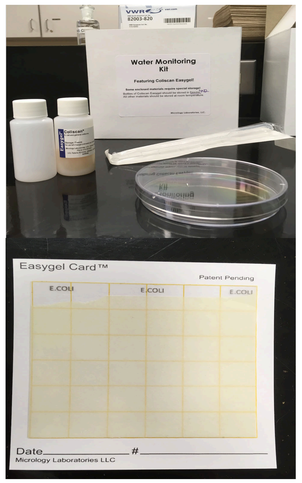
The Efficacy of Three Water Quality Testing Techniques

Can these tests differentiate between good & poor quality water?

Microbiology 311, Ashley McKibben & Jessica Grant-Burt
Supervisor: Douglas A. Campbell

Water Quality Tests



COLISCAN POUR PLATE TECHNIQUE

- Can distinguish between fecal and non- fecal coliforms
- Easy to use: 1 mL of water is added to media and plated
- Blue Colonies: fecal coliforms
- Pink Colonies: non-fecal coliforms

COLISCAN EASYGEL CARD

- Can detect *E.coli* or *Enterococcus*
- Easy to use:1 mL of water is added to the card
- Colonies can then be counted

MEMBRANE FILTRATION

- Water (100 mL) is filtered through the membrane and then the membrane is placed on an Easygel card

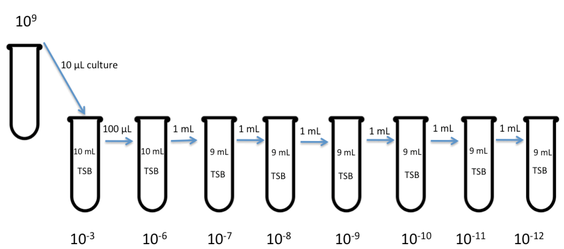
Indicator Organism Thresholds

Water Quality Index According to Health Canada:

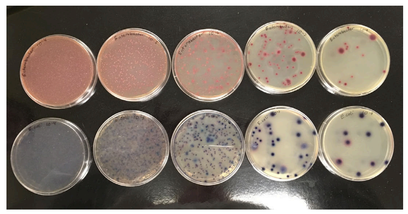
E.coli: A geometric mean of ≤**200** *E.coli*/100mL
Enterrococcus: A geometric mean of **35** *Enterococci*/100mL
Enterrococcus: A single measurement of **70** *Enterococci*/100mL

Culturing & Dilution Series

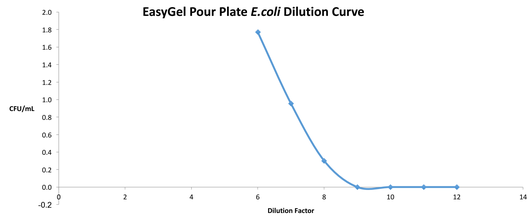
Serial dilutions were preformed on two fecal indicators *E.coli* and *Enterococcus*, and a non-fecal coliform *E.aerogenosa.* Indicator organisms were isolated from stock cultures, and incubated for 24 hours at 37°C. The initial estimated cell count was 1x10^9 cells/mL, and a serial dilution followed the schematic outlined below.



Pour Plate Test

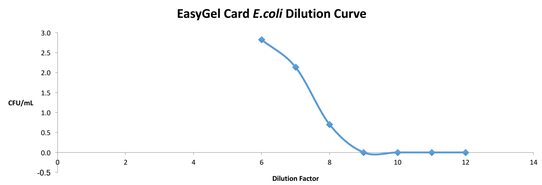


The Easygel pour plate technique is only applicable for use in the detection of E.coli.



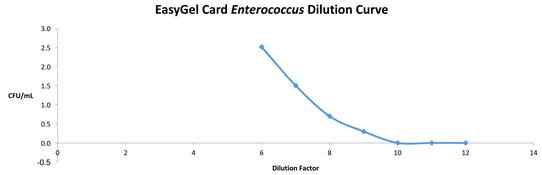
Detection range: 200-590 CFU/100 mL.

Easygel Card Test



E.coli Detection Range: 50-6650 CFU/100 mL

Enterococcus Detection Range: 20-3270 CFU/ 100 mL.



The maximum resolvable count for the Easygel cards is relatively high, and the detectable range is vast.

Salinity Test

The effects of salinity on the Coliscan EasyGel cards were tested, 9 mL of syringe filter sterilized well water and seawater were both inoculated with 1 mL of 24-hour culture for both *E.coli* and *Enterococcus.*

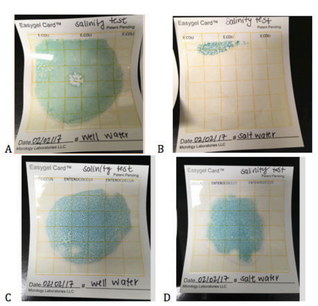
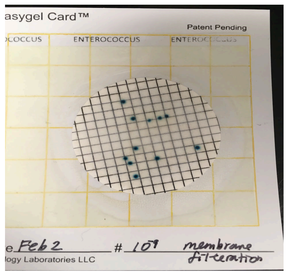


Figure 1.8. Effects of Salinity on Quantitative Results of EasyGel Cards, A) *E.coli* diluted in well water, B) *E.coli* diluted in Seawater, C) *Enterococcus* diluted in well water, D) *Enterococcus* diluted in seawater

- *E.coli* counts in seawater could not be accurately determined
- *E. faecalis* counts could be determined in both fresh and salt water.
- EasyGel cards are effective for direct water quality testing of seawater, when *Enterococcus* is the indicator organism used.

Membrane Filtration Test

Suction filtration was used for the membrane filtration test. 100 mL of seawater was inoculated with 1 mL of 10^-7 diluted culture, and filtered through a 0.45 micron filter. The filter was then placed on an Easygel card.



E.coli and *Enterococcus* Detection Range: 7-16 CFU/100mL

However, the range was limited based on the number of samples tested, and this technique is likely to have a much larger resolvable range.

Conclusion/Future Directions

PROS & CONS OF COLISCAN EASYGEL PLATES & CARDS

PROS:

- Low Cost
- Easy to Use
- Quick Results

CONS:

- Narrow Dynamic Range
- Limited Resolution
- Susceptible to Contamination
- User Error

IN CONCLUSION, the kits have limited resolution, i.e. they may not be useful for direct quantitation around a water quality index. While they have the capacity to differentiate between very poor water, and relatively good water, they may not be able to distinguish between 60 Enterococci/100 mL and 80 *Enterococci/* 100 mL. These kits maybe useful for surveys but not for swimming advisory decisions.

FUTURE DIRECTIONS:

- Standardize the use of *Enterococcus* as the main indicator organism used for seawater quality
- Standardize a testing method
- Implementation of sediment testing
- Proper technician training and use of aseptic technique