PRACTICAL PHYSIOLOGY II (PHS 212)

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ESTIMATION OF PACKED CELL VOLUME

- Packed Cell Volume
- Blood Glucose Test
- Salivary Secretion
- Nerve-Muscle preparation
- Reflex Action
- Urinalysis

PACKED CELL VOLUME (HEMATOCRIT)

ESTIMATION OF PACKED CELL VOLUME

- The haematocrit is expressed as the percentage volume of the blood which is occupied by the red blood cells.
- Normal value of PCV

  In males: 40.7% to 50.3

  In Females: 36.1% to 44.3%

ESTIMATION OF PACKED CELL VOLUME

Procedure

- Take a capillary tube which has already been rinsed to prevent the blood from clotting
- Take a sample of blood through venipuncture or blood lancet
- Allow the blood to enter the tube by capillary action until the tube is about three-quarters filled with the blood.
- Seal off the end free of blood by corking it with plasticine.
- The sealed tubes will then be spun in a centrifuge for about 15 minutes at 3,000 r.p.m.
- The haematocrit may then be read off directly using the microhaematocrit reader provided.

BLOOD GLUCOSE TEST

Blood Glucose Test

- A blood sugar meter(Glucometer) is used to test blood sugar.
- The meter measures the amount of sugar in a small sample of blood. Most often, the blood comes from the side of the fingertip. Then the blood is placed on a disposable test strip.

Types of Blood Glucose Test

- **Fasting Blood Sugar Test:** Refraining from eating or drinking food or liquids besides water for at least eight hours. The blood sample must be taken after fasting, typically in the morning before breakfast.

  How to read your numbers: The normal range is 70-100mg/dL. 100-126 mg/dL indicates prediabetes, while 126 mg/dL and above indicates diabetes.

- **Random Blood Sugar Test:** A random blood sugar (RBS) test measures your blood sugar levels at the time of testing. This test doesn't have to be done at a specific time of day, nor does it require fasting.

  How to read your numbers: A blood sugar level of 200mg/dL and above indicates diabetes.

Types of Blood Glucose Test

- **Oral Glucose Tolerance Test (OGTT):** A glucose tolerance test measures how your body responds to sugar or glucose. Like a fasting blood sugar test, taking a glucose tolerance test requires both fasting and a blood sample taken before breakfast. This is to measure your fasting blood glucose levels. You'll then be given eight ounces of a glucose solution. After two hours, another blood test will be performed to measure your blood glucose levels.

  How to read your numbers: At two hours, the normal range is 140mg/dL and below. 140-199 mg/dL indicates prediabetes, while 200 mg/dL and above indicates diabetes.

Blood Glucose Test

Procedure

- Wash and dry your hands well. Food and other substances on your hands may lead to a reading that isn't correct.
- Place a test strip into your meter.
- Prick the side of your fingertip with the needle that comes with your test kit. That needle also is called a lancet.
- Touch and hold the edge of the test strip to the drop of blood.
- The meter displays your blood sugar level on a screen after a few seconds.

SALIVARY SECRETION

Salivary Secretion

In this experiment, whole mouth saliva will be collected. This is a mixture of the secretion of several sets of glands each with its own mechanism of secretion.

- **Collection of Saliva for Basal Rate of Secretion:** Swallow any saliva in your mouth and start the stop clock immediately and. Sit with your head resting on your hands so that the saliva accumulates near the mouth. Every 2 minutes, expel all the saliva from your mouth into a measuring cylinder and take reading after the addition of each sample. (Ignore any froth when taking a reading). Find average resting rate of secretion of saliva in ml/minutes. After each of the following procedures (Il to VI rinse the mouth with water).

- **II. The Effect of Sodium Chloride**: Place a small amount of solid sodium chloride on the surface of the tongue and repeat 1
- **III The Effect of Citric Acid**: Place a small amount of concentrated citric acid solution on the surface of the tongue and repeat 1
- **IV. The Effect of Chewing Meat**: Repeat I after continuously chewing a piece of boiled meat for five minutes.
- **V. The Effect of Chewing**: Repeat I while continuously chewing on a piece of tasteless chewing gum.
- **VI The Effect of Chewing And Citric Acid:** Determine the combined effect of chewing and citric acid together. Repeat

Investigating The Digestive Action Of Saliva

- Place the piece of bread provided in your mouth and without chewing it, note its taste and record.
- Now chew it for about 5-6 seconds and again note and record its taste.
- Continue chewing it for as long as you like till it is ready for deglutition and just before you swallow please note and record the taste for a third time. Is there any difference between its taste during the three occasions? You may repeat the entire experiment if you are not so sure you have recorded the actual tastes you sensed. Be precise.
- Explain your findings.

