

INTERNSHIP REPORT

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SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

In partial Fulfilment 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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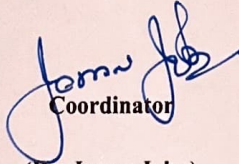
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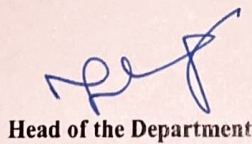
BONAFIDE CERTIFICATE

This is to certify that this internship report is the Bonafide work of **Mr. Yokeshwaran(41737027)** student of III-year B.Sc., Department of Medical Laboratory Technology, School of Allied Health Sciences, Sathyabama Institute of Science and Technology has done his internship work in the “**Lions Blood Bank and Research Foundation at Ambattur and Voluntary Health Services at Adyar**” under our supervision from August 2023 to April 2024.



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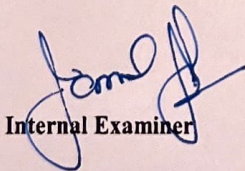


Head of the Department

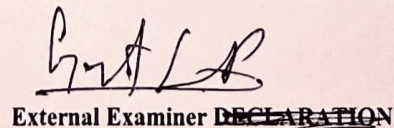
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Submitted for Viva voce examination held on 12th April 2024



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External Examiner DECLARATION

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DECLARATION

I, **S.YOKESHWARAN (41737027)**, hereby declare that the internship trainings done by me at **Lions Blood bank and Research Foundation at Ambattur** under the guidance of **Ms. D. JASMINE PRIYA** and "**Voluntary Health Services at Adyar**" under the guidance of **Dr. JAMES JOHN** 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**.

DATE:

PLACE: CHENNAI


(Mr. YOKESHWARAN.S)

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I wish to express my deep sense of gratitude and thanks to my internship guide **Dr. James john**, Assistant professor, Department of Medical Laboratory Technology and **Ms. D. Jasmine Priya**, Assistant professor, Department of Medical Laboratory Technology for their excellent guidance and strong support throughout the course of my study.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of MEDICAL LABORATORY TECHNOLOGY who were helpful in many ways for the completion of the internship.

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1.INTRODUCTION

I had the opportunity to do my internship at institutions, **VOLUNTARY HEALTH SERVICES, ADYAR** and **LIONS BLOOD BANK AND RESEARCH FOUNDATION, AMBATTUR**. During the period from 28.11.22 to 03.12.22 , I completed my internship at Lions blood bank and research foundation in Ambattur followed by an internship at Voluntary health services from 01.11.23 to 30.11.23. These internships provided me with valuable experience observing a wide range of tests conducted in both blood banks and diagnostic laboratories. This report summarizes my learning and observations from these internships.

2.PHLEBOTOMY

Phlebotomy is the act of drawing or removing blood from the patients through a cut or puncture in order to obtain a sample for analysis and diagnosis. I have gained knowledge about several typical responsibilities carried out in phlebotomy, such as selecting the correct tube color for blood sample collection and effectively communicating with patients during the process.

Materials required:

- Gloves
- Syringes
- Evacuated collection tubes
- Alcohol wipes
- Tourniquet

Procedure:

- Confirming the patient's identity and medical records
- Utilizing sterile equipment, primarily vacuum tubes, for blood collection.
- Choosing the suitable vein for blood extraction.
- Prior to blood collection, it is advised to label the designated tube with patient information for accurate identification.
- The blood samples are transported to the laboratory for analysis.
- Appropriately disposing of used needles and biohazardous materials.

This department made me understand the duty of a phlebotomist is to guarantee the secure and effective retrieval of blood samples, all also ensuring a favourable response from the patient.

3.CLINICAL PATHOLOGY

I have gained knowledge about procedures for urine routine and physical examination of stool samples, including urine strip, urine deposit, wet mount for stool, physical examination of stool, and occult blood.

3.1 OCCULT BLOOD:

The faecal occult blood test (FOBT) is a simple, inexpensive and most frequently performed chemical screening test on faeces. It is done for the detection of blood in the stool that is not visible.

Principle:

The principle of chemical tests to detect occult blood is based on the fact that haemoglobin and its derivatives react in a similar way to peroxidase enzymes by catalysing the transfer of an oxygen atom from the peroxide to a chromogen such as benzidine, o-toluidine, guaiac or aminophenazone.

Procedure:

- Collect a stool sample- The first step in testing for occult blood is to collect a small sample of stool. This can be done at home using a special collection kit provided by your healthcare provider.
- The test is performed on a paper slide that contains paper squares coated with **guaiac**, a chemical derived from tree resin. A small portion of stool(faecal) specimen is applied to the paper.
- A developer solution containing hydrogen peroxide is added to the paper.
- If the blood is present in the specimen, the iron (Fe) in the haemoglobin catalyses the reaction between guaiac in the paper and the hydrogen peroxide. The completed reaction forms a blue color.

3.2 WET MOUNT:

Wet mount slide is a slide that is prepared with some type of liquid placed at the center of the slide that will serve as the medium through which the specimen will move or interact with during microscopic observation.

Procedure:

- Prepare a wet mount slide by placing a drop of physiological saline or tap water on a clean microscope slide.
- Using a clean applicator stick, transfer a small amount of the stool sample onto the drop of water and mix it gently to form a homogenous mixture.
- Carefully place a coverslip over the stool sample to avoid trapping air bubbles.
- Examine the wet mount preparation under a microscope using low power (10x) and high power (40x) objective lenses to observe any parasites present.
- Dispose of the slide and coverslip appropriately following standard biohazard disposal protocols.

3.3 URINE ROUTINE:

Urine routine tests are among the most commonly scheduled tests. The routine consists of tests designed to assess the physical, chemical, and microscopical properties of urine. It aids in evaluating

general health and serves as an early warning sign of illnesses such as kidney disease, urinary tract infection and liver disease

Urine routine includes:

- Urine strip
- Urine deposit.

Procedure for Sample collection:

- Instruct the patient to collect a clean, mid-stream urine sample in a sterile container.
- Ensure the date and time of collection are recorded on the container.
- Seal the container tightly to prevent leakage.
- Send the sample to a laboratory for analysis within 2 hours.
- The laboratory will visually examine the urine, measure its volume, and test for pH, protein, glucose, ketones, blood, and nitrites.
- The results will be interpreted to diagnose any underlying illnesses or monitor treatment progress.



