

INTERNSHIP REPORT

Submitted to

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

In partial Fulfilment for the Award of The Degree Of

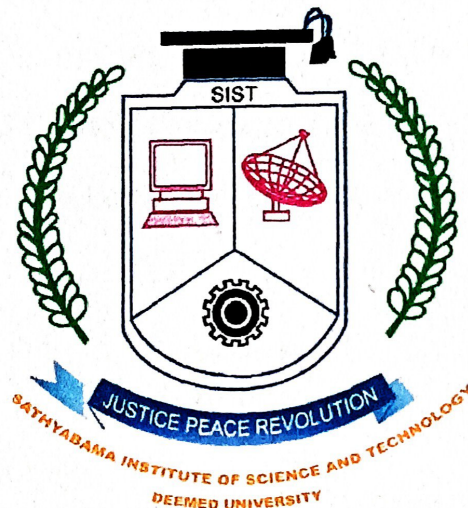
BACHELOR OF SCIENCE

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)

Accredited with Grade "A++" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2024



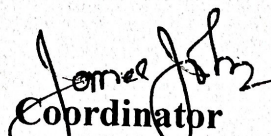
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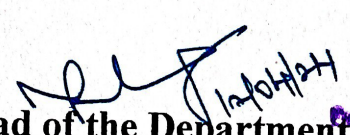
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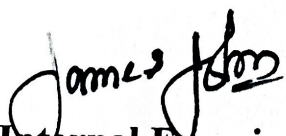
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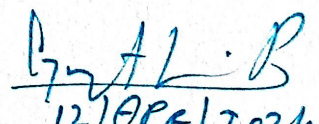
This is to certify that this internship report is the bonafide work of **LEKHA SHREE.K** who have done the internship work as a team and carried out the training program at **GERI CARE HOPITAL** at **T.NAGAR SATHYABAMA UNIVERSITY** and **LIONS BLOOD BANK** at **AMBATTUR** under our supervision from August 2023 to April 2024.


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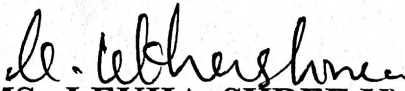

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DECLARATION

I, **LEKHA SHREE.K** 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**, "**GERI CARE HOSPITAL** at **T. NAGAR**" and **SATHYABAMA UNIVERSITY** 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**.

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

We would like to express our thanks to our parents for their unwavering support to us during these years.

S.no.	TOPIC	Page no.
1	INTRODUCTION	1
	GERI CARE INTERNSHIP	
2	PHLEBOTOMY	1
2.1	BLOOD COLLECTION	1
2.2	ORDER OF DRAW	3
2.3	NASAL / THROAT SWAB COLLECTION	4
3	MICROBIOLOGY	5
3.1	GRAM STAINING	6
3.2	SMEAR MAKING	7
3.3	MEDIA PREPARATION	8
3.4	URINE CULTURE	13
3.5	BLOOD CULTURE	13
3.6	STOOL OCCLUT BLOOD	15
3.7	BIOCHEMICAL TEST	16
3.8	ACID FAST STAINING	16
3.9	DEGNUE PROFILE TEST	18
4	BIOCHEMISTRY	
4.1	C- REACTIVE PROTINE	19
4.2	D- DIMER TEST	19
4.3	NT- PRO TEST	19
4.4	URINE ROUTINE	20
4.5	TROPONIN TEST	22
4.6	BIOCHEMICAL ANALYZER	22
4.7	ELECTROLYTE ANALYZER	23
5	HEMOTOLOGY	
5.1	PERIPHERAL SMEAR	24
5.2	LEISHMNS STAINING	25
5.3	DIFFERENTIAL COUNT	25
5.4	ERYTHROCYTE SEDIMENTATION RATE	26
5.5	COMPLETE BLOOD COUNT	27
5.6	HBA1C TEST	27
5.7	PROTHROMBIN TIME	28
5.8	ACTIVATED PARITAL THROMBOPLASTIN TIME	28

S.no.	TOPIC	Page no.
	SATHYABAMA INTERNSHIP	
6	MICROBIOLOGY	
6.1	TSI TEST	29
6.2	CITRATE TEST	30
7	SEROLOGY	
7.1	SANDWICH ELISA	32
7.2	SDS PAGE	33
7.3	DOT ELISA	35
	LIONS BLOOD BANK INTERNSHIP	
8	BLOOD DONOR	37
9	BLOOD BAG	38
10	BLOOD DONOR RESQUESTING FROM	39
11	BLOOD DONATION	40
12	DONOR CONSLING	41
13	TYPES OF BLOOD GROUP	42
14	BLOOD GROUPING	44
15	BLOOD COMPONENTS & SEPARATION	48
16	CROSS MACTHING	49
17	STORAGE	50
18	BLOOD RECORD	52
19	GERI CARE CERTIFICATE	55
20	SATHYAMA CERTIFICATE	56
21	LIONS BLOOD BANK CERTIFICATE	57
22	CONCLUSION	58

INTRODUCTION

I have done my internship at Gericare Hospital, T Nagar during the period of 1st October 2023 to 31st October 2023. I have learned about so many departments like phlebotomy, microbiology, biochemistry, haematology clinical pathology etc.

I have gone another two internships in Satyabhama general hospital for one month 1st November to 30th November in that I have learned about biochemicals for microorganisms, electrophoresis etc

Next is lions blood bank for one week where I got knowledge about the different types of tests and management of patient samples and also about the importance of blood donation

PHLEBOTOMY

BLOOD COLLECTION

PROCEDURE

- ✓ Identify the patient, two forms of active identification are required.
 - Ask the patient to state their name and date of birth.
 - This information must match the requisition.
- ✓ Reassure the patient that the minimum amount of blood required for testing will be drawn.
- ✓ Verify that any diet or time re
- ✓ strictions have been met
- ✓ Assemble the necessary equipment appropriate to the patient's need of test
- ✓ Wash hands and put on gloves.
- ✓ Position the patient with the arm extended to form a straight-line from shoulder to wrist.
- ✓ Do not attempt a venipuncture more than twice so in first itself we should find the vein correctly
- ✓ The larger median cubital, basilic and cephalic veins are most frequently used, but other may be necessary and will become more prominent if the patient closes his fist tightly.
- ✓ Apply the tourniquet 3-4 inches above the collection site.
- ✓ Never leave the tourniquet on for over 1 minute.
- ✓ If a tourniquet is used for preliminary vein selection, release it and reapply after two minutes.
- ✓ Clean the puncture site by making a smooth circular pass over the site with the 70% alcohol pad, moving in an outward

- ✓ Pull the skin tightly and insert the needle slowly in the vein
- ✓ Blood reaches the top of the plastic hub then insert the blood collecting tubes according to the order of draw
- ✓ After collecting the blood slowly remove the needle and give pressure to the site using cotton
- ✓ cover the area with band-aid
- ✓ Blood can be collected by butterfly needles also in case of small veins or for Childrens



Figure 1 Venipuncture

ORDER OF DRAW

1. **Blood Culture tube**
2. **Light Blue Top (plasma):** 3.2% sodium citrate. These tubes are used for coagulation tests and need to be completely filled to ensure the proper ratio of blood to anticoagulant.
3. **Red Top (serum):** Plain and gel. Used for chemistry and reference tests.
4. **Green Top (plasma):** With and without gel, contains lithium heparin. These tubes are used primarily for chemistry tests.
5. **Lavender or Pink Top (plasma):** Contains EDTA. Used primarily for haematology and blood bank testing.
6. **Gray Top (plasma):** Contains sodium fluoride/potassium oxalate. Used by chemistry for glucose testing.
7. **Yellow Top (plasma and cells):** Contains ACD solution A or B. Used for Genetics testing.



Figure 2 Order of draw

NASAL/THROAT SWAB COLLECTION

- Identify the patient and explain the procedure to the patient
- Have the patient open the mouth and relax the tongue by keeping out side.
- Press the tongue down using a tongue depressor.
- Gently rub the swab against both tonsils and the posterior pharynx.
- Place the swab in the culture medium, transport medium, or sterile test tube.

MICROBIOLOGY

GRAM STAINING

PRINCIPLE

Gram staining is a differential staining technique used to classify bacteria into two main groups: Gram-positive and Gram-negative. It involves staining bacterial cells with crystal violet, iodine, alcohol or acetone, and a counterstain such as safranin. The key principle lies in the ability of Gram-positive bacteria to retain the crystal violet-iodine complex due to their thick peptidoglycan layer, while Gram-negative bacteria lose the stain due to their thinner peptidoglycan layer and outer membrane, resulting in different colour under a microscope: purple for Gram-positive and pink or red for Gram-negative.

