EXPERIMENT 12

AIM

To detect the presence of albumin in urine.

THEORY

Alumina protein present in plasma which important for the maintenance of fluid balance within the vascular stem. Proteins are usually reabsorbed from the kidney by blood and not passed out in urine.

Kidneys are major excretory organs of vertebrates which filter out the waste materials from the body. Nephrons are the structural and functional unit of kidneys. If the kidney is damaged or not functioning well, there may be a leakage of certain protein molecules which are otherwise absent in urine The presence of albumin in urine is known as albuminuria. It shows level/seriousness of damage to kidney on the extent of pathological disturbance. Presence of albumin can be tested by heat coagulation test, Heller's test or sulphosalicylic acid tests.

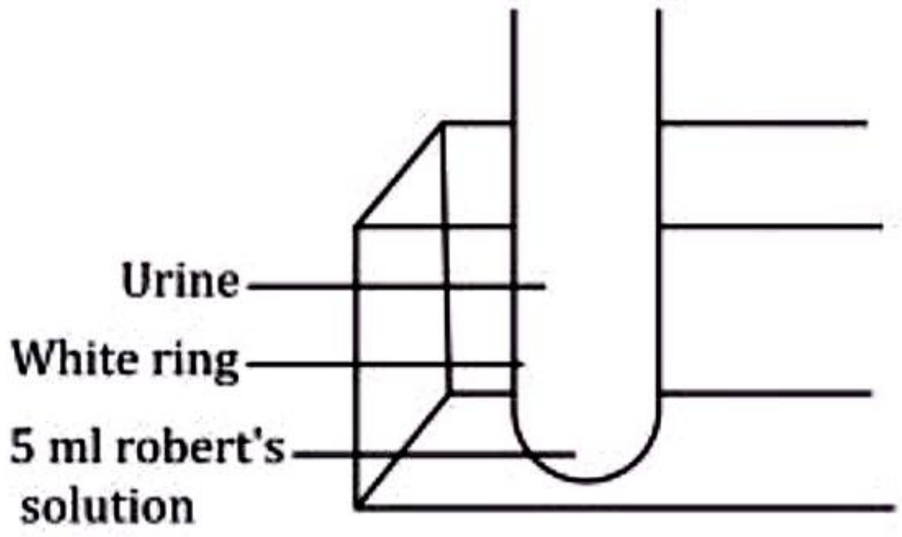
MATERIAL REQUIRED

Test tubes, test tube stand, test tube holder, graduated pipette (5 ml capacity) spirit lamp, urine sample, concentrated nitric acid, acetic acid, Robert's solution and sulphosalicylic acid (or solution containing 13% salicylic acid and 20% sulphuric acid).

PROCEDURE AND OBSERVATIONS

1. **Heat Coagulation Test**
   - **(i)** Take 6-8 ml of urine in a test tube.
   - **(ii)** Incline the test tube at an angle and on a low flame, heat the tube in a way so that only upper one-third of test tube gets heated.
   - **(iii)** The heated portion develops turbidity.
   - **(iv)** Add 1% acetic acid drop by drop in the test tube and boil its contents or simply add a drop of 33% acetic acid.
   - **(v)** Look out for any change in turbidity.
2. **Sulphosalicylic Acid Test**
   - **(i)** Take 3 ml of urine sample in a test tube.
   - **(ii)** Add few drops of sulphosalicylic acid to it.
   - **(iii)** Heat the tube gently.
   - **(iv)** Note down the observed changes.
3. **Heller's Test (Nitric Acid Ring Test)**
   - **(i)** Take 5 ml of concentrated nitric acid in a test tube.
   - **(ii)** Add the urine sample with a dropper, keeping the tube inclined, so that the urine flows down slowly along the side of the test tube to form a separate layer.
   - **(iii)** Observe any changes and record in your notebook.

Note: In place of nitric acid, Robert's solution (2g of $MgSO_4$ is dissolved in 10 ml of water, add 5 ml of this $MgSO_4$ solution in 5 ml conc. HNO_3) can be used. This test is also called as Heller's test.



Nitric acid ring test for presence of albumin

OBSERVATIONS

1. **Sulphosalicylic acid test:** Appearance of cloudy or whitish turbidity in the solution shows the presence of albumin. The turbidity increases on gentle heating.
2. **Nitric acid ring test:** The white ring is formed at the junction of two liquids (Robert's solution or nitric acid and urine solution) which confirms the presence of albumin in the sample of urine.
3. **Heat coagulation test:** Persistance of present turbidity confirms presence of albumin in urine.

Note: Disappearance of turbidity confirms the presence of phosphates.

RESULT

The above tests confirm the presence of albumin in urine.

PRECAUTIONS

1. Wash the test tubes thoroughly before and after use.
2. Heat the contents gently, do not boil unless required.
3. Use standard reagents and do not waste excess of reagents or chemicals.

VIVA VOCE

Q1. State the main function of kidney.

Ans. Formation of urine is the main function of kidney.

Q2. Why is urine formed in kidney?

Ans. Urine is formed in the kidney to excrete urea from the body.

Q3. Name the term for the condition in which albumin is excreted through kidney.

Ans. Albuminuria.

Q4. What is the cause of albuminuria?

Ans. Albuminuria refers to the condition of high concentration of albumin being passed out in the urine sample of an individual. It may result from inflammation of glomeruli in kidneys or a condition called nephritis. High blood pressure may also cause this diseased condition.

Q5. Name the reagents that demonstrate the presence of protein in urine.

Ans. Sulphosalicylic acid and Robert's reagent are used to detect the presence of protein in urine sample.

Q6. Explain the following conditions:

(i) Uremia

(ii) Hematuria

(iii) Glycosuria.

Ans. (i) **Uremia:** It refers to the condition when excess amount of urea is detected in urine.

(ii) **Hematuria:** It refers to the condition when blood cells are detected in urine.

(iii) **Glycosuria:** It is the condition caused due to the improper secretion of insulin in the pancreas which leads to presence of high concentration of glucose in urine sample of the patient.

Q7. Name the three processes by which urine is formed in human body.

Ans. Urine is formed by the following three processes

(i) Tubular secretion

(ii) Ultrafiltration or glomerular filtration

(iii) Selective reabsorption

Q8. How is the precipitation of protein measured in sulphosalicylic acid test?

Ans. Sulphosalicylic acid causes precipitation of dissolved protein which is measured from the degree of turbidity

Q9. Name the other excretory organs apart from kidney.

Ans. Lungs liver and skin.