Urine strip

Procedure:

- Collect a fresh urine sample in a clean container.
- Immerse the urine strip into the urine sample, ensuring all reagent pads are covered.
- Remove the strip after the specified time (typically 1 minute).
- Shake off excess urine from the strip using Kim wipes.
- Compare the reagent pad colours to the provided color chart or use a urine strip analyzer to detect substances like glucose, protein, blood, ketones, and pH levels.
- Record the result using the analyzer.
- Dispose of the urine strip and sample according to waste disposal guidelines.

Urine deposit:

Urine deposit refers to the identification of mucus, RBC or any other bacterial substance.

Procedure:

- Transfer the urine from the container into a centrifuge tube
- Centrifuge the urine at 1500 rpm for 10 minutes.
- Remove the supernatant and collect the deposit using a dropper.
- Place a coverslip over the deposit and examine it under a microscope.

3.4 STOOL EXAMINATION:

Stool examination helps to diagnose certain conditions that affect the digestive tract. These conditions may include infection, poor nutrient absorption or cancer. It involves collecting a sample of stool and observing its consistency, color, odor and any abnormal substances.

Procedure:

- **Stool Collection:** Patients are instructed to collect a small, uncontaminated sample in a clean container, ensuring no urine or water mixes with it.
- **Color Inspection:** The color of the stool, typically brown, provides insight into digestive health. Abnormal colours like red (indicating blood), black (from upper gastrointestinal bleeding), or pale (suggesting liver or bile duct issues) should be noted.
- **Consistency Assessment:** Stool consistency, such as watery (diarrhea) or hard (constipation), offers diagnostic clues.
- **Odor Examination:** The smell of stool can indicate gastrointestinal disorders like malabsorption or bacterial overgrowth.
- **Detection of Abnormal Substances:** The stool sample is examined for mucus, pus, parasites, undigested food, and other abnormal substances.
- **Occult Blood Testing:** A guaiac test may be used to detect occult (hidden) blood in a small stool sample, indicating potential gastrointestinal bleeding.

4. MICROBIOLOGY

INTRODUCTION:

I have extensively studied the procedures utilized in Microbiology labs, where different microorganisms are researched.

- Blood culture
- Urine culture
- Stool culture

- Sputum culture
- Tissue culture
- Wound swab
- Covid swab

4.1 BLOOD CULTURE:

The principle of a blood culture is to detect the presence of microorganisms, such as bacteria or fungi, in the bloodstream. This is done by collecting a sample of blood from the patient and then culturing it in a suitable medium under controlled conditions to promote the growth of any potential pathogens. The culture is observed for signs of microbial growth, which can then be further analyzed to identify the specific microorganism causing the infection.

1. Patient Preparation: Explain the procedure to the patient. Clean the skin over the venipuncture site with an antiseptic solution.

2. Collection of Blood Sample: Using a sterile technique, draw blood into aerobic and anaerobic culture bottles. The volume of blood collected depends on the culture bottle size and the laboratory's protocol.

3. Labeling: Label each culture bottle accurately with the patient's name, date, and time of collection to ensure proper identification.

4. Transportation: Transport the culture bottles to the laboratory promptly to maintain the viability of microorganisms and improve the chances of detecting pathogens.

5. Incubation: In the laboratory, the culture bottles are placed in a suitable incubator set at specific temperatures to promote the growth of aerobic and anaerobic microorganisms.

6. Monitoring: Check the culture bottles regularly for signs of microbial growth, such as turbidity (cloudiness) or gas production. Automated systems may also be used to monitor growth continuously.

7. Subculturing: If microbial growth is observed, subculture the contents of the positive culture bottles onto agar plates for further isolation and identification of the specific microorganism.

8. Identification: Perform biochemical tests, molecular methods (e.g., PCR), and other techniques to identify the type of microorganism present in the blood culture.

9. Reporting: Report the results to the healthcare provider, including the type of microorganism identified and its susceptibility to antibiotics, if applicable.

10. Interpretation: Interpret the results in the context of the patient's clinical condition to guide appropriate treatment decisions.

Note:

Throughout the procedure, maintaining sterility, accurate labeling, proper transportation, and timely processing are crucial to obtaining reliable blood culture results.

4.2 URINE CULTURE:

A urine culture is a diagnostic test performed to detect and identify any bacteria or other pathogens present in a urine sample. This test is commonly used to diagnose urinary tract infections (UTIs) and to guide appropriate treatment. Here's how the process typically works.

SAMPLE COLLECTION:

A clean-catch midstream urine sample is usually collected. This involves cleaning the genital area and then collecting urine in a sterile container after the initial stream of urine has passed, which helps minimize contamination from the skin.

TRANSPORT TO LAB:

The urine sample is promptly sent to a laboratory for analysis. It's important to transport the sample as soon as possible to maintain the viability of any bacteria present.

INOCULATION AND INCUBATION:

In the lab, a small amount of urine is inoculated onto specific culture media that promote the growth of bacteria. These media may include agar plates or broth cultures. The cultures are

then incubated at a controlled temperature (usually around 37°C) to allow any bacteria present to grow.

IDENTIFICATION:

After incubation, microbiologists examine the culture plates or broth for the presence of bacterial growth. They identify the types of bacteria present using various techniques, such as microscopy, biochemical tests, or automated systems.

ANTIBIOTIC SENSITIVITY TESTING:

In some cases, antibiotic sensitivity testing may be performed on the isolated bacteria. This test determines which antibiotics are effective in treating the infection by exposing the bacteria to different antibiotics and observing their response.

REPORTING RESULTS:

The lab reports the results to the healthcare provider who ordered the test. The report typically includes the type of bacteria identified, the bacterial count (indicating the severity of the infection), and any antibiotic sensitivity information if applicable.

NOTE:

Based on the urine culture results, healthcare providers can prescribe appropriate antibiotics or other treatments to address the specific infection. It's important to note that urine cultures are typically not needed for uncomplicated UTIs, but they are recommended for complicated cases, recurrent infections, or when the initial treatment is not effective.

4.3 STOOL CULTURE :

PRINCLPLE :

The principle of a stool culture is to detect and identify the presence of pathogenic bacteria, parasites, or other microorganisms in a stool sample. This is typically done to diagnose gastrointestinal infections, such as bacterial or parasitic gastroenteritis. The stool culture procedure involves collecting a stool sample from the patient and then culturing it in a suitable medium under controlled conditions to promote the growth of any potential pathogens. The culture is observed for signs of microbial growth, and if growth occurs, further tests are conducted to identify the specific microorganism causing the infection and determine its susceptibility to antibiotics or other treatments. This information helps healthcare providers diagnose and treat gastrointestinal infections effectively.

PROCEDUR :

1. Patient Preparation: Instruct the patient to collect a fresh stool sample into a clean, dry container. Advise them to avoid urine, water, or toilet paper contamination during collection.

