INTERNSHIP PROJECT

At

MEDANTA HOSPITAL

GURUGRAM, (HARYANA)

submitted in fulfillment of the requirements for the award of the degree of

BACHELOR OF SCIENCE

IN

MEDICAL LAB TECHNOLOGY

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Course :- **B.sc MLT**

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NSHM COLLEGE OF MANAGEMENT AND TECHNOLOGY

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ACKNOWLEDGEMENT

To acknowledge is a very great way to show your gratitude towards the persons who has contributed in your success in one or other way. Any accomplished requires the effort of many people.

So, it is my prime duty to acknowledge the person who directly or indirectly helped me during completion of this comprehensive project. So, I take an opportunity to heartily thank Medanta Hospital for their valuable guidance and touch of inspiration and motivation throughout the training Internship

Last but not least, I would like to thank my university to give us an opportunity to do this training internship as a part of academic curriculum, so that I able to improve my ability and confidence for future professional career.

ABOUT THE ORGANIZATION

Medanta – The Medicity is one of India's largest multi-super specialty institutes located in Gurgaon, a bustling town in the National Capital Region. Founded by eminent cardiac surgeon, Dr.NareshTrehan, the institution has been envisioned with the aim of bringing to India the highest standards of medical care along with clinical research, education and training. Medanta is governed under the guiding principles of providing medical services to patients with care, compassion, commitment.

The Medical Laboratories are designed to perform various medical tests for appropriate diagnosis, cure and control of a disease for a patient.

TABLE OF CONTENTS

ABBREVIATION

ESR	Erythrocyte sedimentation rate
Hb	Hemoglobin
WBC	White blood cell
RBC	Red blood cells
Hct	Hematocrit
BUN	Blood urea nitrogen
HIV	Human immune deficiency virus
RFT	Renal function test
LFT	Liver function test
KFT	Kidney function test
ASO	Anti Streptolysin-O
VDRL	Venereal disease research laboratory
WIDAL	Widely investigated disease assay laboratory
SGOT	Serum Glutamate Oxaloacetate Transaminase
SGPT	Serum glutamate Pyruvate Transaminase
ALP	Alkaline Phosphatase
G6PD	Glucose 6 peroxidase
CBC	complete blood counts
mm	Milli meter
IU	International Unit
L	Low value
H	High value

SECTION – 1

PHLEBOTOMY

Phlebotomy is the act of drawing or removing blood from the circulatory system through a puncture in order to obtain a blood sample for analysis and diagnosis. Phlebotomy is also done as part of the patient's treatment for certain blood disorders. Health professionals perform phlebotomy in a medical clinic. A health professional inserts a needle into a vein and take require amount of blood. The procedure takes about 10 minutes.

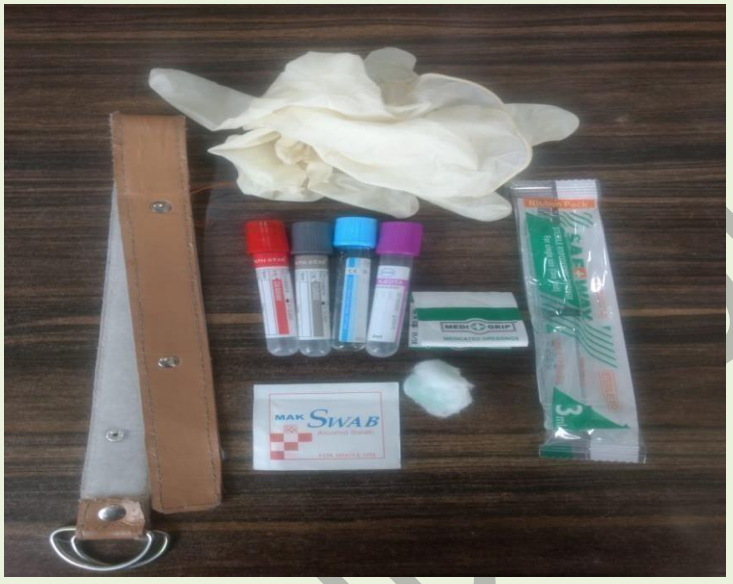


FIG 1.1 REQUIREMENTS FOR BLOOD COLLECTION

THE 6 STEPS TO PHLEBOTOMY ORDER OF DRAW

1. Sterile Blood Culture Tubes or Vials
2. Blue Top Tubes
3. Red Top Tubes
4. Green Top Tubes
5. Purple Top Tubes
6. Gray Top Tubes

PHLEBOTOMY'S WORK

✓ Order form / Request form

1. Requesting physician's complete name. Source of specimen. This information must be given when requesting microbiology, cytology fluid analysis, or other testing where analysis and reporting is site specific.
2. Patient's Name.
3. Patient's Unique ID number.
4. Patient's date of birth and sex.
5. Date and Time of Collection
6. Address and contact no. if possible.
7. Clinical history.

All the details sharply checked by the phlebotomist

Labelling the Sample

* Patient's Name
* Patient's Unique ID number.
* Date, time and initials of the phlebotomist must be on the label of each tube.
* Test request

After blood collection all specimens should be properly labelled immediately after the specimen is collected and unique barcode/registration number should be given.

Fig.1.2 Site of blood collection

COLLECTION OF BLOOD

The general methods for blood collection are:

1. **Vein Puncture** - It is the collection of blood from the veins through the use of a needle and a syringe. The most common site of Vein puncture is the antecubital fossa where the cephalic, basilic and mid-cubital veins are found. This procedure is required when large amounts of blood is needed for testing like in glucose, cholesterol, uric acid, creatinine, alkaline phosphatase test, and many blood chemistry determinations.

2. **Capillary Puncture** – it is also known as finger stick or finger puncture, is used when smaller volumes of blood are needed, like when performing Peripheral Blood Smears, Clotting Time, Bleeding Time And Malarial Smears.

PROCEDURE OF DRAWING BLOOD FROM VEIN

I. **Perform Vein puncture as follows**.

I. Greet the Patient by Saying Good Morning/Afternoon/Evening.
II. Allow the Patient to Sit Comfortable on the Chair.
III. Check the Prescription; Patients Information and Any Special Requirements for Test Required.
IV. Match the Number of Test in Prescription and Bill Done by Attendant or Patient.
V. Label the Tubes as Per the Barcode.
VI. Prepare the Equipment, the Patient and Puncture Site.
VII. Select the Suitable Site for Vein Puncture
VIII. Disinfectant the Puncture Site with 70% Isopropyl Alcohol from Centre to Peripheri.
IX. Puncture the Site with Needle and Collect the Sample in Appropriate Tube.
X. While the Tube Fills Remove the Tourniquet.
XI. Gently Invert the Tube and Mix Well.
XII. Ask the Patient to Press Puncture Site with Cotton for 1-2 min.
XIII. Apply the Spot Banded at the Puncture site.

Fig-1.3 Different Types of tubes

II. Types of Blood Collecting Tube

- Purple Top EDTA Vial (Presence of ETHYLENE DIAMINE TETRA ACETIC ACID)
- Yellow Top Serum Separating Tube (Silica Particles and Serum Separating Tube)
- Blue Top Sodium Citrate (Presence of Sodium Citrate in 1:9 ratio)
- Grey Top Tube (Presence of Sodium Fluoride & Potassium Oxalate)
- Dark Green Top Tube (Presence of Sodium Heparin)
- Black Top Tube (Presence of 3.8% Sodium Citrate)
- Red Top Tube (Nothing is Present, Plain Tube)

Section-Blood Collection

Table 1.1: Different types of vials which we are used in lab for different types of tests.

