

Laboratory safety

Medical laboratory science professionals (also called clinical laboratory scientists or clinical laboratory technicians) are highly skilled scientists who discover the presence or absence of disease and provide data that help physicians determine the best treatment for the patient. Although they are not often personally involved with patients, medical laboratory scientists and technicians play a crucial role in the process of providing personalized care. They generate vitally important data for identifying and treating cancer, heart disease, diabetes and many other health conditions. Using sophisticated biomedical instrumentation and technology, as well as highly skilled manual techniques, clinical laboratory professionals:

- Examine and analyze body fluids, tissues and cells
- Identify infective microorganisms
- Analyze the chemical constituents of body fluids
- Identify blood-clotting abnormalities
- Cross-match donor blood for transfusions
- Test blood for drug levels to measure the efficacy of particular treatments
- Evaluate test results for accuracy and help interpret them for the physician

Personal protection

1. Laboratory coveralls, gowns or uniforms must be worn at all times for work in the laboratory.
2. Appropriate gloves must be worn for all procedures that may involve direct or accidental contact with blood, body fluids and other potentially infectious materials or infected animals. After use, gloves should be removed aseptically and hands must then be washed.
3. Personnel must wash their hands after handling infectious materials and animals, and before they leave the laboratory working areas.

4. Safety glasses, face shields (visors) or other protective devices must be worn when it is necessary to protect the eyes and face from splashes, impacting objects and sources of artificial ultraviolet radiation.
5. It is prohibited to wear protective laboratory clothing outside the laboratory, e.g. in canteens, coffee rooms, offices, libraries, staff rooms and toilets.
6. Open-toed foot wear must not be worn in laboratories.
7. Eating, drinking, smoking, applying cosmetics and handling contact lenses is prohibited in the laboratory working areas.
8. Storing human foods or drinks anywhere in the laboratory working areas is prohibited.
9. Protective laboratory clothing that has been used in the laboratory must not be stored in the same lockers or cupboards as street clothing.

3. BASIC LABORATORIES – BIOSAFETY LEVELS 1 AND 2

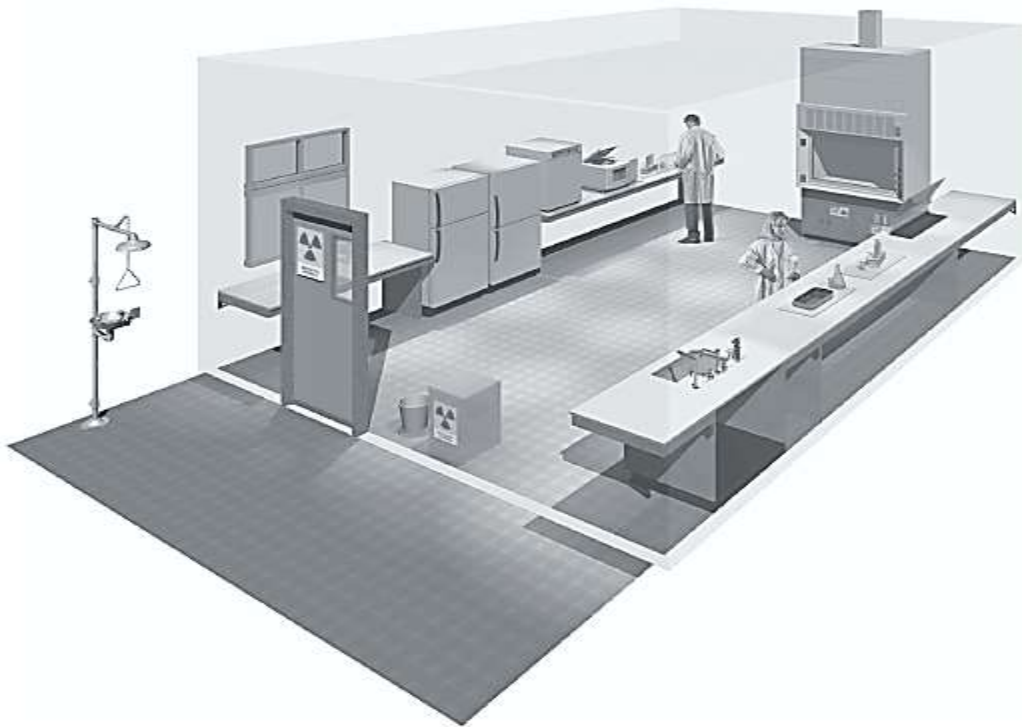


Figure 2. A typical Biosafety Level 1 laboratory
(graphics kindly provided by CUH2A, Princeton, NJ, USA)

Specimen Collection

- Lab request and lab report forms:

Lab request form: it fills computerize or paper filled by the doctor then send it to the lab. The lab request contains a list of tests to be performed on specimen of patient. Each lab has its specific request; for example, chemistry request, hematology request... etc.