2. Transportation: Transport the stool sample to the laboratory promptly, preferably within 2 hours of collection, to maintain the viability of any microorganisms present. If immediate transport is not possible, store the sample in a refrigerator at 2-8°C and transport it as soon as possible.

3. Labeling: Label the stool sample container accurately with the patient's name, date, time of collection, and any relevant clinical information, such as symptoms or suspected infection.

4. Specimen Processing: In the laboratory, process the stool sample by inoculating a portion onto selective and differential culture media appropriate for the detection of enteric pathogens, such as Salmonella, Shigella, Campylobacter, and Escherichia coli.

5. Incubation: Incubate the culture plates at specific temperatures and conditions suitable for the growth of enteric bacteria and other pathogens. Incubation times can vary but typically range from 24 to 72 hours.

6. Observation and Colony Morphology: After incubation, examine the culture plates for the presence of bacterial colonies. Observe colony morphology, such as size, shape, color, and texture, which can provide initial clues about the type of bacteria present.

7. Subculture and Identification: If significant bacterial growth is observed, subculture representative colonies onto additional agar plates for further identification and Perform biochemical tests, Gram staining, and molecular methods (e.g., PCR) as needed to identify the specific microorganism causing the infection.

8. Reporting: Report the culture and antimicrobial susceptibility results, including the identification of pathogens and their susceptibility profiles, to the healthcare provider for interpretation and treatment decisions.

9. Quality Control: Implement quality control measures throughout the procedure, including using control strains for culture media, incubation conditions, and antibiotic susceptibility testing, to ensure accurate and reliable results.

Note:

By following these steps with precision and adherence to established protocols, healthcare providers can obtain valuable information from stool cultures to diagnose and manage gastrointestinal infections effectively.

4.4 SPUTUM CULTURE:

A sputum culture is a laboratory test that examines a sample of sputum, which is the mucus that is coughed up from the lower respiratory tract (lungs and bronchi). This test is commonly done to identify and diagnose bacterial, fungal, or viral infections in the respiratory system.

SAMPLE COLLECTION:

The patient is asked to cough deeply to produce sputum from the lower respiratory tract. The sputum is collected in a sterile container.

TRANSPORT TO THE LAB:

The collected sample is then sent to the laboratory for analysis. It's important to transport the sample properly to maintain its integrity and prevent contamination.

SAMPLE PREPARATION:

In the lab, the sputum sample is processed to remove any debris or saliva that might be present, ensuring that only the relevant components are analyzed.

CULTURE:

The processed sample is then cultured on specific media that promote the growth of bacteria, fungi, or viruses. This allows the microorganisms in the sample to grow and form colonies.

IDENTIFICATION:

Once colonies have grown, they are examined under a microscope and subjected to various tests to identify the specific microorganisms present. This may involve biochemical tests, genetic analysis, or other techniques depending on the suspected pathogens.

REPORTING:

Finally, the laboratory generates a report detailing the findings of the sputum culture, including the type(s) of microorganisms present and their susceptibility to antibiotics or antifungal medications.

NOTE:

Sputum cultures are particularly useful in diagnosing respiratory infections such as pneumonia, tuberculosis, bronchitis, and chronic obstructive pulmonary disease (COPD). The results of the culture help healthcare providers determine the most appropriate treatment for the infection, especially in cases where the cause is unclear or when initial treatments are not effective.

4.5 TISSUE CULTURE:

Tissue culture, also known as cell culture or in vitro culture, is a technique used in biology and biotechnology to grow and maintain cells outside their natural environment. This method involves taking cells from a plant or animal and placing them in a controlled environment with appropriate nutrients and conditions for growth.

PRINCLPLE :

The principle of tissue culture involves the cultivation and maintenance of cells or tissues in a controlled environment outside their natural setting, such as in a laboratory. This technique allows researchers to study cellular behavior, biochemical processes, and responses to various stimuli in a controlled and reproducible manner.

CULTURE PROCEDURE :

The tissue culture procedure involves several key steps to cultivate and maintain cells or tissues in a controlled laboratory environment. Here's a general outline of the tissue culture procedure:

1. Preparation of Culture Vessels and Equipment:

1- Sterilize all culture vessels, tools, and equipment using appropriate methods such as autoclaving, UV irradiation, or chemical disinfection.

2- Prepare culture dishes or flasks with suitable growth surfaces (e.g., tissue culture-treated plastic, coated with extracellular matrix proteins).

2. Preparation of Culture Medium:

1 - Prepare the appropriate culture medium based on the cell type being cultured. This may include basal medium supplemented with serum, growth factors, hormones, antibiotics, and other additives.

2- Filter-sterilize the medium using a sterile filter unit to remove any contaminants

3. *Cell or Tissue Harvesting:

1- Obtain the cells or tissues from a suitable source (e.g., cell lines, primary cells, tissue explants).

2 - Disaggregate tissues into single-cell suspensions using enzymatic digestion (e.g., trypsin, collagenase) or mechanical dissociation (e.g., gentle pipetting).

3- Count the cells using a hemocytometer or automated cell counter to determine the cell density.

4. Seeding Cells:

1 - Seed the appropriate number of cells into each culture vessel to achieve the desired cell density for growth and experimentation.

2- Allow cells to attach and adhere to the culture surface by incubating them at the appropriate temperature and CO₂ concentration.

5. Culturing Cells:

1- Incubate the culture vessels in a humidified CO₂ incubator set to the optimal conditions for cell growth (e.g., 37°C, 5% CO₂).

2 - Regularly monitor cell morphology, growth rate, and confluence under an inverted microscope.

6. Media Changes:

1 Replace old culture medium with fresh medium regularly (e.g., every 2-3 days) to provide cells with nutrients and remove metabolic waste products.

2 - Adjust the medium composition and supplements based on cell growth and experimental requirements.

7. Cell Passaging:

1- When cells reach confluence or the desired growth stage, detach them from the culture surface using trypsin or a suitable cell detachment solution.

2 - Seed the detached cells into new culture vessels at an appropriate dilution to prevent overgrowth and maintain healthy cell proliferation.

8. Quality Control and Maintenance:

1- Perform regular quality control checks, such as cell viability assays, mycoplasma testing, and cell line authentication, to ensure culture integrity.

2 - Maintain detailed records of culture conditions, passage numbers, and experimental procedures for traceability and reproducibility. **Note:**

By following these steps with precision, maintaining sterile conditions, and optimizing culture parameters, researchers can successfully establish and maintain cell cultures for various scientific applications, including cell biology research, drug development, disease modeling, and tissue engineering.