EDTA VIAL	PLAIN VIAL (RED)	PLAIN VIAL (RED)	FLOURIDE VIAL (GREY)	S. HEPARIN (GREEN)	CITRATE VIAL (SKY BLUE)
CBC	ELECTROLTES	PROTEIN ELECTROLYTES	BLOOD SUGAR FASTING	AMINO ACIDS	PT
HB	THYROID PROFILE	VIT-D	BLOOD SUGAR POST PRANDIAL	KAROTYPING SINGLE	INR
TLC	LIPID PROFILE	HCV	BLOOD SUGAR RANDOM	KAROTYPING COUPLE	APTT
DLC	LIVER PROFILE	HBsAg	INSULIN	TOPONIN-I	FIBRINOGEN
PLATELET	RENAL FUNCTION	HIV	GTT		LUPUS ANTICOGULANT
BLOOD GROUP	CARDIAC PROFILE	FOLIC ACID	LACTATE		HEMOPHILIA PROFILE
ESR	WIDAL	ADA	GCTI		FIBRIN DEGRADATION PRODUCT

SECTION 2

HAEMATOLOGY

Introduction: Hematology is the study of the morphology and physiology of blood. The hematology laboratory set in a healthcare setting is concerned with the diagnosis and monitoring of diseases of the blood and blood-forming organs. Blood is a tissue consisting of cells within a fluid matrix. Blood creates an internal environment which directly or indirectly baths all cells of the body and protects it from the external environment. Blood contains Erythrocytes or Red Blood Cells (RBC), Leukocytes or White Blood Cells and Thrombocytes or Platelets (PLT). Thus, the hematology laboratory routinely reports the enumeration of cells in circulation, hemoglobin concentration and differential count of leukocytes based on the study of the stained blood smear. Study of the blood smear also helps in detecting the morphological abnormalities of various cells seen in the peripheral blood circulation. Another aspect of the haematology laboratory is to investigate causes of bleeding disorder.

HAEMATOLOGY INSUTRUMENT

Fig 2.1 Sysmex XN-20

PRINCIPLE: - It is automated 5-part differential hematology analyser with automatic loading and sampling. It uses the principle of electrical impedance, Laser Light Scattering and Dye Bonding to count cell and to calculate various parameters.

Sample used are:- EDTA Blood and Plasma.

Blood and its Components: Blood is a body fluid in humans that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products away from those

same cells. It is composed of blood cells suspended in blood plasma. The components of blood cells are mainly Red Blood Cells, White Blood Cells and Platelets.

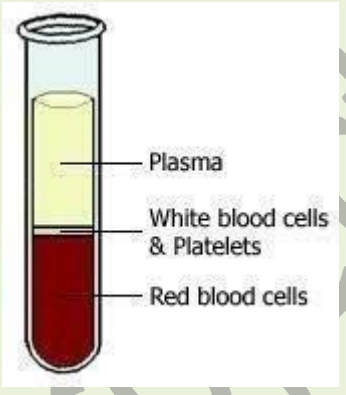


Fig 2.2 Components of Blood

- **PLASMA-** Plasma is the clear, straw-coloured liquid portion of blood that remains after red blood cells, white blood cells, platelets and other cellular components are removed. It is the single largest component of human blood, comprising about 55 percent, and contains water, salts, enzymes, antibodies and other proteins.
- **ERYTHROCYTES-** Also called **(RBC)** red blood cell, which (in humans) is typically a biconcave disc without a nucleus. Erythrocytes contain the pigment haemoglobin, which imparts the red colour to blood, and transport oxygen and carbon dioxide to and from the tissues.
- **LEUKOCYTES-** also called White blood cells (WBC) are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders. All white blood cells are produced and derived from multipotent cells in the bone marrow known as hematopoietic stem cells. Leukocytes are found throughout the body, including the blood and lymphatic system.

III. TYPES OF LEUKOCYTES

NEUTROPHIL

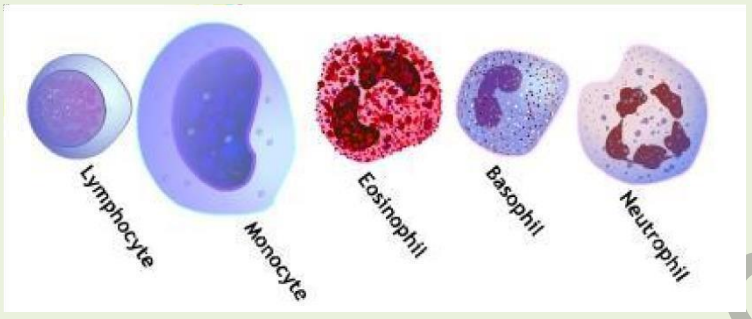
BASOPHIL

EOSINOPHIL

LYMPHOCYTE

MONOCYTE

Fig 5.3 Types of Leukocytes



THROMBOCYTES- It is also called platelets are tiny blood cells that help your body form clots to stop bleeding. If one of your blood vessels gets damaged, it sends out signals that are picked up by platelets. The platelets then rush to the site of damage and form a plug, or clot, to repair the damage.

Principle:- Sysmex SP-10 can make a smear from a from a sample that has been judged abnormal in hematology test.SP-10 is a fully automated slide preparation machine.From scanning of UHID of sample, mixing it, making smear and Staining of slide . It uses leishmaan stain and giemsa stain for staining.

Fig 2.2 Staining Machine

Hematology test

COMPLETE BLOOD COUNT (CBC)

A complete blood count (CBC) is a blood test used to evaluate your overall health and detect a wide range of disorders, including anaemia, infection and leukaemia. A complete blood count test measures several components and features of your blood, including: -

Red blood cells, which carry oxygen

White blood cells, which fight infection

Haemoglobin, the oxygen-carrying protein in red blood cells

Haematocrit, the proportion of red blood cells to the fluid component, or plasma, in your blood

Platelets, which help with blood clotting

Abnormal increases or decreases in cell counts as revealed in a complete blood count may indicate that you have an underlying medical condition that calls for further evaluation.

Table 5.1: Type of cell and their abnormalities

TYPE OF CELL	INCREASE	DECREASE
Red blood cell	Erythrocytosis,	Erythrocytopenia
White blood cell	Leucocytosis	Leukopenia
Lymphocyte	Lymphocytosis	Lymphocytopenia
Monocyte	Monocytosis	Monocytopenia
Neutrophil	Neutrophilia	Neutropenia
Eosinophils	Eosinophilia	Neutropenia
Basophils	Basophilia	Basopenia
Platelets	Thrombocytosis	Thrombocytopenia
All cell lines	Pancytosis	Pancytopenia

Normal Range of components of CBC:

WBC: 4 to 11 thousand

RBC: Males: 4.5to 5.5 m/mcL

Females: 4.2 to 5 m/mcL

HCt: Males: 42% to 52%

Females: 37% to 47%

Hb: Male: 13.5 - 18.0 gm/dl Female:

11.5 - 16.5 gm/dl MCV:

(81-101) fl.

MCH: (25-30) Pg.

MCHC: (32 – 36) %

RDW: 11.5% to 14.5%

REPORT: CASE 1 Patient

Name: Abc

Sex :- Male

Sample no: 2021038274

Table 5.2: COMPLETE HAEMOGRAM

Test Name	Value	Unit	Reference value
Haemoglobin (HB)	13.60	Gm/dl	12.5
TLC (Total leucocyte count)	3000	cu/ mm	4000-11000
Differential Leukocyte Count			
Neutrophil	40	%	45-75
Lymphocyte	45	%	20-45
Eosinophil	05	%	1-6
Monocyte	10	%	1-10
RBC (Red blood cell)	4.15	Millions/cu mm	3.8-5.8
HCT(Haematocrit)	39	%	38-47
MCV (Mean corpuscular volume)	87.2	FL	74-100

MCH (Mean corpuscular haemoglobin)	30.8	Pg.	27-32
MCHC (Mean corpuscular haemoglobin concentration)	33.6	g/DL	32-37
Platelet Count	92	X10^3/Ul	150-450

INTERPRETATION: The CBC report shows decrease count of TLC and PLATELETS, which means the person, is suffering from **leukocytopenia** and **thrombocytopenia**. Decreased platelet count occurs in aplastic anaemia, acute leukaemia, or in case of dengue fever.

Leukocytopenia places individuals at increased risk of infection.

Leukocytopenia (decrease in WBC) is most often due to a lower number of neutrophils, referred to as **Neutropenia.**

Thrombocytopenia can result from drug toxicity.

As the White Blood Cells reduce, it may lead to Thrombocytopenia due to the damage of bone marrow. Platelets count reduces to a large extent due to Leukocytopenia.

