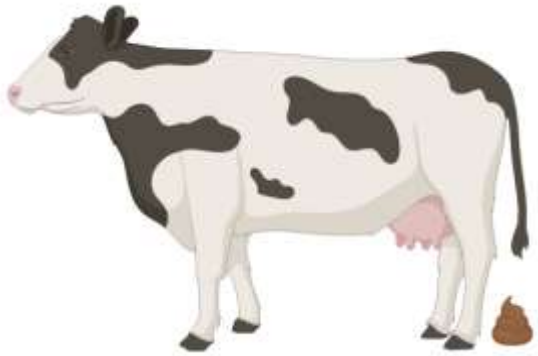
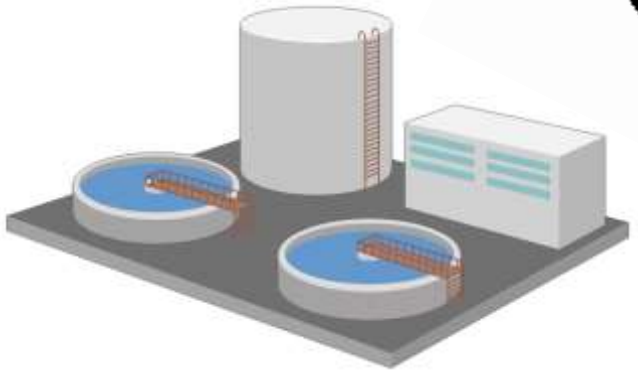
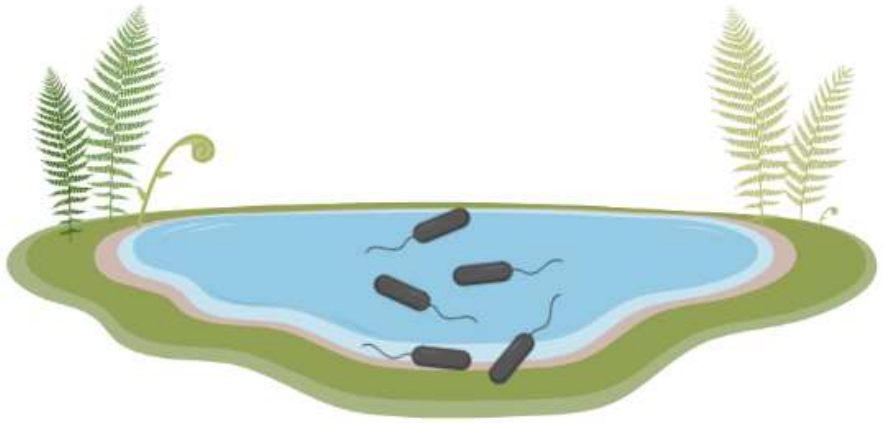
Surface water and mahinga kai as vectors of antibiotic resistance