Example for gram positive bacteria

- *Staphylococcus aureus*
- *Mycobacterium tuberculosis*
- *Bacillus anthracis*

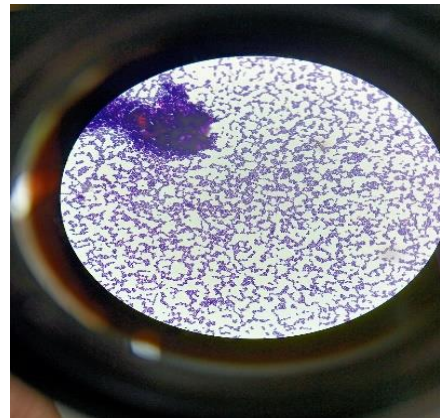


Figure 3 Gram positive

Example for Gram negative bacteria

- *Neisseria gonorrhoea*
- *Salmonella typhi*
- *Vibrio cholerae*

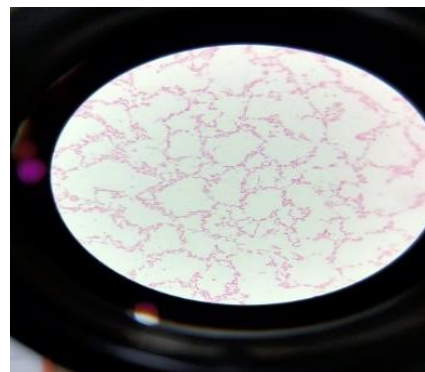


Figure 4 Gram negative

GRAM STAINING

PROCEDURE

Preparation of Bacterial Smear: A small sample of bacteria is spread onto a clean glass slide and allowed to air dry.

Fixation: The bacterial smear is heat-fixed by passing the slide through a flame or using a chemical fixative like methanol. Heat fixing kills the bacteria, adheres them to the slide, and denatures their proteins, allowing them to better absorb the subsequent staining solutions

Primary Stain (Crystal Violet): The fixed bacterial smear is flooded with a solution of crystal violet, a purple dye. Leave it for 1 minute, Crystal violet penetrates the cell wall of both Gram-positive and Gram-negative bacteria, staining them purple.

Mordant (Gram's Iodine): After rinsing off excess crystal violet, the smear is flooded with Gram's iodine solution for 1 minute. Iodine acts as a mordant, forming a complex with crystal violet within the bacterial cells. This step helps to intensify the staining and fixes the dye within the cell.

Decolorization: The smear is washed with a decolorizing agent, typically alcohol or acetone. This step is crucial as it differentiates between Gram-positive and Gram-negative bacteria. Gram-positive bacteria retain the crystal violet-iodine complex due to their thick peptidoglycan layer, while Gram-negative bacteria lose the stain due to their thinner peptidoglycan layer and outer membrane. Thus, Gram-positive bacteria remain purple, while Gram-negative bacteria lose the purple colour.

Counterstain (Safranin): The smear is then stained with a contrasting colour, usually safranin for 2 minutes. This counterstain stains the decolorized Gram-negative bacteria pink or red, allowing them to be visualized.

Observation: Finally, the slide is rinsed with water, air-dried, and observed under a microscope. Gram-positive bacteria appear purple, while Gram-negative bacteria appear pink or red.

SMEAR MAKING

Prepare the Slide: Label the microscope slide with relevant information such as sample identification, date, and any other necessary details. Ensure that the slide is clean and free from any debris or residues.

Transfer the Bacterial Sample: Using a sterile loop or swab, pick up a small amount of the bacterial sample. This sample can be obtained from a culture plate, liquid culture, or any other source containing bacteria.

Spread the Sample: Gently streak the bacterial sample onto the surface of the microscope slide. For liquid samples, a drop can be placed onto the slide and spread evenly. If using a loop, spread the sample in a circular motion to create an even layer. If using a swab, gently roll the swab over the slide surface to distribute the bacteria.

Allow the Smear to Air Dry: Let the slide air dry completely to ensure that the bacteria adhere to the slide surface. This usually takes a few minutes depending on the volume of the sample and environmental conditions.

Fixation: Heat-fix the smear by passing the slide through a flame a few times. This helps to kill the bacteria, adhere them to the slide, and denature their proteins, which aids in better staining.

Stain the Smear: Once fixed, the smear can be subjected to staining techniques such as Gram staining or other differential staining procedures to visualize and characterize the bacteria.

Observation: After staining, rinse off excess stain, air-dry the slide again, and observe it under a microscope at appropriate magnifications to examine the morphology, arrangement, and other characteristics of the bacteria.

MEDIA PREPARATION:

INGREDIENTS:

1. Eosin Y: 6.0 g
2. Methylene Blue: 0.5 g
3. Lactose: 10.0 g
4. Peptone: 5.0 g
5. Agar: 15.0 g
6. Distilled water: 1000 mL

PROCEDURE:

1. Dissolve the Eosin Y, Methylene Blue, lactose, peptone, and agar in distilled water in a conical flask or beaker. Stir well to ensure all components are dissolved.
2. Adjust the pH of the solution to around 7.2-7.4 using a pH meter or pH indicator paper.
3. Once the pH is adjusted, sterilize the agar solution by autoclaving at 121°C for 15 minutes.
4. After sterilization, allow the agar to cool to approximately 45-50°C. This temperature is necessary to prevent the agar from solidifying before pouring.
5. While the agar is cooling, prepare your Petri dishes by stacking them and labelling them with the appropriate information.
6. Pour the agar into the Petri dishes to a depth of about 4-5 mm. Pour enough agar to cover the bottom of the dish completely.
7. Allow the agar to solidify at room temperature or in a refrigerator.
8. Once solidified, store the Petri dishes inverted in a refrigerator until ready to use.

Microorganisms which grows in EMB agar

Escherichia coli, colonies grow with a metallic sheen with a dark centre.

Klebsiella pneumonia, large, viscid, dome, shaped brownish colonies



Figure 5 *E. coli* in EMB agar

PREPARATION OF BLOOD AGAR:

INGREDIENTS:

1. Trypticase Soy Agar (TSA) base: 40-50
2. Blood (sheep, horse, or rabbit)
3. Distilled water

PROCEDURE:

1. Measure out the required amount of Trypticase Soy Agar (TSA) . The recommended concentration is typically 40-50 grams per liter of distilled water.
2. Dissolve the TSA base in distilled water in a conical flask or beaker. Stir well to ensure complete dissolution.
3. Autoclave the TSA solution at 121°C for 15 minutes to sterilize it. Ensure proper sealing of the container to prevent contamination during autoclaving.
4. While the TSA solution is still hot, cool it down to approximately 50-55°C, ensuring it remains in a liquid state.
5. Then add the desired volume of defibrinated blood (sheep, horse, or rabbit) to the TSA solution. The usual concentration of blood is 5-10%.
6. Mix the blood and TSA solution thoroughly by gentle swirling or stirring to ensure even distribution of blood throughout the agar medium.
7. Pour the blood agar medium into sterile Petri dishes to a depth of approximately 4-5 mm.
8. Allow the agar to solidify at room temperature or in a refrigerator with the Petri dishes left slightly ajar to prevent condensation.
9. Once solidified, invert the Petri dishes and store them in a refrigerator at 2-8°C until ready to use.

Microorganisms which grow in blood agar

1. *Staphylococcus aureus*:

- Appearance: Golden-yellow colonies.
- Characteristic: Beta-haemolytic, meaning it completely lyses red blood cells in the medium, resulting in a clear zone around the colonies.



Figure 6 *Staphylococcus* in B.A

2. *Streptococcus pyogenes*:

- Appearance: Small, greyish-white colonies.
- Characteristic: Beta-haemolytic, similar to *Staphylococcus aureus*, produces a clear zone around colonies due to complete lysis of red blood cells.

PREPARATION OF MACCONKEY AGAR

INGREDIENTS:

1. Peptone: 17.0 g
2. Proteose peptone: 3.0 g
3. Lactose: 10.0 g
4. Bile salts No. 3: 1.5 g
5. Sodium chloride: 5.0 g
6. Neutral red: 0.03 g
7. Crystal violet: 0.001 g
8. Agar: 13.5-14.0 g
9. Distilled water: 1000 ml

PROCEDURE:

1. Weigh and dissolve all the ingredients in the distilled water except for agar.
2. Adjust the pH of the solution to approximately 7.1.
3. Once the components are dissolved, add agar to the solution.
4. Mix well and heat the solution to boiling to completely dissolve the agar.
5. After boiling, sterilize the medium by autoclaving at 121°C for 15 minutes.
6. After autoclaving, cool the medium to about 50-55°C.
7. Pour the medium into Petri dishes to form agar plates.
8. Allow the plates to solidify and dry completely before use.
9. Store the prepared MacConkey agar plates in a cool, dry place or in the refrigerator until ready for use.

Organisms which grows in MacConkey agar

1. *Proteus mirabilis*

- Appearance: Colourless or swarming colonies.
- Characteristic: Non-lactose fermenter, does not produce acid, hence colonies are colourless or non-pink.

2. *Salmonella typhi*:

- Appearance: Colourless colonies.
- Characteristic: Non-lactose fermenter, does not produce acid, hence colonies are colourless.

3. *Klebsiella spp.* grow as large mucoid colonies.