4.6 WOUND AND PUS CULTURE

A skin or wound culture is a test to find germs (such as bacteria, a virus, fungus) that can cause an infection. A sample of skin, tissue, or fluid is added to a substance that promotes the growth of germs. If no germs grow, the culture is negative. If germs that can cause an infection grow, the culture is positive.

Principle:

The principle behind wound and pus culture is to isolate and identify the microorganisms causing an infection in a wound or pus sample. This process helps determine the type of infection and guides the selection of the appropriate treatment.

Procedure:

- Use a sterile swab or needle to collect the wound or pus sample, ensuring no contamination from the surrounding area.
- Streak the collected sample onto suitable culture media like blood agar and MacConkey agar, each supporting the growth of different microorganisms for diverse infection detection.
- Place the inoculated media in an incubator at around 37 degrees Celsius, the optimal temperature for bacterial growth, with incubation time adjusted for suspected pathogens and infection type.
- After incubation, examine the culture plates for colony growth, noting different colony characteristics (size, shape, color) indicating various microorganisms. Isolate these colonies onto separate plates for further analysis.
- Conduct identification tests on isolated microorganisms, such as gram staining, biochemical tests, and molecular techniques like PCR, to determine species, and sometimes strain or serotype, aiding in targeted treatment.

Interpretation:

Aspect	Identification
Identification	Helps identify the type of infection, e.g., <i>S. aureus</i> for skin infection, <i>S. pyogenes</i> for streptococcal infection.
Quantity	Indicates infection severity; high load of bacteria like <i>P. aeruginosa</i> or <i>E. faecalis</i> suggests a significant infection
Antibiotic susceptibility	Guides antibiotic therapy, determines effective antibiotics and resistance patterns.

5. HEMATOLOGY

INTRODUCTION:

In this laboratory department, I gained knowledge about a comprehensive range of blood tests including CBC, DC, ESR, and HbA1c, along with coagulation tests. Additionally, I observed staining procedures such as PAP stain and Leishman stain.

5.1 BLEEDING TIME:

Bleeding time is a test used to measure the time it takes for a cut to stop bleeding. The bleeding time test is dependent on appropriate functioning of platelets blood vessels and platelets and evaluates earliest hemostasis.

Procedure:

- Blood pressure of the patient is measured with sphygmomanometer the help of blood pressure of the patient should be normal before going to the further process.
- The volar surface of the forearm is cleansed with ethanol 70% and allowed to dry.

- With the help of a lancet, in quick succession, three punctures are made about 5 cm apart. Note that scars and superficial veins should be avoided.
- Start the stopwatch as soon as puncture made on the volar surface of the forearm.
- With the help of the filter paper, blood oozing from the puncture wound is gently absorbed with intervals of 15 seconds.
- The timer is stopped when blood no more mark the filter paper.
- Time measured for bleeding to stop from all the three-puncture wound is recorded.
- The average time is calculated and reported as the bleeding time.

Reference Ranges:

Normal range: 2 -7 minutes.

5.2 CLOTTING TIME

Clotting time, also known as coagulation time, measures the time it takes for blood to clot. The principle behind clotting time is to assess the functional integrity of the intrinsic and common coagulation pathways. Here's the procedure:

1. Preparation:

- 1 - Collect a sample of venous blood using a sterile technique
- 2 - Ensure the blood is anticoagulated properly to prevent clotting before the test begins.

2. Equipment:

- 1 - A stopwatch or timer
- 2 - A clean, dry glass or plastic tube called a test tube or a coagulation tube

3. Procedure:

- 1 - Fill a clean, dry test tube with the blood sample
- 2 - Start the timer immediately after adding the blood to the tube.
- 3 - Tilt the tube gently every few seconds to observe for clot formation.
- 4 - The clotting time is recorded as the time elapsed from the moment blood is drawn until a stable clot forms in the tube.
- 5 - This is typically indicated by the absence of movement of the blood when the tube is tilted.

4. Interpretation:

- 1 - Normal clotting time varies but typically ranges from 6 to 15 minutes.

2 -Prolonged clotting time may indicate disorders such as hemophilia, liver disease, or vitamin K deficiency, among others.

3 -Shortened clotting time may indicate hypercoagulable states or the presence of prothrombotic conditions.

results.

Clotting time is a simple yet crucial test in assessing the overall coagulation status of an individual and diagnosing various clotting disorders.

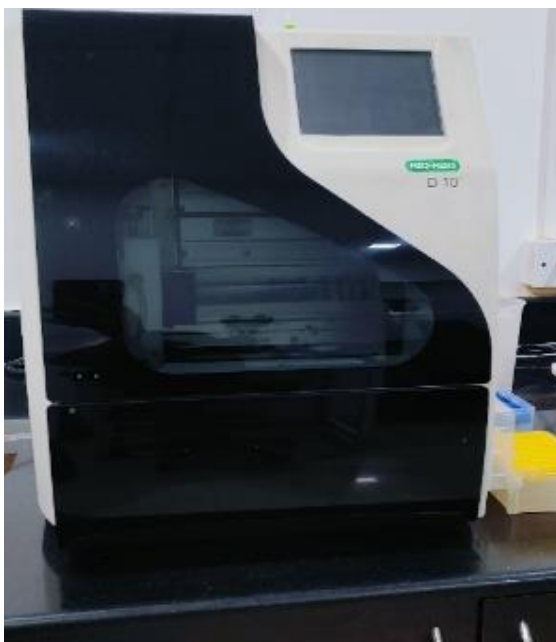
5.3 HbA1C:

Sample preparation:

Blood is collected in EDTA tube and mix it thoroughly.

Procedure:

- Turn on the analyzer and wait for it to initialize.
- Prepare the HbA1C test samples by collecting blood in an EDTA tube. Mix the sample by gently rotating the tube to ensure the blood mixes with the anticoagulant.
- Load the test samples into the analyzer, ensuring each sample is correctly labelled to avoid mix-ups.
- Start the analysis process on the analyzer, which may involve selecting the appropriate test protocol and running the analyzer with the specified settings.
- Monitor the progress of the analysis on the analyzer's display screen.
- Once the analysis is complete, review the results provided by the analyzer. Check for any errors or inconsistencies and troubleshoot as needed.
- Record the results of the HbA1C analysis in the patient's medical records or laboratory documentation.



5.4 ACTIVATED PARTIAL THROMBOPLASTIN

Sample preparation:

The venipuncture needs to be a 'clean' without excessive venous stasis. Once the needle is removed from the syringe, transfer the blood into tubes. Mix with one part of Trisodium citrate exactly nine parts of the freshly collected blood. Immediately centrifuge at 3000 rpm for 15 minutes, then move the plasma into a sterile test tube. Plasma has to be checked within three hours of collecting the blood. Platelet deficient plasma should be used for determination of heparin, hence higher centrifugation time is required.