REPORT: CASE 2

Patient Name: Xyz

Age: 77Yrs

Sex: Female

Sample no: 2021055471

Table 5.3: COMPLETE HAEMOGRAM

Test Name	Value	Unit	Reference value
Haemoglobin (Hb)	10.90	gm/dl	11.5-14.5
TLC (Total leukocyte count)	9200	/cu mm	4000-11000

Differential leukocyte count			
Neutrophil	50	%	45-75
Lymphocyte	43	%	20-45
Eosinophil	03	%	1-6
Monocyte	0.00	%	1-10
RBC (Red blood cell)	4.27	Millions/cu mm	3.8-5.8
HCT (Haematocrit)	33.5	%	38-47
MCV (Mean corpuscular volume)	78.6	Fl	74-100
MCH (Mean corpuscular haemoglobin)	24.6	Pg	27-32
MCHC (Mean corpuscular haemoglobin concentration)	31.3	gm/DL	32-37
Platelet count	280	X10^3/uL	150-450

INTERPRETATION: As from the report it's clear that the person has Hb, HCT, MCV, MCH, and MCHC below normal ranges, which indicate the person is suffering from anaemia.

Anaemia occurs when the body doesn't have enough iron, leading to the decreased production of red blood cells. Red blood cells carry oxygen in whole body.

- **ERYTHROCYTE SEDIMENTATION RATE (ESR)**

Fig 5.4 ESR Machine

Erythrocyte Sedimentation Rate is a non- specific screening test indicative of inflammation. It is used as an initial screening tool and also as a follow up test to monitor therapy and progression or remission of diseases. This test measures the distance the RBCs will fall in a vertical tube over a given period of time. The ESR is reported in millimetres. ESR vacuum tubes are used which contains 3.2% sodium citrate as anticoagulant.

(*Westergren's Method*)

Principle: When anti-coagulated blood is allowed to stand undisturbed for a period of time, the erythrocytes tend to settle down to the bottom. Two layers are formed upper plasma layer and lower one of RBCs. The rate of which the RBCs fall is known as the erythrocyte sedimentation rate.

Specimen: 3.8% Tri-sodium citrated blood Procedure:

1) Westergren's tube was filled exactly up to zero (0) mark.

2) Placing the tube upright in the machine.

3) Note the time allowing the tube to stand for exactly one hour.

4) Note the level to which the red cell column has fallen at the end of one hour.

Result: Report in terms of ……. mm/hr

Normal Range: -

MALE- 00mm/hr - 15mm/hr

FEMALE- 00mm/hr - 20mm/hr

Report Case: 1

Name: Efg

Age: 23yrs

Sex: Male

Table 5.4: Abnormal ESR result

TEST NAME	VALUE	UNIT	NORMAL RANGE
ESR	55	mm/hr	0.0-20

Clinical Significance:

ESR Increase: - It is observed in kidney diseases, pregnancy, rheumatic fever, anaemia, rheumatoid arthritis, syphilis and thyroid diseases.

INTERPRETATION: The patient has high value of ESR, which indicates that, the patient has inflammation in body.

It can be due to:
Pregnancy, Macrocytic Anemia, Thyroid, Kidney Disease, Tuberculosis, Blood Cancer, R.A.

Reticulocyte count Principle: Supravital staining method is used for reticulocyte count. Blood is mixed with the stain and the stain enters the cells in living condition. The RNA in the cells is precipitated by staining as dark blue network of reticulum. Blood smear is made afterwards. Since a direct count is not possible, a relative count is taken against the number of red blood cells and expressed as a percentage of red cells.

Normal value:

Adults: 0.2 – 2%

Infants: 2 – 6%

Clinical significance:

The number of reticulocytes in peripheral blood is a reflection of red cell forming activity of bone marrow. Increase in their number indicates increased activity of the marrow (haemolytic anaemia or acute blood loss). This is known as reticulocytotic.

Repeated absence or low counts of reticulocyte indicate bone marrow suppression (aplastic anaemia

Procedure:

1) Two drops of blood were added to the tube containing brilliant cresyl blue solution.

2) Mixing the tube gently.

3) One drop of mixture was placed in the smear.

4) Thin smear was made using spreader and leaving for dry.

5) The smear was examined using 100X oil immersion objective.

Calculation:

Reticulocyte count (%) = Number of reticulocytes counted X 100

Number of red cells counted

PRECAUTION:

1) Add equal quantity of stain and blood.

2) Incubate the sample proper time.

3) Use clean and dry glassware.

COAGULATION TIME :- It include PT/INR, APTT, Factor V, VIII, IX, XI, D-dimer.

Clotting **time** is the **time** required for a sample of blood to coagulate in vitro under standard conditions. There are various methods for determining the clotting **time**.It is affected by calcium ion levels and many diseases. Normal value of clotting **time** is 2-8 minutes.

Fig 5.5 Sysmex CS 2400

Principle :- The CS 2400 is a fully automated Blood Coagulation Analyzer for in vitro diagnostic use, that can quickly analyze large volume of sample with a high degree of accuracy. This instrument can analyze sample using **Coagulation, Chromogenic, Immunoassay** and **Aggregation Methods**.

PROTHOMBIN TIME (PT):- NORMAL RANGE 11 TO 13

ACTIVATED PARTIAL THROMBOPLASTIN TIME (APTT) **:-** Normal Range 30 to 40 second

FACTOR V :- 90-100%

FACTOR VIII :- 50-150%

FACTOR IX :- 60-140%

FACTOR XI :- 65-130%

D-dimer :- 0.5 ng/ml

Report Case 1

Name : Mnt

Age : 65

Gender : Male

Test Name	Value	Unit	Reference value
PT	28	sec	11-13
APTT	55	sec	30-45
Factor V	130	%	90-100
Factor VIII	210	%	50-150
Factor IX	186	%	60-140
Factor XI	168	%	65-130
D- dimer	1.8	Ng/ml	0.5

INTERPRETATION :- The Coagulation Time show increase in time, which means person is suffering **from Blood Clotting or Hyper Coagulation . The reason may be Heart disease, Cancer, liver disorder, Splenomeggaly.**

Report Case 2

Name : Ghi

Age : 47

Sex : Female

Test Name	Value	Unit	Reference value
PT	05	sec	11-13
APTT	17	sec	30-45
Factor V	55	%	90-100

Factor VIII	21	%	50-150
Factor IX	34	%	60-140
Factor XI	47	%	65-130
D- dimer	0.1	Ng/ml	0.5

INTERPRETATION : The Coagulation Time show decrease in Time, which means Person is Suffering **from Liver Disease, Vitamin K Deficiency,Bleeding and Clotting Disorder.**

SECTION 3

MICROBIOLOGY

INTRODUCTION:

Microbiology involves the study of microscopic organisms. A student should have and understanding of the microbiological diversity in the biosphere and be better prepared to appreciate the extent to which microbiology shapes our daily lives. Although microorganisms are generally beneficial and essential for life, some are, however, pathogenic and cause infectious diseases. The diagnostic microbiology laboratory is engaged in the identification of infectious agents. These infectious agents are broadly classified as viruses, bacteria, mycotic agents and parasites. Identification of the infectious agent is the principle function of diagnostic microbiology laboratory. In addition, the laboratory also provides guidance in therapeutic management. This is particularly true in the case of bacterial infection where the laboratory provides information regarding the most effective antimicrobial agent and its dosage to be used for the specific patient.

Principle: - The sample to be tested is inoculated into the vial which is entered into the BACTEC instrument for incubation and periodic reading. Each vial contains a sensor which responds to the concentration of CO2 produced by the metabolism of microorganisms or the consumption of oxygen needed for the growth of microorganisms. The sensor is monitored by the instrument every ten minutes for an increase in its fluorescence, which is proportional to the increasing amount of CO or the decreasing amount of O present in the vial. A positive reading indicates the presumptive presence of viable microorganisms in the vial.

Fig 3.1 Microbial Detection

Principle: -

The VITEK 2 compact system is an automated microbiology bacterial identification and antimicrobial susceptibility system.Uses advanced colorimetry technology to determine

individual biochemical reactions contained in variety of microbe identification cards. After inoculation with a standardized suspension of the unknown organisms, each self- contained cards is incubated and read by the instruments internal optics. Comparison of results to known species specific reactions in the VITEK 2 database yields organism identification.

Fig 3.2 VITEK 2 COMPACT

Sample Receive:- Blood Culture, Sputum, Urine, Stool, Pus Swab, Wound Swab, Throat Swab and Vaginal Swab.