Figure 7 *Klebsiella* in MacConkey agar

PREPARATION OF NUTRIANT AGAR

INGREDIENTS:

- 28-30 grams of nutrient agar powder
- 1 liter of distilled or deionized water

PROCEDURE:

1. Measure out the appropriate amount of nutrient agar powder.

2. Add the measured nutrient agar powder to a beaker containing about 900-950 millilitres of distilled or deionized water.
3. Gently swirl the mixture to ensure the agar powder is evenly distributed in the water.
4. Heat the mixture while stirring until the agar powder has completely dissolved. .
5. Once the agar is completely dissolved, adjust the volume to 1 liter with additional distilled or deionized water if necessary.
6. Sterilize the agar solution by autoclaving at 121°C (250°F) for 15 minutes at 15 psi pressure. For sterilization.
7. After sterilization, allow the agar solution to cool to around 45-50°C (113-122°F) before pouring into sterile petri dishes for agar plates. Make sure to work quickly and pour the agar into the petri dishes.
8. Allow the agar plates to solidify at room temperature before storing them inverted in a refrigerator at 4°C (39°F) until ready to use.

Organisms which grows in nutrient agar

1. *Bacillus subtilis*:

- Appearance: Large, irregular, white colonies with a rough texture.
- Characteristics: Gram-positive, aerobic bacterium commonly found in soil;

2. *Pseudomonas aeruginosa*:

- Appearance: Medium-sized, round, smooth, bluish-green colonies.
- Characteristics: Gram-negative bacterium commonly found in soil and water; opportunistic pathogen associated with various infections.



Figure 8 *Pseudomonas* in nutrient agar

URINE CULTURE

1. **Inoculation:** In the laboratory, a small volume of the urine sample is streaked onto the surface of agar plates containing a growth medium such as blood agar or MacConkey agar. The agar plates are then incubated at the appropriate temperature, usually around 37°C (98.6°F).
2. **Incubation:** The agar plates are placed in a controlled environment, such as an incubator, where they are allowed to incubate for a specified period, typically 24 to 48 hours. During this time, any bacteria or fungi present in the urine sample will multiply and form visible colonies on the agar surface.
3. **Colonial Morphology:** After incubation, the agar plates are examined for the presence of bacterial or fungal growth. Each distinct colony morphology is observed and recorded. This may include characteristics such as size, shape, colour, and texture.
4. **Identification:** Once colonies have grown, they are subjected to further testing for identification. This may involve biochemical tests, such as catalase test, coagulase test, or API strips, or automated systems such as VITEK. These tests help to identify the specific species of bacteria or fungi present in the urine sample. It also gives appropriate antibiotics according to the concentration of bacteria.
5. **Reporting:** The results of the urine culture, including the identified microorganisms and their antibiotic susceptibility profiles, are reported to the healthcare provider. This information is used to guide appropriate treatment decisions for the patient.

BLOOD CULTURE

1. **Inoculation:** Each blood sample is inoculated into specialized culture bottles such as aerobic and anaerobic bottles, containing a nutrient-rich growth medium that supports the growth of microorganisms. The blood sample is typically injected directly into the culture bottle using a syringe or specialized needle.
2. **Incubation:** The inoculated culture bottles are placed in a controlled environment, such as an incubator, where they are allowed to incubate at the appropriate temperature, usually around 37°C (98.6°F). During incubation, any microorganisms present in the blood sample will multiply and grow in the culture medium.
3. **Monitoring:** The culture bottles are monitored regularly for signs of microbial growth, such as turbidity (cloudiness) or gas production. Automated blood culture systems may continuously monitor the bottles for microbial growth and provide alerts when positive results are detected.

4. **Subculture and Identification:** When microbial growth is detected in a culture bottle, a small volume of the culture broth is subculture onto agar plates for further identification. Colonies grown on agar plates are then subjected to various biochemical tests,
5. **Antibiotic Susceptibility Testing:** In addition to identification, isolated microorganisms may undergo antibiotic susceptibility testing to determine the most effective antibiotic for treatment.
6. **Reporting:** The results of the blood culture, including the identified microorganisms and their antibiotic susceptibility profiles, are reported to the healthcare provider. This information is used to guide appropriate treatment decisions for the patient.



Figure 9 bact alert 3D



Figure 10 Blood culture bottle

STOOL OCCULT BLOOD

PRINCIPLE:

- The stool occult blood test relies on the detection of heme, a component of haemoglobin found in red blood cells.
- Small amounts of blood that are not visibly apparent in the stool can be detected using chemical reagents that react with heme to produce a colour change.

PROCEDURE:

- Collect the stool sample from the patient in a clean dry container, mix of urine may cause result accuracy
- Take the test kit add stool sample in one side (B) if we need add positive control in another side(A)
- Then add test buffer in stool sample wait for few minutes
- If the sample changes to green or blue then it is positive it doesn't change means the test is negative



Figure 11 Stool occult blood

BIOCHEMICAL TEST

- Oxidase test
- Catalase test
- indole test
- vogues Proskauer test
- citrate test
- urease test
- TSI test

These are some biochemical tests which is used to identified the organisms

ACID FAST STAINING

Acid-fast staining is a laboratory technique used to sss acid-fast bacteria from non-acid-fast bacteria. It's particularly useful for identifying Mycobacterium species, including Mycobacterium tuberculosis, the causative agent of tuberculosis. Here's a basic procedure for acid-fast staining.

MATERIALS

1. eat-fixed bacterial smear on a glass slide
2. Carbol fuchsinH solution
3. Acid-alcohol decolorizer (typically a 3% hydrochloric acid in 95% ethanol solution)
4. Methylene blue or malachite green counterstain
5. Water or distilled water
6. Microscope
7. Immersion oil (if using an oil immersion objective)

PROCEDURE

1. Prepare a heat-fixed bacterial smear on a clean glass slide. Ensure that the smear is thin and evenly spread.
2. Flood the smear with carbol fuchsin solution, covering the entire area. Carbol fuchsin is a primary stain that penetrates the cell wall of acid-fast bacteria.
3. Heat the slide gently over a Bunsen burner or slide warmer for 5-10 minutes. The heat helps the carbol fuchsin penetrate the cell wall of acid-fast bacteria, making them resistant to decolorization.
4. After heating, allow the slide to cool for a few minutes.
5. Rinse the slide with water to remove excess stain.
6. Decolorize the slide by flooding it with acid-alcohol decolorizer. Tilt the slide to allow the decolorizer to flow over the smear for about 15-30 seconds. Acid-fast bacteria will retain the carbol fuchsin stain and appear red or pink, while non-acid-fast bacteria will be decolorized and appear colourless.
7. Rinse the slide again with water to stop the decolorization process.
8. Counterstain the smear with methylene blue or malachite green for about 1 minute. This will stain any non-acid-fast bacteria that may have been decolorized during the previous step.
9. Rinse the slide with water and blot it dry with bibulous paper.
10. Examine the slide under a microscope using the oil immersion objective (if available) at 1000x magnification.

INFERENCE

- Acid-fast bacteria, such as *Mycobacterium* species, will appear red or pink due to retaining the carbol fuchsin stain even after decolorization.
- Non-acid-fast bacteria and other cellular material will appear blue or green due to the counterstain (methylene blue or malachite green).
- A positive acid-fast stain indicates the presence of acid-fast bacteria in the specimen, which may suggest infections such as tuberculosis or leprosy.
- A negative acid-fast stain suggests the absence of acid-fast bacteria in the specimen, but it does not rule out other bacterial infections or conditions.

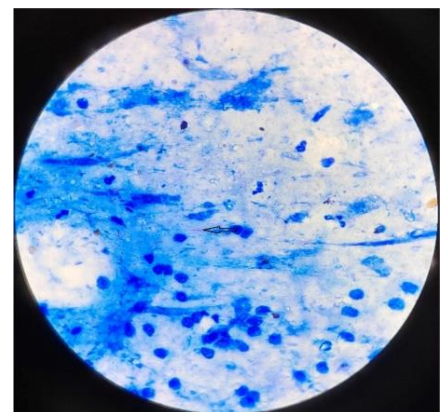


Figure 12 Acid fast staining

SEROLOGY

DENGUE PROFILE (card method)

PROCEDURE (NS1)

- ✓ Take the centrifuged sample from the patient
- ✓ Open the NS1 kit, add 100ml of buffer and 50ml of sample (serum) in a cuvette and mix well by using pipette
- ✓ Then add 75 ml of that mixed sample in a NS1 card. incubate it for 12 minutes
- ✓ Insert the NS1 card in Ichroma machine it gives the result in less than 1 minute

PROCEDURE(IgG/IgM)

- ✓ Take the centrifuge sample from the patient
- ✓ Open the IgG/IgM kit add 150 ml of buffer and 5ml of sample (serum) in a cuvette and mix well by using pipette
- ✓ Then add 75 ml of that mixed sample in a IgG/IgM card. incubate it for 12 minutes
- ✓ Insert the IgG/IgM card in Ichroma machine it gives the result in less than 1 minute

INTERPRETATION

- ✓ NS1 positive - currently present
- ✓ IgG positive- before 2 weeks
- ✓ IgM positive- past 6 months to more than a year

BIOCHEMISTRY

C-REACTIVE PROTINE (card method)

