

# Point of Care Team Urinalysis Interpretation

Q-Pulse No	PCM65
Version	3
Site	MPH

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## BILIRUBIN

### CLINICAL

Bilirubin in urine indicates an excess of conjugated or direct bilirubin in plasma. Presence of bilirubin in the urine is indicative of intra or extra hepatic biliary disease or hepatocellular disease. Bilirubin may appear in urine before other signs of abnormality are apparent. This can be due to liver cell injury as in viral or drug-induced hepatitis, paracetamol overdose, late-stage cirrhosis, biliary tract obstruction e.g. gall-stones, carcinoma of the head of pancreas, biliary atresia in infants, late-stage primary biliary cirrhosis or drug-induced intra-hepatic cholestasis.

**False NEG:** Urine not freshly voided

**False POS:** Metabolites of etodolac may cause false positive or atypical results

Indican (indoxyl sulphate) can produce a yellow-orange to red colour response that may interfere with the interpretation of a negative or positive reading. Atypical colours may indicate bile pigment abnormalities and the urine specimen should be tested further.

### RESULTS

**NEG:** result normal, no action required.

**POS:** result should always be followed up. Utilise urobilinogen result to provide help with differential diagnosis.

**SENSITIVITY:** 0.4 – 0.8 mg/dL Bilirubin.

## UROBILINOGEN

### CLINICAL

Normally a small amount of Urobilinogen is present in urine. Urinary excretion of urobilinogen reflects the combined effects of production of bilirubin, conversion of bilirubin to urobilinogen in the gut and reabsorption into the blood stream. The urobilinogen test result should be considered with the bilirubin test result in order to provide differential diagnosis.

*Increased excretion:* Urobilinogen will be increased in any condition that increases the production of bilirubin and by any disease that prevents the liver from removing reabsorbed urobilinogen from circulation. Urobilinogen is also increased in conditions with an increased destruction of red blood cells, such as Haemolytic anaemia, Pernicious anaemia, malaria, infectious hepatitis, toxic hepatitis, portal cirrhosis and congestive heart failure.

*Decreased excretion:* Normal levels of bilirubin are not excreted into the intestinal tract, which indicates obstruction of the bile ducts. This occurs with conditions such as Cholelithiasis, severe inflammatory disease and neoplastic disease.

*Sterilisation of colon:* During antibiotic therapy, suppression of the normal intestinal flora may prevent or reduce the bacterial conversion of bilirubin to urobilinogen, leading to an absence or reduced level of urobilinogen in the urine.

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**False NEG:** Urine not freshly voided, Formaldehyde can inhibit reaction and cause falsely low results. False negative results may be obtained if formalin is present.

The test pad may react with interfering substances known to react with Ehrlich's reagent, such as p-aminosalicylic acid and sulphonamides. Atypical colour reactions may be obtained in the presence of high concentrations of p-aminobenzoic acid.

### RESULTS:

Normal: Up to 1.0 mg/dL

**SENSITIVITY:** 0.2mg/dL

## KETONES

### CLINICAL

Ketones are the breakdown products of fatty acid metabolism, caused by starvation or uncontrolled diabetes. It indicates accumulation of acetoacetate secondary to excessive breakdown of body fat. Acetone and B-hydroxybutyrate are released at the same time. The test strip is sensitive to acetoacetic acid.

**NOTE:** It is important that urine is tested for ketones as well as glucose so as not to miss ketonuria without glycosuria.

### INTERFERENCES

False Trace results may occur with highly pigmented urine specimens or those containing large amounts of levodopa metabolites. Compounds that contain sulfhydryl groups, such as mesna (2-mercaptoethane sulphonic acid) and captopril, may cause false positive results or an atypical colour reaction.

### RESULTS:

**NEG:** Normal - No action required.

**POS:** Diabetic ketoacidosis (grossly uncontrolled insulin-dependent), fasting, particularly with fever and/or vomiting, most often seen in children, ketotic hypoglycaemia in young children, pregnancy, frequent strenuous exercise, high protein/low carbohydrate diet. (Refer to local protocol for further information).

