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SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

In partial Fulfillment for the Award of The Degree Of

BACHELOR OF SCIENCE

In

MEDICAL LABORATORY TECHNOLOGY

By

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DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

SCHOOL OF ALLIED HEALTH SCIENCES

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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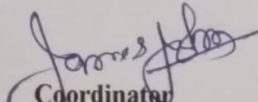
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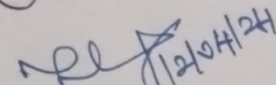
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BONAFIDE CERTIFICATE

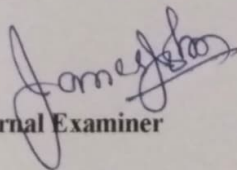
This is to certify that this internship report is the bonafide work of Mrs. SUMITHRA V have done the internship as a team and carried out the training program LIONS BLOOD BANK at EGMORE RESEARCH FONDATION AND GERI CARE HOSPITAL under our supervision from November 2022 and October 2023.

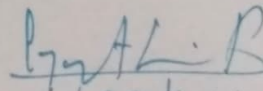

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DECLARATION

I, Mrs. SUMITHRA.V (41737018), here by declare that the internship trainings done by "GERI CARE HOSPITAL at ADHAMBAKKAM" under the guidance of Dr. JAMES JOHN and "EGMORE LIONS BLOOD BANK AND RESEARCH FOUNDATION-EGMORE" under the guidance of Ms. D. JASMINE PRIYA at Sathyabama Institute of Science and Technology is submitted in partial fulfilment of the requirements for the award of Bachelor of science degree in MEDICAL LABORATORY TECHNOLOGY.

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Place: CHENNAI

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INTRODUCTION

I have gone to Geri care hospital for one month internship . I learnt many things in that lab .in that lab various department were there phlebotomy, Microbiology, immunology , biochemistry , hematology .

PHLEBOTOMY

BLOOD COLLECTION

Blood collection is necessary to diagnose the disease and assess the condition. Blood is collected for testing. Blood collection is basically a safe procedure, but complications may occur however rare they may be.

Specimen Type And Method of Collection

- Venous Direct puncture of vein by venipuncture, vascular access device
- Arterial Direct puncture of artery, vascular access device
- Capillary Dermal puncture of fingertip or heel

Blood collection procedure:

- Blood is drawn from a vein (vein puncture),
- usually from the inside of the elbow or the back of the hand.
- A needle is inserted into the vein, and the blood is collected in an air-tight vial or a syringe.
- Preparation may vary depending on the specific test.

ORDER OF DRAW

To avoid cross-contamination, blood must be drawn and collected in tubes in a specific order. This is known as the Order of Draw.

- Blood Culture Tubes or Vials
- **Coagulation Tubes (Blue-Top Tubes)**
- **Serum Tubes without Clot Activator or Gel (Red-Top tubes)**
- **Serum Tubes with Clot Activator or Gel (Gold or Tiger Top Tubes)**
- **Heparin Tubes (Green-Top Tubes)**
- **EDTA Tubes (Lavender-Top Tubes)**

- **Oxalate/Fluoride Tubes (Gray-Top)**

NASAL AND THROAT SWAB COLLECTION

The nasal and throat swab collection procedure involves gently inserting a swab into the nostril, rotating it to collect a sample from the nasal cavity, then repeating the process in the throat to collect a sample from the back of the throat. The collected samples are then sent to a laboratory for analysis, typically for diagnostic testing of respiratory infections like COVID-19. It's important to follow proper hygiene protocols and guidelines provided by healthcare professionals during this procedure to ensure accurate results and minimize discomfort for the patient.

Nasal sample collection procedure involves the following steps:

- **Prepare:** Ensure you have clean hands and a sterile swab ready.
- **Positioning:** Ask the person to tilt their head back slightly.
- **Insertion:** Gently insert the swab into one nostril, aiming towards the back and slightly upwards, following the natural curve of the nasal passage.
- **Rotation:** Rotate the swab gently for about 10-15 seconds to collect an adequate sample from the nasal cavity.
- **Removal:** Carefully remove the swab from the nostril.
- **Repeat:** Repeat the process with the same swab in the other nostril using the same technique.
- **Packaging:** Place the swab in a sterile container or transport medium as per the testing requirements.
- **Labeling:** Ensure the sample container is properly labeled with the patient's information and collection details.
- **Transport:** Store and transport the sample according to the specific instructions provided by the testing facility or healthcare provider.

Following these steps helps ensure a proper nasal sample is collected for testing purposes.

Throat swab collection procedure involves the following steps:

- **Prepare:** Ensure you have clean hands and a sterile swab ready.
- **Positioning:** Ask the person to tilt their head back slightly and open their mouth wide.

- **Visualize:** Use a light source, if available, to visualize the back of the throat and tonsils.
- **Insertion:** Gently insert the swab into the mouth, avoiding touching the tongue or teeth, and reach towards the back of the throat.
- **Sampling:** Rub the swab gently against the back of the throat and tonsils, making sure to collect a sample of the mucous membranes and any visible discharge.
-
- **Rotation:** Rotate the swab gently for about 10-15 seconds to ensure adequate sampling.
- **Removal:** Carefully remove the swab from the mouth without touching any other surfaces.
- **Packaging:** Place the swab in a sterile container or transport medium as per the testing requirements.
- **Labeling:** Ensure the sample container is properly labeled with the patient's information and collection details.
- **Transport:** Store and transport the sample according to the specific instructions provided by the testing facility or healthcare provider.
- **Dispose:** Dispose of any used materials appropriately and maintain proper hygiene throughout the procedure.

Following these steps helps ensure a proper throat sample is collected for testing purposes.

STOOL SAMPLE COLLECTION

Patients usually collect this sample themselves during toileting, following instructions to prevent the sample from becoming contaminated from other material in the toilet bowl. Patients may also be told to avoid certain foods during the test period. Depending on the test, patients may be instructed to collect the sample in a container, scoop a small portion into a vial, or smear a small amount on special test paper. Wash your hands well after handling the sample.

URINE SAMPLE COLLECTION:

Most urine specimens are collected by having the patient urinate into a container or receptacle. To keep the sample from becoming contaminated by materials outside the urinary tract, patients are given instructions on how to clean the genital area and void a bit of urine before collecting the specimen into the container. (If a urinary catheter is required, a health practitioner is usually

responsible for insertion.) Collecting the urine specimen is awkward but not in itself uncomfortable (An infection, however, can create a burning sensation during urination.). For certain tests, 24-hour urine samples are collected at home and must be refrigerated during the collection process. Remember to wash hands well after collecting the specimen.

MICROBIOLOGY

SMEAR MAKING PROCEDURE:

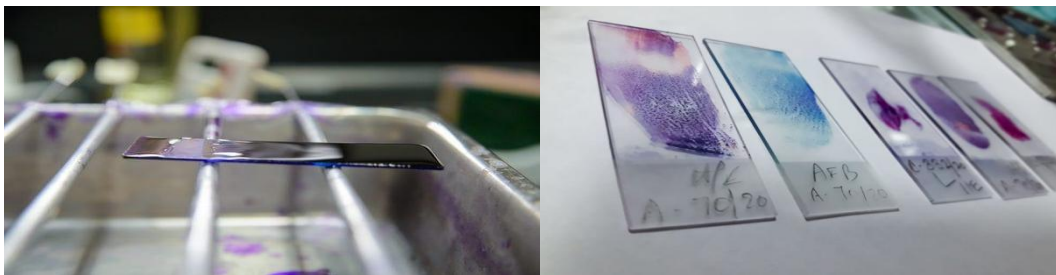
- Prepare a clean microscope slide.
- Place a small drop of the sample (such as blood, bacteria, or tissue) onto the center of the slide.
- Using a sterile loop or applicator, spread the sample thinly and evenly across the slide.
- Allow the smear to air dry completely.
- Optionally, fix the smear by passing the slide through a flame or using a fixative solution.
- Once dried and fixed (if necessary), the smear is ready for staining and microscopic examination.

GRAM STAINING PROCEDURE:

The Gram staining procedure is a common microbiological technique used to differentiate bacteria into two groups: Gram-positive and Gram-negative. Here's a simplified version of the procedure:

- Prepare a bacterial smear on a clean microscope slide from a pure culture.
- Fix the smear by passing the slide through a flame or by using a fixing agent (such as methanol).
- Flood the smear with crystal violet stain and let it sit for about 1 minute. This stains all bacteria purple.
- Rinse the slide gently with water to remove excess stain.
- Flood the smear with iodine solution (Gram's iodine) and let it sit for about 1 minute. This acts as a mordant, fixing the crystal violet stain in the bacterial cells.
- Rinse the slide gently with water to remove excess iodine.
- Decolorize the smear by gently flooding it with a decolorizing agent (usually alcohol or acetone) until the runoff appears colorless. This step differentiates between Gram-positive and Gram-negative bacteria.

- Rinse the slide immediately with water to stop the decolorization process.
- Counterstain the smear with safranin stain and let it sit for about 30 seconds to 1 minute. This stains Gram-negative bacteria pink/red.
- Rinse the slide gently with water to remove excess stain.
- Blot the slide dry with bibulous paper or allow it to air dry.
- Observe the stained bacteria under a microscope using oil immersion at 1000x magnification.



(Figure.1)

MEDIA PREPARATION

Types of media

In microbiology, various types of media are used to culture and grow microorganisms for research, diagnostic, and industrial purposes. Some common types include:

- **Nutrient Agar:** General-purpose medium containing essential nutrients, suitable for the growth of a wide range of microorganisms.
- **Blood Agar:** Enriched medium containing blood (usually sheep or horse) that supports the growth of fastidious bacteria and allows for the detection of hemolytic activity.
- **MacConkey Agar:** Selective and differential medium used to isolate and differentiate lactose-fermenting Gram-negative bacteria, particularly enteric pathogens.
- **Mannitol Salt Agar:** Selective and differential medium used to isolate and differentiate *Staphylococcus aureus* based on its ability to ferment mannitol and tolerate high salt concentrations.
- **Sabouraud Dextrose Agar:** Selective medium used for the isolation and cultivation of fungi and yeast species, particularly those causing superficial infections.