PROCEDURE

- ✓ Take a sample in a pipe which is provided in a kit
- ✓ Add it in a buffer which is also provided in a kit
- ✓ Mix the sample and buffer
- ✓ Discard 2 drops and add 2 drops in a card
- ✓ Incubate it for 3 minutes, then insert the card in the Ichromo machine
- ✓ Within 1-minute results will be showed

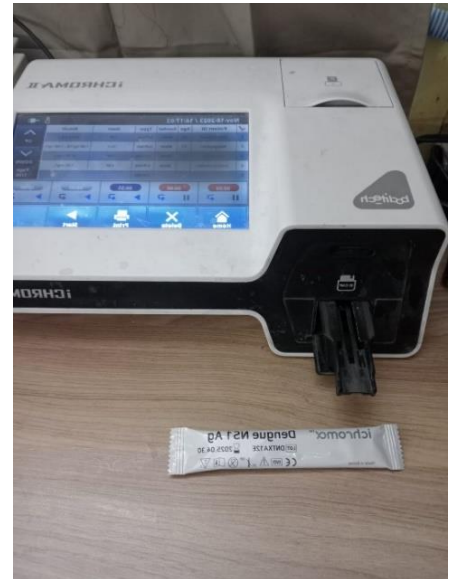


Figure 13 I chroma

D-DIMER TEST (qualitative)

PROCEDURE

- ✓ Add 10 ml of sample in a cuvette (containing buffer)
- ✓ Incubate it for 12 minute and add 3 drops in the card
- ✓ Insert it in Ichromo machine
- ✓ NORMAL RANGE: <500ng/ml

NT PRO

PROCEDURE

- ✓ Add 150ml reagent in a cuvette
- ✓ Then add 10ml sample in the same cuvette, mix well the sample
- ✓ Then add 75 ml of sample in a card then
- ✓ incubate it for 12 minutes. Then insert in a Ichromo machine

URINE ROUTINE

- ✓ A test that determines the content of the urine.
- ✓ It is generally done using a device called urometer;
- ✓ Urinalysis consists of the following examination:
- ✓ Macroscopic Examination
- ✓ Chemical Analysis
- ✓ Microscopic Examination

1. Macroscopic Examination:

Looking at the physical properties of the urine:

Colour:

Normal urine should be a shade of yellow ranging from a straw to amber colour.

Abnormal urine can be: colourless, dark yellow, orange, pink, red, green, brown, or black.

Clarity (transparency):

Normal urine should be clear

Abnormal urine can be: hazy, cloudy, or turbid

2. Chemical analysis:

The chemical properties of urine, including pH, specific gravity, protein content, glucose content, ketone content, are tested.

Urine test strips are often used to detect the chemical properties of urine.

PH

Test measures if urine is acidic, basic or neutral

Normal urine ranges from 4.6 to 8.0

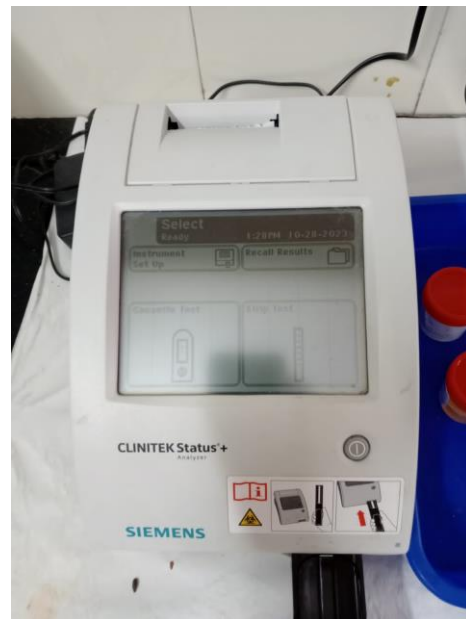


Figure 14 urine analyser

Specific Gravity:

Test measures the concentration of particles in the urine and evaluates the body's water balance.

The more concentrated the urine, the higher the urine specific gravity.

The most common increase in urine specific gravity is the result of dehydration.

Normal urine ranges between 1.002 to 1.028

Ketones:

Test measures the presence or absence of ketones, the endpoint of rapid or excessive fat breakdown, in the urine.

Normal urine does not contain ketones

Protein:

Normal urine levels of proteins (called albumin) are very small, usually approximately 0 to 8 mg/dl.

Glucose:

The test measures the amount of sugar in a urine sample.

Normal urine does not contain glucose.



Figure 15 PH strip

3. Microscopic examination:

A variety of normal and abnormal cellular elements may be seen in urine when looked at under a microscope, including:

Red blood cells

White blood cells

Epithelial cells

Crystals

Bacteria

Red blood cells are not found in normal urine.

White blood cells and bacteria, signs of infections, are not found in normal urine.

Epithelial cells are found in urine as they are the cells that line the urinary tract

Common crystals seen even in healthy patients include calcium oxalate, triple phosphate crystals and amorphous phosphates. Certain types also seen which present the kidney stones

TROPONIN TEST

PROCEDURE

- ✓ Take 75 ml of sample in a cuvette
- ✓ Add 75ml of buffer in the same cuvette
- ✓ Mix well add 75ml of mixed sample in a card which is provided in the kit
- ✓ Incubate it for 12 minutes, then insert it in the Ichroma machine

BIOCHEMICAL ANALYSER

A biochemical analyser is an automated instrument used in medical laboratories the process of analysing biological samples, such as blood, urine, and other bodily fluids, for various biochemical markers. These markers can include glucose, cholesterol, enzymes, electrolytes, hormones, and many others.

LFT panel, RFT panel are done by automated biochem analyzer,, vitamin B, vitD, vitB12, hormones such as THS, T3, T4, progesterone, oestrogens these are some tests done by automated immunoanalyser

We should keep the serum sample ready and select the respective test then load the sample in the automated machine can load more samples in a automated analyser.it gives a correct result according the patient sample

In biochem automated analyser we should check the reagent volume by daily or weekly basis to avoid the error

ELECTOLYTE ANALYZER

This is a automated analyzer, it deducts the sodium, potassium chloride values by sucking the serum sample by using the probe then it gives the result within 1 minute.

HEMATOLOGY

PERIPHERAL SMEAR

PROCEDURE

Using lens paper, gently wipe two glass slides to remove any dust or glass fragments. Place the glass slide on an even surface

Mix blood thoroughly Place a small drop of blood on one end of one glass slide. Hold the bottom (frosted edge) of the slide with the thumb.

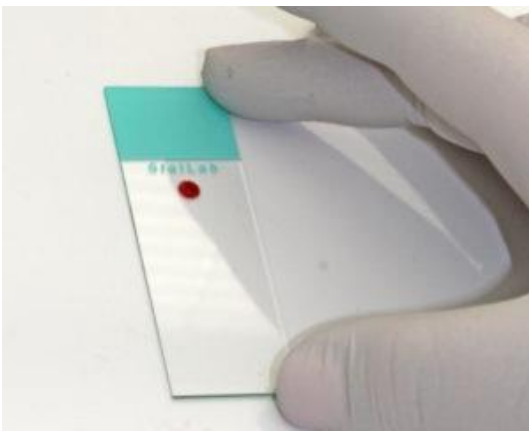


Figure 16 step 1

Place the edge of the other slide at an approximately 35-45° angle on the first glass slide, in front of the blood drop. Using gentle pressure, gently pull the second slide back into the blood drop and allow the blood to spread to the edge of the slide.

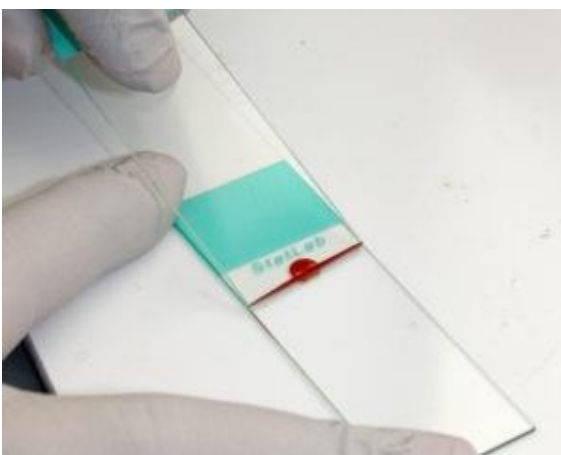


Figure 17 step 2

To spread the blood, rapidly but gently push the top slide forward through the remainder of the smear. It is important to keep gentle, equal pressure throughout the whole process, and do not lift the top slide before it reaches the edge of the bottom slide. So that the tongue shaped smear will be coming.



Figure 18 tongue shape sear

LEISHMEN'S STAINING

PROCEDURE

- ✓ pour Leishman's stain fully on the slide till the slide get covered by it
- ✓ incubate it for 3 minutes then add buffer on it in the zig-zag way
- ✓ then incubate it for 15 minutes and wash it in running tap water

DIFFERENTIAL COUNT

1. Identification of White Blood Cells:

- Count the WBC manually moving from one field to another, and identify white blood cells (leukocytes).
- Differentiate between the different types of white blood cells: neutrophils, lymphocytes, monocytes, eosinophils, and basophils. Each type has distinct morphological features.