Media for Sample :-

Blood Culture:- Blood and Mac-Conkey Plate

Sputum and Throat Swab :- Mac, Blood and Chocolate

Pus Swab and Vaginal Swab :- Chocolate and Blood plate

Procedure for Culture :-

Blood, Urine, Swab, Sputum etc. keep them all in laminar flow.

Inoculate the sample on respective media and keep it in incubator for 24 to 48 hours.

Check the Growth of Micro-Organism after 24 or 48 hours.

If there then note it Down and go for further Process.

Staining

1.GRAM STAIN

REQUIREMENTS: - Glass slides, inoculating loop, Bunsen burner, Microscope, Crystal Violet Stain, Gram iodine solution, Acetone alcohol & Safranin.

PRINCIPLE: Gram staining is used to differentiate between gram positive and gram-negative bacteria. The procedure is based upon the ability of microorganism to retain colour of the stain used during the gram stain reaction. Gram negative bacteria are decolorized by the alcohol and loose the colour of the primary stain (crystal violet) which is purple. Gram positive bacteria are not decolorized by alcohol and will remain as purple. After decolourizer step, a counter stain (safranin) is used to impart a pink colour to the decolorized gram-negative organisms.

PROCEDURE:

1. Make the smear of specimen air dry and heat fix it.
2. Flood the slide with crystal violet stain and leave for 60 seconds.
3. Wash the stain with clean water.
4. Cover the smear with iodine solution and leave for 60 seconds.
5. Wash the iodine with water.
6. Decolorize the smear acetone – alcohol solution for 20-30 seconds.
7. Cover the smear with counter stain safranin for 10 seconds.
8. Wash the slide with water wipe the back of the slide and place in a rack for the smear to air dry.
9. Examine the smear microscopically under oil immersion.

PRECAUTION:

1. Use clean, grease free, dry slide for making smear.
2. Allow to smear to air dry completely.
3. Fix the smear carefully.
4. If is necessary to allow the timing for applications of stains.
5. The acetone – alcohol solution is highly inflammable. Therefore, it should not be brought near the flame.

RESULT: -

Gram positive bacteria: **- Dark purple**

Gram negative bacteria: -Pale to dark red

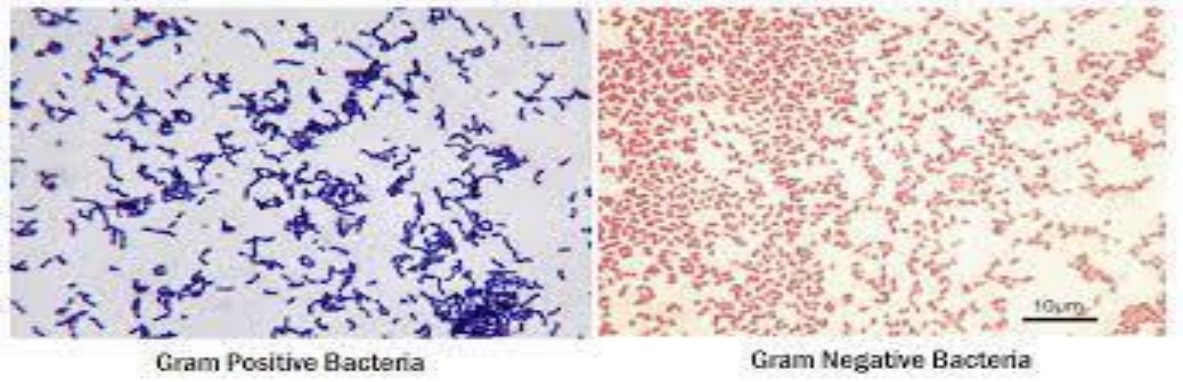


Fig 3.3 Gram Stain

3. ACID FAST STAIN

Principle:

The organism such as Mycobacterium tuberculosis is extremely difficult to stain by ordinary stain. This differential staining technique is useful for identification of the Mycobacteria species which depends on the chemical composition of the bacterial cell wall. The outer layer of Mycobacterium is made up of mycolic acid which other stain is not able to penetrate. When the smear is heated with Carbol fuchsin the mycolic layer is loosened up and stain penetrates into the cell and stains it. Once the smear cools down, rearrangement of the mycolic acid occurs and produce a tough barrier which is not able to penetrated with decolourizing agent either, thus it takes the colour of primary stain and appear as pink; but in case of non-acid fast bacteria i.e. not having outer layer of mycolic acid, primary stain is washed off by decolourizer and they take the colour of counter stain.

Procedure:

1. A smear was prepared on the slide and heat fixed.
2. Filtered carbol fuchsin and flood the slide with it.
3. Then the slide was gently heated with carbol fuchsin on it until vapour rose, stained for 5 minutes.
4. Slide was gently washed with water until all free stain is washed away.
5. Then the water was drained away.
6. Then the slide was covered with 25% sulphuric acid for 2- 4 minutes.
7. Washed the slide thoroughly with water.
8. Then covered with counter stain 0.1% methylene blue for 30 seconds.
9. After 30 seconds counter stain was drained and gently rinsed with tap water.
10. Then the slides were air dried in standing rack.

11. The smear was viewed under oil immersion.

12. Acid Fast Bacteria: Find red rods against blue background. **Result: -**

Acid fast bacteria- Pink to red in colour

Non- acid-fast bacteria- Blue in colour

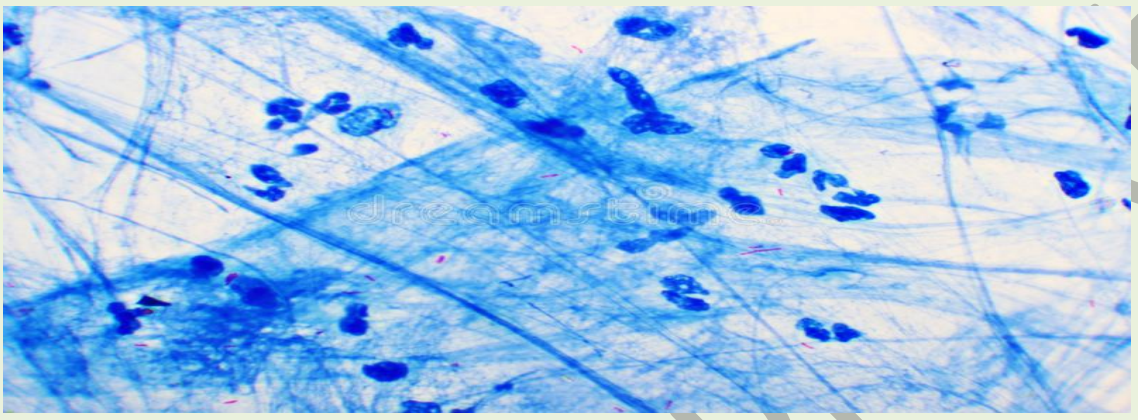


Fig 3.4 AFB Stain

SECTION 4

SEROLOGY

Introduction:- Serology is the scientific study of serum to diagnose infectious diseases by observing the immune antibody produced by the entry of the antigen into the body. It is the study of antigen antibody or immunological reactions of the body by using a serum specimen. Serologic tests focus on proteins made by the body's immune system. Immune system helps keep us healthy and destroying foreign invaders that can make us ill. Antigens are the substances that stimulate a response from the immune system. They are most often too small to be seen with naked eye. Antigens that commonly affect people include: Bacteria, Fungi, Virus, parasites. The immune system defends against antigens by producing antibodies in response to the presence of antigens. These antibodies are particles that attach to the antigens to deactivate them.

Agglutination: -Agglutination is the visible expression of the aggregation of the antigen and antibodies. Agglutination reactions apply to particulate test antigens that have been conjugated to a carrier.

Principle: The single test concept top. The vidas principle is based on the interaction of two elements the coated SPR receptacle, containing antigen or antibodies and the strip made up of a series of wells containing the correct amount of reagent necessary for the test.

Fig 4.1 Vidas

Sample Used are :-

Blood Serum and Whole Blood.

