INTRODUCTION TO PHYSIOLOGY

For most of recorded history, human have been interested in how their bodies work. Indian and Chinese writing describe attempts by physicians to treat various diseases and to restore health. In order appropriately treat disease and injury, we must first understand the human body in its healthy state.

The study of the normal function of a living organism and its component parts, including all chemical and physical processes, is the field of **Physiology**.

CIRCULATORY SYSTEM

Circulatory system is the transport system that supplies O_2 and substances absorbed from gastrointestinal tract to the tissues, returns CO_2 to the lungs and other products of metabolisms to the kidneys, functions in the regulation of body temperature, and distribute hormones and other agents that regulate cell function.

HAEMATOLOGY

Haematology is the study of the blood forming tissues and circulating blood components.

BLOOD

Blood is the fluid that circulates in the cardiovascular system, has many kinds of chemicals dissolved in it and millions upon millions of cells floating in it.

An adult has about 5 liters of blood in his body. The circulating blood accounts for 5-7% of total body weight and is composed of two major elements:

A- CELULAR ELEMENTS

1. Red Blood Cells (Erythrocytes)

-Carrying O_2 &CO_2 between lungs and tissues via haemoglobin Hb content in their cytoplasm.

-Red color = occurs when O_2 is attached to the Hb.

-Life span is short because it lacks nucleus.

2. **White Blood Cells (Leukocytes)**

Colorless nucleated cell, main function is protection against invading organisms.

3. **Platelets (Thrombocytes)**
   Nucleated disk shape, prevent leakage or bleeding caused by vessel walls. (Fig.1)

B-FLUID ELEMENTS (PLASMA)

Plasma is composed of

1.Water: 70% of body

2.Electrolytes: essential to cellular function

The important plasma electrolytes are: (Na^+, K^+, Cl^-, H^+, Ca^{++}, Mn^{++})

3.Proteins:

a. Coagulation protein (fibrinogen)

b. Immunoproteins (anti bodies)

c. Transport proteins

- Osmotic pressure (albumin)
- Binding proteins (transferrin)
- Lipoproteins

BLOOD PLASMA AND SERUM

Plasma is the fluid portion of the blood in which cellular elements are suspended and circulated through the body. The volume of the plasma part of blood is usually a little more than half the volume of whole blood. Blood cells make up the remaining part of the whole blood's volume. (Normal volumes: 2.6 L, blood cells 2.4 L, total blood volume 5 L).

Serum is the clear fluid that separates from blood upon coagulation, when all cellular elements are removed.(Fig. 2)

BLOOD PLASMA AND SERUM

Peripheral blood examination is a routine part of patient evaluation by most physicians, regardless of specialty. Because if its accessibility and close proximity to all tissues, the blood often provides the earliest evidence of changes in the state of health and the development of illness.

BLOOD COLLECTION

A- Capillary Blood

Capillary blood may be used for haemoglobin estimation, cell counts, blood grouping, bleeding and coagulation times or for microchemical investigations. Although of great value in children and in adults with 'difficult' veins is not only subject to sampling error but tests can not be repeated in the laboratory, as the whole sample will have been used and further tests which may be required can not be performed.

Procedure

1. Select a suitable site of puncture (Fig.2)

(a) The lobe of ear

(b)The ball of the finger, or the side of the thumb (in adults)

(c) the base of the heel, or the great toe (in babies)

2. Clean the site with alcohol, and allowed to dry.

3. A quick stab is made with a pre-sterilized disposable lancet.

4. Apply a little pressure to insure a free flow of blood. Squeezing must be avoided as this can cause lymph to dilute the blood, giving errors in results.

5. Wipe away the first few drops of blood.

6. Gently draw blood into the cappilary tube.

7. If blood films are required, gently touch a frsh drop of blood onto one end of a clean, grease-free slide or onto coverslip.

B-Venous Blood

Puncturing a vein with a needle attached to a syringe is called venipuncture. This is best withdrawn from an antecubital vein by means of dry glass or plastic syringe, the needle should not be too fine or too long. If larger volumes of blood are required, a venous sample of blood must be obtained.