- Use oil immersion if necessary for clearer visualization.
- Once a white blood cell is identified, count at least 100 white blood cells.
- Keep track of the number of each type of white blood cell counted.
- Record the counts separately for neutrophils, lymphocytes, monocytes, eosinophils, and basophils.
- Calculate the percentage of each type of white blood cell by dividing the number of cells of that type by the total number of white blood cells counted and multiplying by 100.

2. Reporting:

- Report the differential count as percentages of each white blood cell type.
- Include any relevant observations regarding the morphology of the white blood cells.



Figure 19 WBC manual counting

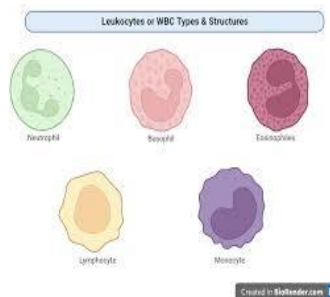


Figure 20 types of WBC

ERYTHROCYTE SEDIMENTATION RATE

- Allow the blood sample to stand undisturbed at room temperature for 30-60 minutes to allow red blood cells to settle.
- After the specified time, carefully place the tube in the Westergren ESR rack, ensuring it stands vertically.
- Start the timer as soon as the tube is placed in the rack.
- Measure the height of the settled red blood cell column (in millimetres) after exactly one hour (60 minutes).

Interpretation:

- ✓ Record the measured height of the red blood cell column in millimetres.
- ✓ The result represents the ESR, typically reported as the distance the red blood cells have fallen in one hour (e.g., 20mm/hour).

COMPELETE BLOOD COUNT

1. **White Blood Cell Count (WBC):** This measures the total number of white blood cells in a sample of blood. White blood cells are a crucial part of your immune system and help fight infections and other diseases.
2. **Red Blood Cell Count (RBC):** This measures the total number of red blood cells in a sample of blood. Red blood cells carry oxygen from your lungs to the rest of your body and remove carbon dioxide.
3. **Haemoglobin (Hb):** Haemoglobin is a protein in red blood cells that carries oxygen throughout the body. Haemoglobin levels indicate how well your blood can carry oxygen.
4. **Haematocrit (Hct):** Haematocrit measures the percentage of your blood that is made up of red blood cells. It's a measure of blood volume and helps diagnose conditions such as anaemia and dehydration.
5. **Mean Corpuscular Volume (MCV):** MCV measures the average volume of your red blood cells. It can help diagnose different types of anaemia.
6. **Mean Corpuscular Haemoglobin (MCH):** MCH measures the average amount of haemoglobin in your red blood cells. It's another indicator of red blood cell health.
7. **Mean Corpuscular Haemoglobin Concentration (MCHC):** MCHC measures the concentration of haemoglobin in your red blood cells. It's also used to diagnose different types of anaemia.
8. **Red Cell Distribution Width (RDW):** RDW measures the variation in size and shape of your red blood cells. It can help diagnose different types of anaemia and other blood disorders.
9. **Platelet Count:** Platelets are small cell fragments in your blood that help with blood clotting. The platelet count measures the number of platelets in your blood.
10. **Mean Platelet Volume (MPV):** MPV measures the average size of your platelets. Changes in MPV can indicate certain platelet disorders.

Above mentioned types were measured by automated cbc machine, where we should mix the EDTA tube gently then load it in the analyz

HBAIC

HbA1c, also known as glycated haemoglobin, haemoglobin A1c, or simply A1c, is a blood test that measures the average level of blood sugar (glucose) over the past 2 to 3 months.it measures up to 10 samples. NORMAL RANGE: below 5.7 percent

PROTHROMIN TIME:

1. Place the cuvette with steel ball in the holder.
2. Add 50ul of sample
3. Select the PT test and select 60secs as incubation period.
4. After 60secs immediately add 100ul of thromborel reagent and click start.
5. Note the readings in seconds.

PT NORMAL RANGE: 12-16 Seconds

ACTIVATED PARTIAL THROMBOPLASTIN TIME (APTT)

1. Place the cuvette with steel ball in the holder.
2. Add 50ul of sample.
3. Add 50ul of Actin reagent.
4. Select the APTT test and select 180 secs as incubation period and press start
5. After 180secs immediately add 100ul of Calcium reagent and click start.
6. Note the readings in seconds

APTT NORMAL RANGE: 26-36 Seconds.



Figure 21PT/APTT analyser

MICROBIOLOGY

PREPARATION OF BIOCHEMICAL TEST

TSI-A

Ingredients:

- ✓ Peptone
- ✓ Beef extract
- ✓ Yeast extract
- ✓ Proteose peptone
- ✓ Lactose
- ✓ Sucrose
- ✓ Glucose
- ✓ Sodium chloride
- ✓ Ferrous sulphate
- ✓ Agar
- ✓ Preparation:

Preparation:

- Dissolve the appropriate amounts of peptone, beef extract, yeast extract, proteose peptone, lactose, sucrose, glucose, and sodium chloride in distilled water according to the manufacturer's instructions or the recipe you are following.
- Adjust the pH of the solution to around 7.2-7.4 using either hydrochloric acid (HCl) or sodium hydroxide (NaOH).
- Add ferrous sulphate solution to the mixture. Ferrous sulphate acts as an indicator for hydrogen sulphide production.
- Add agar to the solution to solidify it.
- Dispense the medium into tubes or plates and autoclave at 121°C for 15 minutes to sterilize.

Storage:

- Store the prepared agar plates or tubes in a cool, dry place away from direct light. Properly sealed plates can typically be stored for several weeks to months.

Quality Control:

- Ensure that the pH of the medium is within the acceptable range.
- Check for any signs of contamination before use.

- Perform appropriate positive and negative control tests to verify the medium's performance.

Usage:

- Inoculate the TSI Agar with the bacterial culture using a sterile inoculating loop.
- Incubate the plates or tubes aerobically at 35-37°C for 18-24 hours.
- After incubation, observe the color changes and other reactions in the medium. Interpret the results based on the characteristic reactions of different bacteria on TSI Agar



figure 22 biochemical test

CITRATE:

Ingredients:

- ✓ Sodium citrate
- ✓ Ammonium dihydrogen phosphate
- ✓ Dipotassium hydrogen phosphate
- ✓ Magnesium sulphate
- ✓ Agar

Preparation:

- Dissolve the appropriate amounts of sodium citrate, ammonium dihydrogen phosphate, dipotassium hydrogen phosphate, and magnesium sulphate in distilled water according to the manufacturer's instructions or the recipe you are following.
- Adjust the pH of the solution to around 7.0 using either hydrochloric acid (HCl) or sodium hydroxide (NaOH).
- Add agar to the solution to solidify it.
- Dispense the medium into tubes or plates and autoclave at 121°C for 15 minutes to sterilize.

- Storage:
- Store the prepared agar plates or tubes in a cool, dry place away from direct light. Properly sealed plates can typically be stored for several weeks to months.

Quality Control:

- Ensure that the pH of the medium is within the acceptable range.
- Check for any signs of contamination before use.
- Perform appropriate positive and negative control tests to verify the medium's performance.
- Usage:
- Inoculate the Citrate Agar with the bacterial culture using a sterile inoculating loop.
- Incubate the plates or tubes aerobically at 35-37°C for 18-24 hours.
- After incubation, observe the growth and color change of the medium. Interpret the results based on the characteristic reactions of different bacteria on Citrate Agar.

SEROLOGY

SANDWITCH ELISA:

Principle:

- The sandwich ELISA is based on the principle of antigen-antibody binding, where the target molecule (antigen) is captured between two specific antibodies (hence the term "sandwich") that recognize different epitopes on the antigen molecule.

Coating the Plate:

- A microplate (usually a 96-well plate) is coated with a capture antibody that specifically binds to the target antigen. The plate is typically coated with the capture antibody by incubating it with a solution containing the antibody.

Blocking:

- After coating, the plate is washed to remove any unbound capture antibody and then blocked with a blocking buffer (e.g., bovine serum albumin or milk) to prevent non-specific binding of other proteins to the plate surface.

Sample Incubation:

- The biological sample containing the target antigen is added to the coated and blocked plate and incubated for a specific period. During this incubation, the target antigen binds to the immobilized capture antibody.

Washing:

- After sample incubation, the plate is washed multiple times to remove any unbound sample components, debris, or non-specific interactions.

Detection Antibody Addition:

- A detection antibody, which recognizes a different epitope on the target antigen, is added to the plate and allowed to bind to the captured antigen. This detection antibody is typically conjugated to an enzyme (e.g., horseradish peroxidase, alkaline phosphatase) that catalyzes a colorimetric or chemiluminescent reaction.

Washing:

- The plate is washed again to remove any unbound detection antibody.

Substrate Addition:

- A substrate solution containing a chromogenic or chemiluminescent substrate specific to the enzyme conjugated to the detection antibody is added to the plate. The enzyme catalyzes a reaction with the substrate, resulting in a color change or luminescent signal that is proportional to the amount of bound antigen.

Signal Detection:

- The colour change or luminescent signal is measured using a microplate reader. The intensity of the signal is directly proportional to the concentration of the target antigen in the sample.