Lab report form: it contains the result of patient.

Laboratory work flow cycle:

The flow cycle includes the entire steps of laboratory test, starting from test ordering by a doctor until reporting the results.

Three phases of laboratory testing:

- *Pre-analytical:* test ordering, specimen collection, transport and processing
- *Analytical-testing*
- *Post-analytical:* testing results transmission, interpretation, follow-up, retesting.

Phlebotomy :

Phlebotomy or blood collection:

The term phlebotomy refers to blood draw from a vein, artery, or the capillary bed for lab analysis or blood transfusion.

The phlebotomy equipment's:

For specimen collection, the following materials will be required:



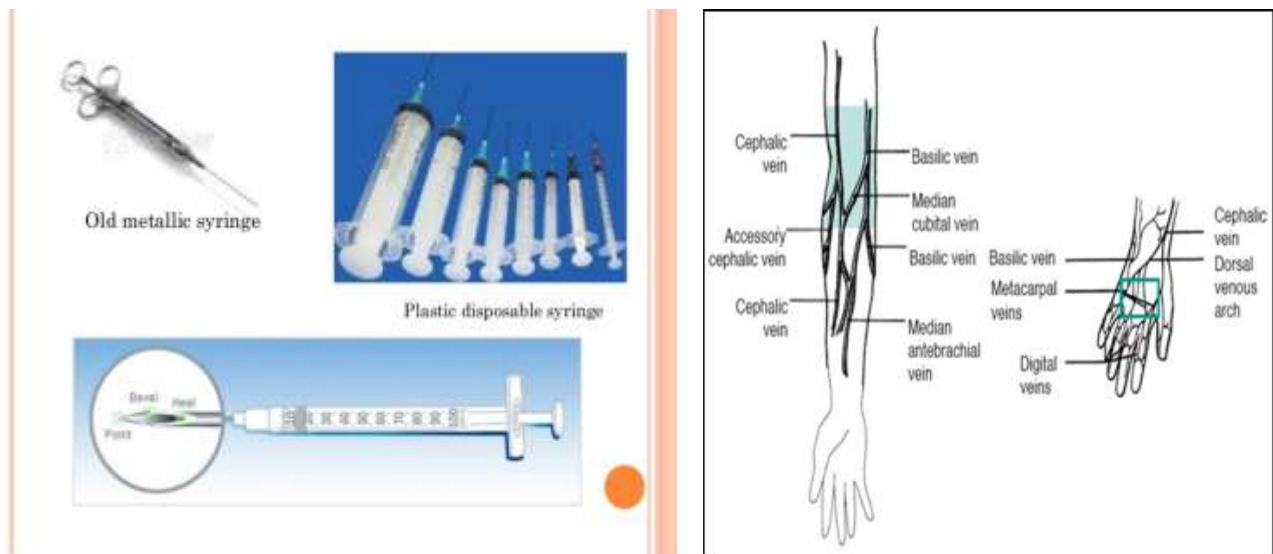
Selecting vein site:

Usually vein is used to collect blood by veinpuncture procedure.

In adults: most venipuncture procedure use arm vein. On arm, one of three arm veins is used: median cubital vein "located on the middle", cephalic vein or basilic vein "located on both sides".

Median capital vein is the best choice (why?) because it has good blood flow than cephalic and basilica which has slower blood flow. However if vein puncture procedure is unsuccessful in median capital; cephalic or basilica is used.

Artery blood is rarely used in special cases as when blood gases, pH, PCO₂, PO₂ and bicarbonate is requested. It is usually performed by physicians.



Preparation of Blood Sample

One of three different specimens may be used:

Whole blood, Serum, Plasma

First: Whole-blood specimen:

It must be analyzed within limited time (why?)

Over time, cells will lyse in whole-blood which will change the conc. of some analytes as potassium, phosphate and lactate dehydrogenase. Some cellular metabolic processes will continue which will alter analytes conc. like glucose and lactate.

Second Serum:

Difference between Serum and plasma:

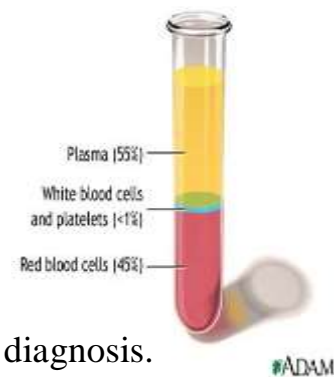
- Serum is the same as plasma except it doesn't contain clotting factors (as fibrin).
- Plasma contains all clotting factors.
- So, serum and plasma all has the same contents of electrolytes, enzymes proteins, hormones except clotting factors
- Serum is mainly use in chemistry lab & serology.