Sophie van Hamelsveld



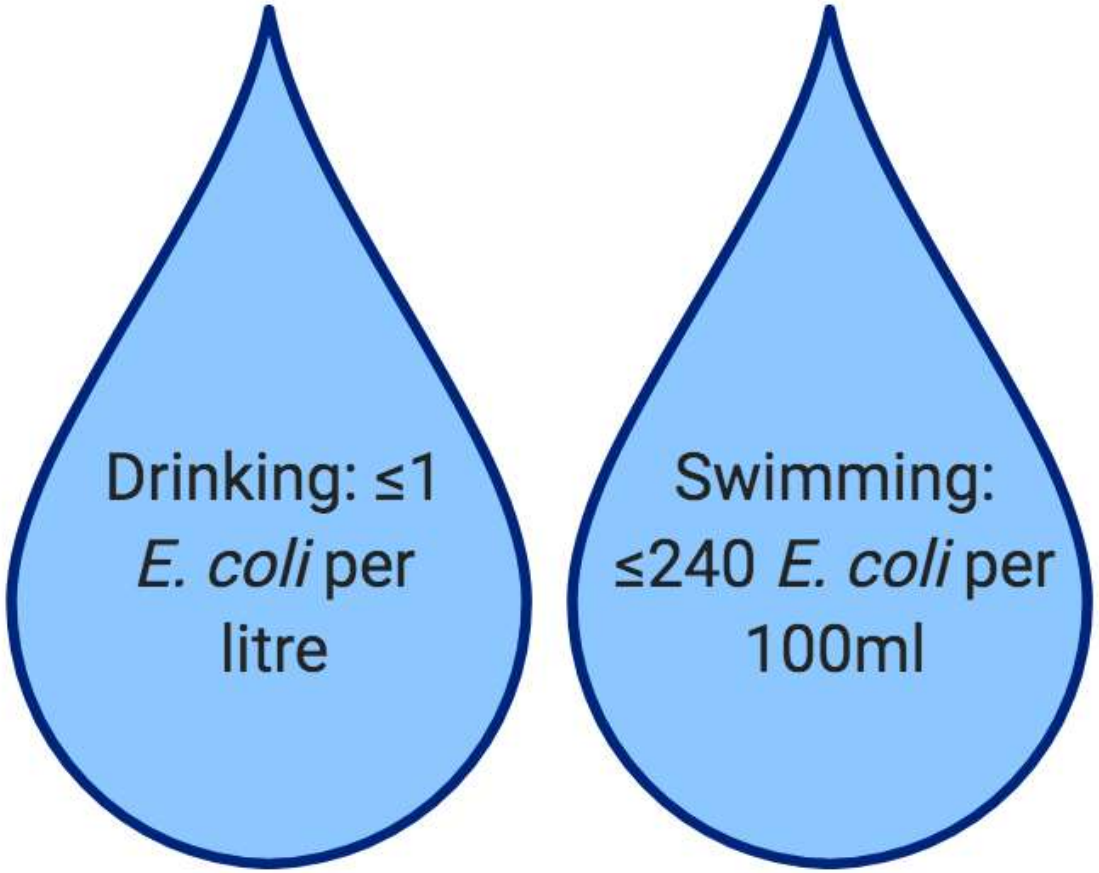
THE ANTIBIOTIC RESISTANCE CYCLE





E. coli, water safety and antibiotic resistance

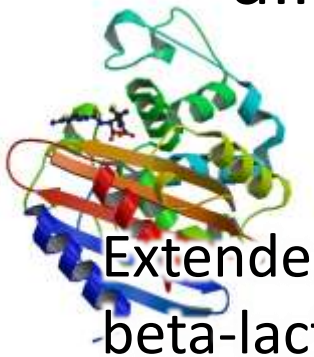
- Water is a focus of kaitiakitanga.
- *E. coli* indicates fecal contamination
- Can be a pathogen.
- Focus is on antibiotic resistance in human bacteria.
- Phenotypic and genotypic.