Test Done are :-

- ✓ Epstein Barr Virus (EBV) IgG and IgM
- ✓ Hepatitis A,B,C,E (IgG and IgM)
- ✓ Cytomegalo Virus (CMG) IgG and IgM
- ✓ Procalcitonin (PCT)
- ✓ Rubella (IgG and IgM)
- ✓ Clostidium difficle
- ✓ Toxoplasma

LIST OF SEROLOGY TESTS: -

- Widal test
- HIV test
- Dengue test

1) WIDAL test: -

Method: - Slide method

Principle: The Widal test is agglutination technique where the mixing of serum sample with the provided kit components (antisera) gives the agglutination reaction in the positive case.

When the antibody against the typhoid and paratyphoid fever are present in the patient's serum, they combine with the respective antisera and give the agglutination reaction.

Requirements: - Glass slide with ceramic ring, applicator stick

Reagent: - salmonella typhi O & H. salmonella Para typhi A(H) and B(BH) positive and negative control.

Specimen: - serum

Procedure: -

1. Bring all reagents of Widal test and specimen to room temperature
2. Place one drop of test serum in all wells labelled as O, H, AH, and BH in a glass plate provided for Widal test.
3. Place one drop of each antisera O, H, AH, and BH in circle.
4. Mix the content of each circle with separate applicator sticks.
5. Rotate the slide for 1-2mintue and observe for agglutination

Fig 4.2 Antisera

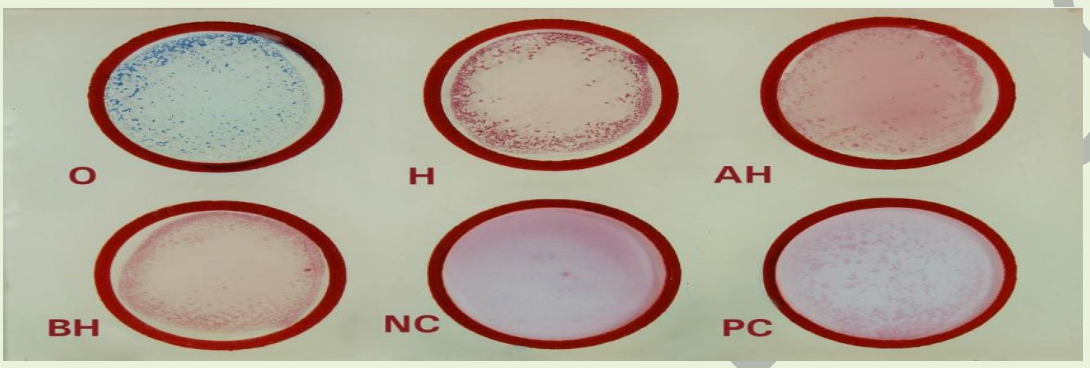


Fig 4.3 Agglutination

2.HIV test (Human immuno deficiency virus)

The human immunodeficiency virus (HIV) is a retrovirus that infects cells of the immune system, destroying or impairing their function. HIV infection causes acquired immunodeficiency syndrome (AIDS). There are two HIV viruses: HIV-1 and HIV-2. Both belong to retrovirus group.

Principle: The HIV TRI-DOT Test is a visual, rapid, sensitive and accurate immunoassay for the differentia detection of HIV-1 and HIV-2 antibodies in human serum using HIV-1 and HIV2 antigens immobilized on an immune filtration membrane. The test is screening test for antiHIV-1 and anti- HIV-2 and is for in vitro use only.

REQUIREMENTS: HIV test card, HIV buffer, HIV conjugate, patient serum.

PROCEDURE:

1. Take a HIV tri-dot card.
2. Put two drop of HIV buffer into it.
3. Wait for few seconds until the test card is completely dry.
4. Now add 1-2 drops of patient serum into it.
5. Wait for seconds.

6. Add 2 drops of HIV buffer into it.
7. Wait for seconds.
8. Add 2 drops of HIV conjugate into t.
9. Now after drying add HIV buffer for the clarification.
10. Now see the appearance of dots on the card.

INTERPRETATIONS: If dot (pinkish purple) appears only one on control which means results is negative.

If dot on control as well as on HIV-1 & HIV-2 which means result is positive.

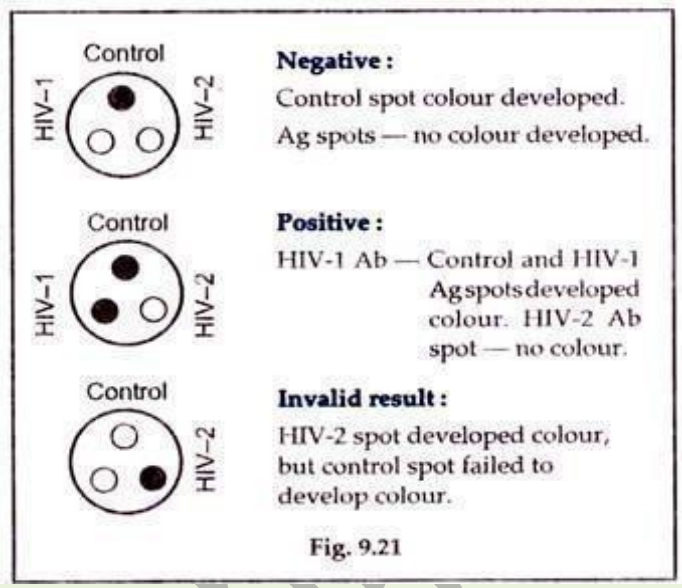


Fig 4.4 HIV Result

ELISA

Enzyme – **L**inked **I**mmunosorbent **A**ssay is biochemical Technique used to Detect the presence of an Antibody or an Antigen in Sample.

Test done by Elisa are:-
Dengue
Tb Gold
Glactomannan
Scrub Typhus
E.Histolytica

Glyctomannan Elisa :- it is a test done for detection of the Aspergillus

Fungus. BAL sample is used for this Test.

Requirements:- Antigen Coated Well
Blood Serum or BAL
ELISA Reagent
Micro Pippet
5.0 ml Tube
Incubator
Centrifuge

Procedure :- Take 5.0 ml tube according to sample and control.

Tube 1 : Positive Control 300 µ l + 100 µl Sample Treatment

Tube 2 : Negative Control 300 µ l + 100 µl Sample Treatment

Tube 3 : Cut 300 µl + 100 µl Sample Treatment

Tube 4 : BAL or Blood Serum 300 µl + 100 µl Sample Treatment

Mix Well then heat it at 120˚Celsius for 6 minutes

Centrifuge it at 10000 rpm for 10 minutes.

Take well Plates Add 50 µl sample + 50 µl conjugate

Incubate at 37˚ Celsius for 1 and hour.

Wash 5 times with Buffer.

Add Substrate 100 µl (TMB)

Again Incubate for 30 min at Room Temperature.

Add 100 µl Stop Solution.

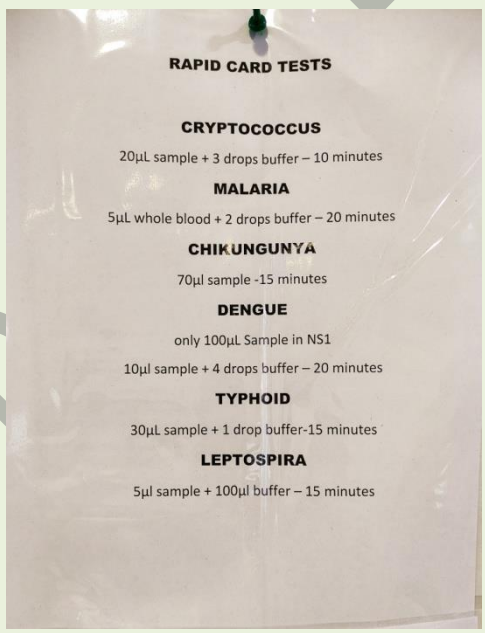
Then put the well in Elisa Reader.

Note the Value.

Result :- less than 0.5 Negative

More Than 0.5 Positive

Card Test



SECTION 5

HISTO- PATHOLOGY

INRODUCTION:- Histopathology Refers to the Microscopic Examination of Various forms of Human Tissues. Specifically, in Clinical Medicine.It also Refers to the Examination of a Biopsy or Surgical specimen by a Pathologist after the specimen has been Processed and Histological Sections have been placed on Glass Slide.

