Microbial modelling

NIWA provides expertise in modelling of microbial contaminants from catchments and within the coastal environment.


Coastal Modelling

The DHI MIKE-3 coastal hydrodynamics and dispersion model is used to find how microbial contaminants disperse in the marine environment. By constructing a model that includes both point and non-point sources, the relative role of point and non-point pollutants in coastal environments can be assessed. This approach has recently been taken in the Whangarei Harbour.

The coastal modelling is also complemented with fieldwork and monitoring systems for microbial effects for shellfish harvesting areas.
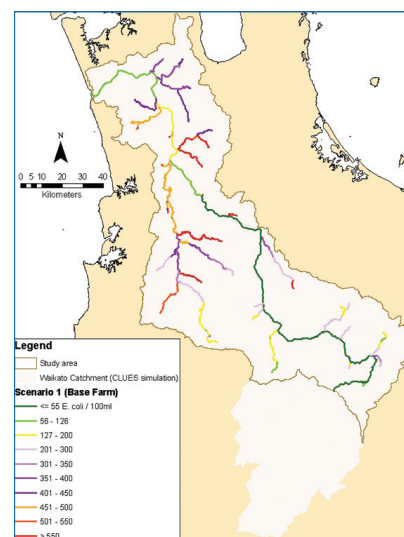
Microbial Catchment modelling

Catchment models are used to determine the quantity and temporal distribution of microbial contaminants in streams and entering the coastal environment, along with an assessment of the sources and effect of mitigation measures. Examples include:

– NIWA have developed an E.Coli component for the CLUES model, and this is being extended to incorporate new data from the National Rivers Water Quality Network. The model was applied recently to assess the implications of mitigation measures on water quality in the Waikato.
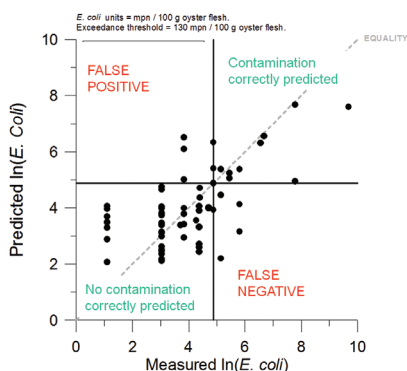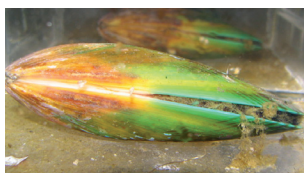

E.coli predictions vs measurements

– Detailed dynamic models of *E. Coli* and *Campylobacter* have been developed in-house. These couple hydrologic and stream transport processes. An example is recent catchment modelling for the MAF/MfE research project on Campylobacter.

– Monte Carlo models provide a simplified representation of catchment processes, but take account of uncertainty and variability of key parameters, drivers, and processes. A model for Campylobacter has been developed. These approaches are currently being developed further in conjunction with AgResearch.
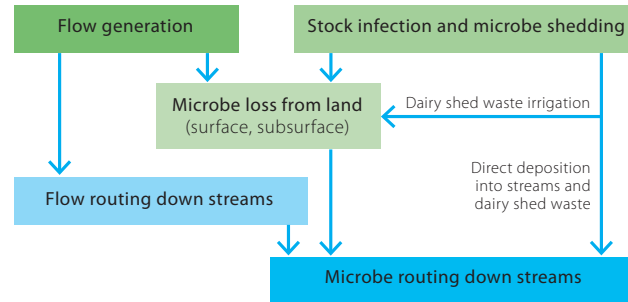
Flow diagram of catchment dynamic catchment model for *Campylobacter*.

Quantitative microbial risk assessment

QMRA (Quantitative Microbial Risk Assessment) is a quantitative way of estimating the health risk to people who are swimming in and consuming raw shellfish harvested from waters which are near sources of microbial contamination such as river plumes and wastewater outfalls. NIWA has expertise on QMRA applied in a range of situations, for example:

• swimming suitability of beaches near outfalls and polluted river plumes

• safety of wild shellfish harvesting near outfalls and polluted river plumes

• Comparison of existing wastewater disposal options with proposed ones in regard to their impact on public health

• public health risk for the location of shellfish aquaculture

• Disease transmission in human populations

General flow diagram of QMRA calculation sequence for swimmers and consumers of raw shellfish - all italicised items are subject to variability or uncertainty.