- **EMB Agar (Eosin Methylene Blue):** Selective and differential medium used for the isolation and differentiation of Gram-negative enteric bacteria, particularly *Escherichia coli*, based on lactose fermentation and acid production.
- **Thioglycollate Broth:** Enriched medium used for the cultivation of anaerobic and microaerophilic bacteria, as well as for determining oxygen requirements and motility.
- **Chocolate Agar:** Enriched medium made from blood agar that has been heat-treated to release growth factors, used for the cultivation of fastidious organisms such as *Haemophilus influenzae* and *Neisseria* species.
- **Triple Sugar Iron Agar (TSI):** Differential medium used for the identification of enteric bacteria based on their ability to ferment sugars (glucose, lactose, sucrose) and produce hydrogen sulfide.

These are just a few examples of the many types of media used in microbiology laboratories, each serving specific purposes in the isolation, identification, and characterization of microorganisms.

The procedure for preparing media (such as agar plates or broth) typically involves the following steps:

- **Gather ingredients:** Gather the necessary components for the specific type of media you are preparing, including agar, peptone, nutrients, and any other additives.
- **Measure ingredients:** Measure out the appropriate amounts of each ingredient according to the recipe or protocol you are following. Use a balance or measuring tools to ensure accuracy.
- **Mixing:** Dissolve the ingredients in distilled water by heating and stirring until completely dissolved. For agar media, the agar should be completely dissolved to avoid clumps.
- **Adjust pH:** Adjust the pH of the media to the desired level using a pH meter or pH indicator and appropriate acid or base solutions.
- **Autoclaving:** Sterilize the media by autoclaving at the appropriate temperature and pressure for the specified time. This ensures that the media is free from any contaminating microorganisms.

- **Cooling:** Allow the media to cool to around 45-50°C before pouring into Petri dishes for agar plates or into tubes for broth media. Cooling too much may cause solidification of agar media.
- **Pouring:** Pour the liquid media into sterile Petri dishes or tubes, being careful to avoid bubbles or contamination.
- **Solidification:** Allow agar plates to solidify by leaving them on a flat surface at room temperature, or by placing them in a refrigerator for faster solidification.
- **Storage:** Once solidified, store the plates or tubes in a refrigerator or at the appropriate temperature until ready to use. Label them clearly with the date, type of media, and any other relevant information.

Following these steps will help ensure the preparation of sterile and effective media for microbiological experiment.

MICROSCOPIC EXAMINATION:

The smear making procedure in microbiology involves several steps:

- **Preparation of Slide:** Place a clean glass slide on a clean surface.
- **Sample Collection:** Using a sterile swab or loop, collect the specimen from the source (such as a bacterial culture or clinical sample).
- **Spreading the Sample:** Spread the collected sample onto the slide evenly. If it's a solid sample, a small amount is mixed with a drop of sterile water or saline on the slide and spread thinly. If it's a liquid sample, a drop is directly placed on the slide.
- **Air Drying:** Allow the smear to air dry completely. This can be done by leaving the slide at room temperature or gently waving it in the air.
- **Heat Fixation:** Heat fix the slide by passing it through a flame a few times. This kills the bacteria, adheres them to the slide, and prevents them from being washed off during staining.
- **Staining:** Proceed with staining the smear using appropriate staining techniques such as Gram staining, acid-fast staining, or simple stains like methylene blue or crystal violet.

- **Observation:** After staining, observe the slide under a microscope to examine the morphology, arrangement, and staining characteristics of the microorganisms present in the sample.

Proper technique and adherence to aseptic principles are crucial throughout the smear making procedure to avoid contamination and ensure accurate results.

CULTURING OF SAMPLE:

URINE CULTURE

The urine culture lab processing procedure typically involves the following steps:

Sample Collection: A clean-catch midstream urine sample is collected from the patient using sterile containers to minimize contamination.

Transport to Lab: The sample is transported to the laboratory promptly to prevent any changes in the microbial composition.

Labeling and Logging: Upon arrival, the sample is labeled with patient information and logged into the laboratory system for tracking purposes.

Specimen Preparation: The urine sample is centrifuged to concentrate any bacteria present in the sediment.

Inoculation: A portion of the concentrated urine is streaked onto agar plates or inoculated into broth media that support the growth of bacteria.

Incubation: The inoculated plates or broth tubes are placed in a controlled incubator set at the appropriate temperature (usually 35-37°C) to allow bacterial growth.

Observation: After a designated incubation period (typically 24-48 hours), trained technicians examine the plates or broth tubes for visible bacterial growth.

Identification: If bacterial growth is observed, further tests are conducted to identify the specific bacteria present in the sample.

Antibiotic Sensitivity Testing: Identified bacteria are tested against a panel of antibiotics to determine their susceptibility or resistance to various antimicrobial agents.

Reporting: The laboratory generates a report detailing the type(s) of bacteria present, along with their quantities and antibiotic susceptibility profiles. This information is communicated to the healthcare provider to guide appropriate treatment decisions.

Following these procedures helps ensure accurate diagnosis and effective treatment of urinary tract infections.

BLOOD CULTURE

The blood culture procedure involves drawing a blood sample from a patient and incubating it in a culture medium to detect the presence of bacteria or fungi. Here's a basic outline of the procedure:

- **Inoculation of culture bottles:** Transfer the blood from the syringe into sterile blood culture bottles containing culture medium. Mix the blood and culture medium by gentle inversion.
- **Blood collection:** Using a sterile technique, draw the blood into the syringe. Typically, two sets of blood cultures are collected from different sites to increase the chances of detecting pathogens.
- **Labeling:** Label the culture bottles with the patient's information, including name, date, and site of blood collection.
- **Transportation:** Transport the culture bottles to the laboratory as soon as possible to ensure accurate results. If there's a delay, store the bottles at appropriate temperatures to maintain viability of organisms.
- **Incubation:** In the laboratory, the culture bottles are placed in an incubator set at the appropriate temperature to promote the growth of microorganisms.
- **Monitoring:** Regularly check the culture bottles for signs of growth, such as turbidity or color changes, indicating the presence of microorganisms.
- **Identification:** Once growth is detected, the microorganisms are identified using various techniques, such as microscopy, biochemical tests, or molecular methods.
- **Reporting:** Results are reported to the healthcare provider, who can then initiate appropriate treatment based on the identified pathogens.

It's crucial to follow strict aseptic techniques throughout the procedure to minimize the risk of contamination and ensure accurate results.



(Figure.2)



(Figure.3)

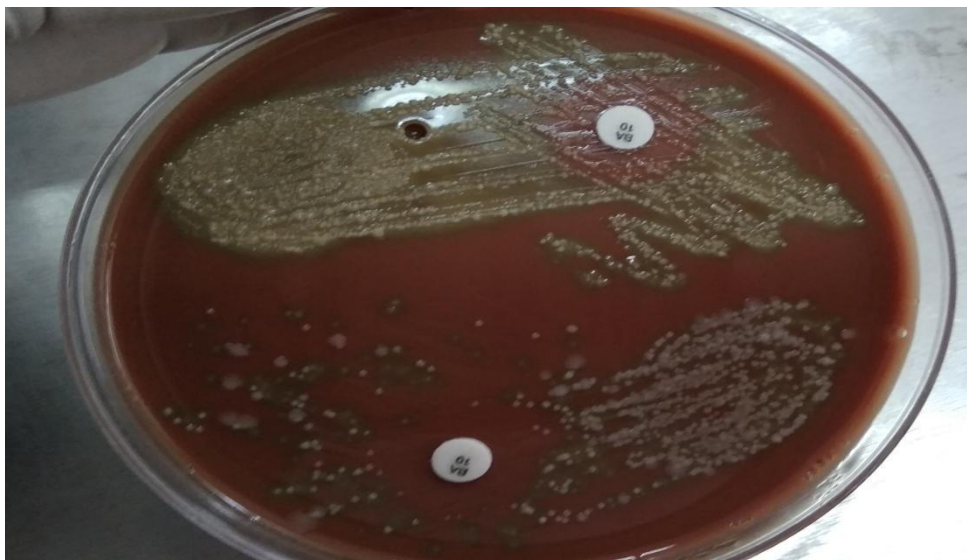
SPUTUM CULTURE

The sputum culture procedure is used to detect bacterial or fungal infections in the respiratory tract by analyzing a patient's sputum sample. Here's an overview of the procedure:

- **Patient preparation:** Instruct the patient to rinse their mouth with water to minimize contamination from oral flora. Ask the patient to take a deep breath and cough deeply to produce a sputum sample from the lower respiratory tract.
- **Collection of sputum:** Using a sterile container, collect a sputum sample from the patient. It's essential to avoid saliva contamination, so the patient should cough deeply to produce sputum from the lungs.

- **Labeling:** Label the sputum container with the patient's information, including name, date, and any relevant clinical information.
- **Transportation:** Transport the sputum sample to the laboratory as soon as possible to prevent degradation of microorganisms and ensure accurate results. If there's a delay, store the sample at appropriate temperatures.
- **Processing:** In the laboratory, the sputum sample is processed to remove contaminants and concentrate the microorganisms. This may involve centrifugation or filtration techniques.
- **Inoculation:** The processed sputum sample is then inoculated onto various culture media, including agar plates or broth, to promote the growth of microorganisms.
- **Incubation:** The culture plates or broths are placed in an incubator set at the appropriate temperature to facilitate the growth of bacteria or fungi.
- **Monitoring:** Check the culture plates or broths regularly for signs of growth, such as colonies on agar plates or turbidity in broths, indicating the presence of microorganisms.
- **Identification:** Once growth is observed, the microorganisms are identified using various techniques, such as microscopy, biochemical tests, or molecular methods.
- **Reporting:** Results are reported to the healthcare provider, who can then initiate appropriate treatment based on the identified pathogens.

As with any microbiological procedure, it's crucial to maintain strict aseptic techniques to minimize the risk of contamination and ensure accurate results.