NERVE-MUSCLE PREPARATION

Nerve-Muscle Preparation

- Nerve fibres control the activity of skeletal muscle. Fibres and the experiments in this section use an isolated nerve-muscle preparation dissected from the toad. Toad tissue has the advantage that it will function at room temperature without a blood supply, its oxygen requirements being met by diffusion from the air into the solution bathing the preparation

Pithing A Frog

- Grasp the frog firmly with the left hand with the snout between the forefingers and the middle finger.
- Bend the tip of the nose down and run a fingernail of the right hand over the head (anterior to posterior) to find the depression between the rear of the skull and the first vertebra. This point is the foramen magnum (refer to diagram).
- Insert the pithing needle at this point towards the brain and twist from side to side to destroy the brain. Remove the needle and reverse the direction, pushing it down the
- spinal cord with a screwing motion. If your frog has been adequately pithed, it will not lift its leg if its toes are pinched nor will it blink in response to its comes being touched.

Exposing The Left And Right Sciatic Nerve

As shown in the diagram overleaf, the muscle lies on the back of the leg ending at the heel in the tendo-achillis. Its supplying-nerve comes from the vertebral column between the muscles of the thigh to enter the muscle at the top near the knee.

During the dissection, do not allow the tissues to dry, exposed nerve and muscle should be flooded with Ringer's solution. Try not to touch nerve tissue at all, pick it up by holding adjacent connective tissue, do not, stretch it and do not compress it with forceps

Exposing The Left And Right Sciatic Nerve

Dissection

- Cut the skin all the way around the trunk of the frog
- Grasping the cut skin firmly with forceps, pull it firmly downwards until the skin is pulled off both legs.
- Lay the frog on the dissecting board with the dorsal side up. Locate the left and right sciatic nerves buried in the large muscle masses of the upper thigh as indicated in the diagram
- Taking care not to damage the nerve, place glass probes under both nerves, isolating them from the surrounding tissue.
- Lift the sciatic nerve and by further blunt dissection, expose the nerve until you reach the back of the knee. Note that when year cut any branch of the nerve, the muscle it supplies contracts due to its mechanical stimulation. Avoid stretching the nerve
- Cut through the termur and thigh muscles a few millimetres above the knee
- Locate the tendon achillis at the back of the ankle and free it from its attachment to the bone
- Tie a thread around it and if necessary, make a cut
- Holding the thread, separate the gastrocnemius muscle from other tissues
- Cut away the tibia below the knee.

REFLEX ACTION IN MAN

Reflex Action

- If a normal reflex is obtained, it indicates that the reflex path (sense organ or receptor, ingoing nerve, connection in central nervous system, outgoing nerve muscle or effector is intact). Reflexes may be exaggerated, diminished or altered. It is important to know the normal reflex in order that any departure from it may be recognised.
- Tests of reflex function in human subjects raise particular problems. Firstly, many reflex activities, normally controlled by the lower level of the central nervous system can be extensively modified by the activity of higher centres. Thus, when spinal reflexes are being tested, the subject must be kept at ease, both mentally and physically and his attention distracted from the part under investigation.
- Secondly, it is difficult to test a single sense; we normally receive information from several senses simultaneously. The experimenter must devise and conduct tests where the subject cannot obtain information from other sources i.e. where the subject cannot 'cheat' either at a conscious or a subconscious level.
- Lastly, where the subject's co-operation is required, he must be given precise simple instructions. It would be pointless to tell average person to focus on a near object, he may be told, look at my finger.

Reflex Action

Cutaneous Or Superficial Reflexes

- **Plantar Reflex:** Scratch the sole of the foot near the inner side. All the toes become plantar reflexes. If the hallux is pointed upwards and the other toes fanned, this is described as the Babinski or the extensor type of plantar response and in the waking adult subject indicates damage to the pyramidal fibres. It is however, the normal response of a child in the first year of life when these fibres are still myelinating; it can also be elicited in adults who are deeply asleep.
- **Abdominal Reflex:** Stroke the skin of the abdominal wall. The reflex contraction of the abdominal wall will pull the umbilicus to the side stroked.
- **Cramasteric Reflex:** Stroke the inner side of the thigh. There will be a contraction of the cremasteric muscle.
- **Cillo-spinal Reflex:** Stroke or lightly pinch the skin of the neck, reflex dilatation of the pupil occurs. This observation should be carried out in a strong light.

Reflex Action

Tendo Or Deep Reflexes

- **Knee Jerk:** The subject sits on a chair and crosses one knee over the other, the quadriceps of the upper of the two thighs is now slightly on the stretch; the leg should be allowed to hang limply. With the edge of the hand or with a tendon hammer, strike the patellar tendon on midway between the lower head of the patellar and its incertion. The quadricep gives a sharp contraction extending the leg on the thigh so that the foot kicks forward.
- **Triceps Jerk:** The subject's arm should be limp with the upper arm supported in a horizontal position by the experiments and the forearm hanging vertically down. Tap the triceps tendon just above the elbow joint and note the movement of the arm.
- **Biceps Jerk:** The subject's arm should be limp with his forearm supported by the experimenter's forearm. The subject's elbow should be steadied by the experimenter's left palm, while the left thumb is placed on the biceps tendon. Hit the thumb with the tendon hammer, noting the tension in the tendon under the thumb as the biceps contracts.

