



E. coli

Tools for understanding microbial contamination

Handouts

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Diverse microbial communities are a healthy part of any freshwater ecosystem. They carry out essential functions that drive nutrient cycling and support invertebrates and fish communities. Understanding when, how and why microbial communities get out of balance is important for developing and implementing freshwater management solutions.

The presence of *Escherichia coli*, often called *E. coli*, is frequently used as an indicator of faecal contamination in waterways. This bacteria is normally found in the guts and faeces of animals including people, birds and other warm-blooded animals.

Possible sources of inputs into agricultural waterways:

- runoff from farm animals and wildlife
- wastewater discharges and leaky septic systems
- waterfowl and duck ponds

E. coli tells us if water is contaminated by faecal material and poses human health risks, but does not affect plants, invertebrates or fish living in a waterway. Not all *E. coli* is bad, but its presence can indicate that other harmful microbes (pathogens) that come from faeces may be present.

From water and sediment samples taken in a waterway, we can learn:

What is moving through the waterway?

Microbes can travel in the water downstream to larger rivers and into the ocean.

What remains in the waterway?

Harmful bacteria and pathogens can accumulate in the sediment leaving a legacy of microbial contamination.



Tools to detect *E.coli* and microbial contamination

Several tools and tests are used to measure microbial communities in waterways. These tools and tests can be combined to better understand the nature and risk of microbial contamination. Checking *E. coli* levels is the first step to see if there is a problem and then other tools can be used to answer additional questions:

1. How much *E. coli* is present? Use *E. coli* counts

- Standard *E. coli* counts give us an indication whether there is faecal contamination in the waterway. National guidelines for acceptable levels of *E. coli* in the water for drinking or contact recreation are available from the Ministry for the Environment.

2. What are the sources of contamination? Use faecal source tracking (FST)

- Faecal source tracking will tell us if a source is present or absent and provide an estimate of how much is present. This set of tools identify markers or “fingerprints” specific to different animals, including ruminants (cattle, sheep, deer, goats), waterfowl and humans.

3. Is there potential for future contamination? Test for persistent (naturalised) *E. coli*

- Microbes can survive and remain in a waterway for some time. In some cases, they can grow and maintain their population in an environment, such as sediment, which is outside their animal host. In a waterway with no suspected source of faecal contamination, repeated water samples at different times can be used to confirm sustained high levels of persistent (naturalised) *E. coli*.

CAREX Steps & tools to help with microbial contamination

Address potential microbial contamination sources and legacies to improve waterway health. Use multiple tools to detect if *E. coli* is present, its likely source, and if it is persistent (naturalised).



1. Identify issues & treat hotspots - Identify potential sources of contamination and “hotspots” where bacteria are entering the waterway, which could include broken fences, slumps or rills. Repair broken fences to exclude stock and rebatter or reshape banks or low lying areas to reduce surface runoff from paddocks into the waterway.



2. Apply restoration tools - Riparian planting acts as a filter between land and water and can be effective at stopping sources of microbial contamination entering a waterway. Our research has shown that sediment traps may also help reduce microbial legacies. Microbes and sediment settle out in sediment traps, and the microbes die-off in different ways, such as UV radiation from the sun.

CAREX collaborates with ESR to measure and understand microbial contamination in agricultural waterways. ESR is trialling restoration tools, such as sediment traps, to help address this issue in waterways. For more information on their research and findings, please visit www.waterquality.org.nz.

For more details and steps to get you started, please check out our other handouts.