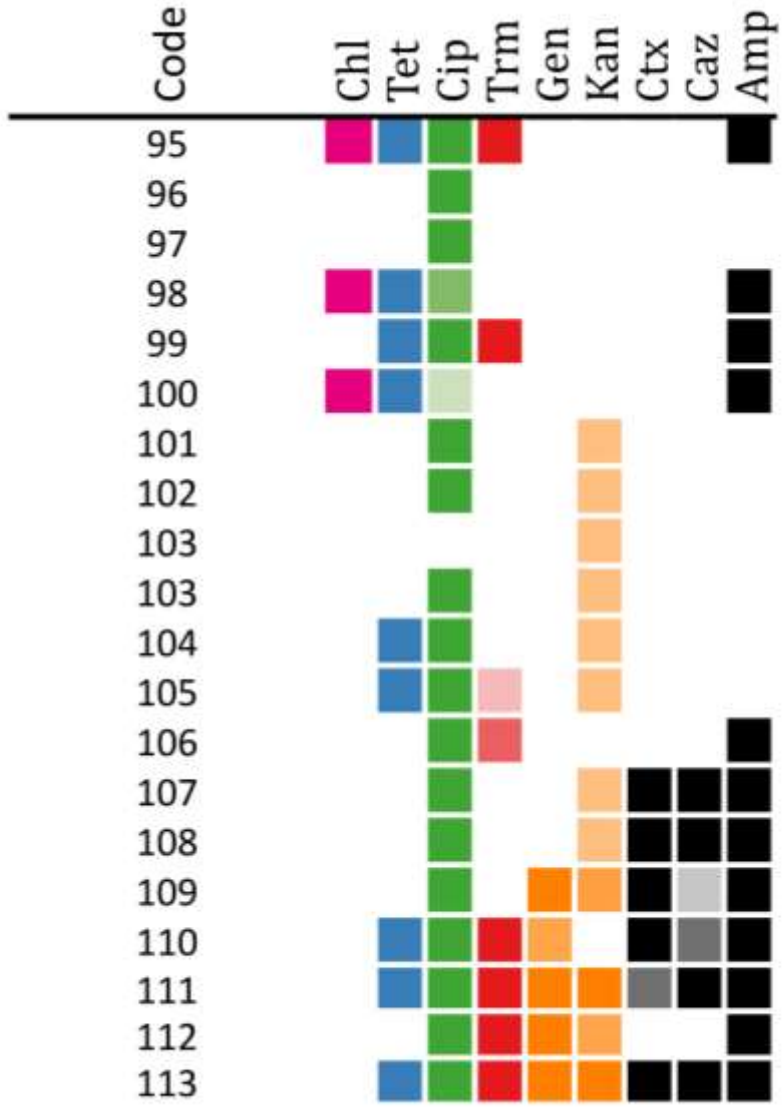
Ōtākaro/Avon River

Isolated on 1µg/ml ciprofloxacin

- Many ESBL producing strains.
- Two Cip^{R} isolates have blaCTX-M-55 allele.



Extended spectrum beta-lactamase (ESBL)

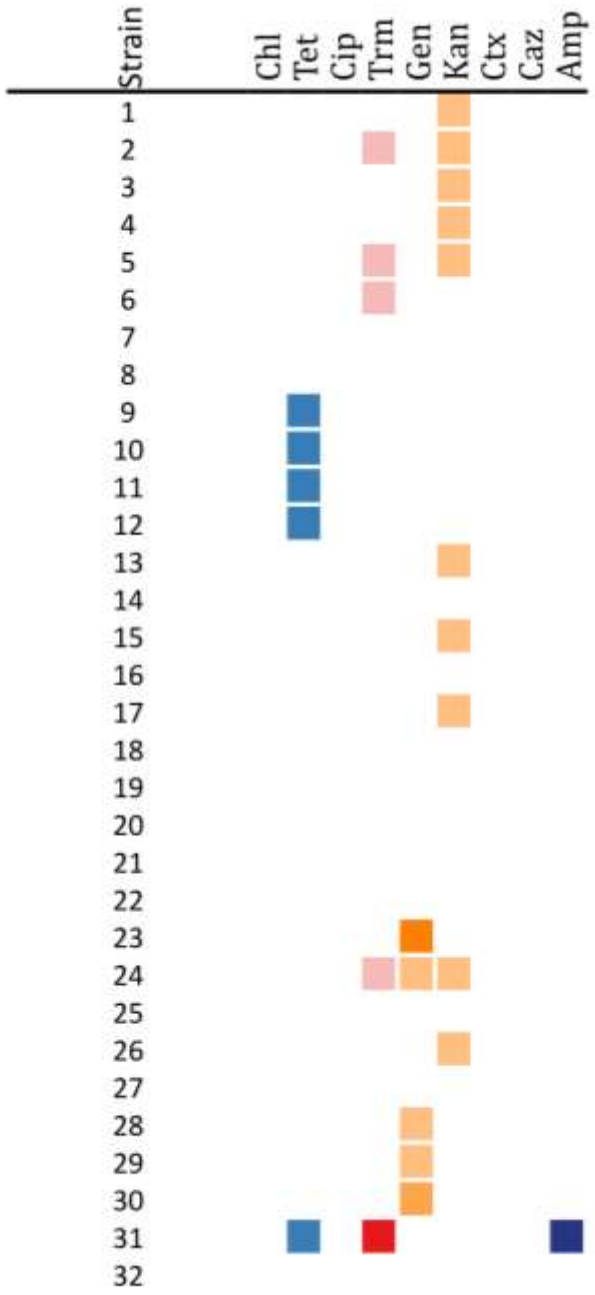


Key

Antibiotic	[µg/ml]				
Chl			8	16	32
Tet			4	8	16
Cip	1	2	4	8	16
Trm		2	4	8	16
Gen			4	8	16
Kan			16	32	64
Ctx	1	2	4	8	16
Caz		2	4	8	16
Amp			20	40	80