Procedure of Serum preparation:

- Draw blood from patient. Select vacutainer with no anticoagulant.
- Allow to stand for 20-30min for clot formation.
- Centrifuge the sample to speed separation and affect a greater packing of cells. Clot and cells will separate from clean serum and settle to the bottom of the vessel.
- The supernatant is the serum which can be now collected by
- Dropper or pipette for testing purposes or stored (-20°C to -80°C) for subsequent analysis or use.

Third Plasma:

The tube will have anti-coagulation after centrifugation the blood sample got separated into three layers



URINE SPECIMEN:-

Urine specimen remains an important tool for clinical diagnosis.

- A correct urine result is influenced by the collection method, timing and handling.

The laboratory test ordered determines the type of container to be used for collecting a specimen

TYPES OF COLLECTION

Laboratory urine specimens are classified by the type of collection conducted or by the collection procedure used to obtain the specimen.

- **RANDOM SPECIMEN:** This is the specimen most commonly sent to the laboratory for analysis, primarily because it is the easiest to obtain and is readily available. This specimen is usually submitted for urinalysis and microscopy analysis. Although there are no specific
- **FIRST MORNING SPECIMEN:** This is the specimen of choice for urinalysis and microscopic analysis, since the urine is generally more concentrated due to the length of time urine is allowed to remain in the bladder and, therefore, contains relatively higher levels of cellular elements and analytes such as protein, if present.

NOTE: any urine that is voided from the bladder during the eight hour collection period is pooled and refrigerated, so that a true 8hour specimen is obtained.

MIDSTREM CLEAN CATCH SPECIMEN: This is the preferred type of specimen for culture and sensitivity testing because of the reduced incidence of cellular and microbial contamination into a clean container, (any excess urine should be voided into the toilet). This method of collection can be conducted at any time of day or night.

TIMED COLLECTION SPECIMEN

Among the most commonly performed

CATHETER COLLECTION SPECIMEN

This assisted procedure is conducted when a patient is bedridden or cannot urinate independently. The healthcare provider inserts a Foley catheter into the bladder through the urethra to collect the urine specimen.

Specimen may as well be collected through an existing Foley catheter.

DEEP SPECIMEN COLLECTION

- Specimens for wound, lesion, abscess drainage, effusions, exudates, boils, incisions or ulcerations are best collected by aspirating with a syringe and needle.

- Using aseptic technique, clean the area in and over the lesions with sterile saline and sterile gauze prior to collection.
- Debride skin lesions, removing the crust and any purulent exudates with the moistened gauze.

SPUTUM SPECIMEN

- Preferably, the specimen should be a first morning collection. If more than one specimen is collected, they should be obtained one per day on consecutive mornings. To properly collect a sputum specimen, ask the patient to
 - i. Remove the container from the package and lift the top hinged

FECES SPECIMEN

Collect feces specimens in containers provided by the laboratory. Specimen should be well covered and labeled.

For culture only or both culture and parasite examination the specimen must be returned to the laboratory within one hour of collection.

- i. Remove the container from the package and lift the top hinged
 - ii. Do not spit into the container as saliva and postnasal secretions are not the maternal.
 - iii. Close the lid, label the specimen.
- Bring the specimen to the clinical laboratory as soon as possible for best results.
- If there is a delay in transport, refrigerate specimen. Patients name, ID.

GENITAL SPECIMEN

Patients should not use or be exposed to vaginal medications for 24hours prior to collection.

- In female – insert swabs slowly into vaginal opening. For endocervical collections remove excess mucus from the endocervix and discard it. Rotate swab vigorously for 30seconds, allowing absorption to occur swab comes into contact with all urethral surfaces. Allow swab to remain inserted for 2-3 seconds. Replace the swabs in the tube label and deliver to laboratory promptly.

CERVICAL SMEAR

- It's a screening test that helps a doctor diagnose and prevent cervical cancer in women. This test is also known as a

- THROAT CULTURE

- Use a tongue depressor to hold the tongue down.
- Carefully yet firmly rub swab over areas of exudate or over the tonsils and posterior pharynx, avoiding the cheeks, teeth, and gums
- Insert swab into packet and follow directions for handling the transport medium.

WOUND CULTURE

- Specimens are culture for aerobic and anaerobic organisms.
- Using a sterile swab supplied by the laboratory, collect as much exudate as possible from the advancing margin of the lesion.
- Avoid swabbing surrounding skin.
- Place the swab immediately in appropriate transport culture tube and take to the laboratory.
- Label with the specific anatomic site