(Figure.4)

STOOL CULTURE

Stool culture is a diagnostic test used to identify bacterial, parasitic, and fungal pathogens present in the stool. The procedure typically involves:

- **Sample Collection:** A fresh stool sample is collected in a clean, dry container. It's important to avoid urine or water contamination.
- **Transport:** The sample should be transported to the laboratory as soon as possible to maintain its viability. If immediate transportation is not possible, it can be stored in a refrigerator at 2-8°C for up to 24 hours.
- **Lab Processing:** In the laboratory, a small portion of the stool sample is inoculated onto various culture media designed to support the growth of different types of pathogens.
- **Incubation:** The inoculated culture plates are then placed in a controlled environment, typically an incubator set at specific temperatures, to encourage the growth of any present pathogens.
- **Observation:** After a period of incubation (usually 24-48 hours), the plates are examined for the presence of bacterial, parasitic, or fungal colonies.
- **Identification:** Colonies with distinct morphology are isolated and subjected to further biochemical and molecular tests to identify the specific pathogens present.
- **Reporting:** Once the identification process is complete, the laboratory issues a report with the results, including any identified pathogens and their susceptibility to antibiotics if applicable.

It's important to note that stool culture is just one of several tests used to diagnose gastrointestinal infections, and the specific procedures may vary slightly depending on the laboratory and the suspected pathogens.

BIOCHEMICAL TEST

Biochemical test types

Biochemical tests are used to identify and characterize various compounds based on their chemical reactions. They are commonly used in fields such as microbiology, biochemistry, and medicine. Here are some types of biochemical tests:

- **Carbohydrate Fermentation Tests:** Determine if an organism can ferment specific carbohydrates, producing acid and/or gas.
- **Indole Test:** Detects the ability of an organism to produce indole from tryptophan.
- **Catalase Test:** Identifies organisms that produce the enzyme catalase, which breaks down hydrogen peroxide into water and oxygen.
- **Oxidase Test:** Determines the presence of cytochrome c oxidase in bacteria, which is an enzyme involved in the electron transport chain.
- **Coagulase Test:** Identifies bacteria that produce the enzyme coagulase, which causes blood plasma to clot.
- **Urease Test:** Detects the ability of an organism to produce the enzyme urease, which hydrolyzes urea to produce ammonia and carbon dioxide.
- **Gram Staining:** Classifies bacteria into Gram-positive and Gram-negative based on their cell wall composition.
- **API (Analytical Profile Index):** A commercial system of biochemical tests used for bacterial identification.

BIOCHEMICAL TEST PROCEDURE

general procedure for biochemical tests commonly performed in a laboratory:

- **Preparation:** Gather all necessary materials and reagents, ensure proper labeling of test tubes or plates, and sterilize equipment if needed.
- **Inoculation:** Inoculate the organism onto the appropriate medium or substrate. This could involve streaking for isolation, or using a loop to transfer a small amount of the organism into the medium.
- **Incubation:** Incubate the inoculated medium at the appropriate temperature and conditions required for growth of the organism. This could range from a few hours to several days depending on the organism and the test being performed.
- **Observation:** After the appropriate incubation period, observe the growth characteristics of the organism. This could include colony morphology, color changes in the medium, or other visible changes.
- **Performing the Test:** Depending on the specific biochemical test being performed, follow the instructions for that test. This could involve adding reagents to the medium or using specific techniques to test for the presence or absence of certain biochemical reactions.
- **Interpretation:** Interpret the results of the biochemical test based on the observed changes in the medium or substrate. This could involve comparing the results to known standards or control samples.
- **Recording:** Record the results of the biochemical test accurately, including any observations or interpretations made during the testing process.
- **Analysis:** Analyze the results of the biochemical tests in conjunction with other tests or clinical information to draw conclusions about the organism's identity or characteristics.
- **Reporting:** Report the results of the biochemical tests in a clear and concise manner, following any applicable guidelines or protocols for documentation and communication within the laboratory or to healthcare providers.
- **Quality Control:** Perform appropriate quality control measures to ensure the accuracy and reliability of the test results. This could include running control samples alongside the test samples and verifying the performance of equipment and reagents.



(Figure.5)

SENSITIVITY TEST IN MICROBIOLOGY:

In microbiology, sensitivity testing is commonly performed to determine the susceptibility of bacteria or fungi to antimicrobial agents. This process helps healthcare providers select the most effective treatment for infections. Here's an outline of the sensitivity testing procedure:

Specimen Collection: A sample is collected from the site of infection, such as blood, urine, sputum, wound swab, or other body fluids/tissues.

Isolation and Identification of the Pathogen: The sample is cultured on appropriate growth media to isolate and identify the causative microorganism. Various biochemical, immunological, or molecular methods may be used for identification.

Preparation of Inoculum: A standardized inoculum of the isolated microorganism is prepared. This ensures consistency and accuracy during testing.

Inoculation of Antimicrobial Susceptibility Testing (AST) Plates: The inoculum is then spread or streaked onto AST plates. These plates contain agar medium with predefined concentrations of antimicrobial agents.

Incubation: The AST plates are incubated under optimal conditions (temperature, humidity, and duration) to promote microbial growth.

Interpretation of Results: After incubation, the plates are examined for microbial growth. The zones of inhibition around antibiotic disks or wells containing antimicrobial agents are measured and compared to standardized interpretive criteria. The size of the inhibition zone correlates with the sensitivity of the microorganism to the antibiotic.

Reporting: Results are interpreted and reported as "susceptible," "intermediate," or "resistant" based on established guidelines and breakpoints. This information is then communicated to healthcare providers to guide antibiotic therapy.

Quality Control: Quality control measures are implemented to ensure the accuracy and reliability of the testing process. This includes using reference strains with known susceptibility patterns and monitoring the performance of laboratory equipment and personnel.

Additional Testing: In some cases, additional testing may be performed to further characterize antimicrobial resistance mechanisms, such as molecular testing for specific resistance genes.

It's important to note that sensitivity testing should be performed by trained laboratory personnel following standardized procedures and quality control measures to ensure accurate and reliable results. The choice of antimicrobial agents for testing should be guided by the clinical context, local resistance patterns, and patient-specific factors.

CULTURAL CHARACTERISTICS :

In microbiology laboratories, cultural characteristics refer to the observable traits of microorganisms when grown on culture media. These characteristics can provide valuable information for the identification and classification of bacteria, fungi, and other microorganisms. Here are some common cultural characteristics assessed in microbiology:

- **Growth Pattern:** The overall growth pattern of microorganisms on agar Plates or in broth cultures can vary. It may be observed as colonies on solid media or turbidity in liquid media. Growth patterns can range from filamentous (molds) to punctiform (tiny colonies) to spreading (bacterial colonies that spread across the agar surface).

- **Colonial Morphology:** The size, shape, color, texture, and elevation of colonies formed by microorganisms are important for identification. For example, bacterial colonies may be smooth, rough, mucoid, wrinkled, or irregular in shape. Fungal colonies can exhibit characteristics such as cottony, powdery, or filamentous growth.
- **Pigmentation:** Some microorganisms produce pigments that result in distinct colony colors. For example, bacterial colonies may appear white, yellow, pink, red, orange, or green. Pigment production can be influenced by factors such as nutrient availability, pH, and oxygen concentration.
- **Opacity/Transparency:** The transparency or opacity of colonies can provide information about the microorganism's ability to produce extracellular substances like capsules or slime layers. Capsule-producing bacteria may exhibit mucoid or glistening colonies, while non-capsulated strains may appear dry or rough.
- **Hemolysis:** Hemolytic activity can be observed on blood agar plates, where bacteria produce enzymes that lyse red blood cells. This results in distinct patterns of hemolysis, including alpha (partial), beta (complete), and gamma (no) hemolysis, which can aid in bacterial identification.
- **Texture:** The texture of microbial colonies can vary from smooth and glossy to dry and rough. This characteristic can provide additional clues for identification and differentiation between species.
- **Odor:** Some microorganisms produce characteristic odors when grown on specific media. These odors can range from pleasant to foul-smelling and may aid in preliminary identification.
- **Specialized Growth Requirements:** Some microorganisms have specific growth requirements, such as the need for enriched media, selective media, or unique growth conditions (e.g., anaerobic, high salt, low pH). Observing growth under these conditions can help narrow down potential microbial species.

By carefully observing and documenting these cultural characteristics, microbiologists can make preliminary identifications of microorganisms and select appropriate biochemical, immunological, or molecular tests for further characterization. These characteristics, along with biochemical testing and genetic analysis, play a crucial role in the accurate identification and classification of microorganisms in clinical, research, and industrial settings.

DENGU TEST:

PROCEDURE:

The laboratory procedure for testing for dengue fever typically involves the following steps:

Sample Collection: A blood sample is collected from the patient, usually from a vein in the arm using a needle. Sometimes, a smaller sample of blood obtained through a finger prick may be used.

Sample Processing: The collected blood sample is processed to separate the serum or plasma from the cellular components (such as red blood cells and white blood cells).

Dengue Serology Tests: There are several laboratory tests used to diagnose dengue fever:

a. NS1 Antigen Test: This test detects the presence of the dengue virus NS1 antigen in the patient's blood. It is usually performed during the acute phase of the illness (within the first few days of symptoms).

b. Dengue IgM and IgG Antibody Tests: These tests detect the presence of dengue-specific antibodies (IgM and IgG) produced by the immune system in response to the dengue virus. IgM antibodies are usually detectable a few days after the onset of symptoms, while IgG antibodies may persist for a longer period.

Real-Time Polymerase Chain Reaction (RT-PCR): In some cases, especially when the NS1 antigen test is negative but dengue fever is still suspected, RT-PCR may be used to detect the genetic material (RNA) of the dengue virus in the blood.

Data Analysis: The results from the dengue serology tests and RT-PCR are analyzed to determine the presence of the dengue virus and the stage of infection.

Interpretation: The results are interpreted in the context of the patient's clinical symptoms and history. Positive results indicate the presence of dengue fever, while negative results do not completely rule out the possibility of dengue infection.

Reporting: The results are reported to the healthcare provider who ordered the tests, and they use the information to assist in diagnosis and treatment decisions.

As with any laboratory test, strict adherence to quality control measures and standard operating procedures is crucial to ensure accurate and reliable results.

