



FUNCTIONS OF THE CLINICAL LABORATORY

- This section will familiarize **YOU** with the functions of the various departments found in a typical clinical laboratory.



We are going to:

- Identify the most common laboratory departments and their functions.
- Identify the various safety issues you should be familiar with.
- Define terms generally unique to the laboratory environment.
- Define terms used to describe quality control measures.
- Describe quality controls standards used to determine reliable results as determined by laboratory equipment.



FUNCTIONS OF THE CLINICAL LABORATORY

- Identify the chemical composition of blood and urine samples.
- Identify and count the different types of cells found in blood and other body fluids.
- Blood typing and determination of transfusion compatibility between blood donors and recipients.
- The culturing and identification of bacteria and viruses from sites of infection in the body.



The main clinical laboratory area is generally divided into two sections:

- ▶ The **Clinical Laboratory**, which is further divided into 6 sub-sections:
 - *Hematology*
 - *Serology*
 - *Chemistry*
 - *Urinalysis*
 - *Microbiology*
 - *Blood Bank*
- ▶ **Anatomical Pathology**, which is further divided into 2 sub-sections:
 - *Cytology*
 - *Histology*



The general function of the *Clinical Laboratory* is to perform **qualitative** and **quantitative** analyses on blood, urine and other body fluids and secretions.

- ▶ A **Qualitative Analysis** is a test designed to identify the components of a substance or mixture. What is in it?
- ▶ A **Quantitative Analysis** is a test designed to determine the amounts or proportions of the components of a substance. How many or how much is in it?



Clinical Laboratory Departments

- ▶ **Hematology** - *The study of blood. This section counts and qualifies the different types of blood cells and other components found in blood.*
- ▶ **Serology** - *The study of serum for its antibody content. Certain microorganisms (antigens) stimulate the body to produce antibodies during an infection. In the Serology lab, the antibodies react with antigens in specific ways that can be used to confirm the identity of the specific microorganism.*
- ▶ **Chemistry** - *Performs most chemical analyses including glucose, sodium, potassium, and cholesterol.*



Clinical Laboratory Departments

- ▶ **Urinalysis** - *The study of urine for the purpose of medical diagnosis. Urine is initially examined for such characteristics as **color**, **odor**, and **specific gravity** (density relative to water). It is routinely tested for its acidity level, as indicated by its pH reading, and screened for glucose (sugar).*
- ▶ **Microbiology** - *The study of microorganisms, including viruses, that can only be seen with a microscope.*
- ▶ **Blood Bank** - *Collects, tests, types and stores blood donations used for blood transfusions.*



Anatomical Pathology Departments

- **Anatomical Pathology** is the study of disease. The Pathology department is most often associated with determining cause of death through autopsy.
 - **Cytology** - *The study of cells. This department examines cells obtained from body tissue or fluid to determine if they are malignant (cancerous) or benign (non-cancerous).*
 - **Histology** - *The study of tissues. Often referred to as Histopathology. This department is concerned with the study of the microscopic changes in diseased tissue.*



Ancillary Laboratory Departments

- ▶ **Immunology** - *Studies the biology of white blood cells. Has its roots in the defense against infectious disease, the development of vaccines, organ transplantation and immune responses to malignancy.*
- ▶ **Cardiopulmonary Lab** - *The study, diagnosis and treatment of heart disorders and related conditions. Not generally found in the main laboratory section but in Cardiology and often associated with Respiratory Therapy.*
- ▶ **STAT Lab** - *Usually found only in larger hospitals. Performs a number of common procedures from hematology and chemistry. Emphasizes fast turnaround time for lab results.*



GENERAL LABORATORY SAFETY

Laboratory Clothing

- Laboratory coats should be worn at all times, buttoned up with the sleeves rolled down.
- Protective footwear should be fully enclosed.
- Safety glasses should be worn when a risk of splash is possible.
 - Technicians who wear contact lenses are normally required to wear fully enclosed safety goggles due to the risk of chemical absorption onto contact lenses which may cause ongoing damage to the eye.
- Gloves are required when carrying out certain laboratory procedures.



GENERAL LABORATORY SAFETY

• General Laboratory Safety Measures

- Never indulge in horseplay or run in the laboratory.
- No eating or drinking in the laboratory.
- Application of cosmetics is prohibited.
- A face shield is to be worn when working with caustic chemicals.
- Hair should be secured back and off the shoulders to prevent it from coming in contact with contaminated materials or surfaces and to prevent shedding of organisms into the work area.



GENERAL LABORATORY SAFETY

• General Laboratory Safety Measures

- Hands should be washed before leaving the laboratory, before and after contact with patients and before eating and drinking.
- Mouth pipetting of specimens, chemicals or reagents is prohibited.
- Never operate a centrifuge with the cover open.
- Never centrifuge uncovered tubes of specimens or flammable liquids.
 - Centrifugation creates a vacuum; contaminated items can become aerosolized and flammable liquids can become bombs.
- Waste must be placed in the appropriate containers provided for correct disposal of glass, chemicals, solvents, sharps and biological waste.



