**Urinalysis – the interpretation of reagent strips**

Reagent strips (‘dipsticks’) can be used to detect a number of substances in urine. The Medi-Test Combi 8 dipsticks include: nitrite, leucocyte, glucose, protein, pH, ketones, and blood.

**Important points to note**

* Urine dipstick analysis is NOT diagnostic, but can be a useful screening tool.
* The tests may be subject to both positive and negative interferences. Some (but not all) of these are listed below.
* Laboratory blood/urine tests, as appropriate, should be used to confirm results(as indicated below).

**Glucose**

Detects urine glucose >200 mg/L (= 1.1 mmol/L).

The test is not diagnostic for diabetes mellitus and should not be used for this purpose. A negative result does NOT exclude DM. A fasting blood glucose should be measured for diagnosing DM (refer to WHO guidelines).

*False positive:* may occur if the sample is contaminated with residues of peroxide-containing detergents. This test is not affected by the presence of ascorbic acid (vitamin C).

**Protein**

Detects urine protein >0.3 g/L (300 mg/L).

A positive result should always be investigated further by sending a random urine sample to the laboratory for prot:creat ratio or a timed collection (e.g. 24 hour sample).

Benign proteinuria can occur, e.g. orthostatic proteinuria, but this can only be confirmed/excluded by further investigation and assessment of the clinical status of the patient.

*False negative:* a negative dipstick does NOT exclude proteinuria. Some proteins do not react with the dipstick (e.g. immunoglobulin light chains or Bence Jones protein).

*False positive:* may occur if the pH of the urine is very high (i.e. very alkaline samples, pH >9.0), in patients on polyvinylpyrrolidone (blood substitute) infusion and in patients on quinine medications. False positives may also be caused by sample contamination with residues of disinfectant.

NB: The presence of medical dyes (e.g. methylene blue) or beetroot pigments in the sample may mask the colour of the reaction pad.

**pH**

Detects how acidic or alkaline the urine is. Usual pH value is 5-6 on a freshly passed sample.

A very alkaline urine (pH >9.0) may be associated with a urinary tract infection. However, a high pH value may also indicate that the sample is old or has not been stored properly and is, therefore, unsuitable for other tests on the dipstick. Some tests on the dipstick strip may give false results if the pH of the urine is too high (e.g. protein).

**Ketones**

Detects urine ketones >2.5 mmol/L. The test is more sensitive to acetoacetate than it is to acetone.

It does NOT detect beta-hydroxybutyrate.

Useful in rapid assessment of possible diabetic ketoacidosis – a positive result gives strong evidence that the patient has DKA. However, the test is NOT diagnostic and a laboratory blood glucose must be urgently performed as well.

NB The dipstick does not detect beta-hydroxybutyrate.

**Blood**

Detects haemoglobin or erythrocytes in urine (> 5 erythrocytes/µl).

A positive test is not specific for any particular cause of renal dysfunction. A positive test must be followed up with appropriate laboratory investigations (e.g. microscopy, renal function tests, etc.).

*False negative:* Normal concentrations of ascorbic acid (vitamin C) <40 mg/dL do not interfere with this test.

*False positive:* may occur as a result of contamination of the sample with menstrual blood flow or external injury to the urethral tract. Sample contamination with peroxide-containing detergents can also cause false positives.

**Nitrites**

Detects urine nitrites > 0.5 mg/L

Any pink colour is consistent with bacterial infection of the urinary tract (microorganisms are able to reduce nitrate to nitrite).

*False negative:* may occur with bacteria that do not reduce nitrate to nitrite, with very dilute urine, high concentrations of ascorbic acid (vitamin C) or antibiotic therapy.

*False positive*: may be caused by presence of medical dyes in the sample

**Leucocytes**

Detects leucocytes > 10-25 per μl urine.

NB: bacteria, trichomonads and erythrocytes do not react with this test

NB: Excretion of bilirubin, nitrofurantoin or other strongly-coloured compounds may mask the colour of the reaction pad.

*False negatives*: may occur in samples with protein >5 g/L and glucose >20 g/L (111 mmol/L) as well as in patients on cephalexin and gentamicin.

*False positives:* may occur if sample is contaminated with formaldehyde. Vaginal discharge may cause a false positive reaction.

**Other sources of error**

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| **Problem** | **May cause** | **Solution** |
| Dipsticks out of date or inappropriately stored | False results due to altered reagent activity | Discard strips and repeat the test with a new vial of test strips. |
| Reading strip after too short or too long a time interval | False results | Repeat test, reading the results at the appropriate time. For the Medi-Test Combi 8 dipsticks this is 60-120 seconds for leucocytes; 30-60 seconds for everything else.  **NB** different makes of dipsticks will have different reaction times. |
| Inappropriate specimen pot and/or sampling vessel | False results due to residues of disinfectant and detergents. | Collect a fresh specimen using appropriate specimen pot and/or sampling vessel and re-test. |
| Old sample | False results | Collect a fresh urine sample and test within 2 hours of collection. |
| Note: if visually checking the test strip (by eye):  Test strip pot held the wrong way round when comparing test strip to reference colour fields | Wrong results | Ensure that the arrows on the test strip are aligned to those on the label before comparing to the colour scale. |
| Highly coloured urine (e.g. medical dyes or beetroot pigments) | May mask the colouration of test fields giving false positive or false negative results. | Be aware that test field colour changes may be affected when interpreting results. |
| Various drugs | Falsely high or low results | Be aware of any medications that the patient is taking and their effect on urine dipstick testing. |