Machine Principle :- The TPC 15 Duo/Trio is a high-production multi-protocol tissue processor with 15 stations capable of processing two (TPC 15 Duo) or three (TPC 15 Trio) different runs simultaneously and independently. The TPC 15 Duo/Trio is the result of years of retro engineering. With a maximum capacity of 440 (TPC 15 Duo) or 660 (TPC 15 Trio) specimen cassettes the TPC 15 Duo/Trio is a multi-processing workhorse. To protect user and environment, the instrument is closed by a stainless steel lid. The TPC 15 Duo/Trio includes an extraction sytem for solvent fumes with the connection to an external exhaust facility. Additionally, the instrument is equipped with a large activated charcoal filter, the use of which is computer monitored. Heaters and stirrers are controlled to provide optimum energy saving.

Fig 5.1 Tissue Processor

➢ Sample IN Histo- Pathology Lab

- **All types biopsy**
- **Body Tissue**
- **Body Fluid**
- **FNAC (Fine Neddle Aspiration Cytology)**

➢ Tissue Processing :-

I. **Fixation (10% buffered Formalin)**
II. **Dehydration (Alcohol)**
III. **Cleaning (Xylene)**
IV. **Impregnation/Inflitration (Paraffin Wax IN, Xylene OUT)**
V. **Embedding**
VI. **Section Cutting/ Microtome**
VII. **Deparaffinization**

VIII. Staining (H & E Staining)
IX. Mounting
X. Microscopic

➢ H and E Staining

I. After Section Cutting the Warm the Slide for 5-10 Min.
II. 3 Changes of Xylene for 3 minutes Each
III. 2 Changes of Absoulte Alcohol for 2 Mintues
IV. Wash the Slide in Running Tap Water
V. Stain the Slide with Hematoxyline for 5 Minutes
VI. Wash the Slide in Running Tap Water
VII. Give one to two dip in 1% Acid Alcohol for differentiate
VIII. Wash the Slide in Running Tap Water
IX. Stain with Aqueous 1% Eosin 1-2 Minutes
X. Dehydrate the Slide
XI. Clear it with Xylene
XII. Mount with DPX.

Primary Stain :- Hematoxylin is a basic Dye with give Colour to NUCLEUS

Counter Stain:- Eosin is a acidic Dye with gives colour to CYTOPLASM.

SECTION 6

CLINICAL PATHOLOGY

Introduction :- **Clinical pathology** or Laboratory medicine, is a medical specialty that is concerned with the diagnosis of disease based on the laboratory analysis of Urine, Smen and Stool using the tools of chemical, Physical and MIcroscopic.

Instruments Principle:- The UD-10 closes the total urinalysis workflow by capturing the particle images in urine samples. With its stage scanning technology, you confirm abnormal results from previous chemical and sediment analysis in a fully automated device.

Particles can be classified into eight different classes based on the size of particles. The images provide a detailed view of urine particles without performing a manual sediment or microscopy; the entire workflow can be processed automatically.

Particle images from the UD-10 help by differentiating abnormal or unclear results. Through individual rule settings with the Urinalysis Work Area Information Management System (U-WAM), you can modify workflows to meet your needs.

Measurement principles

- Automatic focus adjustment
- Cells are settling down on the bottom of imaging cell after aspiration
- Moving CCD camera captures images with pulsed LED

Fig 6.1 Sysmex UD 10

URINE ROUTINE: (URINALYSIS) :- A urine sample can be analyzed via 3 different methods. These methods include Physical examination, Chemical examination and Microscopic examination of the sample. The urinalysis is a form of urine routine checkup that is usually

done in order to diagnose a particular disease condition. These can be UTI(Urinary Tract Infection), Kidney problems, Liver problems or Diabetic condition. Sometimes it is even done prior to a surgery or for a regular checkup. The 3 different methods of examination of urine sample involves a number of parameters that are analyzed during diagnosis. These are:

a) **Physical parameters:** These involve analysis of color, odor, turbidity, specific gravity and pH of the urine sample.
b) **Chemical parameters:** Various chemical properties such as glucose, protein, keto bodies, bilirubin, urobilinogen, blood, nitrite, and leukocytes are checked.
c) **Microscopic Parameters:** These involve the analysis of various infection causing micro organisms such as epithelial cells, crystals, bacteria and yeasts.

The Analyzers:

2 fully automated analyzers were used for performing urinalysis. One was for physical and chemical examination and the other one was used for microscopic examination. These are:

Iris iChem Velocity: This analyzer uses ascorbic acid test pads to determine any ascorbic acid interference as well as examine various physical parameters. It makes use of an iris strip for determination of various parameters. The analyzer is based on the photometric effect. Photometric effect- The automated method of urinalysis is based on the principle of reflectance photometry in which minimum amount of light is reflected by the darkest pad turned. The light thus reflected is then detected by a photodetector, which then emits a signal that is quantified by the analyzer.

Dipsticks are often used for manual analysis of the urine. Eg: urocolor strip which is a multistix.

The parameters tested depend upon different methodologies. These are:-

- **Blood:** The hemoglobin and erythrocytes have a peroxidase like activity that catalyze the reaction of diisopropylbenzenedihydroperoxide thereby resulting in colours that

may range from orange to green. Interpretation says that Hematuria, Hemoglobinurea or Myoglobinurea can be the cause of blood in urine.

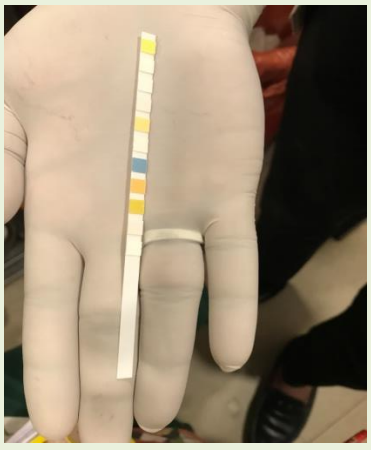
- **Specific Gravity:** The apparent change in the pKa value of polyectrolytes corresponding to the ionic concentration is the underlying principle of determination of specific gravity. The colourrange from deep blue, green blue in case of low ion conc to green and yellow green in case of high ion conc in urine. The values may range from 1.005-1.035.
- **pH:** pH stands for power of hydrogen. The principle behind ph measurement is the double ph indicator method in which bromomethyl blue and methyl red give a wide range of colours over the pH range of 5-9. Interpretation of a normal healthy person should have a urine pH ranging between 4.6-8.0.
- **Protein:** Protein error of indicator principle is the one in which a green colour is developed due to presence of protein at a constant pH. The colours range from yellow in case of negative result to yellow green, whereas in case of positive it changes from green to blue green.
- **Ketone:** The detection of keto bodies take place in a strong alkaline medium in which reaction takes place between acetoacetic acid and nitroprusside. The colour may range from beige or buff pink (negative) to pink-purple(positive).
- **Glucose:** The principle involved in glucose estimation in case of a urine sample is the double sequential enzyme reaction. The colours range from blue-green to greenish-brown through brown and dark brown.
- **Urobilinogen:** In a strong acidic medium the urobilinogen reacts with p-diethylaminobenzaldehyde. The colours range from light pink to bright magenta.
- **Bilirubin:** The reaction takes place in a strong acidic medium in which bilirubin is coupled with diazetizeddichloroamitine. The colour range from light-tan to reddish brown.
- **Color:** A pigment known as urochrome is used to determine the yellow color of the urine. In case of normal urine the color may range from light yellow to amber. The higher number of solute particles the deeper the color of urine.

- **Odor:** A bacterial infection can lead to an ammonia smell from the urine.
- **Turbidity:** A normal urine is usually clear in appearance and is transparent. A presence of other substances such as phosphates, etc can lead to a cloudy like appearance of the urine.

UD-10 Analyzer: The manual microscopic analysis of urine can often be tedious. Hence, a fully automated microscopic analyzer UD-10 is used to generate microscopic images. This is used to determine the morphology of any particle or micro organisms present in the urine sample. Firstly, the urine particles are isolated, followed by their identification and characterization. The following analyzer is capable of functioning either alone or can be connected with UD-10 analyzer. The basic principle behind the functioning of this is either Electrical impedance or image based analysis system. Which of the two is superior is still a matter of controversy.