C REACTIVE PROTEIN:

The C-reactive protein (CRP) test procedure in a laboratory typically involves the following steps:

- **Sample Collection:** A blood sample is collected from the patient, usually from a vein in the arm using a needle.
- **Sample Processing:** The collected blood sample is then processed to separate the serum or plasma from the red blood cells.
- **CRP Assay:** The serum or plasma sample is analyzed using an immunoassay technique to measure the concentration of CRP. This can be done using various methods such as enzyme-linked immunosorbent assay (ELISA) or immunoturbidimetric assay.
- **Calibration and Quality Control:** Before testing patient samples, the assay instrument is calibrated using standards of known CRP concentrations. Quality control samples are also run to ensure the accuracy and precision of the assay.
- **Data Analysis:** The results from the CRP assay are analyzed, and the concentration of CRP in the patient's sample is determined.
- **Interpretation:** The CRP concentration is interpreted in the context of the patient's clinical condition. Elevated CRP levels are often indicative of inflammation or infection, but further evaluation is usually necessary to determine the underlying cause.
- **Reporting:** The results are reported to the healthcare provider who ordered the test, and they use the information to assist in diagnosis and treatment decisions.

Throughout the procedure, strict adherence to quality control measures and standard operating procedures is essential to ensure accurate and reliable results.

STOOL OCCULT BLOOD

Stool occult blood test procedure in laboratory

- **Sample Collection:** The patient collects a small sample of their stool using a special kit provided by their healthcare provider.
- **Sample Preparation:** The collected stool sample is transferred to a clean container or tube provided in the kit.
- **Testing Preparation:** The laboratory technician prepares the sample for testing by mixing it with specific reagents or solutions that help detect the presence of occult (hidden) blood.
- **Testing:** The prepared sample is then subjected to testing methods such as the guaiac-based fecal occult blood test (gFOBT) or immunochemical fecal occult blood test (iFOBT). These tests detect the presence of blood in the stool, which may indicate various gastrointestinal conditions such as colorectal cancer or bleeding ulcers.
- **Analysis:** After the testing process, the laboratory technician analyzes the results. Positive results indicate the presence of occult blood in the stool, while negative results suggest its absence.

- **Reporting:** The results are then reported to the healthcare provider, who will discuss them with the patient and recommend further action if necessary, such as additional diagnostic tests or treatments.

BIOCHEMISTRY

The biochemistry test is done by automated machine (mindray)



(Figure.6)

The biochemistry tests are

RENAL FUNCTION TEST (RFT)

Tests of renal function can be used to assess overall renal function by direct measurement or estimation of the glomerular filtration rate. Estimation of the GFR is utilized to determine the presence of renal impairment. Remove waste products and balance the body fluids.

Renal function

- Remove waste products and balance the body fluids.
- Balance the variety of electrolytes.
- Release hormones to control blood pressure.

- Release a hormone to control red blood cell production.
- Help with bone health by controlling calcium and phosphorus.

UREA

NORMAL VALUES: 15-45 mg/dl

INCREASED BLOOD UREA LEVEL: (UREMIA)

- Nephrotic syndrome
- Stones in the urinary tract

DECREASED BLOOD UREA LEVEL:

- Liver disease

CREATINIE

NORMAL VALUE:

- 0.7-1.3 mg/dl

CLINICAL SIGNIFICANCE:

- High levels may indicate a problem with the kidneys.
- While low levels can occur with low muscle mass.

CALCIUM

NORMAL VALUES: 8.5to 10.5mg/dl

CLINICAL SIGNIFICANCE:

- High level of calcium in your in blood can weaken our bones , create kidney stones, (hyper calcemia).
- Low level – hypocalcemia.

SODIUM

NORMAL VALES: 130-155 Millieqilents per litter (Meq/L)

CLINICAL SIGNIFICANCE:

- Hybern timers
- Water excess
- Liver disease
- Renal failure
- Hybern timers
- Water deficiency
- Excessive sweating
- fever

POTTASIUM

NORMAL RANGE: 3.5-5.5 mmol/l

CLINICAL SIGNIFICANCE:

HYPERKALEMIA

High intake/ decreased excretion –renal failre, diuretics.

HYPOKALEMIA

Decrease intake

CHOLORIDE

NORMAL VALUE:

- CSF choloride – 118 to 132 mmol/l
- Serum- 95 to 115 mmol/l
- Urine – 170 to 250 mmol/l

CLINICAL SIGNIFICANCE:

- Increased: hyperparathyroidism
Dehydration
- Decreased: Salt losing renal disease
over hydration

URIC ACID**NORMAL VALUES:**

- Serum uric acid- 3.0 to 7.0 mg/dl
- Urinary uric acid – 250 to 750 gms/d

INCREASED SERUM URIC ACID LEVEL:(Hyperuremia)

- Renal disease

DECREASED LEVEL SERUM URIC ACID:(Hypouricemia)

- Wilsons disease
- Endothelial dysfunction

MEGNI SIUM

NORMAL VALUES: 1.7 – 2.2mg/dl

CLINICAL SIGNIFICANCE:**HIGH LEVEL OF MEGNI SIUM:(Hypermegnesemia)**

- Hypotension
- Arrhythmias
- Neurological disorder (confusion & lethargy)

LOW LEVEL OF MEGNI SIUM:

- Hypocalcaemia

PHOSPORUS

NORMAL VALUES: 3.4 to 4.5 mg/dl

HIGH LEVEL OF PHOSPHORUS:

- Hyperphosphatemia (often a sign of kidney damage)

LOW LEVEL OF PHOSPHOROUS:

- Appetite
- Anxiety
- Bone pain

Other renal function test

- Hemocysteine – 5 to 15 mg/l
- Folic acid – 3.1 to 17.5 ng/ml
- GCT – 140 mg/dl
- GTT – 140 to 199 IU/L
- Lipoprotein – 1.7 mmol/l
- TIBC – 240 to 450 mcg/dl

LIVER FUNCTION TEST (LFT) :

Liver function tests (LFTs) are a series of blood tests that assess the health and function of the liver. These tests measure various substances in the blood that are produced or processed by the liver, including enzymes, proteins, and bilirubin

Liver functions

- *Filtration.*
- *Digestion.*
- *Metabolism and Detoxification.*
- *Protein synthesis.*
- *Storage of vitamins and minerals*

ALBUMIN

NORMAL RANGE: 3.5 to 5.2 g/dl

CALCULATION:

- Albumin = $\text{Abs.T} - \text{Abs.B} / \text{Abs.Std} - \text{Abs.B} \times \text{std value}$

A/G RATIO

CALCULATION:

- Globulin = Total protein – Albumin
- A/G Ratio = Albumin/Globulin

NORMAL VALUE:

- Total proteins - 6.8 g/dl
- Globulin – 3.2 to 4.5
- A/G Ratio – 1:2 to 2:1

CLINICAL SIGNIFICANCE:

Hypoproteinemia

- Water overload
- Severe hemarage
- Increase protein break down

Hyperproteinemia

- Chronic liver disease
- Dehydration
- Multiple myeloma

Hypogammaglobinaemia can be due to

- Defective immune system
- Malignancy

ALKALINE PHOSPHATASE**CALCULATION:**

Calculate the average change in absorbance/minute

$$\text{ALP (U /L)} = \text{A/Min} * 2764$$

NORMAL VALUE:

- Male : 53 – 165 U/L
- Female : 42-136 U/L

CLINICAL SIGNIFICANCE:**Hypophosphatasia**

- Genetic condition

Hypophosphaturia

- Hepatobiliary
- Cholestasis
- Cirrhosis
- Tumors in liver

TOTAL BILIRUBIN

CALCULATION:

- $Total\ bilirubin\ (mg/dl) = Abs.\ T * 23\ (factor)$

NORMAL RANGE:

- New born – 0.8 – 12 mg/dl
- Adult upto 1.2 mg/dl

CLINICAL SIGNIFICANCE:

Hyperbilirubinaemia (unconjugated- indirect)

- Hemolysis
- Decreased hepatic uptake
- Hepatocellular disease – hepatitis, cirrhosis.

Hypobilirubinemia (conjugated – direct)

- Impaired hepatic excretion
- Alcoholic liver disease
- Jaundice

DIRECT BILIRUBIN

CALCULATION:

- $Direct\ bilirubin = ABS.T * 13\ (factor)$
- $Indirect\ bilirubin = T.B - D.B$

NORMAL RANGE:

- D.B = 0.3 mg/dl
- I.B = 0.2 – 0.8 mg/dl

SGOT - (SERUM GLUTAMATE OXALATE TRANSAMINASE)

- It is also called AST (Aspartate aminotransferase)

CALCULATION

SGOT (AST) in IU/L = Abs/min * 1975

NORMAL RANGE:

- Men: 46 IU/L
- Women: 30 IU/L

CLINICAL SIGNIFICANCE:

- Acute hepato cellular damage
- Tumors in liver
- Liver cirrhosis

SGPT (SERUM GLUTAMATE PYURATE TRANSAMINASE)

- It is also called ALT (Alanine Transaminase)

CALCULATION

Calculate the average change in absorbance/min.

SGPT (ALT) in IU/L = Abs/min*1975

NORMAL RANGE:

Men: 48 IU/L

Women: 30 IU/L

CLINICAL SIGNIFICANCE:

Acute hepatitis

Chronic hepatitis

Alcoholic fatty liver

LIPID PROFILE

A lipid profile test, also known as a lipid panel, is a blood test that measures the levels of various types of lipids (fats) and cholesterol in the bloodstream.

The normal values for different types of lipids are as follows:

- Total Cholesterol: Less than 200 mg/dL.
- HDL (high-density lipoproteins) cholesterol: More than 60 mg/dL.
- LDL (low-density lipoproteins) cholesterol: Less than 100 mg/dL; less than 70 mg/dL for people with diabetes.

TROPONIN TEST:

NORMAL RANGE:

The normal range for troponin I is less than 0.04 ng/mL, and for troponin T, it is less than 0.014 ng/mL.

CLINICAL SIGNIFICANCE:

Very high levels of troponin are a sign that a heart attack has occurred.

NT PROBNP TEST

NORMAL RANGE:

The normal range for NT-proBNP is lower than 125 pg/mL for adults younger than 75 years and lower than 450 pg/mL for adults 75 years or older.

CLINICAL SIGNIFICANCE:

Higher than normal levels of BNP or NT-proBNP mean that you could have heart failure.

