and HIV request following a needle prick injury. This is directly received by the laboratory staff, logged into the Laboratory data entry database and processed immediately. The result is communicated back to the requesting clinician. This is done by either returning the completed form (all examinations completed) or a copy of the request form with the results so far obtained.



### 2.4.3. Out Of Working Hours

Please refer to the table in section 2.4.4 below for general guidance on sample transport, stability and storage. However, note that some specialized tests like Testosterone have particular collection requirements which fall outside the scope of this generalised document and you can contact the laboratories (4494072/9 ext 1918) for advice.

Again, it is very important to collect a good specimen and get it to the laboratory in good condition and time.

### 2.4.4. Sample Stability and Storage

Sample Stability and Storage			
<i>Any non-urgent specimens collected/received late, out of normal working hours or at weekends will be appropriately processed and stored as detailed below.</i>			
Department	Sample type	Storage	Stability
Biochemistry	ALL	Send to clinical laboratories. Spin and store serum separator tube (SST) vacutainer upright at +4°C.	Processed within 48 hours of collection.
Haematology	ALL	Send to clinical laboratories Store @ 2-8°C	Processed within 4 hours of collection.
Microbiology	Blood cultures	Send to clinical laboratories. Do not refrigerate.	Processed within 4 hours of collection.
	Genital swab	Incubate @ 37 °C	
		Contact laboratory for agar plate prior to specimen collection for immediate inoculation.	Required urgently.
	Cerebrospinal fluids (CSF)	Send to clinical laboratories immediately.	Required urgently. Processed within 2 hours preferable an hour  (Ideally inform laboratory staff prior to taking sample).
	Wound, ear, pus swabs, eye swabs and other aspirates.	Store at room temperature. Do not refrigerate.	Required urgently.
	Lung aspirates, pleural aspirates, etc.	Do not refrigerate. Store in ward incubator or room temperature.	Required urgently.  (Ideally inform laboratory staff prior to taking sample).
	All other specimens	Store @ 4°C	Stable for 24 hours.
	Urine specimens	Send to clinical laboratories immediately.	Required urgently if possible; otherwise keep at 4°C.

### 2.4.5. Private Patient's Specimens

Non MRC specimens for laboratory investigations are normally delivered to the clinical laboratories by an employee of the concerned clinic and it is also their responsibility to collect completed results. Occasionally, a private patient delivers

their specimen directly to the laboratory and this should be done at the specimen reception room through the window provided for this purpose. Requests from private patients must be accompanied with a receipt before a sample can be collected or processed.

NOTE: Any person delivering samples to sample reception should wait for the receptionist to check for sample integrity before leaving.

### 3. TABLES OF EXAMINATIONS

The following tables are structured according to laboratories, and contain the name of the test, specimen type, specimen tube/container required, volume and the expected turnaround time (TAT). Reference intervals are provided with the results.

By its nature, the handbook is unable to provide details of all the services and analytes offered by each laboratory. Senior laboratory staff are however always happy to discuss the changing requirements of clinical users and to advice on the most appropriate choice of investigations.

Test/Analyte	Specimen Type	Tube/Container	Volume (ml)*	TAT ( urgent )
3.1 Biochemistry (Clinical Chemistry)				
ELECTROLYTES PR OFILE			2mL	2 hours
Sodium	Whole blood	5ml Gel separation BD vacutainer ( Gold top )		
Potassium				
Chloride				
RENAL PROFILE			2mL	2.5 hours
ECO2 (Bicarb)	Whole blood	5ml Gel separation BD vacutainer ( Gold top )		
Urea				
Creatinine				
Glucose (Fasting – more than 8 hours)	Whole blood	Sodium Fluoride BD vacutainer ( Gray top )	2ml	2 hours
Test/Analyte	Specimen Type	Tube/Container	Volume (ml)*	TAT ( urgent )
Glucose (Post Prandial)	Whole blood	Sodium Fluoride BD vacutainer ( Gray top )	2mL	2 hours
LIVER PROFILE			3mL	3.5 hours

Aspartate (AST)	Whole blood	5ml Gel separation BD vacutainer ( Gold top )					
Alanine (ALT)							
Alk. Phosphatase							
Total Bilirubin							
Conj. Bilirubin							
GGT							
Protein, Total							
Albumin							
Globulin							
PANCREATIC PRO FILE			1.5mL	2.5 hours			
Amylase	Whole blood	5ml Gel separation BD vacutainer ( Gold top )					
Lipase							
CARDIAC MARKERS PROFILE			2.0mL	2.5 hours			
Creatinine Kinase	Whole blood	5ml Gel separation BD vacutainer ( Gold top )					
CKMB							
%MB							
LDH							
LIPID PROFILES			2.0mL	3 hours			
Cholesterol, Total	Whole blood	Gel separation BD vacutainer (Gold top)	5ml	< 5.2			
Triglycerides				< 1.69			
Cholesterol, HDL				> 1.03			
Cholesterol, LDL				< 3.4			
Cholesterol, VLDL							
BONE PROFILE			1.5mL	2.5 hours			
Calcium	Whole blood	Gel separation BD vacutainer (Gold top)	5ml	2.10 – 2.55			
Magnesium				0.7 – 1.0			
Phosphorus				0.81 – 1.45			
			1.0 mL				
Iron	Whole blood	5ml Gel separation BD vacutainer ( Gold top )		30 mins			