Procedure:

- Prepare the reagents and equipment, including APTT reagent, calcium chloride, and patient plasma sample. Turn on the Start Max coagulation analyzer, allowing it to warm up. Calibrate the analyzer following the manufacturer's instructions.
- Use a cuvette designed for the machine, adding 50 μL of sample and APTT reagent. Incubate for 170 seconds, then at the 180th second, add 50 μL of calcium chloride reagent and start the timer.
- Record the APTT value displayed on the analyzer and interpret it based on established reference ranges and clinical guidelines, such as Normalized Ratio (NR).
- Clean and maintain the analyzer as per the manufacturer's instructions and dispose of used reagents and biohazardous waste properly.
- Document the test results in the patient's medical record.

6. BIOCHEMISTRY

INTRODUCTION:

During this laboratory session, through a series of experiments and analyses, I have learnt the intricate biochemical pathways governing cellular function and metabolism. Specifically, I explored the functionalities of the Siemens Biochemical Analyzer and Roche Electrolyte analyser.

6.1 SIMENS BIOCHEMICAL ANALYSER:

Siemens biochemical analyzers typically operate based on principles of spectrophotometry, enzymatic reactions, and immunoassays. Here's a general overview of the principles and procedures involved:

Principle:

1. Spectrophotometry: Measures the absorbance of specific wavelengths of light by biochemical substances in the sample.

2. Enzymatic Reactions: Utilizes enzymes to catalyze reactions that produce detectable changes in color or fluorescence.

3. Immunoassays: Detects and quantifies specific molecules (e.g., proteins, hormones) using antibodies that bind to the target molecule.

Procedure:

1. Sample Preparation: The sample (e.g., blood, urine) is collected and prepared according to the analyzer's requirements, which may involve dilution, mixing, or centrifugation.

2. Loading Sample: The prepared sample is loaded into the analyzer, usually through an automated system or manual placement.

3. Analytical Process: The analyzer performs the biochemical tests based on the programmed protocols. This may involve mixing the sample with reagents, incubation periods, and measurement of absorbance or fluorescence.

4. Data Analysis: The analyzer interprets the results based on the detected signals and converts them into quantitative measurements.

6.2 ROCHE ELECTROLYTE ANALYSER:

The Roche electrolyte analyzer is a medical device used to measure the concentration of electrolytes (such as sodium, potassium, chloride, and ionized calcium) in blood samples.

Principle:

1. Ion-Selective Electrode (ISE) Technology: The analyzer uses ion-selective electrodes specific to each electrolyte being measured. These electrodes selectively respond to ions of interest, generating an electrical signal proportional to the ion concentration in the sample.

2. Potentiometry: The electrical potential difference between the reference electrode and the ion-selective electrode is measured. This potential difference is related to the concentration of the specific ion in the sample.

Procedure:

1. Sample Collection: A blood sample is collected from the patient using standard venipuncture techniques.

2. Sample Preparation: The blood sample may need to be centrifuged or diluted, depending on the specific requirements of the analyzer and the type of sample being analyzed.

3. Loading Sample: The prepared blood sample is then loaded into the Roche electrolyte analyzer.

4. Calibration: Before analyzing patient samples, the analyzer must be calibrated using calibration solutions with known concentrations of electrolytes. This ensures the accuracy of the measurements.

5. Analysis: Once calibrated, the analyzer automatically measures the concentration of electrolytes in the patient's blood sample using ion-selective electrodes.

6. Results: The analyzer provides quantitative results for each electrolyte measured, typically displayed on a screen or printed out for interpretation by healthcare professionals.



6.3 LIVER FUNCTION TEST:

Liver function tests check the levels of certain enzymes and other proteins in your blood.

Principle:

LFTs help assess liver function by measuring the levels of enzymes, proteins, and other substances in the blood that are indicative of liver health. Abnormal levels of these markers can indicate liver damage or dysfunction.

Procedure:

1. Blood Sample Collection: A healthcare professional will draw a blood sample from a vein, usually in the arm. The patient may be asked to fast for a certain period before the test.

2. Laboratory Analysis: The blood sample is then sent to a laboratory for analysis. Different components of the blood are tested to assess liver function.

3. Markers Measured: Common markers measured in liver function tests include:

Alanine transaminase (ALT) and Aspartate transaminase (AST): Elevated levels may indicate liver damage or disease.

4. Interpretation: Results are interpreted based on reference ranges provided by the laboratory. Abnormal levels of any marker may indicate liver disease or dysfunction, but further testing may be needed for a definitive diagnosis.

6.4 RENAL FUNCTION TEST:

Renal function tests (RFT) are a group of tests that may be performed together to evaluate kidney function. The tests measure levels of various substances, including several minerals, proteins, and glucose in the blood to determine the current health of the kidneys.

Tests under RFT:

- BUN (Blood urea nitrogen)
- Creatinine - blood.
- Creatinine clearance.
- Creatinine - urine.
- Urea
- Uric acid
- Bicarbonate
- Amylase
- Lipase
- Phosphorus
- Calcium

CONCLUSION:

In conclusion, I have acquired knowledge in these techniques and attained comprehensive knowledge regarding the tests conducted in clinical laboratories. Through this learning process, I have developed a deeper understanding of laboratory procedures and its importance in health care.

7. SEROLOGY LAB

Serology is the scientific study of blood serum and other bodily fluids. In practical immunological terms, serology is the diagnostic identification of antibodies in the serum. Serological tests are performed on blood serum, and body fluids such as semen and saliva. During this laboratory session, I have examined different serological tests and methodologies to assist in the identification of infectious diseases, autoimmune disorders, and various other health conditions.

Samples:

- Blood
- Urine
- Saliva
- Semen

- Throat swab

Tests to be done in this LAB

RA Factor

CRP

Widal

VDRL

HIV Screening Test

HBsAg Screening Test

HCV Screening Test

7.1 HIV SCREENING TEST

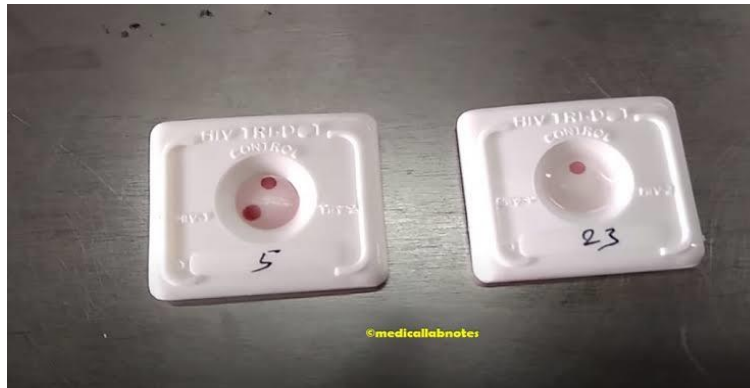
An HIV test examines a blood sample to determine whether people have HIV (Human Immunodeficiency Virus). HIV is a virus that affects and destroys immune system cells, which protect the body against pathogens such as bacteria, viruses, and fungi.