D DIMER TEST

NORMAL RANGE:

A normal D-dimer is considered less than 0.50

CLINICAL SIGNIFICANCE

D-dimer tests to help determine if someone has a blood clotting condition, which include: Deep vein thrombosis (DVT or venous thrombosis): Deep vein thrombosis is a blood clot that develops in a vein deep in your body.

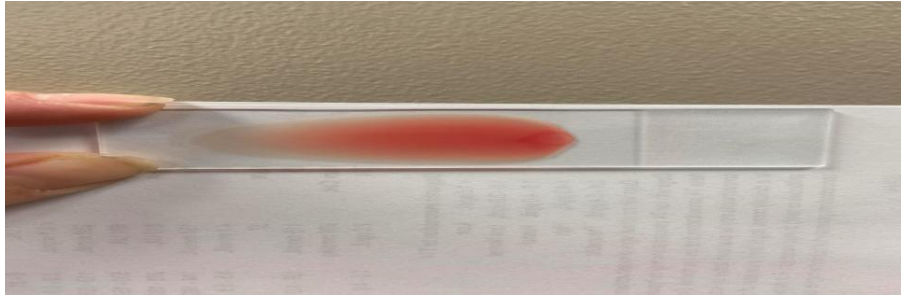
HEMATOLOGY

PERIPHERAL SMEAR

In a laboratory setting, the peripheral smear procedure is typically performed by trained medical technologists or laboratory technicians. Here's a general outline of the procedure:

- **Sample Collection:** A small amount of blood is drawn from the patient using a lancet to prick their fingertip or earlobe. The blood is collected onto a glass slide or sometimes directly onto a specialized slide designed for blood smears.
- **Slide Preparation:** The collected blood is spread thinly and evenly across the surface of the slide. This can be done by dragging another slide at a 30 to 45-degree angle over the first slide, creating a feathered edge.
- **Fixation and Staining:** The smear is fixed to the slide using a fixative such as methanol. Then, it's stained using special dyes such as Wright's stain or Giemsa stain. These stains highlight the different blood cells and allow for better visualization under the microscope.
- **Microscopic Examination:** Once the slide is prepared and stained, it is examined under a microscope by a laboratory professional. They analyze the different types of blood cells, looking for abnormalities such as changes in size, shape, color, and distribution.
- **Interpretation and Reporting:** Based on the microscopic findings, the laboratory professional interprets the results and prepares a report for the healthcare provider. This report helps in diagnosing various blood-related conditions and guiding further treatment.

The peripheral smear procedure is an important diagnostic tool in hematology and plays a crucial role in the evaluation of blood disorders and abnormalities.



(Figure.7)

LEISHMAN STAINING

PRINCIPLE

Leishman stain generally shows violet color of the nucleus and neutrophil granules, making the differential count convenient due to better contrast between nucleus and cytoplasm. The contrast depends on two components Azure B and Eosin Y. Azure B is one of the products from oxidation of methylene blue.

PROCEDURE:

- **Fixation:** Start with the tissue sample and fix it in formalin to preserve its structure.
- **Dehydration:** Transfer the tissue to a series of alcohol solutions with increasing concentrations (e.g., 70%, 95%, 100%) to dehydrate it.
- **Clearing:** Clear the tissue by transferring it through xylene or similar clearing agents.
- If desired, counterstain the tissue with Harris hematoxylin solution for a few seconds to visualize cellular structures.
- Rinse the tissue in tap water to remove excess hematoxylin.
- **Mounting:** Dehydrate the tissue again in alcohol, clear it in xylene, and mount it on a glass slide with a mounting medium.
- **Microscopic Examination:** Examine the stained tissue under a microscope. Lipid droplets will appear red, while other structures may be stained with hematoxylin.

DIFFERENTIAL COUNT

Differential count, also known as a white blood cell differential, is a test performed in clinical laboratories to analyze the different types of white blood cells (leukocytes) present in a blood sample. These cells include neutrophils, lymphocytes, monocytes, eosinophils, and basophils. The differential count provides valuable information for diagnosing various infections, inflammatory conditions, and blood disorders. It helps in assessing the body's immune response and can aid in monitoring the progression of diseases and response to treatment.

PROCEDURE

Prepare Blood Smear: A small drop of blood is spread thinly and evenly onto a glass slide to create a blood smear. The smear is then stained using special dyes to make the different types of WBCs visible under a microscope.

Microscopic Examination: The stained blood smear is examined under a microscope at high magnification. A trained laboratory technician or hematologist carefully identifies and counts the different types of WBCs present.

Counting WBCs: Using a systematic approach, each type of WBC (neutrophils, lymphocytes, monocytes, eosinophils, and basophils) is identified and counted. This is often done by scanning the entire smear in a grid-like pattern and counting the cells within specific fields of view.

Calculation: Once the counts are completed, the total number of each type of WBC is recorded. The percentages of each type of WBC are then calculated by dividing the number of cells of that type by the total number of WBCs counted and multiplying by 100.

Reporting: The differential count results are typically reported as percentages, with each type of WBC represented as a proportion of the total WBC count. This information is then used by healthcare providers to aid in diagnosis and monitoring of various medical conditions.

It's important to note that the differential count may vary slightly depending on factors such as staining technique, sample quality, and the skill of the technician performing the count. Therefore, results should always be interpreted in conjunction with other clinical findings and laboratory tests.

CBC ANALYZER

CBC (Complete Blood Count) analyzer is a sophisticated medical instrument used in laboratories to automate the process of analyzing blood samples. It provides comprehensive information about the cellular components of blood, including red blood cells (RBCs), white blood cells (WBCs), and platelets. Here's a detailed explanation of how a CBC analyzer works and its significance in medical diagnostics:

- **Sample Processing:** The CBC analyzer begins by processing a small volume of the blood sample provided by the patient. The sample may be collected through venipuncture or finger prick, depending on the specific testing requirements.
- **Automated Analysis:** Once the sample is loaded into the analyzer, the instrument performs a series of automated tests to measure various parameters. These tests typically include:
 - **RBC Parameters:** The analyzer measures parameters such as hemoglobin concentration, hematocrit (the proportion of blood volume occupied by RBCs), red blood cell count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC).
 - **WBC Parameters:** The analyzer counts the total number of white blood cells and provides a breakdown of different types of WBCs, including neutrophils, lymphocytes, monocytes, eosinophils, and basophils. It also calculates the WBC differential, which represents the percentage of each WBC type relative to the total WBC count.
 - **Platelet Parameters:** The CBC analyzer measures the platelet count, mean platelet volume (MPV), and platelet distribution width (PDW), which provide information about platelet size and distribution.
 - **Other Parameters:** Some advanced CBC analyzers may also measure additional parameters, such as reticulocyte count (an indicator of bone marrow activity) and red cell distribution width (RDW), which reflects the variation in RBC size.
- **Quality Control:** To ensure the accuracy and reliability of results, CBC analyzers undergo regular calibration and quality control checks. This involves running control samples with known values to verify that the instrument is performing within acceptable limits.

- **Data Analysis and Reporting:** Once the analysis is complete, the CBC analyzer generates a comprehensive report containing all the measured parameters. This report is typically printed or transmitted electronically to the healthcare provider responsible for interpreting the results.
- **Clinical Significance:** The CBC is one of the most commonly ordered tests in medicine and provides valuable information for diagnosing and monitoring a wide range of medical conditions. Abnormalities in CBC parameters can indicate various disorders, such as anemia, infections, inflammation, bleeding disorders, and leukemia. The CBC results are often used in conjunction with other clinical findings and laboratory tests to guide further investigation and treatment decisions.

In summary, CBC analyzers play a crucial role in modern healthcare by providing rapid, accurate, and comprehensive assessment of blood composition. They enable healthcare providers to make informed diagnoses and monitor patients' health status effectively.



(Figure.8)

HbA1C

HbA1c, or glycated hemoglobin, is a measure of the average blood glucose levels over the past 2-3 months. It forms when hemoglobin, the protein in red blood cells that carries oxygen, combines with glucose in the bloodstream. The higher the blood glucose levels, the more HbA1c is formed. HbA1c is a crucial marker in managing diabetes, as it provides insight into long-term blood sugar control and helps healthcare providers assess the effectiveness of treatment plans.

Sample Collection: Collect a blood sample from the patient using a lancet and capillary tube or venipuncture into an EDTA tube.

Sample Preparation: Centrifuge the blood sample to separate the plasma from the cells. Use the plasma for the test.

HbA1c Measurement: There are various methods for measuring HbA1c manually, including chromatography, immunoassays, and electrophoresis. One common method involves ion-exchange high-performance liquid chromatography (HPLC).

Calibration: Calibrate the equipment according to the manufacturer's instructions using known HbA1c standards.

Analysis: Inject the prepared plasma sample into the chromatography system and allow it to separate. Measure the absorbance of HbA1c using a detector.

Data Interpretation: Compare the absorbance readings to a calibration curve to determine the concentration of HbA1c in the sample

Reporting: Record the HbA1c concentration and report the results to the healthcare provider or patient.

It's crucial to follow the specific protocol provided by the manufacturer of the equipment or reagents being used, as procedures may vary slightly depending on the method and equipment available.

IMMUNOLOGY- Vitros Analyzer

Introduction

The Vitros Analyzer is a critical instrument used in the field of immunology for analyzing various parameters related to immune system function and specific disease markers.

Principle of Operation

The Vitros Analyzer operates on advanced technology that utilizes various immunoassay techniques to measure specific proteins, antibodies, and antigens present in biological samples. These techniques may include enzyme-linked immunosorbent assay (ELISA), chemiluminescent immunoassay (CLIA), or other immunological assay methods.

Components of the Vitros Analyzer

Key components of the analyzer include the sample handling system, reagent storage and dispensing system, reaction chambers, detection system, and data analysis and reporting modules. These components work together to automate the process of immune system parameter measurement with high precision and accuracy.

Parameters Analyzed

The Vitros Analyzer is capable of measuring a wide range of immunological parameters, including but not limited to cytokines, hormones, tumor markers, infectious disease markers, autoimmune disease markers, and allergy-related markers.

Sample Analysis Process

The process involves sample loading, reagent dispensing, incubation, reaction detection, and data analysis. The analyzer automates these steps to provide reliable and reproducible results for a variety of immunological assays.