To perform urinalysis using MultistixUroColor Strip:

1. Enter the patient Id. into the instrument.
2. Multi strip is dipped in the urine specimen. The strip should be dipped fully so that all the 10 reagents can sock the urine.
3. Place the strip on the instrument platform it automatically read the strip colour and give result in printed form.



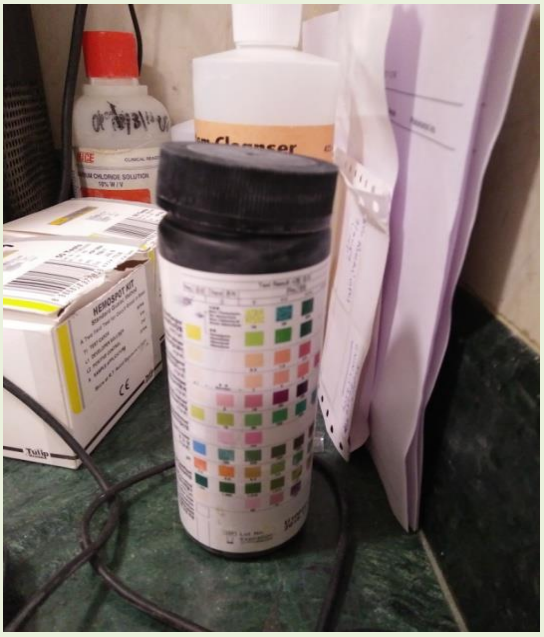


Fig 6.2 **The color chart of Urocolor strips**

Table 5.6: Normal and abnormal urine analysis result

PARAMETRS	RESULT	NORMAL RANGE
Colour	Pale yellow	Pale yellow
Appearance	Slightly hazy	Clear
Specific Gravity	1.020	1.010-1.030
Odour	Aromatic	Aromatic
Glucose	Nil	Nil
Protein	Nil	Nil
Ph	6.5	4.6-8.0
Ketone	Nil	Nil
Bilirubin	Trace	Nil
Nitrate	Nil	Nil
Urobilinogen	0.2E.U./dl	0.2E.U./dl
Epithelial cells	8-10	0-5
Pus cell	2-3	0-5

RBC	2-3	Nil
Casts	Nil	Nil
Crystals	Nil	Nil

URINE MICROSCOPY:

PROCEDURE:

a) Take about 4-5 ml of urine sample to be tested in a test tube.

b) Centrifuge the tube at 1500 rpm for 5 minutes.

c) Discard the supernatant.

d) Take the final sediment drop on a slide and place a coverslip over it.

e) Observe the slide at 40x.

INTERPRETATION:

At 40x pus cell, epithelial cell or red blood cell may be found. Cast, Crystals, Yeast or any abnormality may be if there is any type of infection.

CLINICAL SIGNIFICNCES:

The numbers and types of cells and/or material such as urinary casts can yield a great detail of information and may suggest a specific diagnosis.

Haematuria– associated with kidney stones, infections, tumours and other conditions; Pyuria– associated with urinary infections; Eosinophil urea – associated with allergic interstitial nephritis, atheroembolic disease; Red blood cell casts – associated with glomerulonephritis,

➢ ROUTINE SEMEN ANALYSIS

Routine semen examination consists of these following tests: pH

Liquefaction time

Sperm count

Motility

Viability

Morphology **pH:**

After liquefaction of semen pH paper is dipped into the semen sample & check the colour of pH paper, compare with the normal strip and report the same.

Liquefaction time:

After ejaculation of sperm the sperm is kept for 1 hour. Normal semen is liquefied within 40 min.

Sperm count:

- *The Semen is Diluted Semen with semen diluting fluid, 1:20 Dilution is Prepeared.*
- *After this the solution is cbarged in Neubauer Chamber, Cover with Cover Slip.*
- *Examine the WBC Counting Square and Count the Sperms.*
- *Calculate the Total Sperm Count by using this formula.*

No. of sperm counted × dilution factor

Total sperm count=million/ml.

Area counted × depth of the fluid CLINICAL SIGNIFICANCE:

- **Aspermia: absence of semen**
- **Azoospermia: absence of sperm**
- **Hypospermia: low semen volume**
- **Oligozoospermia: low sperm count**
- **Asthenozoospermia: poor sperm motility**
- **Teratozoospermia: sperm carry more morphological defects than usual**
- **Normozoospermia: all sperm in the ejaculate are dead**
- **Leucospermia: a high level of white blood cells in semen**

To examine the morphology of parasite in a stool:-

1. Label the stool samples in a serial wise format.
2. Perform physical examination of the stool by checking its color, mucus and odor.
3. Take a clean dry slide and label it according to the sample.
4. Place one drop of Lugol iodine on the slide.
5. With the help of tooth pick, mix some amount of stool with the drop of lugol iodine.
6. Carefully place a cover slip.
7. Observe it under microscope.

Fig 6.3 Stool Slide

Stool test results interpretation:

The stool is tested for its color, odor and mucus which is a part of stool's macroscopic examination. A normal stool must be brown- yellow in color and free from mucus. This is followed by microscopic examination for parasites.

SECTION 7

BLOOD BANK

Introduction :- **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**.**

Criteria for Blood donor Selection :-

PHYSICAL EXAMINATION:-

The donor should be in good healthy condition.

Age :- Between 18-65 year

Weight :- above 45 kg

Blood Pressure :- Systolic should be between 100 -150 mm/Hg & Diastolic should be 50-90mm/Hg.

Pulse rate :- 60-100 bpm

Hemoglobin :- between 12-16 gm/dl.

Donor Skin should be free from any skin lesion or addiction of narcotics.

Medical History :- Before donation some question to be asked to determined the donor's normal health or he/she is suffering from any serious illness. As example cardiovascular condition, renal disease, allergy, abnormal bleeding, epilepsy, asthma, diabetes, malignant disease, Infectious disease, drugs or alcohol, types of medication and Vaccination.

- ***Steps of phlebotomy***

- ✓ *Choose the site of venipuncture in the anticubital area of the arm, check both the arms to choose the site. It is preferable to make venipuncture in* the left hand, as this hand is less frequently used.
- ✓ *Apply tourniquet or B.P. Cuff.*
- ✓ *Clean 4-5 cm area starting at the site of venipuncture and moving Outwards in a concentric spirit.*
- ✓ *Inflate the blood pressure cuff to 50-60 mm of Hg and check for the Prominence of vein.*
- ✓ *Inspect the bag for leakage or the other defects check the labelon the Bag*

- ✓ *Uncover the sterile needle and perform venipuncture immediately using aseptic procedures.*
- ✓ *Make the donor open and close hand. If possible then by asking him to open and close hand.*
- ✓ *Mix the blood and anticoagulant gently and periodically.*
- ✓ *See that the blood flows freely. On an average one unit of blood collection takes 8-10 minutes.*
- ✓ *Keep a constant watch on donor for nervousness or any sign for reaction. Keep the donor busy in talking by talking to him in a polite and pleasing manner.*
- ✓ *After the required amount of blood has been collected clamp the tubing of the bag with artery forceps. Deftate the cuff. Place the sterile swabs at the venipuncture site apply light pressure and withdraw the needle. Put the needle in pilot tube.*
- ✓ *Apply pressure over the swab at venipuncture site and ask the donor to put the hand of other arm at the site.*
- ✓ *Take the bag and pilot tubes to the processing table.*
- ✓ *Loosen the artery forceps and apply light pressure on the bag to transfer 5-6 ml blood in the pilot tubes.*
- ✓ *Now tighten the knot and cut the tube distal to the knot and separate the needle.*
- ✓ *Stored or Transporated the blood bag at 20-22˚C after collection.*

Care of the donor after phlebotomy

1. *Check the arm and apply band-aid/bandage after the bleeding stops.*

2. *Ask the donor to remain on the bleeding couch for a few minutes under the observation of staff.*

3. *Allow the donor to sit up and go for refreshment, while sitting inquire as to how he feels.*

4. *Instruct him to drink more fluids than usual in next 4 hours.*

5. *Ask him not to smoke for half an hour.*

6. *Thank the donor for an important contribution and encourage repeat donation.*

Component Separation :- The present concept of modern transfusion medicine in rational use of blood. Each patient needs a particular component of blood. It is logical and scientific to transfuse the component needed.