Antibiotic resistance profiles of *E. Coli* isolated with no antibiotic pre-selection

- Overall *E. coli*: ≤400 cfu /100ml.
- Variable percentage of antibiotic resistance.
- Chloramphenicol resistance between 1% and 50%
  Ciprofloxacin resistance between 1% and 50%



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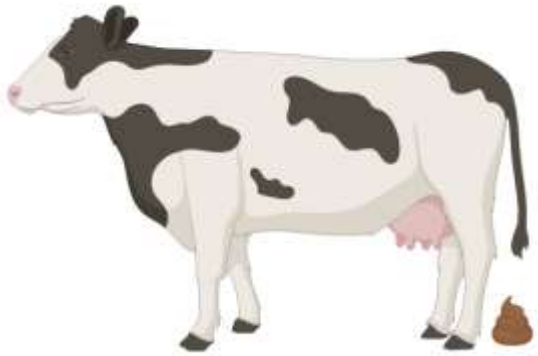

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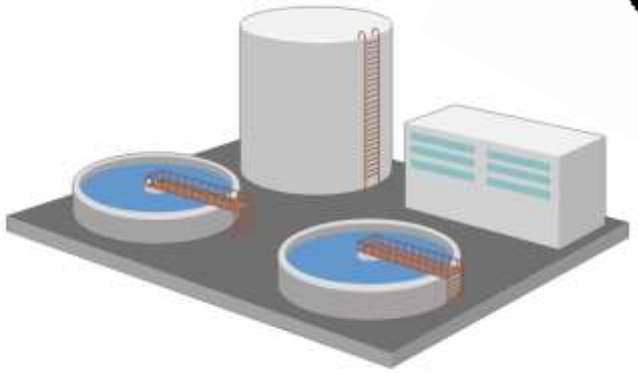
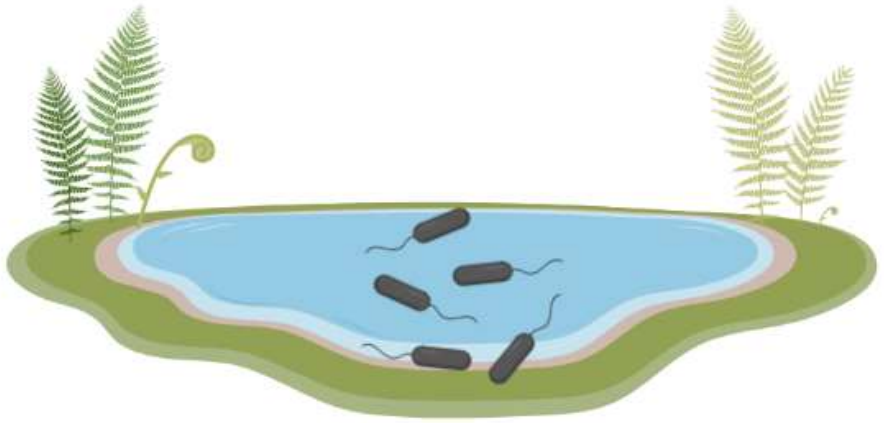




Mahinga kai

- ’Food production’
- Important source of nutrition.
- Access to mahinga kai eroded.
- Shellfish and watercress could have same pollutants as water.

Shellfish as vectors of *E. coli*

- A popular food.
- Sometimes eaten raw.
- Concentrate bacteria relative to the water.

Study sites

- Rakahuri/Ashley River Estuary: central to the identity of Tūāhuriri.
- Whakaraupō/Lyttleton Harbour: raw sewage discharge.