Applications

The Vitros Analyzer finds extensive use in clinical immunology for diagnosing and monitoring various diseases, such as autoimmune disorders, infectious diseases, endocrine disorders, and cancer. It also plays a crucial role in research settings for studying immune system function and disease mechanisms.

Quality Assurance and Maintenance

Regular calibration, quality control procedures, and routine maintenance are essential to ensure the accuracy and reliability of the analyzer's measurements. This includes adherence to strict quality assurance protocols and troubleshooting to address any issues that may arise during operation.

Advantages and Limitations

The advantages of the Vitros Analyzer include its high sensitivity, specificity, and automation, which contribute to efficient and reliable immunological testing. However, limitations such as the need for proper maintenance and quality control should also be considered.

CONCLUSION

In conclusion, hospital lab internship provided invaluable hands-on experience and insights into the realm of medical diagnostics. Through diverse tasks and collaborations with seasoned professionals, I honed my technical skills, developed a deeper understanding of laboratory protocols, and witnessed the importance of accuracy and efficiency in healthcare delivery. This internship reinforced my passion for the medical field and equipped me with practical knowledge that will undoubtedly benefit my future endeavors. I am grateful for the opportunity and look forward to applying the lessons learned to contribute positively to the healthcare industry.

FIG.NO	FIGURE NAME	PAGE
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BLOOD BANK REPORT

INTRODUCTION

BLOOD BANK

The BLOOD BANK MANAGEMENT SYSTEM is great project. This project is designed for successful completion of project on blood bank management system. The basic building aim is to provide blood donation (figure.1) service to the city recently. Blood Bank Management System (BBMS) is a browser based system that is designed to store , process , retrieve and analyze information concerned with the administrative and inventory management within a blood bank. The project aims at maintaining all the information pertaining to blood donors, different blood groups available in each blood bank and help them manage in a better way. Aim is to provide transparency in this field , make the process of obtaining blood from a blood bank hassle free and corruption free make the system of blood bank management effective .

The Blood bank system project report contain information related to blood like

- Date of donation of blood
- Validity of blood
- Available Blood group
- Blood type

FUNCTIONS OF BLOOD BANK

- Blood bank collects, separates, tests and stores blood until a patient needs it. If you've donated blood before, you've been part of the blood banking process.
- The first blood bank in the United States was established in 1937 by Dr. Bernard Fantus at Cook County Hospital in Chicago.

FACTS OF BLOOD BANK

- A blood bank is a center where blood gathered as a result of blood donation is stored and preserved for later use in blood transfusion.
- The term "blood bank" typically refers to a department of a hospital usually within a Clinical Pathology laboratory where the storage of blood product occurs and where pre-transfusion and Blood compatibility testing is performed.
- However, it sometimes refers to a collection center, and some hospitals also perform collection.
- Blood banking includes tasks related to blood collection, processing, testing, separation, and storage.



(Figure.9)

BLOOD DONOR

DONOR SELECTION CRITERIA

- Any healthy adult, both male and female , can donate every three months.
- Good health of the donor must be fully ensured. The universally accepted criteria for donor selection are:
 - Age between 18 and 60 years
 - Haemoglobin - not less than 12.5 g/Dl
 - Pulse - between 50 and 100/minute with no irregularities
 - Blood Pressure -Systolic 100-180 mm Hg and Diastolic 50 - 100 mm Hg
 - Temperature - Normal (oral temperature not exceeding 37.50C)
 - Body weight - not less than 45 Kg
 - **Health conditions:** The donor should be in a healthy state of mind and body.
 - They should fulfill the following criteria:
 - Past one year - not been treated for Rabies or received Hepatitis B immune globulin.
 - Past six months - not had a tattoo, ear or skin piercing or acupuncture, not received blood or blood products, no serious illness or major surgery, no contact with a person with hepatitis or yellow jaundice.
 - Past three months - not donated blood or been treated for Malaria.
 - Past one month - had any immunizations.
 - Past 48 hours - taken any antibiotics or any other medications (Allopathic or Ayurveda or Sidha or Homeo)
 - Past 24 hours - taken alcoholic beverages

- Past 72 hours - had dental work or taken Aspirin
- Present - not suffering from cough, influenza or sore throat, common cold
- Women should not be pregnant or breast feeding her child
- Women donor should not donate during her menstrual cycles
- Free from Diabetes, not suffering from chest pain, heart disease or high BP, cancer, blood clotting problem or blood disease, unexplained fever, weight loss, fatigue, night sweats, enlarged lymph nodes in armpits, neck or groin, white patches in the mouth etc.
- Ever had TB, bronchial asthma or allergic disorder, liver disease, kidney disease, fits or fainting, blue or purple spots on the skin or mucous membranes, received human pituitary - growth hormones etc .

DONOR REJECTION CRITERIA

The following patient are not eligible for donating blood:

- Affected with HIV viruses or AIDS
- If the patient had undergone any open heart surgery
- Donor the lady in pregnant
- Cancer patient
- Kidney disorder
- TB patient
- Low haemoglobin or Anemic patient
- When tattooed
- Allergic
- High blood pressure

- Unexpected weight loss of more then 5kg over 6months
- Alcoholic
- Smoker
- Organ transplantation , Any fever

BLOOD DONOR REQUEST FORM

Madras Egmore Lions Blood Bank Research Foundation

EGMORE : 130, Marshall's Road, Egmore, Chennai - 600 008. Mob : 9841917256 Tel : 28414949 / 4959 / 5959 Web : www.lionsbloodbank.net

AMBATTUR : C-15, A.T.C. Road, Ambattur Industrial Estate, Chennai - 600 026. Tel : 48504959 Mob : 9841917506 E-mail : info@lionsbloodbank.net

BLOOD DONOR CONSENT FORM

LOCATION : _____ DATE : _____

குருதி கொடுக்க யாரைப் பூரித்தி செய்ய வேண்டியபுறமை
TO BE FILLED BY DONOR

குருதி வங்கி ஊழியர் பூரித்தி செய்ய வேண்டியபுறமை
TO BE FILLED BY BLOOD BANK STAFF

TYPE OF DONOR VOLUNTARY REPLACEMENT

செய்தி / Date : _____

செய்தி / Name : _____

முகவரி / Address : _____

மின்னஞ்சல் முகவரி / Email ID : _____

செய்தி எண் / Mobile No. : _____

கல்யாணி (அ) அலுவல் முகவரி / College or Company Address : _____

பாலினம் / Gender Male Female

எடை / Weight _____

பிறந்த தேதி / Date of Birth _____

வயது / Age _____

இரத்த குழுவும் / Blood Group : _____

கடைசி இரத்த தானம் செய்த தேதி / Last Donation Date : _____

மொத்த இரத்த தானம் அளவிற்கு / Total No. of Donation : _____

கடைசி உணவு உண்டாக்கிய தேதி / When did you had your last meal? : _____

TYPE OF BLOOD BAG USED

SINGLE DOUBLE TRIPLE QUADRUPLE

Quantity : 350ml / 450ml

BLOOD BAG NUMBER : _____

SEGMENT NUMBER : _____

BLOOD DONATION TIME : _____ START TIME : _____

END TIME : _____

PHELEBOTOMIST : _____

கொடை யாரருக்கு கொடுக்க தகுதிகள் / Donor Eligibility Criteria

வயது / Age : 18 - 65 Years

எடை / Weight : >45 Kgs

இரும்பு சத்து / Hemoglobin : 12.5 gms%

நாடிதடிப்பு / Pulse : 60-100 / minute

இரத்த அழுத்தம் / B.P. : 100 / 60 - 140/90 mm Hg

நிரந்தர தடை / PERMANENT DEFERRAL

1. உயர் இரத்த அழுத்தம் விளைவாக பக்கவாதம் ஏற்பட்டுள்ளதா?
H/O Uncontrolled Blood Pressure / Stroke?

2. இயல்பு எலும்புக்கூட்டம் / மூன்றுமேல் / மருத்துவம் உட்கொள்பவரா?
H/O Heart Disease or Anti Arrhythmic?

3. வலிப்பு எலும்புக்கூட்டம் / மூன்றுமேல் / மருத்துவம் உட்கொள்பவரா?
H/O Epilepsy or Anticonvulsants or Cytotoxic drugs?

4. அநிர் இரத்தப்போக்கு / கசிவு ஏற்பட்டுள்ளதா?
H/O Abnormal bleeding tendencies / Enzyme Deficiencies with known history of Hemolysis?

5. சர்க்கரை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Diabetes mellitus or treatment with Insulin or Hypoglycemic drugs?

6. கல்லீரல் நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

7. நரம்பு தளர்ச்சி / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Parkinson's diseases?

8. கைநிலை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

9. நரம்பு தளர்ச்சி / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Parkinson's diseases?

10. கைநிலை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

11. அநிர் இரத்தப்போக்கு / கசிவு ஏற்பட்டுள்ளதா?
H/O Abnormal bleeding tendencies / Enzyme Deficiencies with known history of Hemolysis?

12. சர்க்கரை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Diabetes mellitus or treatment with Insulin or Hypoglycemic drugs?

13. கல்லீரல் நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

14. நரம்பு தளர்ச்சி / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Parkinson's diseases?

15. கைநிலை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

16. அநிர் இரத்தப்போக்கு / கசிவு ஏற்பட்டுள்ளதா?
H/O Abnormal bleeding tendencies / Enzyme Deficiencies with known history of Hemolysis?

17. சர்க்கரை நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Diabetes mellitus or treatment with Insulin or Hypoglycemic drugs?

18. கல்லீரல் நோய் / மருத்துவம் / மருத்துவம் உட்கொள்பவரா?
H/O Chronic liver Disease or endocrine disorders / Chronic Kidney disease?

(Figure.10)

BLOOD BAG

BLOOD BAG TYPES

AdvaCare manufactures four types of Blood Transfusion Bags in the AccuPoint range:

- Single Blood Bag: used for collection, preservation, and transfusion of human blood.
- Double Blood Bag: separates red blood cells and plasma. It includes a primary bag and a satellite bag.
- Triple Blood Bag: this system separates red blood cells, plasma and buffy coat (includes leucocytes and platelets). It is made of a primary bag and two satellite bags.