Data Analysis:

- The data obtained from the microplate reader are analysed using appropriate software to calculate the concentration of the target antigen in the sample based on a standard curve generated from known concentrations of a reference antigen.

SDS PAGE

Sample Preparation:

- Protein samples are prepared by solubilizing them in a denaturing buffer containing SDS (sodium dodecyl sulphate) and a reducing agent (such as beta-mercaptoethanol or dithiothreitol). SDS denatures proteins by disrupting non-covalent interactions and conferring a negative charge, while the reducing agent breaks disulfide bonds.
- Samples may be heated to further denature the proteins and ensure uniform binding of SDS.

Gel Preparation:

- SDS-PAGE gels are composed of a resolving gel and a stacking gel. The resolving gel typically has a higher acrylamide concentration and separates proteins based on size, while the stacking gel concentrates the protein bands into a sharp zone before they enter the resolving gel.
- The gel components (acrylamide, bis-acrylamide, buffer, initiator, and SDS) are mixed and poured between glass plates, forming a gel slab.

Sample Loading:

- Protein samples, along with a molecular weight marker, are loaded into wells at the top of the gel using a micropipette. The molecular weight marker consists of known proteins of different sizes, serving as a reference for estimating the molecular weight of unknown proteins.
- Electrophoresis:
- The gel assembly is placed in an electrophoresis chamber filled with running buffer, and an electric current is applied. The negatively charged SDS-bound proteins migrate through the gel matrix towards the positively charged electrode at the bottom of the gel.
- Proteins separate according to their molecular weight, with smaller proteins migrating faster and larger proteins migrating more slowly through the gel.

Staining:

- After electrophoresis, the separated proteins are visualized by staining the gel with a protein stain, such as Coomassie Brilliant Blue or silver stain. The stain binds to the proteins, making them visible as bands against the background of the gel.
- Destaining and Imaging:
- Excess stain is removed by washing the gel with a destaining solution, and the gel is then imaged using a gel documentation system or scanner.
- The protein bands are analyzed based on their migration distance (relative mobility) and compared to the molecular weight marker to estimate the molecular weight of the proteins.

Data Analysis:

- The intensity and position of protein bands are analyzed using image analysis software. Quantitative data, such as band intensity or relative abundance, can be obtained for further analysis.

DOT ELISA

Materials Required for Dot ELISA:

- Nitrocellulose membrane or other suitable solid support
- Antigen or antibody solution
- Blocking buffer (e.g., BSA or milk)
- Primary antibody (conjugated with enzyme)
- Substrate solution for enzyme detection
- Washing buffer
- Pipettes and tips
- Incubation trays or containers
- Microscope or imaging system for result analysis



Figure 23 Dot elisa strip

PROCEDURE:

1. Incubate the membrane with the primary antibody conjugated with an enzyme, allowing it to bind to the target antigen.
2. Wash Prepare the nitrocellulose membrane or solid support by cutting it into appropriate sizes.
3. Coat the membrane with the antigen or antibody solution, ensuring an even distribution.
4. Incubate the coated membrane with blocking buffer to prevent nonspecific binding.
5. Wash the membrane with washing buffer to remove any unbound molecules.
6. the membrane again to remove any unbound primary antibody-enzyme conjugate.
7. Add the substrate solution onto the membrane and allow the enzymatic reaction to occur.
8. Observe the appearance of colored dots on the membrane, indicating the presence of the target antigen.
9. Analyze the results using a microscope or imaging system.

Result:

Positive Result: The appearance of colored dots on the membrane indicates the presence of the target antigen, suggesting a positive reaction.

Negative Result: Absence of colored dots on the membrane indicates the absence of the target antigen, suggesting a negative reaction.

BLOOD BANK

Blood banking is the process that takes place in the lab to make sure that donated blood, or blood products, are safe before they are used in blood transfusions and other medical procedures. Blood banking includes typing the blood for transfusion and testing for infectious diseases.

- ✓ About 36,000 units of blood are needed every day.
- ✓ The number of blood units donated is about 13.6 million a year.
- ✓ About 6.8 million volunteers are blood donors each year.
- ✓ Each unit of blood is broken down into components, such as red blood cells, plasma, cryo precipitated AHF, and platelets. One unit of whole blood, once it's separated, may be transfused to several patients, each with different needs.
- ✓ Annually, more than 21 million blood components are transfused.
- ✓ Must be at least 16 years of age, or in accordance with state law
- ✓ Must be in good health
- ✓ Must weigh at least 110 pounds
- ✓ Must pass the physical and health history exam given before donation Some states permit people younger than 16 or 17 years to donate blood, with parental consent.

Blood donation is a vital part of worldwide healthcare. It allows for blood transfusion as a life-sustaining and life-saving procedure. Over one hundred million units of blood are donated each year throughout the world. This activity reviews donor eligibility and selection, adverse effects of donation, and pathogen reduction and inactivation for donated blood. This activity highlights the role of the interprofessional team in ensuring appropriate protocol is followed.



Figure 24 blood

BLOOD DONOR

The purpose of donor selection is to assess the suitability of an individual to be a blood donor so that blood donation is safe for the donor and the blood products derived from this donation are safe for the recipients. The donor selection process should be carried out in a safe manner

- ❖ The health and safety of the donor as well as the recipient must be safeguarded
- ❖ Only individuals in good health should be accepted as donors of whole blood and blood components
- ❖ The selection of blood donors should be based on regularly reviewed selection criteria, including gender, age, phone number, address, name.
- ❖ A prospective donor's health status and medical history should be evaluated for each donation, on the day of donation prior to blood collection
- ❖ Staff should be suitably qualified and trained in the donor selection process

DONOR CRITERIA

- ❖ The donor must be fit and healthy, and should not be suffering from transmitted disease
- ❖ Age and weight- Between 18 and 65 years old and should weigh a minimum of 50 kg.
- ❖ Pulse rate- Between 50 and 100 without irregularities.
- ❖ Haemoglobin level- A minimum of 12.5 g/dL.
- ❖ Blood pressure- Diastolic: 50–100 mm Hg, Systolic: 100–180 mm Hg.
- ❖ Body temperature- Should be normal, with an oral temperature not exceeding 37.5 °C.
- ❖ The time period between successive blood donations should be more than 3 months

BLOOD BAG

- ✓ Blood bags are used for the reliable collection, separation, storage and transport of blood. Rounded blood bag design prevents blood coagulation and ensures the blood and anti-coagulants are properly mixed during separation and transfusion.
- ✓ Blood bag contain some liquid like chemical called sagam which is help as anticoagulant
- ✓ Sagam A as 45 days life time and sagam as 35 days life time.
- ✓ Citrate Phosphate Dextrose Adenine (CPDA-1) anticoagulant is present in blood bag
- ✓ It is used as transportation and transfusion of human blood and blood components.
- ✓ Blood bag stores about 350 to 450 ml of blood for that it has different types of bags
- ✓ Blood bags one of the types is double bag which is help full in collecting blood and transfer the plasma.
- ✓ Blood bag has three types
 - Single bag
 - Double bag
 - Triple bag



Figure 25 blood bag

BLOOD DONOR REQUEST FORM

- First when the donor is arrived, we should give the donor request form
- That request form only decides whether he can donate blood or not
- The donor should fill about him in that form so that doctor can decide donor health condition
- Donor will fill the details like age, weight, haemoglobin level, name, phone number, address, whether he donated blood before or not
- If he is First donor, he has any diseases or genetic problem, last time donated date and If he is alcoholic or drug addict or if he uses tobacco etc...
- The donor should fill these kind of question and put his signature
- The doctor will see If he is eligible by the form then only the donor is allowed to donate blood

Madras Egmore Lions Blood Bank & Research Foundation

BLOOD DONOR REQUEST FORM

LOCATION: TO BE FILLED BY DONOR

DATE: TO BE FILLED BY MEDICAL OFFICER

TYPE OF DONOR: VOLUNTARY REPLACEMENT

Donor Details: Name, Address, Age, Weight, Blood Type, etc.

Medical History: Questions about diseases, allergies, and previous donations.

Consent: Donor's signature and date.

Medical Officer's Section: Fields for medical officer's name, signature, and date.

Figure 26 request form

BLOOD DONATION

HEALTH HISTORY

- You'll answer a few questions about your health history and places you've travelled, during a private and confidential interview.
- You'll tell us about any prescription and/or over the counter medications that may be in your system.
- We'll check your temperature, pulse, blood pressure and haemoglobin level.

PROCEDURE

- At first, we should identify the donor and collect the details about him
- We should find out whether the donor is eligible for blood donation
- After confirmation we should ask the donor about his health, either he ate or not
- Then we should check the haemoglobin level by finger pricking method by lancet and HB machine (see fig 4& 5) if donor's HB level is above 12.5 means we can collect the blood in vein
- For further process the donor should sit in the chair (see fig 6) and comfort him
- We should keep the blood bag, cotton, band-aid and health drink ready
- After that we should wear gloves for our safety purpose and we should talk politely to the donor
- By the way we should find the vein in donor's arm by tying the tourniquet and clean the site with spirit.
- Now we should inject the needle into the vein slowly
- After injecting we should check the blood is coming properly and ask the donor whether he is disturbed
- If he has any problem means we should stop the collection.