Test/Analyte	Specimen Type	Tube/Container	Volume (ml)*	TAT ( urgent )
3.1 Biochemistry (Clinical Chemistry) Cont'd.				
CSF PROFILE	1.0mL			2 hours
Protein (CSF)	CSF			
Glucose (CSF)				
Protein (Urine)	Urine			
Lactate	Whole blood	5ml Gel separation BD vacutainer ( Gold top )	1.0 mL	
INFLAMMATION MARKERS PROFILE			2.0mL	3 hours
Uric Acid / Urate	Whole blood	5ml Gel separation BD vacutainer ( Gold top )		
RA Test				
CRP				
HCG	Urine	Universal	1.0mL	1.5 hours

\* A minimum of 3ml of whole blood is sufficient for a typical clinical chemistry request.

TAT for routine clinical chemistry test(s) is within 24 hours except non-working days.

PLEASE NOTE THAT SOME ANALYTES DO HAVE OVERLAPPING FUNCTIONS IN OTHER PROFILES.

Test/Analyte	Specimen Type	Tube/Container	Volume ( ml )*	TAT
<b>3.2 Biochemistry (Immunochemistry )</b>				
	Whole blood	5ml Gel separation BD vacutainer ( Gold top )	5.0 mL	
tPSA				
fPSA				
PSA ratio				
Testos (male)				
Testos (female)				
Troponin I				
TSH (3 <sup>rd</sup> Gen)				
fT3				
fT4				

\* A minimum of 3ml whole blood is sufficient for a typical immunochemistry request.

A typical immunochemistry request will take a minimum of 24hrs and maximum of 7 days to complete. These requests are processed once a week (Wednesdays only) and results are completed and released on Thursdays.

Test/Analyte	Specimen Type	Tube/Container	Volume (ml)	TAT ( urgent )
<b>3.3 Haematology</b>				
Full Blood Count (FBC)	Whole Blood	K <sub>3</sub> -EDTA vacutainer purple top / Microtainer	3ml 0.5 ml	60 mins
Haemoglobin				
Total WBC				
Differential WBC				
Normoblasts				
RBC				
PCV (HCT)				
MCV				
MCHC				
Platelets				
Malaria microscopy				60 mins
Sickle Test				60 mins
HB Genotype				1 Week
Blood Group				30 mins
Retics				60 mins
ESR				120 mins
Direct Coombs Test				60 mins
Blood film comments				120 mins
Cross matching of Blood				120 mins
Test/Analyte	Specimen Type	Tube/Container	Volume (ml)	TAT ( urgent )
<b>3.3 Haematology - Clotting Studies</b>				
	Whole Blood	Na-Citrate vacutainer blue top	4.5 ml	
Prothrombin Time (PT)				30 mins
INR				
Activate Partial Thromboplastin Time (aPTT)				30 mins

Test/Analyte	Specimen Type	Tube/Container	Volume (ml)	TAT
3.4 Clinical Microbiology				
Miscellaneous Specimens				
Microscopy Culture* and Sensitivity	Blood	One BD Blood Culture Set (1 Aerobic and 1 Anaerobic) – Adults.	8 –10ml per bottle (minimum 3ml)	48 hours ( Majority ) 7 days
		Paediatrics BACTEC PEDS/F	3-5ml (Minimum 1 ml)	48 hours ( Majority ) 7 days
	Cerebrospinal Fluid	Sterile universal container	> 1ml	4 hours (Microscopy + Antigen) -48 hours (Culture & Sensitivity)
	Ascitic Fluid	If inoculated into b/c medium, same as for Blood Cultures	> 1ml	48 hours ( Majority ) 7 days
		Sterile universal containers	> 1ml	4 hours ( Microscopy ) 3 days (Culture & Sensitivity)
	Pericardial/ Pleural/Joint fluids & Aspirates	Sterile universal container	> 1ml	4 hours ( Microscopy ) 3 days (Culture & Sensitivity)
	Swabs	Plain Transport Swabs	NA	3 days
	Pus	Sterile universal container	NA	4 hours ( Microscopy ) 3 days (Culture & Sensitivity)
	Tissue samples	Sterile universal container (if sample is small or likely to dry out, add a small volume of sterile saline)	NA	4 hours ( Microscopy ) 3 days (Culture & Sensitivity)