USAGE

- Open the outer wrap at the tear nicks and take off one blood bag system;
- Apply the blood pressure cuff on the donor's arm, identify injection site and release the cuff;
- Disinfect the injection site. Cover the area with sterilized gauze;
- Hang the tube onto patient's wrist in order to not compress the needle;
- Apply the needle immediately;
- Tie the needle to the patient's arm;
- Make sure there is continuous blood flow. If so, the blood collection is expected to be completed in around 12 minutes;
- Collect the quantity of blood following the instructions indicated on the bag label. Monitor the blood being drawn;
- After blood collection is over, collect the blood needed and stop the collection by fastening the blood collection tube;
- Untie the lace or deflate the blood pressure cuff;
- When the procedure is done, hold the hub with one hand to remove the needle while holding the sterile gauze with the other hand. Pull the hub without exerting too much pressure. Let the patient keep sterilized gauze on the injection site;

- Hold the needle with one hand to keep the tip in the upper position and wait for the blood to flow off through the tube;
- Clamp the bag tube;
- Make sure all the patient information required are written on the label of the blood transfusion bag

BLOOD DONATION

PROCEDURE :

- You lie or sit in a reclining chair with your arm extended on an armrest.
- If you have a preference for which arm or vein is used, tell the person who is collecting your blood.
- A blood pressure cuff or tourniquet is placed around your upper arm to fill your veins with more blood. This makes the veins easier to see and easier to insert the needle into. It also helps fill the blood bag more quickly.
- Then the skin on the inside of your elbow is cleaned.
- A new, sterile needle is inserted into a vein in your arm.
- This needle is attached to a thin, plastic tube and a blood bag.
- Once the needle is in place, you tighten your fist several times to help the blood flow from the vein.
- First, blood is collected into tubes for testing. Then blood is allowed to fill the bag, about a pint (about half a liter).
- The needle is usually in place about 10 minutes.
- When your donation is finished, the needle is removed, a small bandage is placed on the needle site and a dressing is wrapped around your skin.

DONOR COUNSELLING

BEFORE BLOOD COLLECTION :

Before you can donate blood, you will be asked to fill out a confidential medical history. It includes questions about behaviors known to carry a higher risk of bloodborne infections — infections that are transmitted through blood.

Because of the risk of bloodborne infections, not everyone can donate blood. The following are groups that are not eligible to donate blood:

- Anyone who has used injected drugs, steroids or another substance not prescribed by a health care provider in the past three months
- Men who have had sexual contact with other men in the past three months
- Anyone who has a congenital coagulation factor deficiency
- Anyone who has had a positive test for HIV
- Anyone who has engaged in sex for money or drugs in the past three months
- Anyone who, in the past 12 months, has had close contact with — lived with or had sexual contact with — a person who has viral hepatitis
- Anyone who has had babesiosis, a rare and severe tick-borne disease, or the parasitic infection Chagas' disease
- You will also have a brief physical exam. The exam includes checking your blood pressure, pulse and temperature.
- A small sample of blood is taken from a finger prick and is used to check the oxygen-carrying part of your blood (hemoglobin level). If your hemoglobin concentration is within a healthy range, and you've met all the other screening requirements, you can donate blood.

AFTER BLOOD COLLECTION :

After donating, you sit in an observation area, where you rest and eat a light snack. After 15 minutes, you can leave. After your blood donation:

- Drink extra fluids.

- Avoid strenuous physical activity or heavy lifting for about five hours.
- If you feel lightheaded, lie down with your feet up until the feeling passes.
- Keep your bandage on and dry for the next five hours.
- If you have bleeding after removing the bandage, put pressure on the site and raise your arm until the bleeding stops.
- If bruising occurs, apply a cold pack to the area periodically during the first 24 hours.
- Consider adding iron-rich foods to your diet to replace the iron lost with blood donation.

Contact the blood donor center or your health care provider if you:

- Forgot to report any important health information to the blood donation center.
- Have signs and symptoms of an illness, such as a fever, within several days after your blood donation.
- Are diagnosed with COVID-19 within 48 hours after donating blood.

BLOOD GROUPING

PRINCIPLE :

ABO blood grouping is based on the principle of an agglutination reaction. It is the popular method for blood group identification to determine the presence and absence of cellular antigens and their relative antibodies in the blood.

Materials Required :

- Toothpicks.
- Blood sample.
- Alcohol Swabs.

- Lancet.
- Clean glass slide.
- Sterile cotton balls.
- Biohazard disposal container.
- Monoclonal Antibodies (Anti-A, B,D).

PROCEDURE

- Inform the patient or individual about the procedure to be carry out
- Dangle the hand down to increase the flow of blood in the fingers.
- Clean the fingertip to be pierced with spirit or 70% alcohol (usually ring or middle finger) and gently massage the finger to increase blood flow
- With the help of the sterile lancet or pricker, pierce the fingertip and place one drop of blood in each of the four cavities
- Now add one drop of each antiserum into each cavity respectively
- If agglutination is observed when individual's blood is mixed with Anti A reagent, then the individual is said to have a blood group "A".
- If agglutination is observed when individual's blood is mixed with Anti B reagent, then the individual is said to have a blood group "B"
- If agglutination is observed when individual's blood is mixed with Anti A and Anti B reagent, then the individual is said to have a blood group "AB"
- If no agglutination is observed when individual's blood is mixed with Anti A and Anti B reagent, then the individual is said to have a blood group "O"
- If agglutination is observed when individual's blood is mixed with Anti RhD reagent, then the individual is said to have a "+ve" Rh factor.
- If no agglutination is observed when individual's blood is mixed with Anti RhD reagent, then the individual is said to a have "-ve" Rh factor.

Anti-A	Anti-B	Anti-D	Control	Blood type
				O-positive
				O-negative
				A-positive
				A-negative
				B-positive
				B-negative
				AB-positive
				AB-negative
				Not valid

Blood grouping result interpretation : (fig.11)

BLOOD SCREENING

DEFINITION : WHO that all blood donations should be screened for infections prior to use.

Screening for HIV, HCV, Malaria, Hepatitis B should be mandatory. Blood Screening should be performed according to quality system requirements.

PRINCIPLE : The purpose of donor selection is **to assess the suitability of an individual to be a blood donation is safe for the donor and the blood products derived from this donation are safe for the recipients.**

METHOD : Automated Machine - Analyzer Machine (fig.12)

HIV (HUMAN IMMUNODEFICIENCY VIRUS) 18 to 45 days after exposure. There is also a rapid antigen or antibody test available that is done with a finger stick. Antigen or Antibody tests done with blood from a finger stick can take 18 to 90 days after exposure.

HCV (Hepatitis C Virus)

There are two results from a hepatitis C antibody test:

- A non-reactive or negative test result means that the person does not have the virus.
- A reactive or positive test result means that the person has had the virus at some point but does not mean that they still have it.

- A blood test , called an HCV antibody test is used to find out if someone has ever been infected with the Hepatitis C Virus. The HCV antibody test , sometimes called the anti-HCV test, looks for antibodies to the hepatitis C virus in blood.

HBV (Hepatitis B Virus)

- Normal hepatitis B core antibody results are negative. A positive hepatitis B core antibody test may mean
- you have a current or past hepatitis B infection. A positive hepatitis B surface antibody test means you are protected against the hepatitis B virus.
- Blood tests can detect signs of the hepatitis B virus in your body and tell your provider whether it's acute or chronic. A simple blood test can also determine if you are immune to the condition. Liver ultra sound. A special ultra sound called transient elastography can show the amount of liver damage.

VDRL

- Venereal disease research laboratory test; Syphilis - VDRL. The VDRL test is a screening test for syphilis. It measures substances (proteins), called antibodies, which your body may produce if you have come in contact with the bacteria that cause syphilis.

MALARIA

- The DiaMed ELISA malaria antibody test is based on binding of anti-plasmodium antibodies present in a serum sample to antigens immobilized on 96 well plates. The antigens are a mixture of a total extract of cultured p.falciparum and recombinant p.vivax antigens.
- Commercial malaria enzyme – linked immunosorbent assays (ELISA) detect anti malarial antibodies and are commonly used to screen blood donations possible malaria infections.



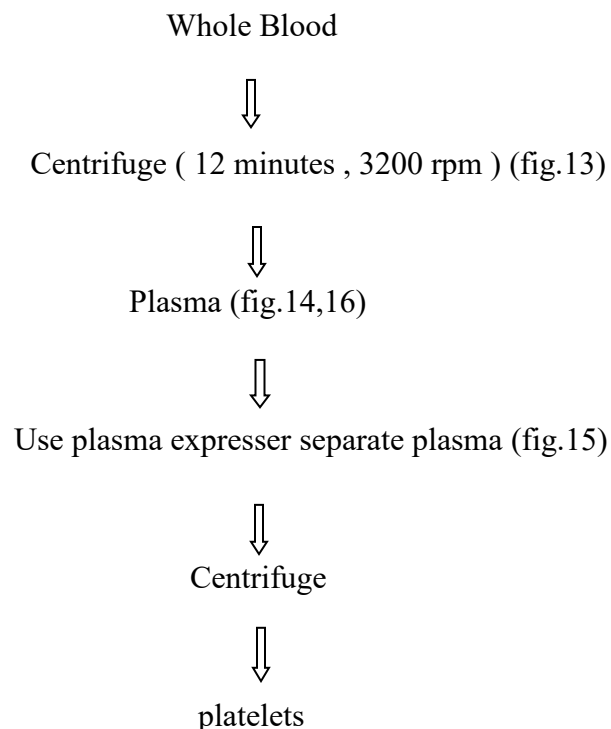
AUTO ANALYZER (figure.12)

BLOOD COMPONENTS SEPARATION

TECHNIQUE:

The separation of plasma from blood usually occurs through centrifugation. The physical force from continuous revolutions pushes the denser, heavier particles to the outer edges of the sample resulting in three layers of different densities: RBCs, a mixture of WBCs and platelets, and plasma.

PROCEDURE :





(figure.13)



(figure.14)



(figure.15)



(figure.16)

BLOOD COMPONENTS STOREGE

A. Packed Red Blood Cell : (fig.17)

- Whole blood and red cells must always be stored at a temperature between +2 °C and +6 °C.
- If blood is not stored at between +2 °C and +6 °C, its oxygencarrying ability is greatly reduced.
- The anticoagulant/preservative solution in the blood bag contains nutrients for the blood during storage and stops the blood from clotting.
- The red cells can carry and deliver oxygen only if they remain viable.
- Shelf life - 35 to 45 days.