Procedure:

1. Support the arm on the edge of a table.

2. Inspect the vein, use the tourniiquet if needed.

3. Clean the area with a swab of cotton dipped in alcohol and allowed to dry.

4. Use a sterile, dry syringe of a size according to the amount of blood required.

5. Choose a proper vein and introduce the needle into the skin with a firm and smooth motion.

6. Puncture the vein (antecubital vein) a few millimeters a head of the skin puncture site and a little from the side of the vein.

7. Draw the required amount of blood, and release the tourniquet.

8. Withdraw the needle and put a fresh cotton swab over the skin puncture and ask the subject (or patient) to flex the arm at the elbow.

9. Remove the needle from the syringe and expel the blood gently into a prepared container of anticoagulant (if whole blood need)

10. Shake the container gently so that the anticoagulant mixes well with the blood and prevents coagulation.

In obese subjects blood may have to be collected from the venous on the back of the hand.

Note: All blood samples; (a) must be regarded as a potential source of infection. (b) should be clearly labeled with patient's name, number, time of collection and the date.

ANTICOAGULANTS:

1-EDTA: Na^+ or K^+ salts of Ethylene diamine Tetra Acetic acid, the anticoagulant of choice for routine haematological work.. EDTA effects on Ca^{++}, so it is not suitable for use in the investigatin of coagulation problems and should not be used in the estimation of prothrombin time.

2- Tri-sodium Citrate: is the anticoagulant of choice in coagulation studies. It is also the anticoagulant most widely used in the estimation of the sedimentation rate (ESR).

3- Heparin: is an effective anticoagulant and does not alter the size of the red cells. Heparinized blood should not be used for making blood films as it gives a faint blue colouration to the back ground when the films are stained by Romanowsky dyes. Heparin is the best anticoagulant to use for fragility test.

4- Acid Citrate Dextrose:is used in blood transfusion.

THE REPORT:

1-Name of experiment
2- Date of experiment
3- Introduction
4- Materials & Methods
5- Results
6-Discussion
7-References