Procedure:

- Collect all the components required for the HIV screening test using the card method, provided in the kit.
- Add 3 drops of the buffer provided in the kit to the card.
- Once dried, add 1 drop of the serum sample to the card.
- Add 5 drops of buffer to the card and allow it to dry.
- After drying, add 2 drops of Enzyme conjugate to the card, followed by 5 drops of buffer.

Interpretation:

- Presence of three dots on the card indicates the presence of both Type 1 and Type 2 HIV antibodies.
- If there are two dots present in the T1 and control areas, it indicates the presence of Type 1 HIV.
- The C always represents the control.



HIV kit

7.2 HBsAg:

The Hepatitis B surface antigen (HBsAg) test is used to detect the presence of the hepatitis B virus (HBV) in the bloodstream

Principle:

The HBsAg test relies on the principle of immunoassay, specifically an antigen-antibody reaction. It uses antibodies that specifically bind to the HBsAg protein. When a patient's blood sample containing HBsAg is mixed with these antibodies, a visible reaction occurs if HBsAg is present in the sample. This reaction is usually detected by a color change or fluorescence, depending on the type of assay used.

Procedure:

1. **Sample Collection:** A blood sample is collected from the patient using a syringe or a fingerstick.
2. **Sample Preparation:** The blood sample is centrifuged to separate the serum or plasma from other blood components.
3. **Testing:** There are several methods for HBsAg testing, including enzyme immunoassay (EIA), chemiluminescence immunoassay (CLIA), and rapid lateral flow immunoassay (LFIA). The specific procedure may vary depending on the method used, but generally involves the following steps:
 - a. **Preparation of Reagents:** The testing kit contains all necessary reagents, including antibodies specific to HBsAg and detection reagents.
 - b. **Incubation:** The patient's serum or plasma sample is mixed with the reagents and incubated for a specific period. During this time, any HBsAg present in the sample will bind to the specific antibodies in the reagents.
 - c. **Washing:** After incubation, the unbound substances are washed away to remove any interference.

d. Detection: The bound HBsAg is then detected using a method appropriate for the assay being performed. This could involve the addition of a substrate that produces a color change or fluorescence in the presence of HBsAg.

4. Result Reporting: The test results are reported as either positive or negative for HBsAg. Positive results may require confirmation with additional testing, while negative results typically indicate the absence of HBV infection.

7.3 C-REACTIVE PROTEIN (CRP)

The CRP (C-reactive protein) test is a blood test used to measure the level of CRP in your blood. CRP is a substance produced by the liver in response to inflammation. The test helps to diagnose and monitor conditions associated with acute and chronic inflammation, such as infections, autoimmune diseases, and cardiovascular diseases.

Principle:

CRP is an acute phase reactant, meaning its levels rise in response to inflammation. The CRP test measures the concentration of CRP in the blood using various methods, including immunoturbidimetry and enzyme-linked immunosorbent assay (ELISA). Immunoturbidimetry involves measuring the increase in turbidity caused by the formation of antigen-antibody complexes when CRP binds to specific antibodies. ELISA utilizes antibodies that bind to CRP, which produces a color change that can be quantified to determine CRP levels.

Procedure:

1. Blood Sample Collection: A healthcare professional collects a blood sample, usually from a vein in the arm, using a needle and syringe or by pricking the fingertip.

2. Sample Processing: The blood sample is processed to separate the serum or plasma from the cellular components.

3. CRP Measurement: The concentration of CRP in the serum or plasma is measured using the chosen method (e.g., immunoturbidimetry or ELISA).

4. Interpretation: The CRP level in the blood is interpreted based on reference ranges provided by the laboratory. Elevated CRP levels indicate inflammation, but further evaluation is needed to determine the underlying cause.



The CRP test is commonly used in conjunction with other tests and clinical assessments to aid in the diagnosis, monitoring, and management of various inflammatory conditions.

7.4. WIDAL TEST:

The Widal test is a serological test used to diagnose typhoid fever

Principle:

The test is based on the detection of antibodies produced by the body in response to *Salmonella typhi*, the bacterium causing typhoid fever. It detects both O and H antigens of *Salmonella typhi*. If the patient has been exposed to the bacterium, their blood will contain specific antibodies against these antigens, indicating a recent or past infection.

Procedure:

1. **Sample Collection:** Blood sample is collected from the patient during the acute phase of the illness (7-10 days after onset of symptoms).

2. **Preparation:** Serum is separated from the blood sample by centrifugation.

3. **Preparation of Antigens:** Suspensions of *Salmonella typhi* antigens (O and H) are prepared.

4. **Test Setup:**

Wells of a test plate are labeled for each antigen.

Patient's serum samples and positive/negative controls are added to the respective wells.

5. **Incubation:** The plate is incubated at a specific temperature (usually 37°C) for a specified period.

6. **Interpretation:** After incubation, the plates are examined for agglutination, indicated by visible clumping of the antigens. The presence and level of agglutination indicate the presence and concentration of antibodies against *Salmonella typhi*.

7. **Reading Results:** Results are interpreted based on the degree of agglutination observed in comparison to the positive and negative controls.

1. A positive result typically shows significant agglutination in both O and H antigens.

2. A negative result shows no agglutination.

8. **Reporting:** Results are reported as titers (e.g., 1:160), indicating the highest dilution of serum that still causes agglutination.

7.5. RHEUMATOID ARTHRITIS (RA) FACTOR

The Rheumatoid Factor (RF) test is used to detect the presence of antibodies against the Fc portion of IgG antibodies in the serum. RA is an autoantibody produced by the immune system in patients with autoimmune diseases such as rheumatoid arthritis.

Procedure:

- A blood sample is taken from the patient's arm vein.
- The serum is separated from the blood and placed on a special card with small wells or circles for mixing with reagents that react with RA factor antibodies.
- The card is then rotated for a specific duration to allow the reaction to take place.
- After rotation, the card is inspected for agglutination, with Positive and Negative controls included in the process.
- The test results are interpreted by a healthcare provider and may be used along with other diagnostic information.