B. Fresh frozen plasma :

- Fresh frozen plasma (FFP) is plasma which is separated from a unit of whole blood within 6 hours of collection, and has been rapidly frozen and maintained at all times at a temperature of minus -30°C or lower.
- FFP, once thawed has a shelf life of 24 hours at 1°C to 6°C .
- Plasma contains water, electrolytes, clotting factors and other proteins (mostly albumin), most of which are stable at refrigerator temperature, i.e. $+2^{\circ}\text{C}$ to $+6^{\circ}\text{C}$.
- Shelf life - 1 year.

C. Platelets :(fig.18)

- Platelet-rich plasma (PRP)/ Platelet concentrate (PC) must be separated from whole blood by centrifugation within 6 hours of collection.
- whole blood should be kept at between $+20^{\circ}\text{C}$ and $+24^{\circ}\text{C}$ until it is processed into platelet concentrates and other blood components.
- Platelet concentrates should be stored at a temperature of between $+20^{\circ}\text{C}$ and $+24^{\circ}\text{C}$ i.e $22\pm 2^{\circ}\text{C}$ with continuous gentle agitation.
- This is essential to prevent platelet aggregation which results in loss of viability.
- Shelf life - 5 days.



(figure.17)



(figure.18)

BLOOD ISSUING

PROCEDURE:

- Donor blood type on units, Transfusion Record and Unit Issue screen of BBIS. Donor unit number on unit, Transfusion Record form, Unit Issue screen of BBIS and Blood Release form.
- Compatibility testing results on Transfusion Record form. Patient name and hospital ID number on Blood Release form, Transfusion Record form Unit Issue screen of BBIS.
- BB ID number on Blood Release form, Transfusion Record form, and unit tag.
- Expiration date/time on unit and Transfusion Record form. Doctor's Orders for Blood/BloodProduct has been received by the BTS and checked for unit quantity and product.
- Tech must ensure an order for transfusion exists prior to releasing blood/blood product. Special Requirements indicated by "Patient Instructions", such as irradiation, antigen-negative are met.
- During the sign-out procedure the Blood Release form is completed with the unit number, time, date and the transporter's signature.
- The BTS technologist and the transporter must confirm agreement between the donor unit number and blood transfusion.

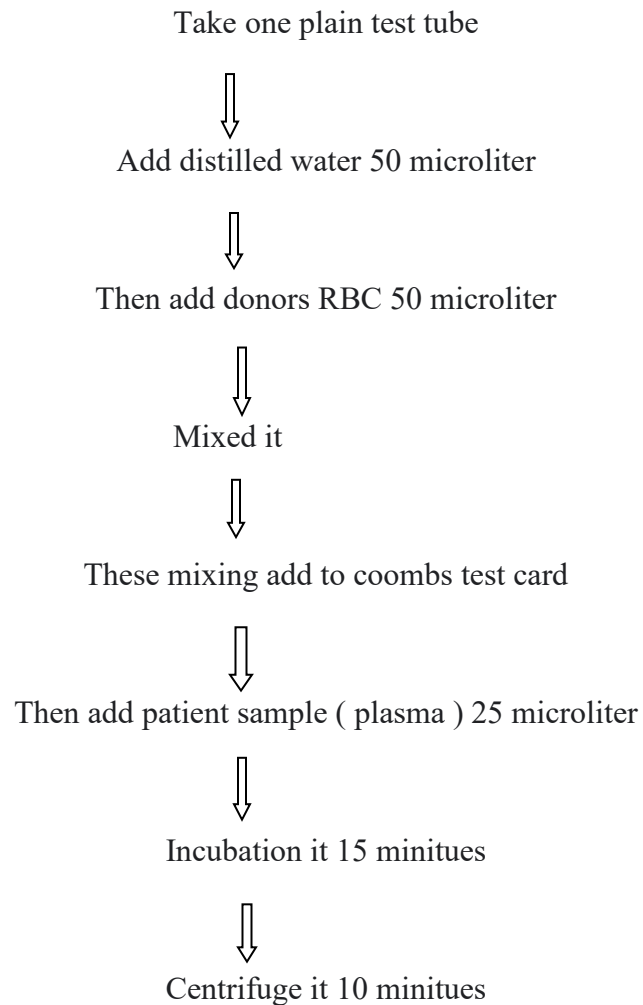
CROSS MATCHING

PRINCIPLE:

A crossmatch is performed prior to administration of blood or blood products (e.g. packed red blood cells). The purpose of the crossmatch is **to detect the presence of antibodies in the recipient against the red blood cells of the donor**. These antibodies attach to the red blood cells of the donor after transfusion.

METHOD : Coombs Method

PROCEDURE :



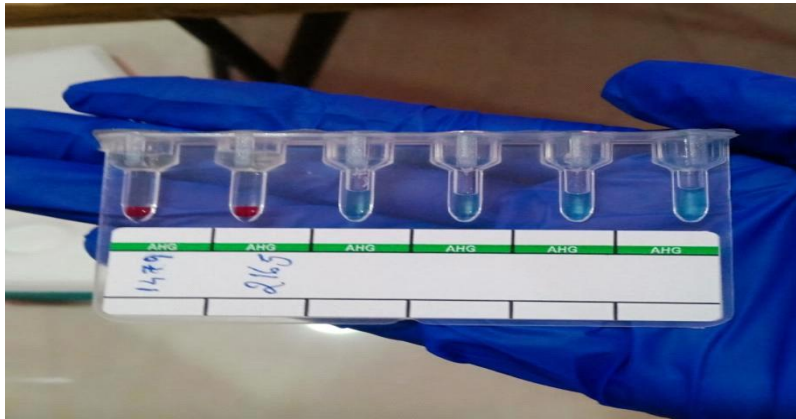
RESULT :

Positive Result :

If the recipient's cells attack and kill the donor cells, the crossmatch is considered positive. This means **the recipient has antibodies "against" the donor's cells**. If the crossmatch is negative, the pair is considered compatible.(fig.19)

Negative Result :

The ratio of patient plasma or serum to donor RBCs is also important, as **too many donor RBCs** could result in a false-negative result if there are not enough antibodies binding to the RBCs to cause a reaction.(fig.20)



(figure.19)



(figure.20)

BLOOD BANKING RECORDS

RECORDS MANAGEMRNT:

- All transfusion records in the recipiants medical chart shall be retained in accordance with care facility policy.
- A complete record pertaining to the identification of the blood component including Transfusion Medicine Laboratory testing results and worksheets and the collecting facility shall be retained indefinitely.
- The recipient transfusion data file in the Transfusion Medicine Laboratory shall be retained indefinitely.

- For each blood component issued, a record system shall be in place which documents :
- Recipient's name and identification number
- Recipient's ABO group
- Recipients Rh group
- Identification number and name of blood component
- ABO group of the blood component
- Rh group of the blood component for red cells, platelets and
- granulocytes
- Compatibility verification for red cells and granulocytes
- Visual inspection
- Date and time of issue
- Identity of the person issuing the blood component
- Identity of the person transporting the blood component to the
- recipient's location
- For each blood product issued , a record system shall be in place which documents:
- Recipient's name and identification number
- Blood product name and manufacturer
- Lot number
- Volume and /or potency
- Dosage/vials issued
- Visual inspection
- Date and time of issue
- Identity of the person issuing the blood product
- Identity of the person transporting the blood product to the
- recipient's location.
- Records of inspection of blood components and blood products prior to issue shall be retained for five years.

- Records for all facilities shall ensure that it is possible for blood components and blood products to be traced from its source to final disposition. The record system must provide a means to locate and access all records related to a given blood component or blood product. These records must be kept indefinitely. The Transfusion Medicine Laboratory shall develop and maintain records that demonstrate that the quality system is operating in an effective manner.
- Healthcare employee signatures, initials and computer identification shall be retained for ten years.

CONCLUSION

- Blood transfusion or its products is an invaluable therapeutic measure which should be with good reasons because of its potential hazards.
- Therefore a well-organised blood transfusion service ,
- Blood loss in during a surgical procedure should be minimized.
- RBC booster should be given pre and postoperatively to patients.
- This report presents the blood bank management system related issues.
- Problem to calculate amount of blood in stock.Difficulty in identifying blood expiry date.

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Sharing Life. Saving Lives..since 1984



**Madras Egmore
Lions Blood Bank &
Research Foundation**

Date: 12th Dec 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Sumithra. V, BSc in MLT, 2nd year of Sathyabama Institute of Science and Technology, Chennai - 119, undergone Internship training in Madras Egmore Lions Blood Bank & Research Foundation(Ambattur Unit), Chennai - 58. She has been observed blood bank procedures including Bleeding the Donors, Bloodgrouping, Cross-matching, Component separation, TTI screening and attend Blood donation camp for the period from 21st Nov 2022 to 26th Nov 2022

During her internship, performance was good and she was able to complete the project on time.

We wish her all the best for her upcoming career.

Ln.J.Madanagopal Rao
Chairman



This project made possible through the co-operation of Lions Club International Foundation, Clubs in the District 324 - A1, A5 & A6 and well wishers - sponsored by Lions Club of Madras Egmore

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Mob : 99419 17505
E-mail : info@lionsbloodbank.net



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01-11-2023

INTERNSHIP COMPLETION LETTER

This is to certify that Ms. V. Sumithra a bonafide BSc. Medical Laboratory Technology student of the Sathyabama institute of science and technology Chennai -600119, has successfully completed Internship with the Laboratory Services Department of our hospital.

Duration : 1st October 2023 to 31st October 2023

**SEMINAR PRESENTED: 1. Liver Function Test
2. Renal Function Tests**

She has learnt to do routine work under supervision and has been aware of basic lab procedures.

She is well behaved and has maintained a cordial professional rapport with lab staff.

We wish her all the best in all her future endeavours.

Best Regards,

For Geri Home Care Services Private Limited,

Dr. Archana Ashwin
Consultant & Laboratory Head
Geri Care hospitals
Chennai

Siddharth B
Head - HR

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