Figure 27 Hb machine



Figure 28 Hb kit



Figure 29 patient chair

- After collecting the blood, we should give any healthy juice to the donor.

- Then take the collected blood bag and we should do the screening test and blood grouping test
- And label blood group in the blood bag, date of collection and keep

DONOR CONSILING

The conditions and situations where blood donor counselling is particularly important are:

- First-time and young donors: to explain the blood donation process and to allay their anxiety and apprehension.
- Individuals who do not meet donor selection criteria based on the assessment of medical history and risk for TTI resulting in temporary or permanent deferral: to explain the reason for deferral

EX; history of cancer, multiple sexual partners and provide information on further management, as appropriate

- Individuals whose basic health check reveals a condition indicating temporary or permanent deferral: to explain the reason for deferral

EX; low haemoglobin level and provide information on further management, as appropriate

- Individuals who may be donating blood to seek testing for infections such as HIV: to understand their motivation for blood donation and provide information on voluntary counselling and testing services
- Donors who had experienced adverse reactions during or after donation in the past: to allay their anxiety and apprehension
- Donors who, after a previous donation, had asked for confidential unit exclusion (CUE) or informed the BTS that their blood should not be transfused: to be aware of the reason for CUE and refer for further management
- Donors who give post-donation information that warrants temporary or permanent deferral

EX; significant health problem developed shortly after donation): to explain the reason for deferral and provide information on further management, as appropriate

- Donors with unusual red cell serology, rare blood groups or abnormal TTI test results: to explain the importance of these results for the donor and provide information on further management

TYPES OF BLOOD GROUPS

ANTIGENS & ANTIBODIES:

A blood type (also known as a blood group) is a classification of blood, based on the presence and absence of antibodies and inherited antigenic substances on the surface of red blood cells (RBCs). These antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the blood group system. Some of these antigens are also present on the surface of other types of cells of various tissues. Several of these red blood cell surface antigens can stem from one allele (or an alternative version of a gene) and collectively form a blood group system.

- ✓ Antigen A with antibody B
- ✓ Antigen B with antibody A
- ✓ Antigen AB with neither antibody A nor B
- ✓ Antigen null (group O) with both antibody A and B (see fig:2)

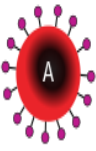
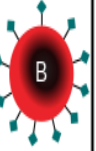
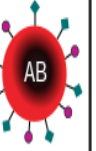
	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	 A antigen	 B antigen	 A and B antigens	None

Figure 30 types of blood group

RH BLOOD GROUP SYSTEM

The Rh system (Rh meaning *Rhesus*) is the second most significant blood-group system in human-blood transfusion with currently 50 antigens. The most significant Rh antigen is the D antigen, because it is the most likely to provoke an immune system response of the five main Rh antigens. It is common for D-negative individuals not to have any anti-D IgG or IgM antibodies, because anti-D antibodies are not usually produced by sensitization against environmental substances. However, D-negative individuals can produce [IgG](#) anti-D antibodies following a sensitizing event: possibly a fetomaternal transfusion of blood from a foetus in pregnancy or occasionally a blood transfusion with D positive [RBCs](#). [Rh disease](#) can develop in these cases. Rh negative blood types are much less common in Asian populations (0.3%) than they are in European populations (15%).

- A POSITIVE
- B POSITIVE
- AB POSITIVE
- O POSITIVE
- A NEGATIVE
- B NEGATIVE
- O NEGATIVE
- AB NEGATIVE, ARE THE TYPES OF THE BLOOD

ABO BLOOD GROUP SYSTEM

The ABO blood group system involves two antigens and two antibodies found in human blood. The two antigens are antigen A and antigen B. The two antibodies are antibody A and antibody B. The antigens are present on the red blood cells and the antibodies in the [serum](#). Regarding the antigen property of the blood all human beings can be classified into four groups, those with antigen A (group A), those with antigen B (group B), those with both antigen A and B (group AB) and those with neither antigen (group O). The antibodies present together with the antigens are found as follows.

BLOOD GROUPING

USES OF BLOOD GROUPING

Blood typing is done prior to a blood transfusion or when classifying a person's blood for donation. Blood typing is a fast and easy way to ensure that you receive the right kind of blood during surgery or after an injury.

If you're given incompatible blood, it can lead to blood clumping, or agglutination, which can be fatal.

PROCEDURE

- ❖ We had received a patient and we collected blood from them and we checked for blood group.
- ❖ First, we had taken three drops of blood in tile and labelled with date and tube number.
- ❖ Then we had 3 types of reagents anti A, anti B, anti D (see fig 3) we should add each reagent in each drop of blood which we have placed in tile
- ❖ And we should mix the blood and reagent with stick and shake the tile so that it mixed well.
- ❖ Look for agglutination in those 3 drops.
- ❖ Then figure out the ABO blood type and RH type.

OBSERVATION

- ✓ If we have agglutination in only anti A means the blood type is A negative
- ✓ If we have agglutination in only anti B means the blood type is B negative
- ✓ If we don't have agglutination means the blood type is O negative
- ✓ If we have agglutination in all then the blood type is AB positive
- ✓ Anti D represent the RH type, it has agglutination means the blood type is positive (see fig 8).



Figure 31 Reagents

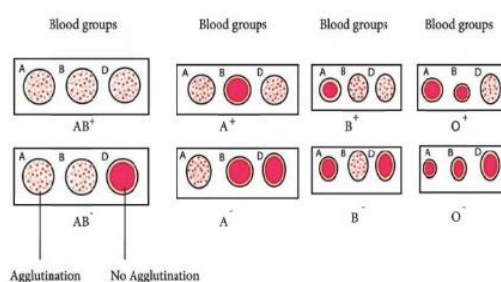


Figure 32 Blood grouping

DONOR SCREENING

Donor blood will be screened for

- HIV
- Syphilis malaria
- Malaria

HIV:

HIV testing, also called HIV screening, is the only way to know if you have the virus.

Several types of tests check your blood or other body fluids to see whether you're infected.

Most can't Importance of HIV Testing

If you have the virus, finding out quickly means you can start treatment right away so you can feel better and live a long, full life. You can also take steps so you don't pass HIV to other people.

Importance of HIV testing

Pregnant women should get tested because early treatment means you probably won't pass it to your baby spot HIV right away because it takes time for your body to make antibodies or for enough of the virus to grow inside you.

Laboratory tests.

For these tests, a technician takes a sample of your blood and tests it. You'll get results within a few days.

Rapid tests:

These tests provide results in about 20-30 minutes. You can get them done in a community clinic or take them at home

HIV Testing Types:

- Standard HIV blood test
- Rapid blood test
- Rapid oral test
- Urine test
- Nucleic acid tests (NAT)

Standard HIV blood test:

This test uses blood that a technician takes from your vein and sends to a lab. I can find antibodies (proteins your immune system makes when you've been exposed to the virus) 23-90 days after infection.

Rapid blood test:

This test looks for antibodies using a drop of blood from a prick of your fingertip. It's about as accurate as the original antibody test, but its window period could be longer -- between 18 and 90 days. Your health care provider can do this test, or you can buy a kit that lets you mail your sample in for testing.

Antibody/antigen test

These tests look for both antibodies and an antigen, a substance the virus makes before your immune system can start making antibodies. An antibody/antigen test that uses blood taken from a vein can find HIV 18-45 days after you're exposed to the virus.

Newer antigen/antibody combination tests (you might hear them called "fourth generation" tests) can find HIV in 99% of people who are tested within 13-42 days of exposure. This test has become the standard HIV blood test in most labs.

A rapid antibody/antigen can also be done using blood from a prick of your fingertip. A health care provider can do this test. Or you can use a mail-in kit. The window period for this test is 18 to 90 days.

Rapid oral test:

You can do this quick, easy test at home. Just rub a swab in the area between your gums and teeth to collect a sample of oral fluid (it isn't the same as saliva) for antibodies against HIV. If you've had the virus for a while, the rapid oral test is highly accurate. But if you have a new infection, even if you got it in the past few months, the test won't be as reliable. The window period is 23 to 90 days.

Urine test:

These also look for HIV antibodies, but they aren't as accurate as other tests that check either your blood or oral fluid. Because it's an antibody test, its window period is similar to that of a standard HIV test.

Syphilis:

Screening for syphilis is typically performed with blood testing to detect antibodies indicating possible infection with syphilis. If the first test is positive, a second blood test is performed to confirm the diagnosis.

Rapid point-of-care testing for antibodies against syphilis, which gives results in 5 to 30 minutes, are generally less accurate and less widely used.

Malaria:

Malaria parasites can be identified by examining under the microscope a drop of the patient's blood, spread out as a "blood smear" on a microscope slide. Prior to examination, the specimen is stained (most often with the Giemsa stain) to give the parasites a distinctive appearance.