**SENSITIVITY:** 5-10mg/dL acetoacetic acid

## SPECIFIC GRAVITY

Specific gravity is a measure of total solute concentration in urine. In health specific gravity varies widely according to the need to excrete water and solutes. Urinary specific gravity is a quick, convenient and reliable test for monitoring the concentrating and diluting power of the kidney, recognising dehydration and aiding interpretation of other test results. For example, a trace protein result with a high SG reading may well be normal, while trace protein with low SG is usually abnormal.

High values are found in hepatic disease, congestive cardiac failure, adrenal insufficiency or excessive water loss through sweating, fever, vomiting and diarrhoea.

Low values are found in individuals with intact renal function and high fluid intake, diabetes insipidus, Glomerulonephritis, Pyelonephritis and various kidney anomalies where tubular damage renders the kidney incapable of concentrating urine.

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### RESULTS:

**Range:** The normal SG of urine ranges from 1.001 to 1.035. If the specific gravity of random urine is 1.023 or greater the concentrating ability of the kidneys can be considered normal.

**Low specific gravity:** May be caused by renal abnormality, continuous high fluid intake, Diabetes insipidus. Highly buffered alkaline urines may cause low readings

**High specific gravity:** May be caused by dehydration/low fluid intake. Usually indicates good kidney concentrating ability. The presence of moderate quantities of protein (100–750 mg/dL) may cause elevated readings.

Fixed value may indicate severe kidney damage.

**Note: If Sp Grav is <1.010 interpret other negative results with care.**

## BLOOD

### CLINICAL

Presence of blood in urine is an indication of damage to the kidney or urinary tract. The reagent strip is able to detect lysed red blood cells and intact red blood cells in urine.

**False POS:** Certain oxidizing contaminants, such as hypochlorite, may produce false positive results. Microbial peroxidase associated with urinary tract infection may cause a false positive reaction.

### RESULTS:

**Negative result:** Normal but at risk patients should be tested regularly to ensure that intermittent bleeding is detected.

**Positive result:** Follow-up will depend upon the results from other tests; clinical picture etc. Persistent positive results should not be ignored.

**SENSITIVITY:** 5-20 red blood cells/ $\mu$ L or 0.015 – 0.062mg/dL haemoglobin.

## PROTEIN

### CLINICAL

Proteinuria refers to an increased amount of protein in the urine and is one of the most important indicators of kidney disease.

Normal urine contains small amounts of albumin and globulins but generally in amounts low enough not to give a positive reagent strip reaction. When testing for urinary protein it is important that the urine is sufficiently concentrated, first morning urine is best.

**False POS:** A visibly bloody urine may cause falsely elevated results.

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### RESULTS

Normally, between 40-80mg of protein are excreted daily, but as much as 100-150mg may be considered normal since the average daily urine volume may range from 1000-1500ml.

Marked proteinuria is characterised by the excretion of more than 4g of protein per day. Typical with nephrotic syndrome and severe cases of glomerulonephritis, nephrosclerosis, amyloid disease and systemic lupus erythematosus.

Moderate proteinuria refers to the daily excretion of between 0.5 and 4g of protein. It is found in the vast majority of kidney diseases as well as the diseases listed above and other conditions.

Minimal proteinuria is the excretion of less than 0.5g of protein per day. It is associated with chronic glomerulonephritis, polycystic disease of the kidneys, renal tubular disorders and various disorders of the lower urinary tract.

**SENSITIVITY:** 15-30mg/dL albumin

**Nitrite and Leucocyte results may not be given on urinalysis meters at specific locations as part of anti-microbial stewardship policies**

## NITRITE

### CLINICAL

Most of the organisms (Gram Negative) which infect the urinary tract contain an enzyme system which catalyses the conversion of nitrate, which is normally present in urine, to nitrite, which is not. Ideally the specimen should be one that has been present in the bladder four hours before voiding, to provide time for the nitrate/nitrite conversion.

