

University of Al-Zahraa for women

College of pharmacy



Biochemistry
Third Stage
Detection of Sugar in Urine

Detection of sugar in urine

The detection of sugar in urine is important in the diagnosis and management of diabetes mellitus, a chronic condition characterized by elevated levels of glucose in the blood.

There are two test to detect sugar in urine:

- ☐-Urine strip

- ☐-Benedict's test

Glycosuria

➤ Definition: abnormal excretion of glucose in urine.

➤ Causes:

- Glycosuria with hyperglycaemia
 - Diabetes
 - Cushing's disease
 - Hyperthyroidism
 - Drug like corticosteroids
- Glycosuria without hyperglycosuria
 - renal tubular dysfunction

Purpose of detection of sugar in urine

- Screening to detect diabetes
- Confirmation diagnosis of diabetes.
- Monitoring the effectiveness of diabetes control.
- Screening to detect gestational diabetes.

Benedict's test

- Benedict's test is a laboratory test used to detect the presence of reducing sugars, such as glucose, fructose, and maltose, in a sample.
- The test involves add Benedict's reagent, a solution containing copper sulfate, sodium carbonate, and sodium citrate, to the sample and then heating the mixture.

- If reducing sugars are present, they will react with the copper ions in the Benedict's reagent, causing a color change from blue to green, yellow, orange, or red, depending on the concentration of reducing sugar in the sample.
- The intensity of the color change is proportional to the amount of reducing sugar in the sample, and the test can be semi-quantitative or qualitative, depending on the procedure used.

- Benedict's test is commonly used in clinical settings to test for the presence of glucose in urine as a diagnostic tool for diabetes.
- However, Benedict's test has some limitations. It is not specific to glucose and can also react with other reducing substances, such as ascorbic acid, which can lead to false-positive results. Additionally, the test is not very sensitive and can only detect reducing sugars at concentrations higher than 0.1%.

Overall, Benedict's test is a simple and inexpensive method for detecting reducing sugars in a sample, but it should be used in conjunction with other tests to confirm the presence of a specific reducing sugar.

Components of benedict's reagent:

- 17.3 g of sodium citrate
- 10 g of anhydrous sodium carbonate
- 1.73 g of copper(II) sulfate pentahydrate
- Distilled water

Principle of Benedict's Test

When Benedict's solution and simple carbohydrates are heated, the solution changes to orange red/ brick red. This reaction is caused by the reducing property of simple carbohydrates. The copper (II) ions in the Benedict's solution are reduced to Copper (I) ions, which causes the color change.

Procedure

Solution A		
17.3 g Sodium Citrate	10 g Sodium Carbonate	80 ml of Distilled Water

Solution B	
1.73 g Copper Sulfate	10 ml of Distilled Water

Benedict Reagent
Solution A + Solution B

Notes

- Adjust the volume of the solution to 100ml with distilled water and mix well.
- Adjust the pH of the solution to approximately 11 using the sodium hydroxide solution.
- Filter the solution through filter paper or a filter funnel to remove any insoluble particles.

Performing Benedict's Test

- Mix 1 ml of sample + 2 ml of Benedict's reagent.
- Heat the solution for 3-5 minutes.
- Observe color change.



**Blue
solution**

**Green / yellow
ppt**

**Orange
red ppt**

**Brick-
red ppt**

None

Traces of
reducing sugar

Moderate

Large
amount of
reducing
sugar

