

Testing the waters with Tecta

Sydney Water Laboratory Services

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Speeding up the return of microbiological data to improve our response to environmental incidents

Why do we test for E. coli?

Escherichia coli (E. coli) is one of many kinds of bacteria that live in the gut of humans and animals. They're easy to find because faeces contains large numbers of E. coli. So to detect faecal pollution, we look for E. coli to warn us that other nasties may be present.

And Faecal Coliforms?

Faecal Coliforms (FC's) or Thermotolerant Coliforms (TTC's) are bacteria that can ferment lactose and grow at 44.5°C. That's how we're able to pick them out from all the other bugs in the environment. Whilst most of the FC's in wastewater are E. coli, some of its relatives will also be picked up. We're usually required to count FC's instead of E. coli when monitoring for contamination from wastewater in the environment.

What is Tecta?

Tecta is a self-contained microbiological test unit. It was developed in Canada in response to a waterborne disease outbreak in Walkerton (2000), to enable remote communities without access to a lab to do their own water testing.

How does Tecta measure FC's?

The water sample is incubated at 44.5°C in a cartridge

containing nutrients, including a labelled precursor molecule. FC bacteria grow and produce β -galactosidase (lactose-degrading) enzyme, releasing the hydrophobic fluorescent marker from the precursor.

The marker migrates into a polymer compartment and generates a fluorescent signal. Tecta constantly measures this. The time to reach signal threshold is proportional to number of bacteria originally present.

Tecta vs. standard lab testing

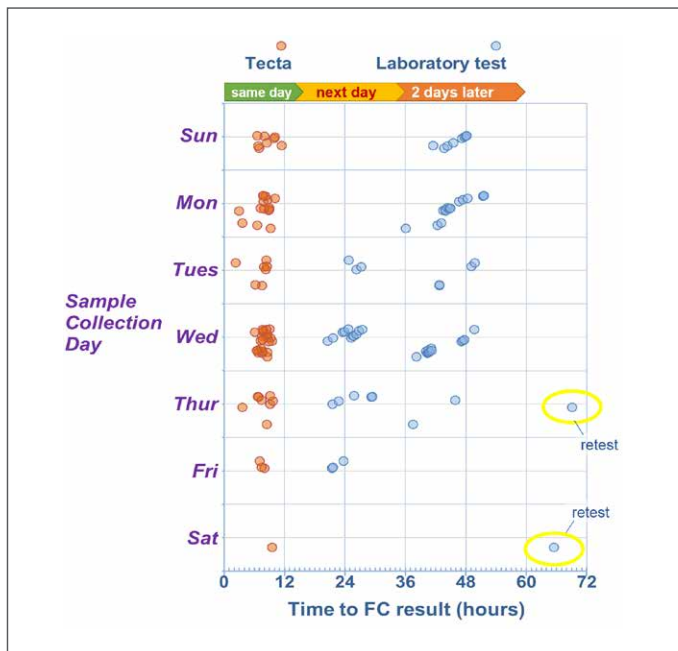
Tecta analysis is highly automated

- Sample set up is 1-2 mins with no special skills required
- No operator intervention is needed for the results which are generated automatically and can be emailed by the machine straight to you.
- Tests can be set up out of hours, at a field station or in a mobile testing van.
- Results are significantly faster than standard methods for samples with moderate-to-high FC contamination (it still takes 18 hours for negative result).

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- For urgent samples, Tecta means no delays from delivering samples to the lab or waiting for lab opening hours.
- Tecta can accommodate a huge range of bacterial concentrations in a single test.
- This eliminates retests - whenever the initial test is unsuccessful because bacterial numbers are above or below the narrow countable range of the traditional method (filtering water and counting the colonies grown on agar plates).
- Turbid water is not a problem. No filtration required, and the signal isn't blocked because the fluorescent indicator molecule migrates out of the sample into a polymer compartment.



What are we doing with Tecta?

Sydney Water is focusing on improving its environmental response to wastewater overflows. Our mission is to speed up the return of microbiological data after incident callouts, so it can be used for investigations and decision-making. Currently, these results are coming in 'after the fact'.

We're running two units back 'at base' in the West Ryde labs, accumulating side-by-side data to validate



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Tecta methodology. This parallel data will be used to demonstrate method equivalence and build confidence with our regulators. We won't be able to replace our lab-based methods with Tecta unless approved by the EPA.

Our Networks team have purchased four more Tectas and are managing their installation in Field Sampling & Testing vehicles, so environmental response samplers can begin testing at the site, and report 'on the road!'

What are the challenges?

We're working with Business Solutions and the manufacturer on a robust networking solution to ensure reliable receipt of results – ultimately importing data directly into laboratory database (Labware). Connectivity is extra important for mobile testing, where we are also addressing control of vibration on the move; adequate power supply and temperature control when parked.

How do the results compare?

Correlation ($\rho_C = 0.91$) with the lab's standard method has been verified over a large range. For 95% of samples, the two tests were within 1 log of each other. This is a good outcome for microbiological analysis. Even repeat testing with the same method has a 0.3 log variation (unavoidable due to the random distribution of bacteria in the sample).