Interpretation:

A positive result in the RA factor test suggests the presence of RA antibodies in the patient's serum, potentially indicating an autoimmune disorder like rheumatoid arthritis.

7.6 VDRL (Venereal Disease Research Laboratory):

The venereal disease research laboratory (VDRL) test is a nonspecific micro flocculation test for the screening of syphilis. It uses antigen-containing cardiolipin, lecithin, and cholesterol and measures both IgG and IgM antibodies to lipoidal and lipoproteins released as a result of damage to host cells and also to cardiolipin released from treponemes.

Principle:

The VDRL test is a nontreponemal test that detects the presence of antibodies in the blood that are produced in response to the presence of syphilis. The test is based on the principle of flocculation, where the antibodies in the serum of the patient cause the antigen-antibody complex to flocculate or clump together.

Procedure:

- a. Collection of Sample:** A blood sample is collected from the patient, usually via venipuncture.
- b. Serum Separation:** The collected blood sample is then centrifuged to separate the serum (liquid portion of blood) from the cellular components.

c. Testing Procedure:

- i. The serum is mixed with a cardiolipin antigen suspension on a glass slide or a microtiter plate.
- ii. The mixture is gently rotated or agitated and observed for the formation of clumps (flocculation).
- iii. The presence or absence of clumping is noted and interpreted as either positive or negative for syphilis antibodies.

Interpretation:

A positive VDRL test result indicates the patient with syphilis.



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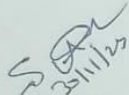
30.11.2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr.YOKESHWARAN.S** (Reg.No.41737027),
B.Sc (MLT) student of Sathyabama Institute of Science and
Technology had done his internship in the Department of Laboratory
for the period from 01.11.2023 to 30.11.2023 at our Institution.

We wish him all the best for his future endeavors.

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8. BLOOD BANK

INTRODUCTION:

A 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. At the time, it was not possible to store blood for more than a few days. Most transfusions were person-to-person, a dangerous process which made it hard to find donors.

Hoping to solve this problem, Dr. Fantus began experimenting with ways to safely store blood. Initially called the Blood Preservation Laboratory, he changed the name to "blood bank" which was less likely to scare away potential donors. The ability to collect and store blood for an extended period of time revolutionized how doctors treated patients. Donating blood was no longer a high-risk process and patients in need had access to blood they needed for survival.

8.1 FUNCTIONS OF BLOOD BANK:

A certain set of standard tests are done in the lab once blood is donated, including, but not limited to, the following:

- Typing: ABO group (blood type)
- Rh typing (positive or negative antigen)
- Screening for any unexpected red blood cell antibodies that may cause problems in the recipient
- Screening for current or past infections, including:
 - Hepatitis viruses B and C
 - Human immunodeficiency virus (HIV)
 - Human T-lymphotropic viruses (HTLV) I and II
 - Syphilis
 - West Nile virus
 - Chagas disease
- Irradiation to blood cells is performed to disable any T-lymphocytes present in the donated blood. (T-lymphocytes can cause a reaction when transfused, but can also cause *graft-versus-host* problems with repeated exposure to foreign cells.)
- *Leukocyte-reduced blood* has been filtered to remove the white blood cells that contain antibodies that can cause fevers in the recipient of the transfusion. (These antibodies, with repeated transfusions, may also increase a recipient's risk of reactions to subsequent transfusions.)

8.2 BLOOD BAG AND ITS TYPE

Blood bags are used for the reliable collection, separation, storage and transport of blood

SINGLE BLOOD BAG:

- Used for collection preservation, transfusion, of human blood
- This single blood bag system with primary bag contains anticoagulant
- Packed RBCs are made by removing 200-250ml of plasma from whole blood.
- 1ml blood weighs **1.06gm.**



DOUBLE BLOOD BAG:

- For whole blood collection.
- Separation of 2 different blood components (red blood cell and plasma)
- This is obtained through the process of centrifugation and extraction.
- The primary bag contains CPDA-1 anticoagulant solution.



TRIPLE BLOOD BAG:

It includes a primary bag and satellite bag

This system separate RBC, plasma puffy coat (includes leucocytes and platelets)



8.3 BLOOD DONOR REQUEST FORM

[illegible]

8.4 BLOOD DONATION PROCEDURE

BLOOD DONATION PROCEDURE:

THE BLOOD DONATION PROCESS

The blood donation process from the time you arrive until the time you leave take about an hour .The donation itself is only about 8 – 10 minutes on average.

HEALTH HISTORY

- You will answer a few question about health history and place you have traveled , during a private and confidential interview
- We will check your temperature, pulse, blood pressure, and hemoglobin.

DONATION

- You'll go into a donor room where you'll lie down on a cot.
- A phlebotomist (an employee who draws blood) will clean your arm and insert a new, sterile needle into your vein. This takes just a few seconds, and it can feel like a quick pinch.
- You'll donate about 1 pint (one unit) of blood. The process should take less than 10 minutes. But if you're donating platelets, red cells, or plasma by apheresis, the process can take much longer: up to 2 hours.
- When you're done, you'll raise your donation arm and put a little bit of pressure on it, which helps your blood clot. Then they'll put an adhesive strip on your arm.

8.5 BLOOD DONOR COUNSELLING

BLOOD DONOR CONSELING:

Blood donor counseling is a **confidential dialogue between a blood donor and a trained counselor** about issues related to the donor's health and the donation process; it may be provided before, during and after blood donation. There are benefits for both the BTS and the wider health system in implementing blood donor counseling

COUNSELLING IN BLOOD BANKS

- Motivate the donor at high risk to test for HIV
- Help the donor to take the right decision
- Create awareness among the donors on HIV AIDS and TTIs
- Encourage voluntary blood donor to donate regularly
- Donor consent for testing of blood for all tests
- Provide an opportunity to ask question and refuse donations
- Risk history assessment
- Donation and test information
- Getting the reports after the tests

TWO TPYE OF COUNSELING:

1. PRE DONATION COUNSELING

This is an opportunity to explain to the blood donor about the donation process, the value of honest responses and the benefit of blood donation.

2. POST DONATION COUNSELING

Donors be notified in a confidential manner of test results for TTI markers and any medically significant finding identified during per-donation evaluation.

PRE DONATION COUNSELING

- Donor consent for testing of blood for all tests
- Provide an opportunity to ask question and refuse donation
- Risk history assessment
- Transfer knowledge of HIV and blood-borne infection
- Donation and test information
- Getting the report after the tests
- Result seeking donors should be given post donation information and counseling

8.6 BLOOD GROUPING

BLOOD GROUPING:

As you are probably aware, the blood of human beings varies in specific viewpoints, however it has all the aspects of being comparable. Different types of collection of blood have been done. Two such groupings—the ABO and Rh—are broadly utilized all around the world.