BLOOD COMPONENTS AND SEPARATION

PLASMA: Plasma accounts for around 55% of blood fluid in humans. Plasma is 92% water, and the contents of the remaining 8% include: glucose, hormones, protein's, fats, vitamins



Figure 33 plasma

ERYTHROCYTES: Red blood cells have a slightly indented, flattened disk shape. They transport oxygen to and from the lungs. Haemoglobin is a protein that contains iron and carries oxygen to its destination. The life span of a red blood cell is 4 months, and the body replaces them regularly. The human body produces around 2 million blood cells every second.



Figure 34 Packed RBC

LEUKOCYTES: it make up less than 1% of blood content, forming vital defences against disease and infection. The number of white blood cells in a microliter of blood usually ranges from 3,700–10,500. Higher or lower levels of white blood cells can indicate disease.

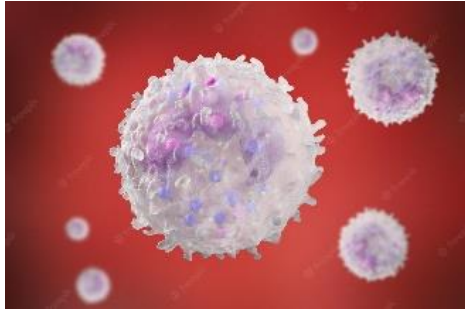


Figure 35 WBC

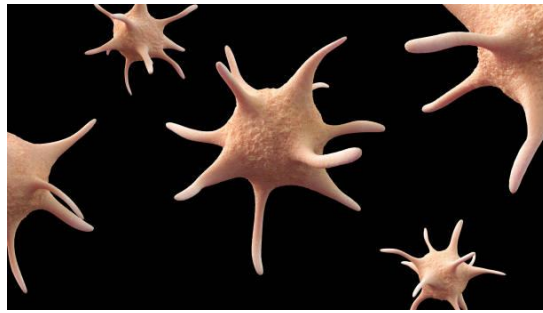


Figure 36 Platelets

THROMBCYTES: Platelets interact with clotting proteins to prevent or stop bleeding. There should be between 150,000 and 400,000 platelets per microliter of blood.

PLSMA SEPARATION

- ❖ At first, we have taken a blood bag (double bag) and we have calculated the blood bag weight.
- ❖ Then we folded the double bag (see fig14) properly and we placed in the centrifuge machine (see fig 15)
- ❖ At the rpm 2800 for 20 mins
- ❖ After 20 mins we can observe the settlement of RBC in the bottom of the blood bag and plasma is clearly visible
- ❖ By the help of plasma expresser (see fig 17) we can transfer the plasma to another empty bag which is connected to blood bag.
- ❖ So that the plasma is separated and we should check the weight
- ❖ If the weight is lower than the normal range, we can add sagam to that bag by the help of connected tubes.
- ❖ After that we can store the plasma in refrigerator, screened means we can keep in -40'c, non-screened means -80'c (see fig 16)



Figure 37 plasma expressor



Figure 38 centrifuge

STORAGE

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 oxygen carrying 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.

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 °C to +6 °C.

Platelet concentrates should be stored at a temperature of between +20 °C and +24 °C i.e. 22±2 °C with continuous gentle agitation. This is essential to prevent platelet aggregation which results in loss of viability.



Figure 39 Refrigerator

CROSS MATCHING

USES OF CROSS MATCHING

Cross matching is a procedure performed prior to transfusion of blood or blood products to detect any serological incompatibilities in the blood of donor and recipient. Before a donor's blood is transfused into a recipient, there should be no antigens or antibodies in both, that would react with each other resulting in transfusion reaction. Cross matching is designed to prevent such transfusion reactions

PROCEDURE

- ❖ Prepare donor and recipient's blood sample Donor's red cells and recipient's serum/plasma.
- ❖ By centrifuging the recipient blood, we will get serum and by adding donors' blood in saline we get cell suspension (segmenting the donor's blood)
- ❖ Prepare 3-5% saline cell suspension of red cells, Label a test tube.
- ❖ Add 25% of recipient's serum and 50% of donor cell suspension in coombs test cord
- ❖ incubate the cord at 37 degrees Celsius for about 10 minutes.

Centrifuge at 1500 rpm for 10 minutes. (see fig 19)

- If RBC is deposited in cord (see fig 20) means we can give the donors blood to respective recipient.

INTERPRETATION

Compatible donor and recipient blood should show **no agglutination** in cross match. Blood which shows incompatibility in cross match should never be transfused, because the large plasma volume of the recipient blood containing antibodies can destroy the donor's red cells easily. Mostly same group will match but if it didn't match means we should not give the blood to recipient.



Figure 40 cross matching cord



Figure 41 blood bag sealer

BLOOD BANKING RECORDS

- Laboratory manual must be prepared and available.
- Standard Operating Procedures must be prepared, reviewed and available.
- Donor's records, including the address, must be complete.
- Batch number of the blood bag must be recorded in the Donor Blood Collection Record.
- Calibration records must be available.
- Records of disposal of Sero-reactive blood and its components must be maintained appropriately.
- Records of sterilization must be maintained.
- Labels must be affixed only after complete testing.
- Two separate storages must be available for under testing and tested blood and components.
- Hospital Transfusion Committee must be formed and should be functional.
- We should collect all the records of both patient and donor by manually and by system.
- Blood Shelf life should be noted
- Example age, name, date of collection, bag number. etc

TABLE OF FIGURE

FIGURE NO	NAME OF THE FIGURE	PAGE NO
FIGURE 1	VENIPUNCTURE	2
FIGURE 2	ORDER OF DRAW	3
FIGURE 3	GRAM POSTIVE	4
FIGURE 4	GRAM NEGAVTIVE	4
FIGURE 5	<i>E. coli</i> IN EMB AGAR	8
FIGURE 6	<i>Staphylococcus</i> IN Blood agar	9
FIGURE 7	<i>Klebsiella</i> IN MACCONKEY AGAR	11
FIGURE 8	<i>Pseudomonas</i> IN NUTRIENT AGAR	12
FIGURE 9	BACT ALERT 3D	14
FIGURE 10	BLOOD CULTURE BOTTLE	14
FIGURE 11	STOOL OCCULT BLOOD	15
FIGURE 12	ACID FAST STAINING	17
FIGURE 13	I CHROMO	19
FIGURE 14	URINE ANALYSER	20
FIGURE 15	PH STRIP	21
FIGURE 16	SMEAR MAKING	24
FIGURE 17	SMEAR MAKING	24
FIGURE 18	TONGUE SHAPE SEAR	25
FIGURE 19	WBC MANUAL COUNTING	26
FIGURE 20	TYPES OF WBC	26
FIGURE 21	PT/APTT ANALYSER	28
FIGURE 22	BIOCHEMICAL TEST	30
FIGURE 23	DOT ELISA STRIP	35
FIGURE 24	BLOOD DONATION	36
FIGURE 25	BLOOD BAG	38
FIGURE 26	REQUEST FORM	39
FIGURE 27	HB MECHIN	40
FIGURE 28	HB KIT	40
FIGURE 29	PATIENT CHAIR	40
FIGURE 30	TYPES OF BLOOD GROUP	42

FIGURE S.NO	NAME OF THE FIGURE	S. NO
FIGURE 31	REAGENTS	44
FIGURE 32	BLOOD GROUPING	44
FIGURE 33	PLASMA	48
FIGURE 34	RBC	48
FIGURE 35	WBC	49
FIGURE 36	PLATELETS	49
FIGURE 37	PLASMA EXPRESSOR	49
FIGURE 38	CENTRIFUGE	49
FIGURE 39	REFRIGERATOR	50
FIGURE 40	CROSS MATCHING CORD	51
FIGURE 41	BLOOG BAG SEALER	51

INTERNSHIP CERTIFICATE

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INTERNSHIP COMPLETION LETTER

This is to certify that Ms. K. Lekha Shree 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. Universal Precaution
2. Needle Stick Injury
3. Spill Management

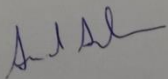
She has learnt to do routine work under supervision and has been aware of basic lab procedures.

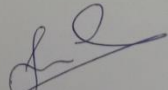
She is well behaved and has maintained a cordial professional rapport with lab staff.

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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Sharing Life. Saving Lives..since 1984



Date: 12th Dec 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Lekha Shree. K, 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 him 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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Web : www.lionsbloodbank.net
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Ambattur Industrial Estate,
Chennai - 600 058. Tel : 48504959
Mob : 99419 17505
E-mail : info@lionsbloodbank.net

CONCLUSION

- ✓ We have gone internship to **LION'S BLOOD BANK** Ambattur I have got a knowledge about blood bank, blood groups and handling blood and blood compounds.
- ✓ I have observed the machines which is placed in the blood bank and I also know to handle.
- ✓ In conclusion, this internship has been a very useful experience for me and I can also safely handle a patient.
- ✓ I have also done internship in **GERI CARE HOSPITAL** in T NAGAR and **SATHYABAMA UNIVERSITY** for each one month because of that I got so many knowledge about laboratory and automated machine.
- ✓ I have also done presentation under the topic of needle stick injury, universal precaution of laboratory and spill management.
- ✓ Now I know to handle patient samples and so many test which was done in the laboratory.