Fig 7.1 component separator

Components which are separated by Whole blood donation are:-

- Packed Red Cell
- Plasma
- Platelet
- Cryoprecipitate

Keep the Packed Red cell at 2-6˚C

Keep the Plasma and Cryoprecipitate at -40 to -80˚C

Keep the Platelets at 22˚C in Agitator.

Test done for Donor Sample :-

HIV, HCV, HBsAg, Malaria, Syphills, Coomb's Test, Blood Grouping.

CROSS MATCHING :- **Crossmatching** is a test performed before a blood transfusion as part of blood compatibility testing. Normally, this involves adding the recipient's blood plasma to a sample of the donor's red blood cells. If the blood is incompatible, the antibodies in the recipient's plasma will bind to antigens on the donor red blood cells. This antibody-antigen reaction can be detected through visible clumping or destruction of the red blood cells.

Major cross match :- *It involves mixing of specified amounts of patient's serum and donors cells in different conditions. Any agglutination in any condition would indicate the presence of*

antibodies, natural or immune, in the patient's serum, capable of causing hemolytic reaction. It is most important cross match for a safe transfusion.

Minor cross match:

It involves mixing of donor's serum and the patients cells in the same way as for major cross match. Any incompatibility in minor cross match may cause minor ill effects or reduced survival of donor's cells but is unlikely to cause severe hemolytic reaction. Ideally both cross matches should be performed the reason why incompatible minor cross match does not cause ill effect is the same why O group is treated as a universal donor. The serum of the donor is small in amount and gets diluted in the patient's blood during transfusion and the antibodies in it are unable to damage the donor's cells.

Cross Match Proocedure :-

Prepare donor and recipient's blood sample: Donor's red cells and recipient's serum/plasma.

Prepare 3-5% saline cell suspension of red cells.

Label a test tube.

Add two drops of recipient's serum and one drop of donor cell suspension.

Mix and incubate the tubes at 37 degree Celsius for about 60 minutes.

Decant the serum completely and wash the cells three times in saline.

Add two drops of Anti-human Globulin (AHG) and mix. Allow to stand at room temperature for 5 minutes.

Centrifuge at 1500 rpm for 1 minute.

Observe macroscopically and microscopically for agglutination.

SECTION 8

BIO-CHEMISTRY

Introduction :- Clinical Biochemistry is the branch of medical science that deals with the biochemical investigation of blood and body fluid. It includes measure of hormones, enzymes, electrolyte, biomolecules etc

The Biochemistry test is very useful to determine the severity of disease of many organs. The Clinical biochemistry tests in relation to the various clinical conditions.

Collection and separation of samples: In biochemistry we received the samples for analyses having yellow top and red top tubes that indicated the samples are without anticoagulant. Some special test such as HbA1c samples were collected in purple top tubes. The yellow and red tubes were centrifuged at 3500 rpm for 15 minutes.

Instrument Principle :-

Fig 8.1 *Vitros 5600*

The automated system is based on **Lamberts and Beers law** and follow the principle of Spectrophotometer. The amount of light is absorbed by coloured solution and the intensity of light absorbed is directly proportional to the concentration Of coloured solution.

- **Name of Test :-**
- ✓ **Glucose (fasting, Post Prandial, Random)**
- ✓ **Renal Function Test**

  Urea
  Creatinine
  Uric acid mg/dL
  Na+ (sodium)

K+ (potassium)
Cl- (chloride)
Ca+ (calcium)
Phosphorous

- ✓ **Liver Function Test**

Total bilirubin
Direct bilirubin
Indirect bilirubin
Total protein
Albumin
Globulin
SGOT (AST)
SGPT (ALT)
ALT
GGT
A/G Ratio

- ✓ **LIPID PROFILE**

Cholesterol
Triglyceride
LDL (low-density lipoprotein cholesterol)
HDL (high-density lipoprotein)
VLDL (Very low-density lipoprotein cholesterol)
C/H Ratio (Cholesterol/HDL ratio)

- ✓ **Thyroid Function Test**

T3
T4
TSH

- ✓ **CARDIAC MARKER:-CK-MB (mass)**

CK-MB (mass) STAT
Myoglobin
NT-proBNP,
Troponin I,
Troponin T etc.

- ✓ **HORMONES**

Cortisol
Progesterone
Prolactin
Testosterone
ACTH
Estradiol
FSH

Procedure: -

1. Centrifuge the blood sample and separate the serum or plasma which you are required for the test with the help of micro pipette.
2. Take the sample in a sample cup or cuvette.
   Give the command to the analyser and select the tests.
3. After select the tests click **OK** button and place the sample cup or cuvette in the analyser.
4. Analyzer gives the result automatically.

Case Study 1

Patient Name :- Xyz

Age :- 54

Sex :- Male

UHID :- 1021098547

Fasting blood glucose = 153 (**H**) mg/dl Post

prandial blood glucose =213(**H**) mg/dl

Normal Range :-
Fasting blood sugar :- 70-110 mg/dl
Post Prandial blood sugar :- 70-150 mg/dl
Random blood sugar :- 100-150 mg/dl

Clinical Significance:

Hyperglycaemia: Increased concentration of glucose in blood is known as hyperglycaemia e.g. >126 mg/dl in fasting condition.

Case Study 2

Patient Name :- Abc

Age :- 36

Sex :- Male, UHID :- 1021098557

Result:

ALT	AST	ALP
236 U/L (**H**)	44 U/L (**H**)	186 U/L (**H**)

Normal Ranges:

ALT	AST	ALP
30-65 U/L	15-37 U/L	50-136 U/L

Clinical Significance:

1. An increase concentration of ALT may be seen in:

Liver cirrhosis, Liver necrosis, Fatty liver disease, Hepatocellular carcinoma, Hepatitis, viral hepatitis, Excessive use of hepatotoxic drugs, Jaundice, Excessive alcohol consumption

2. An increase concentration of AST may be seen in:

Heart attack, Congenital heart disease, Myocardial infarction, Ischemia, Liver diseases, Endocarditis (inflammation in endocardium) .

3. An increase concentration of AST may be seen in:
4. Liver cirrhosis, Viral hepatitis, Obstructive jaundice, Osteomalacia, Hepatocellular carcinoma, Kidney cancer.

Case Study 3

Patient Name :- Mno

Age :- 48

Sex :- Female,

UHID :- 1021093795

Cholesterol level :- 310 mg/dl

Normal range: *0-200mg/dl*

ClinicalSignificance

Elevated levels of serum cholesterol are associated with atherosclerosis, nephritis, diabetes mellitus, and Obstructive jaundice. Biliary cirrhosis, lipoprotenemias, and myxedema. Decreased level in cholesterol is associated with severe infection, severe anemia, and malnutrition.

Case Study 3

Patient Name :- Opq

Age :- 59

Sex :- Female,

UHID :- 1021026887

Test Result	***Unit***	***Normal Range***
T3=191	***μg/dL***	***T3=60-181ng/dL***
T4= 1.2	***μg/dL***	***T4=4.5-12.6μg/dL***
TSH=7.19	***μIU/dL***	***TSH=0.35-5.5 μIU/L***

CLINICAL SIGNIFICANCE:

Increase level of TSH: Hypothyroidism.

Decrease level of TSH : hyperthyroidism

Biomedical Waste in Lab

- **Red Bag -** Syringes (without needles), soiled gloves, catheters, IV tubes etc. should be all disposed of in a red coloured bag, which will later be incinerated.
- **Yellow Bag -** All dressings, bandages and cotton swabs with body fluids, blood bags, human anatomical waste, body parts are to be discarded in yellow bags.
- **Carboard box with blue marking** - Glass vials, ampules, other glass ware is to be discarded in a cardboard box with a blue marking/sticker.
- **White Puncture Proof Container (PPC) -** Needles, sharps, blades are disposed of in a white translucent puncture proof container.
- **Black Bags -** These are to be used for non-bio-medical waste. In a hospital setup, this includes stationary, vegetable and fruit peels, leftovers, packaging including that from medicines, disposable caps, disposable masks, disposable shoe-covers, disposable tea cups, cartons, sweeping dust, kitchen waste etc.
-

-

THANKS, THAT'S ALL FROM MY SIDE