**False NEG:** May be caused by insufficient dietary nitrate, lack of incubation in bladder or presence of non-reductive pathological microbes.

### RESULTS

**NEG:** Normally indicates absence of gram negative bacteria. Negative test result should always be viewed in light of clinical picture and other test results. (**N.B.** A negative result does not exclude infection, because some organisms are unable to convert nitrate to nitrite).

**POS:** Urinary tract infection due to nitrite-producing organisms.

**SENSITIVITY:** 0.06-0.1mg/dL nitrite ion

## LEUCOCYTES

### CLINICAL

Infections of the urinary tract usually produce pus cells (white blood cells or leucocytes). These release an esterase, which reacts with the pad on the dipstick. The presence of leucocytes in the urine is an indication of urinary tract infection.

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**False POS:** Positive results may occasionally be due to contamination of the specimen by vaginal discharge.

**False NEG:** Elevated glucose concentrations ( $\geq 3\text{g/dL}$ ) may cause decreased test results. The presence of cephalixin, cephalothin, or high concentrations of oxalic acid may also cause decreased test results. Tetracycline may cause decreased reactivity, and high levels of the drug may cause a false negative reaction

### RESULTS

**NEG:** Normal (where positive clinical symptoms are present, the result should be confirmed by follow-up testing – refer to local protocols)

**POS:** Indicator of urinary tract infection (refer to local protocols for further information)

**SENSITIVITY:** 5-15 cells/ $\mu\text{L}$  in clinical urine.

## pH

### CLINICAL

The average urine is slightly acidic and is usually around pH 6, but can vary from pH 4.6 to 8. It is affected by the ability of the kidneys to excrete hydrogen ions and by infection of the urinary tract by bacteria containing enzymes promoting production of ammonia from urea. Values are usually lowest after an overnight fast and highest after meals. Urine pH can be a helpful screening test in the diagnosis of renal disease, respiratory diseases, certain metabolic disorders and specific therapeutic regimens e.g. sodium bicarbonate.

**Acidic Urine:** People on high protein diets may excrete urine with a pH lower than 6.0. Certain medications such as ammonium chloride and mandelic acid may also produce acidic urine. People with acidosis and/or uncontrolled diabetes mellitus also excrete highly acidic urine.

**Alkaline Urine:** Alkaline urine is frequently excreted after meals as a normal response to the excretion of HCl in the gastric juice. It also occurs in individuals consuming diets high in vegetables, milk and other dairy products. Certain medicine such as sodium bicarbonate, potassium citrate and acetazolamide also induce the formation of alkaline urine. Highly alkaline urine may be indicative of urinary tract infection or possible bacterial contamination of an old specimen.

**SENSITIVITY:** 5-8.5 if visually read, 5-9 if instrumentally read

## GLUCOSE

### CLINICAL

Glucose is found in urine when the plasma concentration exceeds the renal threshold (approx 10mmol/L). Urine glucose is found in patients with raised blood glucose in Diabetes Mellitus or with normal blood glucose levels when tubular reabsorption of glucose is below normal, leading to glucose in the urine. This may also occur after eating a heavy meal or in conjunction with emotional stress.

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Urine glucose can be found with normal blood glucose in pregnancy and renal glycosuria. Raised blood glucose levels or reduced renal absorption may indicate Diabetes Mellitus, stress, Cushings Syndrome, post general anaesthesia or acute pancreatitis.

**False NEG:** Ketone bodies reduce the sensitivity of the test: high ketone levels (40mg/dl) may cause false negatives for specimens containing small amounts of glucose (75-125mg/dl) but the combination of such ketone levels and low glucose levels is metabolically improbable in screening.

### RESULTS

**NEG:** Normal (refer to local protocol if a diabetic patient)

**POS:** The presence of glucose in the urine may be due to elevated blood glucose. (Refer to local protocol for further information).

**SENSITIVITY:** 75-125mg/dL glucose