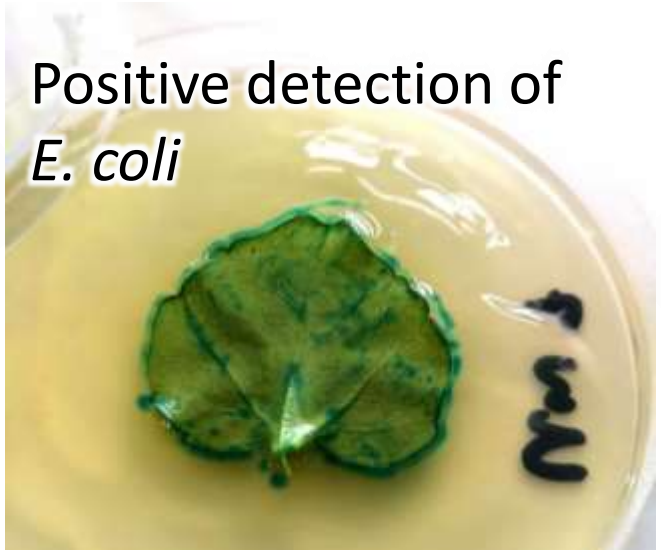
Mussel Smoothie!

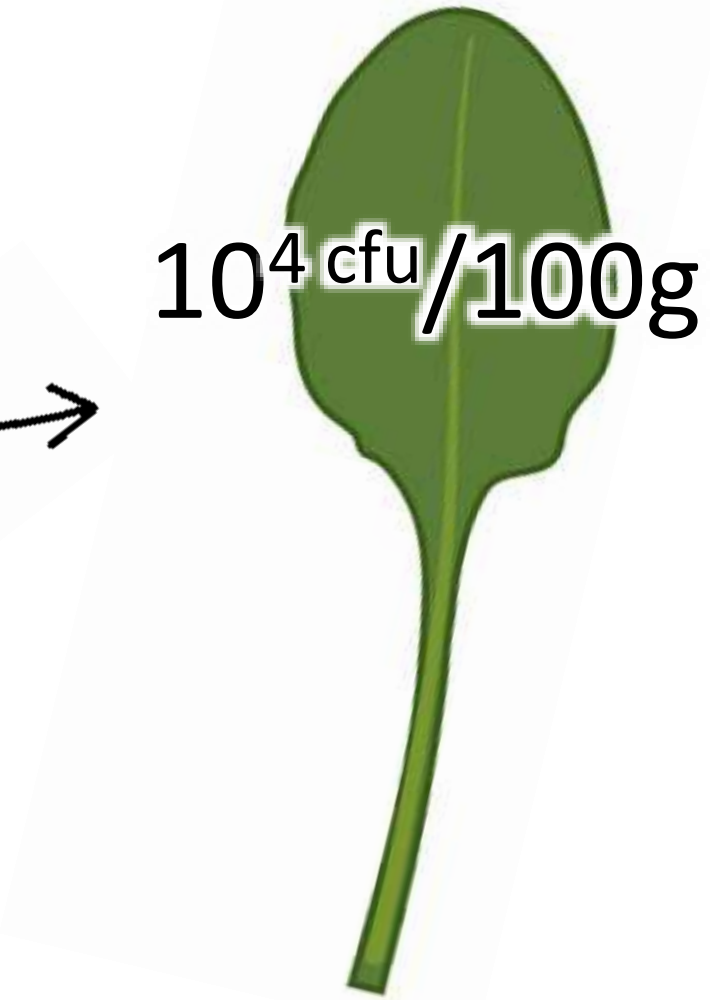

2,000 cfu/ 100g


80 cfu/100ml


700 cfu/ 100g

E. coli in kōwhitiwhiti/watercress





Mahinga kai as a sentinel

- Green-lipped mussels with zero *E. coli*.
- Submerge in Lyttelton Harbour for 1-3 weeks.
- 1 week, 80 *E. coli* per 100g.
- 3 weeks, 160 *E. coli* per 100g.
- Antibiotic resistance detected.

Conclusions

- One resistance = many.
- ‘All or nothing’ phenomenon.
- First environmental detection of blaCTX-M-55 allele.
- Shellfish/watercress unsafe for raw consumption.
- Antibiotic resistance may affect the safety of mahinga kai.

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Science for Communities