GENERAL LABORATORY SAFETY

General Laboratory Safety Measures

- All biological reagents and materials should be treated as potentially hazardous.
- Workers may be exposed to biohazards through a number of routes into the human body:
 - Oral
 - Respiratory
 - Skin puncture
 - Unbroken skin penetration
 - Conjunctiva and other moist surfaces



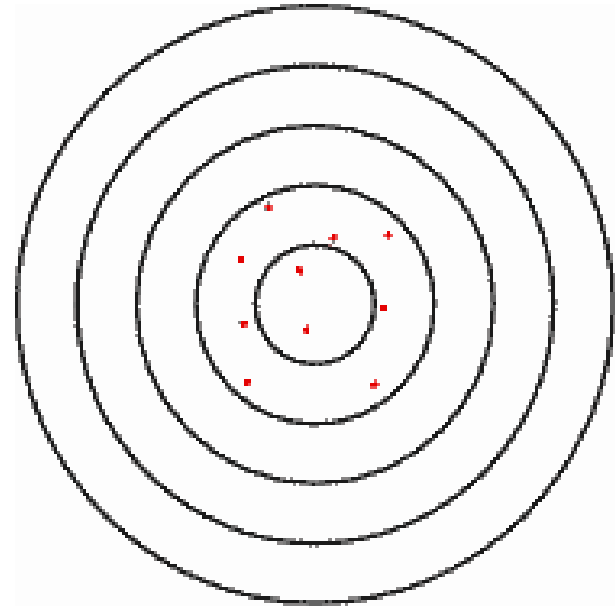
LABORATORY TERMINOLOGY

- **Control:** *A solution with a known value used to verify the **accuracy** and **precision** of the equipment.*



Controls

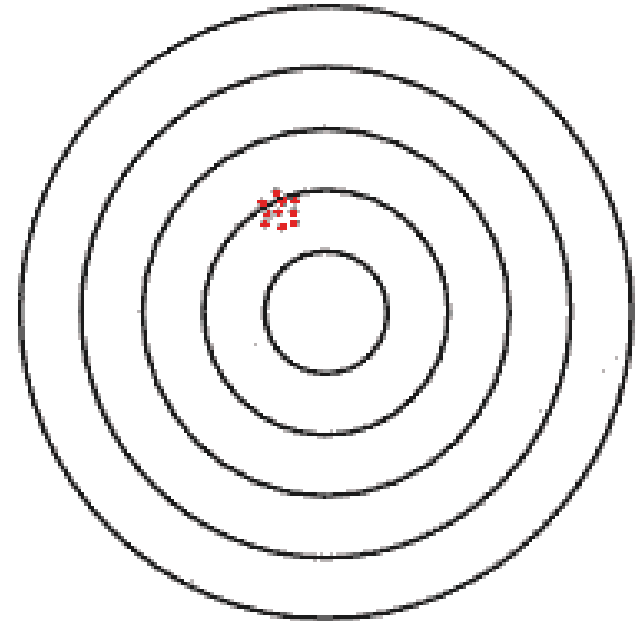
- Accuracy is how close the measured value is to the actual value and implies freedom from error.





Controls

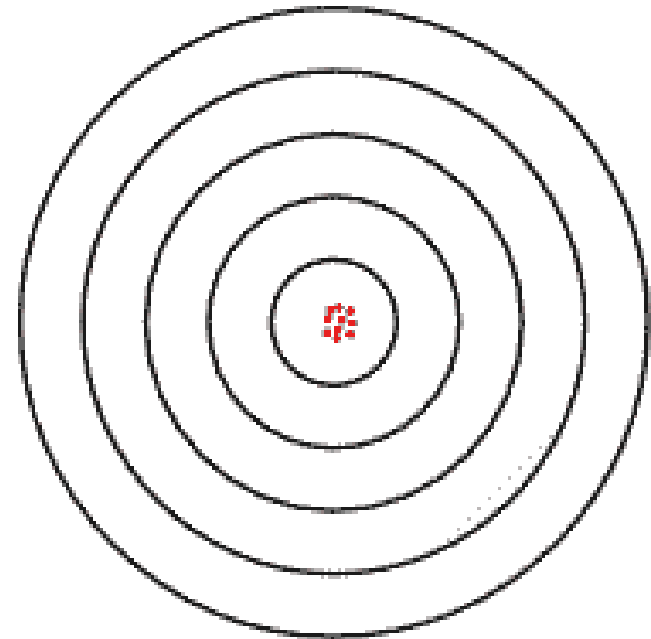
- **Precision** is how well the instrument reproduces the same result and implies freedom from variation.





Controls

- *An instrument is said to be **RELIABLE** when it is both *Accurate* and *Precise*.*





Controls are usually run in a wide range of expected patient values to assure accuracy at all levels.

- Abnormal low
- Normal
- Abnormal high



LABORATORY TERMINOLOGY

- **Standard**: *A solution used as a reference against which unknown samples can be compared.*
 - *Used to calibrate the equipment with the equipment in the calibration mode.*
 - *If the standard is bad, all the results will be useless.*
 - *Also referred to as Calibrators.*
 - *The use of **controls** is a more cost effective way to verify accuracy on a daily basis.*



LABORATORY TERMINOLOGY

- ▶ **Whole Blood**: *Blood as it is in the human body; prior to separation into plasma, serum, packed red blood cells and platelets.*
- ▶ **Plasma**: *Liquid portion of whole blood with the cells removed **prior** to clotting.*
- ▶ **Serum**: *Liquid portion of whole blood with the cells removed **after** clotting.*
 - *This is the most commonly used body fluid for chemical analyses.*
- ▶ **Hematocrit**: *The percent of red blood cells to whole blood volume.*