Integrity Testing in Urine Drug Screening

The first thing to do is to deal with some terminology regarding integrity testing for urine drug screening. When we talk about urine integrity then we are looking at the physical characteristics that make us believe that a urine has been recently passed and that it is appropriate for continued drug screening.

In the first instance a urine should be of a suitable temperature to reflect that it has just been passed, i.e. it should trigger a response on the temperature strip within the 33-38 C range. Lower than that suggests that the sample is not freshly passed and above that suggests that external heating has been applied to the sample and makes it unlikely that it is a fresh sample. This part of the integrity testing is a one-off opportunity to assess integrity as temperature falls reasonably rapidly, hence the need to read the strip within 4 minutes.

Sample substitution with drug free urine can sometimes be quite difficult to detect. Sometimes even direct observation of the urine collection can be circumvented. Individuals have been known to insert drug-free urine into their own bladder prior to testing. There are even elaborate anatomically correct devices that can be obtained via the internet which may fool a collector during an observed collection.

All urine contains creatinine which is a by-product of muscle metabolism. This biochemical marker is an indication of urine strength and so will reflect how dilute or concentrated the urine sample is. The lower the creatinine value the more dilute a sample is and there are a couple of 'trigger' levels where comments are likely to be made. There is a 'normal' range for this compound in human urine that is relatively wide, i.e. lower level where a sample is no longer considered to be human urine is around 0.5 mmol/L while we have seen concentrations in the lab above 40 mmol/L suggesting some degree of dehydration. Generally it is the lower concentrations that are of most interest to us as this is the region where over-hydration can lead to very dilute samples and this can adversely affect the screening process. Samples that have a creatinine reading below 0.5 mmol/L are reported as "being inconsistent with human urine."

The integrity check will also monitor pH which is the degree of acidity or alkalinity of the urine. Again there are limits around acceptable values and generally these range from pH4- pH8. Levels outside these limits are strongly suggestive of some sort of adulteration, such as addition of masking agents, that will interfere with the screening process.

Specific gravity is also run as part of the integrity checking of samples. A definition from "Dr Google" says that urine specific gravity is a measure of the concentration of solutes (dissolved compounds) in a urine. It measures the ratio of urine density compared to water density…". There is a range of acceptable levels of specific gravity from around 1.005 up to around 1.020. The closer a specific gravity is to 1.00, the more like water it is. Conversely higher specific gravity readings are suggestive of more concentrated samples and/or dissolved compounds. Generally a specific gravity alone is not a good reason for rejecting a sample as failing integrity.

Testing for other adulterants like glutaraldehyde and pyridinium chlorochromate that are oxidisers and interfere with the screening reactions, are also available.

These checks along with other observations at the collection site will lead a collector to state whether a sample has failed the integrity checks.

The laboratory process for checking integrity reflects the above although we don't monitor specific gravity routinely but can if required. We have other processes that we run looking at the likelihood of sample substitution or the use of 'fake' urines. The laboratory has available to them a number of biochemical markers over and above those listed above that can be used to assess the integrity of urine samples. A recent addition to the integrity testing panel is the 'Synthetic Urine' screen where an automated screening method looks for abnormalities in the urine that suggest a 'fake' urine. These results can then be checked against a number of biochemical markers to confirm the synthetic urine. This testing has been available since early 2017 and we have noticed a number of these samples coming through for laboratory testing. At this stage screening for synthetic urine is not available as an on-site test.

Canterbury District Health Board
Te Poari Hauora ō Waitaha

Canterbury Health Laboratories
Workplace Drug Testing

IANZ
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Second Floor, Cnr Hagley Avenue & Tuam Street, PO Box 151, Christchurch Telephone 0800 THE LAB 843 522 Facsimile 03 364 1162