\* Preliminary results can sometimes be obtained after 48 hours

Test/Analyte	Specimen Type	Tube/Container	Volume (ml)	TAT
3.4 Clinical Microbiology Cont'd.				
Miscellaneous Specimens Cont'd.				
Microscopy Culture* and Sensitivity	Sputum	Sterile pots (wide mouth)	> 1ml	3 days (Routine ) 10 days (Fungal )
	Faeces	Sterile pots (wide mouth)	NA	24 hours ( Microscopy ) (3 days Culture & Sensitivity)
	Semen	Sterile universal container	> 1ml	4 hours
Genito-Urinary				
Microscopy, Culture* and Sensitivity	Urine	Sterile universal container	3 – 5 ml	4 hours (Microscopy)3 days
HVS, Cervical / Male urethral swabs	Plain swabs, Preinoculated TM plates	NA	4 hours (Microscopy)3 days	NA
Enteric / Parasitology				
Ova, Cysts & Parasites	Faeces	Sterile pots (wide mount)	NA	24 hours
	Hot stool – by arrangement	Sterile pots (wide mount)	NA	4 hours
Mycology				
Investigation of Routine Mycology Samples	Nail clippings, Skin scrapings, Hair roots	Sterile universal container	NA	5 days

\* Preliminary results can sometimes be obtained after 48 hours

NOTE: Refer to the laboratory forms and printouts for reference ranges.



Test/Analyte	Specimen Type	Tube/Container	Volume ( ml )	TAT
<b>3.5 . Serology</b>				
HIV	Venous blood	Plain vacutainer (Red top)	2.0mL	7 days
Rapid Plasma Reagin (RPR)/ <i>Treponema pallidum</i> Haemagglutination Assay (TPHA)	Venous blood	Plain vacutainer (Red top)	2.0mL	48 hours
Hepatitis B surface antigen (HBsAg)	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	48 hours
*Hepatitis B surface antibody (Anti-HBs) - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI
*Total Hepatitis B core antibody (AntiHBc) - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI
*Hepatitis B e antigen (HBeAg) - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI
*Hepatitis B e antibody (Anti-HBe) - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI
*Coxiella burnetii Phase II IgG/IgM - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI
*Multiplex immunoassay for diphtheria, tetanus and pertussis - RESEARCH	Venous blood	5ml serum separator vacutainer (Gold top)	2.0mL	To be agreed with requesting PI

\*Test not part of Serology's scope for ISO 15189:2012 accreditation

3.6 TB Diagnostics				
Specimen for TB microscopy and culture		Tube/ container	Volume /mL	
Sputum		Sterile/clean	5-10. Smaller quantities are acceptable if the quality is satisfactory	
Induced sputum		Sterile container	2-5	
Gastric lavage		Sterile container with 100 mg of Sodium carbonate	2-5	
Cerebrospinal fluid		Sterile container	Adult	1.5 - 2.5
			Adolescent	1.5 - 2.5
			Young Child	1.5 - 2.5
			Infant	1.5 - 2.5
			Term Neonate	1.5 - 2.5
Urine for mycobacterial culture		Sterile container	15-20 mls early morning urine. Keep specimen refrigerated until transport	
Bronchial washing		Sterile container	2-5	
Bronchial brushing		Sterile container	2-5	
Mycobacterial blood culture		Myco/F Lytic	1-5 for children and 10 for adults	
Pleural fluid		Sterile container	1-2	
Pericardial fluid		Sterile container	1-2	
Synovial fluid		Sterile container	1-2	
Ascitic fluid		Sterile container	1-2	
Pus		Sterile container	1-2	
Peritoneal fluid		Sterile container	1-2	
Lung Aspirate		Sterile container	1-2	
Biopsied tissue		Collected into sterile container without fixatives or preservatives		
Test		Turnaround time		
Smear microscopy		≤48 hours from receipt in laboratory		
Culture from date of culture request				
Solid culture		8-10 weeks (Negative culture held for 8 weeks )		
Liquid culture		6-8 weeks		
DST First - line drug from date of request				
Solid culture Liquid culture		3-4 weeks		

	1-2 weeks
Test	Turnaround time
MDR -TB diagnosis from date of request	
Solid culture	After 9-12 weeks
Liquid culture	After 3-4 weeks
MDR-TB diagnosis using Line probe (MTBDRplus) assay from date of request.	After 1-2 days
XDR-TB diagnosis from date of request	
Liquid culture	1-2 weeks
XDR-TB diagnosis using Line from date of request probe (MTBDRsl) assay.	After 1-2 days
Special tests from date of request	
Spoligotyping	After 3-5 days
GeneXpert MTBC/RIF	1-2 days

#### 4. ACCEPTANCE AND REJECTION

##### 4.1. Acceptance criteria for Serology

The following criteria are prerequisites for samples to be accepted:

- Clearly labelled serology request form or sample container.