Reflex Action

Eye Reflexes

- **Direct Light Reflex:** Have the subject face the window. Look at his eyes and note the iris (the coloured part), and the size of the pupil with your two hands cover both his eyes for ten seconds. Instruct the subject to keep looking at a distant object. Then remove one hand and observe the pupil, repeat the procedure for the other eye. The pupil contracts when light enters the eye.
- **Consensual Light Reflex:** Keep the subject in the same position and cover both eyes again. Stand to one side and raise one hand slightly to observe the pupil of one eye; but not so much as to let light from the window into this eye, remove the hand entirely from the other eye while continuing to observe the pupil of the first eye. Observe the pupil of the shaded eye also.
- **Reception on Accommodation (Convergence):** Turn the subject so that he is facing a dully-illuminated wall. Ask him to look at the wall and then at your finger held about six inches from his eyes and slightly above eye level (to keep the upper lids raised). Observe the pupil.

- **QUESTIONS**
- **1. Discuss your results explaining the various pathways involved.**

URINALYSIS

Urinalysis test

- The composition of urine is determined by the quantities of substance that must be removed from the body by the kidney in order to maintain the composition of blood and other body fluids within physiological limits,

  There are two objectives in studying the composition of urine.

- To aid in understanding through the end products formed and excreted in the urine the processes of body metabolism.
- To obtain evidence though the presence of abnormal substances in abnormal amounts that may be of aid in the diagnosis and treatment of pathological states.
- Collection is usually over a 24hr period.
- Collect a sample in a clean specimen jar and carry out the following tests as directed.

Urinalysis test

- **COLOUR:** The colour of urine varies from pale to deep amber, depending on its degree of concentration. The amber-yellow colour is due to the presence of urochrome, a breakdown product of haematin, the non-protein of haemoglobin. A freshly voided urine is transparent. Acid urines are generally darker than alkaline urines. The ingestion of certain food and drugs may cause changes in the colour of urine. Under certain abnormal conditions urine may take on variety of colours. Nearly colourless urine may be due to extreme dilution of the pigments ordinarily present because of increased water elimination.
- **ODOR:** The odor of normal urine, characteristic and faintly aromatic is due to the presence of volatile organic acids when urine undergoes alkaline fermentation in which urea is hydrolyzed to ammonia it develops a strong ammoniacal odor. Upon standing, urine develops an ammoniacal odor which is caused by decomposition of diseases e.g. patients with urinary tract infection usually have foul-smelling urine. It is of no diagnostic significance.

- TEST: Examine your own urine for colour and odor. Record your observation.

Urinalysis test

- **URINARY ACIDITY AND PH:** When freshly voided, urine is usually slightly acidic (pH 6) but early morning urine a often neutral or alkaline on standing ammonia may be formed by bacterial decomposition of urea, the resultant decrease of acid may cause cloudiness due to precipitation of calcium phosphate.

  The kidneys may secrete urine with a pH, value as low as 4.5 and as high as 8.2 under extreme condition; but usually it is around pH 6. The acidity of normal urine is due to a complex mixture of organic acids and acid phosphates. The nature of one's diet has a great deal to do with acidity or alkalinity of the urine.

- Procedures: Read the pH of the urine using a pH meter or test strips

Urinalysis test

- **SPECIFIC GRAVITY:** The specific gravity of urine is directly proportional to the solute content and varies inversely with the volume. It is a diet measure of dissolved solid dietary intake, fluid intake and elimination. It varies between 1.010-1.030 but it may be lower or higher in certain pathological conditions.
- **OSMOLALITY:** The urine osmolality can also be estimated from the knowledge of urine specific gravity. The specific gravity of urine will yield an estimate within ± 200 mOsm/kg H_2O of the true osmolality as measured in an osmometer.
- **REDUCING SUGAR TEST:** Under ordinary circumstance very little glucose is found in the urine. : Alkalosis, and Acidosis, Benign glucosuria

Urinalysis test

- **MICROSCOPIC EXAMINATION:** Urinary sediments are obtained by centrifuging the urine or permitting it to stand. The precipitates are organized and unorganized sediments. Organized sediments may contain erythrocytes epithelial cells, pus cells, bacteria, animal parasites etc.

  While the unorganized one are calcium oxalate and phosphate, uric acid, ammonium and sodium urates etc. Urinary calculi often appear secondary to urinary tract infections. Red blood cells or red casts indicate an underlying pathological condition. The presence of Leukocytes and other components of pus is symptomatic of infections in the kidneys or urinary tract.

Urinalysis test

QUESTION

Explain the following

- Benign Glucosuria
- Acidosis
- Alkalosis

THANK YOU