ABO SYSTEM:

ABO grouping depends on the presence or absence of two surface antigens on the RBCs to be specific A also, B. Like, the plasma of various people contains two normal antibodies. The distribution of antigens and antibodies in the four gatherings of blood, A, B, AB, and O are given in Table. You likely realize that during blood transfusion, any kind of blood can't be utilized; the blood of a donor has to be carefully coordinated with the blood of a beneficiary before any blood transfusion to stay away from extreme issues of clumping.

RH TYPING:

Another antigen, the Rh antigen similar to one present in Rhesus monkeys (hence Rh), is likewise seen on the outer layer of RBCs of a larger part (almost 80 percent) of people. Such people are called Rh positive (Rh+ve) furthermore, those in whom this antigen is missing are called Rh negative (Rh-ve). An Rh-ve individual, whenever presented with Rh+ve blood, will form specific antibodies against the Rh antigens. Subsequently, the Rh group should also be matched prior to transfusions. A special case of Rh incompatibility (mismatching) has been seen between the Rh-ve blood of a pregnant mother and with Rh+ve blood of the fetus. Rh's antigens of the fetus don't get presented to the Rh-ve blood of the mother in the first pregnancy, as the two types of blood are well separated by the placenta.

The ABO blood typing system groups your blood into one of four categories:

- Type A has the A antigen.
- Type B has the B antigen.
- Type AB has both A and B antigens.
- Type O has neither A nor B antigens.



PROCEDURE

- First mix the patient blood with three different reagents including either the three different antibodies. A B or Rh antibodies.
- Look for agglutination, then you take a look at what has happened.
- Figure out the ABO blood group
- Figure out the Rh blood group
- Figure out the blood type
- Label the two different clean slides with the unique ID of the patient.
- Pipette 50/50 μL (one-one drop) of the blood and deliver it to the first slide in two corners and a drop in the remaining slide at the center.
- Put 1 drop of A, B, and Rh antisera onto each slide respectively, and mix it thoroughly with the help of the clean sticks or using a clean glass slide.
- Tilt the glass slide back and forth for up to 2 minutes.
- Look for the agglutination in each slide.
- In the case of Rh, if agglutination is seen it is reported as Rh positive and if no agglutination is seen, it is reported as Rh negative as shown table of result-interpretation



8.7 SCREENING TEST

HIV:

An antigen and antibody test performed by a lab on blood from a vein can usually detect HIV 18 to 45 days after exposure. There is also a rapid antigen and antibody test available test is done with a finger stick. Antigen and antibody test means you are protected against the hepatitis B virus.

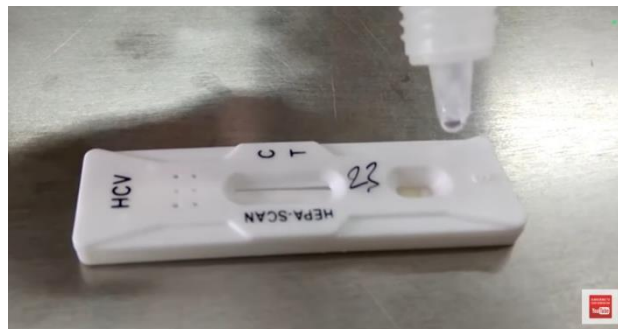
Blood test can be detect signs of the hepatitis B virus in your body and tell your provider whether it acute or chronic

A simple blood test can also determine If your immune to the condition Liver ultrasound.



HCV:

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

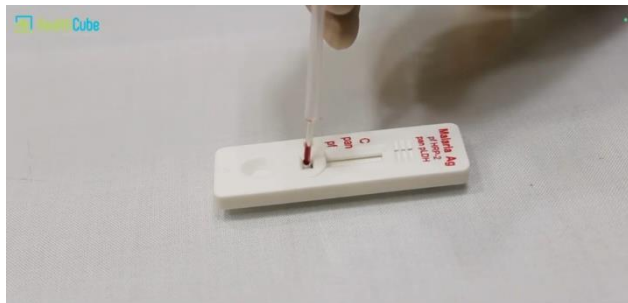


HPD:

This histrionic personality disorder (HPD) Test is deigned to see if you might have the symptoms of histrionic personality disorder. About 3% of adult will have histrionic personality disorder in their lifetime.

MALARIA:

Ensure specimen and test kits are brought to room temperature before testing. open the foil wrapped pouch and remove the cassette. Transfer the whole blood specimen to the blood collection tube using a pipette. Read the result 10 minutes once the coloured lines have appeared.



8.8 PACKED RED BLOOD CELL:

Red cells have a higher specific gravity than plasma, thus settle in the lower portion of the bag.

Store the bag at 2-6°C till processed. place bag in buckets of refrigerated centrifuge and balance the opposite bags.centerifuge at 5000*g for 5min at 2-6°C

8.9 FRESH FROZEN PLAMA:

Plasma removed from cells with 6-8 hours of collection in rapidly frozen to below30°C. severe liver disease. Massive transfusion.

- Fresh frozen plasma is obtained after centrifugation of whole blood and red cell removal, or through direct separation
- Because plasma can be stored for a long time, plasma is quarantine until donor comes back for a new donation so that he can be tested again for the infection disease markers.
- This gives optimal security because infections undetectable at the moment of donation have now become apparent.
- Can be stored at -30°C or below for 1 year.
- Thaw it in a plasma defrosted and put it in a 37°C circulating water bath



8.10 CROSS MATCHING:

Blood cross matching is a series of tests that are done before a blood transfusion is performed. These tests ensure that the blood is compatible between the person giving it and the person receiving.

If the blood isn't a good match for you, blood crossmatching helps to find blood that is close to your own for it to be a success. If the blood isn't a good match, your immune system could reject the donated blood, thinking that it is a foreign invader looking to harm your body. Your immune system could then create antibodies that fight against the new blood cells. This could cause a dangerous reaction.

Blood crossmatching is also called blood typing or compatibility test. Several tests are required to complete this process. The first test is blood typing which tells you blood type. This test also shows whether your Rh blood type is positive or negative.

There are 4 blood groups:

- AB
- A
- B
- O

9. CONCLUSION:

During my internship at Lions blood bank and Voluntary health services, I have gained extensive knowledge in compatibility testing, blood grouping, screening, plasma grouping, microbiology, different staining techniques and more. I'm grateful for the guidance and have gained practical knowledge .