- Same name/sample ID/MRC number on serology request form and sample container.
- Specification of sample type/source.
- Use of an appropriate sample container.
- Non-leaking sample.
- Sufficient sample to perform test.
- Non-haemolysed sample or unclotted sample.

#### 4.2. Rejection criteria for Serology

Samples will be rejected for the following reasons:

- No label on serology request form or sample container.
- Different names/sample ID/MRC number on serology request form and sample container.
- No specification of sample type/source.
- Use of an inappropriate sample container.
- Leaking sample.
- Insufficient sample.
- Grossly haemolysed sample or clotted sample.

A laboratory technician will assess whether, depending on the reason for sample rejection, the sample can still be processed following a correction or whether another sample is required. The laboratory technician must liaise with a senior member of the laboratory if there are doubts in making the right decision.

#### 4.3. Acceptance criteria for TB Diagnostics

The following criteria are prerequisites for samples to be accepted:

- There is patient name or unique identifier on specimen container
- Specimens labelled with correct patient identification
- Specimens match patient information on the laboratory requisition
- Smaller quantities are acceptable if the quality is satisfactory
- Gastric lavage in a sterile container with 100 mg of Sodium carbonate
- Biopsied tissue collected into sterile container without fixatives or preservatives

#### 4.4. Rejection criteria for TB diagnostics

Samples will be rejected for the following reasons:

- There is no patient name or unique identifier on specimen container
- Specimens labelled with the incorrect patient identification.
- Specimens, that do not match the patient information on the laboratory requisition.
- (These specimens may be accepted after responsible individual according to the protocol makes proper identification for "Identification of Specimens" located in the Specimen Collection Manual )
- There is apparently no specimen in container
- Have no collection date/time indicated
- Insufficient specimen to perform testing
- Specimen is too old when received
- Specimens which are obviously or subsequently proved to be contaminated.
- Swabs for Acid Fast Bacilli (AFB) cultures
- Specimens leaking or grossly contaminated on the exterior portion of container
- Gastric sample in ordinary sterile container
- Biopsied tissue collected into sterile container with fixatives or preservatives

#### 4.5. Acceptance Criteria for Clinical Labs

The following criteria are prerequisites for samples to be accepted:

- Clearly labelled/completed request forms (haematology, chemistry and microbiology) and sample container.
- Same name and/or MRC number on request form and sample container.
- Specification of sample type/source.
- Use of an appropriate sample container.

- Non-leaking sample.
- Sufficient sample to perform test.
- Non-haemolysed sample or unclotted sample.

#### 4.6. Rejection Criteria for Clinical Labs

Sample(s) received in the clinical laboratories sample reception room will be rejected under the following circumstances:

- Container not labelled at all;
- an inappropriate sample container has been used;
- a leaking sample;
- haemolysed blood sample;
- anti-coagulated blood sample that contains clots
- no detailed information on the request form
- no indication of sample type/ source;
- The use of the wrong version of the request form
- different names and/or MRC number on request form or sample container
- CSF sample received after 2 hours of collection

Based on the reason for sample rejection, sample receptionist can decide whether the sample can still be processed following a correction or whether another sample is required. Refer to a more senior member of the laboratories if you are unsure of the right course of action.

#### 5. FINAL NOTES

List of factors known to significantly affect the performance of the examination or the interpretation of the results

- **Biochemistry:** Haemolysis, grossly lipaemic, clotted samples received after 24 hours of collection, bloody CSF, certain drugs, none-heparinised plasma, fibrin clots, prolong tourniquetion, highly icteric, more than 1800 meters above sea level and specimen drawn from an arm receiving an intravenous transfusion.
- **Haematology:** Clots in EDTA sample, haemolysed sample, and sample received after 48 hours of collection and inappropriate ratio of blood and anticoagulant for INR test.
- **Microbiology:** CSF samples received after 2 hours of collection, urine samples received after 24 hrs.
- **Serology:** Samples grossly haemolysed, lipaemic or clotted.

Availability of clinical advice on ordering of examinations and on interpretation of examination results

Clinical laboratories' Manager is available to give advice on tests availability, test ordering and interpretations. He can be contacted on 00220 4495442/6 Ext 2125; respective laboratory Heads (Biochemistry, Haematology and Microbiology) can also be reached on Ext 1918.

Likewise, Serology Laboratory Manager - Ext 2116, 5011 and TB Diagnostics; 2103, 2144.

The Unit has arrangements with referral laboratories to ensure continuous delivery of services in case of unforeseen circumstances such as instrument failures.