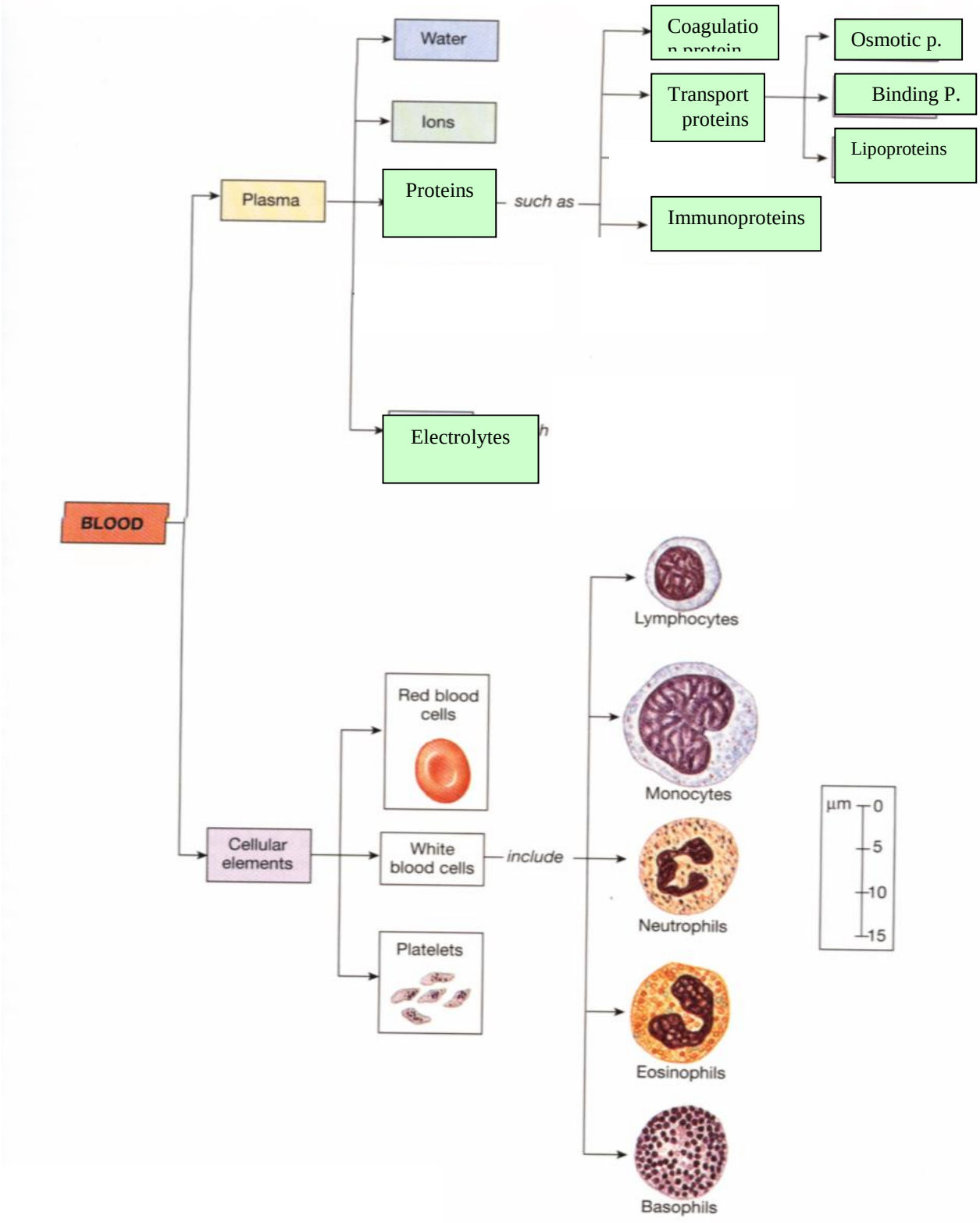

Fig. (1): blood components

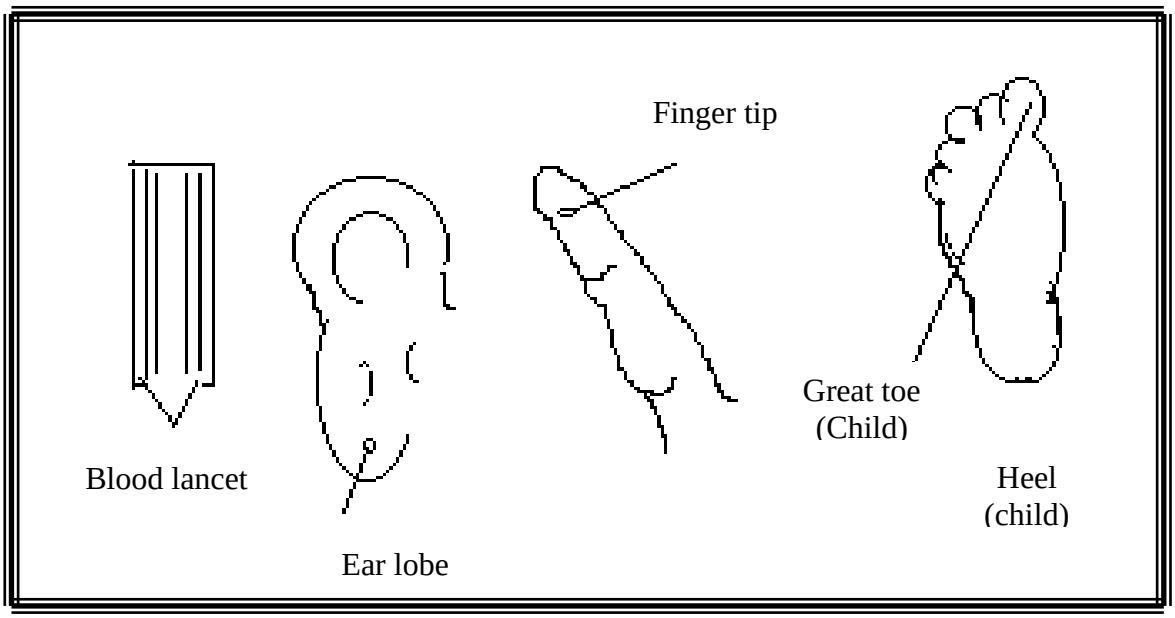

Fig. (2): Sites for obtaining blood by venipuncture