

# MICROBIAL SOURCE TRACKING ANALYSIS

## Ecwise can investigate waterways and catchments to characterise the likely presence of different contamination sources of contamination

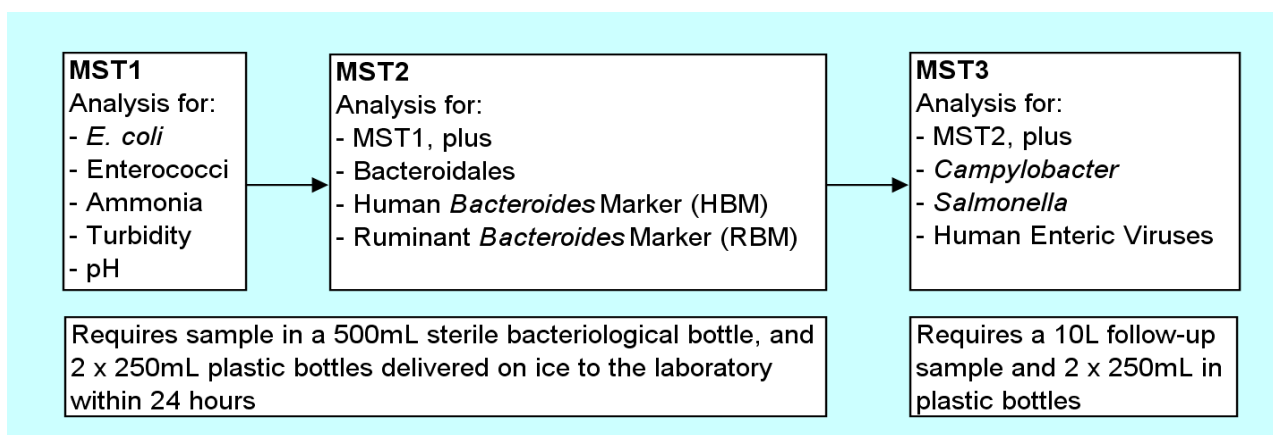
Microbial Source Tracking (MST) involves the detection of markers specific for various sources of contamination in the environment. Recent development of MST has focused on the molecular detection of strains of the bacteria *Bacteroides*, which can differentiate between human and some animal sources of pollution. Ecwise Environmental, in conjunction with several Melbourne water utilities and the Victorian Smart Water Fund, has examined human- and ruminant-specific MST methods using *Bacteroides* markers. These methods were used to examine stormwater and urban waterway sites in parallel with other water quality parameters. On the basis of this trial, the use of this suite of parameters appears promising, and Ecwise is now making the new methods commercially available.



Urban stormwater examined using MST suite in the recent Smart Water Fund study

The *Bacteroides* MST tests can be used to give a qualitative assessment of the likelihood of human or ruminant faecal contamination being present. These methods are likely to be applicable in a variety of situations; such as determining pathogen risks to bathers in recreational waters, or evaluation of source waters for treatment, or for tracing the origins of contamination in catchment studies.

From our investigations, we recommend a tiered approach when using MST methods. This involves initially performing a suite of routine water quality tests (MST1), to screen sites and identify locations requiring further investigation using the *Bacteroides* parameters (MST2). The analytical data from the range of tests are then used to interpret the results. This approach is outlined below.



This tiered approach is used to ensure a cost-effective screening of a large number of sites by MST1, or using historical data (if available), before site-specific evaluation by MST2. Further investigation by MST3 would be advised for sites where there are conflicting results, where there is significant variation over time, where source waters are highly variable e.g. stormwater, or where a legal investigation is underway.

(continued...)

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The *Bacteroides* tests in the MST2 suite only require a relatively small volume of sample, which is stored while awaiting results of the MST1 suite. *Bacteroides* analysis at Ecowise is performed using recently published\* quantitative polymerase chain reaction methods. Further research is currently underway to expand the range of MST2 parameters, to target identification of avian and porcine contamination, as well as to further validate this methodology.

Interpretation of analytical results is essential in MST. Utilising the experience from the wide range of sites examined in the Smart Water Fund study, Ecowise supplies interpretation of MST results into a grouping of the likelihood of contamination (low, medium or high), for each of the potential sources examined (currently human and ruminant).



## Why use Microbial Source Tracking?

MST gives the opportunity to add valuable information to investigations of water supplies and catchment areas.

- Human faecal contamination poses a greater risk to human health than contamination from other faecal sources; MST used on supply sources can determine the scale of response when traditional indicator bacteria are detected.
- Urban stormwater used as a source water requires treatment before use in fit-for-purpose applications. Determining the level of treatment requires assessment of the risks involved; with pathogen risks dependent on the origin of contamination.
- Catchment studies frequently require identification of sources of sporadic contamination, enabling remedial action and protection of supply.
- Environmental waters used for recreation or aquaculture are frequently located in sites sensitive to the impacts of sewage pollution. MST can be used in site risk assessment and in the investigation of contamination incidents in these locations.
- MST techniques based on *Bacteroides* are starting to be used to guide major expenditure decisions and regulatory action regarding sewage disposal in the United Kingdom; substantial studies using these methods are taking place around the world.



Ecowise is Australia's largest provider of specialist environmental, analytical and consulting services. With experience in catchments, mining, industrial and urban applications, Ecowise works in partnership with our clients to develop customised environmental management solutions that address regulatory and operational objectives in diverse environments. MST analysis and interpretation is a new addition to our existing services which we anticipate will find wide application in many situations.

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\*: GH Reischer et al. (2006). Applied and Environmental Microbiology 72:8:5610-5614; AE Bernhard & KG Field (2000). Applied and Environmental Microbiology 66:10:4571-4574