

Normal Constituents of Urine:

Ca^{2+} , PO_4^{3-} , NH_3

Urea, Uric acid, Creatinine

Experiment

Observation

Calcium

- 5 mL urine + 5 drops of 1% acetic acid + 5 mL of 2% potassium oxalate.

white ppt.
(Ca is precipitated as Ca oxalate)

Inorganic Phosphate

- 5 mL urine + 5 drops conc. HNO_3 + pinch of ammonium molybdate

Canary yellow ppt.
(ammonium phosphomolybdate)

Ammonia:

- 5 mL urine + 1-2 mL of 2% Na_2CO_3
- Boil
- Hold red litmus paper at mouth of tube

Red litmus turns blue
(Ammonia is basic)

Urea:

- Sodium hypobromite \Rightarrow to 2 mL of urine, add 4-5 drops of Na hypobromite

Brisk effervescence of N_2 is seen (urea when treated with Na hypobromite, decomposes to give N_2)

Specific Urease Test \Rightarrow

- TEST \rightarrow to 5 mL urine, add 2 mL urease suspension

pink colour observed

Experiment

CONTROL → To 5 mL urine, add 2 mL of heat-inactivated urease suspension

- Incubate both tubes for 15 minutes at room temp.
- Add 2 drops of phenolphthalein to both tubes.

Phosphotungstic Acid Reduction Test:

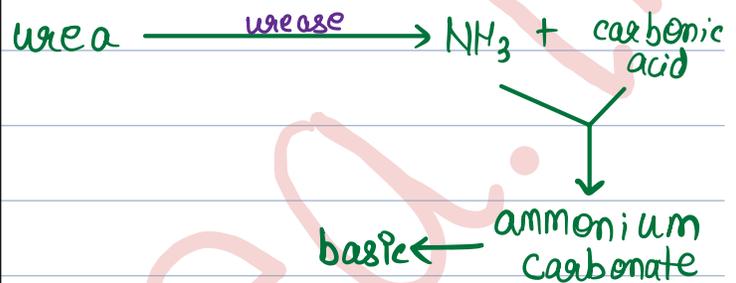
- 5 mL urine + few drops of phosphotungstic acid + few drops of 20% Na_2CO_3

Jaffe's Test (creatinine):

- 5 mL of urine + 2 mL of 1% picric acid + 2-5 drops of 10% NaOH.

Observation

No pink colour.



Blue colour observed

uric acid reduces colourless phosphotungstic acid to tungsten blue.

Orange colour (creatinine picrate)

Constituent	Daily excretion	Increased excretion	Decreased excretion
Ca	100-200 mg/day	<ul style="list-style-type: none"> • Hyperthyroidism • Multiple myeloma 	<ul style="list-style-type: none"> • Rickets
Inorganic Phosphate	1g / day	<ul style="list-style-type: none"> • Increased Phosphorus intake • Hyperparathyroidism 	<ul style="list-style-type: none"> • Hypoparathyroidism • Rickets
Ammonia	0.5-0.8g/day	<ul style="list-style-type: none"> • Acid-forming foods • Acidosis • Urinary Tract Infection 	<ul style="list-style-type: none"> • Alkalosis • Nephritis
Urea	20-30g/day	<ul style="list-style-type: none"> • High protein diet 	<ul style="list-style-type: none"> • Nephritis • Liver diseases
Uric acid	0.6-1g/day	<ul style="list-style-type: none"> • Gout • High purine diet • Leukemia • Lesch-Nyhan Syndrome 	<ul style="list-style-type: none"> • Chronic glomerulonephritis
Creatinine	1-2g/day	<ul style="list-style-type: none"> • Myasthenia gravis • muscular dystrophy 	<ul style="list-style-type: none"> • advanced renal failure

Abnormal Constituents of Urine:

Experiment	Observation
<h3>Heat Coagulation Test (Protein)</h3> <ul style="list-style-type: none">• Fill $\frac{3}{4}$ of test tube with urine• Heat upper $\frac{1}{3}$. Add 1-2 drops of 1% acetic acid• Lower portion serves as control.	white coagulum in heated portion Coagulum intensifies
<h3>Benedict's Test (Reducing Sugars)</h3> <ul style="list-style-type: none">• 5ml of Benedict's reagent + 8 drops of urine• Boil for 2 min.	Blue - Nil Green - 0.5% Yellow - 1% Orange - 1.5% Brick red - $\geq 2\%$
<p style="text-align: center;">acetoacetate \rightleftharpoons acetone ↑</p> <h3>Rothera's Test (Ketone Bodies)</h3> <ul style="list-style-type: none">• 5ml of urine + solid ammonium sulphate (saturated solution)• Add 2-3 drops of freshly prepared 5% Sodium nitroprusside• Add 1ml of ammonium hydroxide along sides of test tube	Purple ring at junction of 2 liquids
<p style="text-align: center;">acetoacetate →</p> <h3>Geshaard's Test (Ketone Bodies)</h3> <ul style="list-style-type: none">• 5ml of urine + 10% FeCl_3 drop-by-drop till max ppt. formation	Portwine colour

Experiment

Observation

Hay's Test (Bile Salts)

- 2 mL urine ; sprinkle sulphur powder (Don't mix)
- (Control: 2 mL of water & sulphur)

Sulphur powder sinks

Sulphur powder floats

Fouchet's Test (Bile pigments)

- 5 mL urine + 2 mL of 10% barium chloride + pinch of magnesium sulphate
- BaSO_4 is precipitated
- After 5 min, filter the solution
- Unfold filter paper on a dry filter
- Add few drops of Fouchet's reagent

Green/blue colour formed

Benzidine Test (Blood)

- Mix 2-3 drops of benzidine sol. + 2 drops of H_2O_2
- Add 2 drops of this mixture to 2 mL urine

Blue/green colour is formed immediately & disappears.

Abnormal Constituent

Clinical Significance

Protein (albumin)

- Nephrotic syndrome
- Glomerulonephritis

{ glycosuria →
Lactosuria →

- Diabetes mellitus
- Pregnancy & lactation
- Renal glycosuria

Ketonuria

- Uncontrolled diabetes mellitus
- Starvation

Bile salts

- Obstructive jaundice

Bile pigments

- obstructive jaundice
- severe hepatitis

Blood

- Nephritic syndrome
- Polycystic kidney disease
- Traumatic catheterisation

Substances giving False Positive Benedict's Test:

- ascorbic acid
- uric acid
- glutathione
- drugs - salicylates, L-dopa