Real-time detection of faecally contaminated drinking water

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Faecal contamination of drinking water

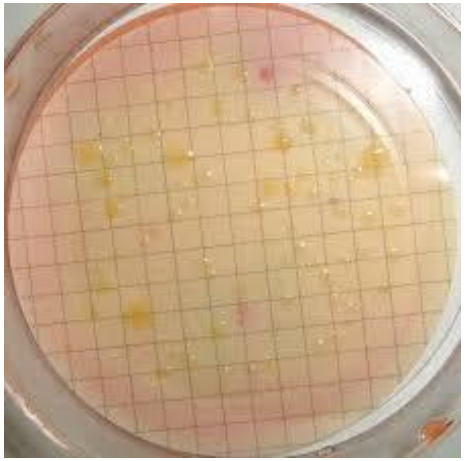
- Globally, 1.8 billion people consume water contaminated with faeces[1]

- >500,000 deaths from diarrhoea alone[2]

[1] Bain et al., 2014, Tropical Medicine & International Health, 19 (8)
[2] Prüss-Ustün et al., 2014, Tropical Medicine & International Health, 19 (8)

Detecting faecal contamination

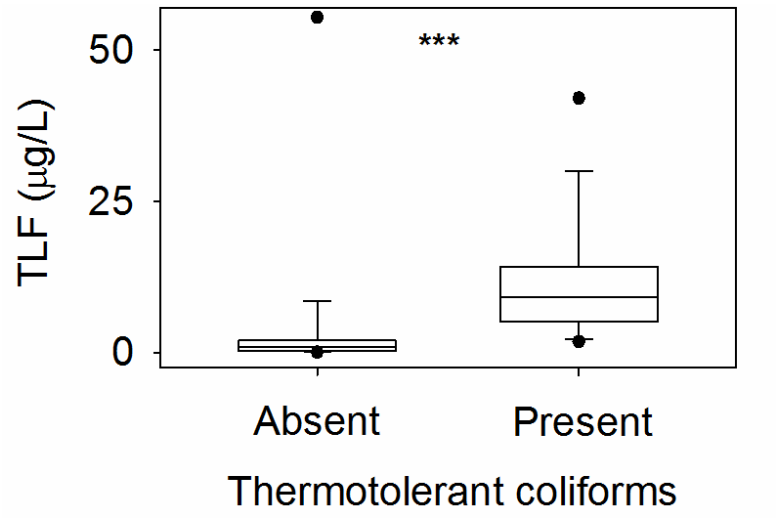
- Plate counts using indicator organisms, e.g. TTCs/E.coli
- Takes 18-24 hours and requires consumables
- Real-time, reagentless indicator – tryptophan-like fluorescence (TLF)

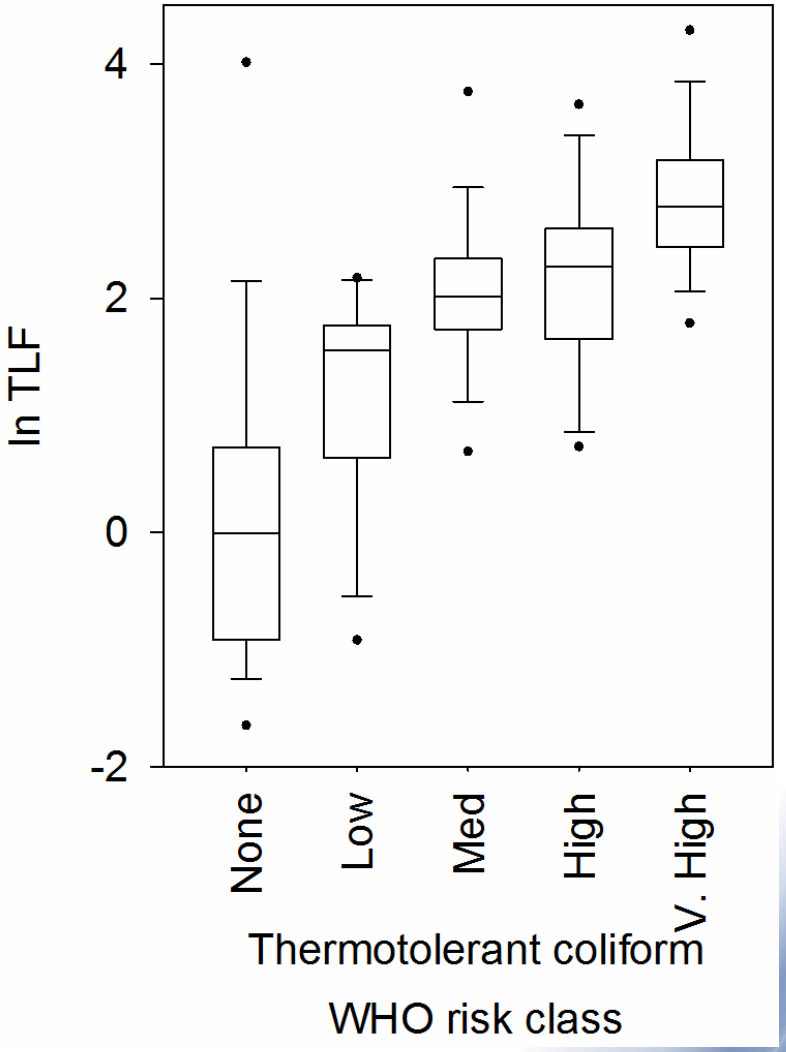


What is tryptophan-like fluorescence?

- Tryptophan is an amino acid
- Fluoresces at known UV-wavelengths
- TLF reflects the array of molecules that share similar fluorescence properties to pure tryptophan
- Quantified with a low-power portable fluorimeter
- Established indicator of sewage effluent in the environment
- Infer the presence or number of indicator organisms of faecal contamination?

An indicator of TTCs



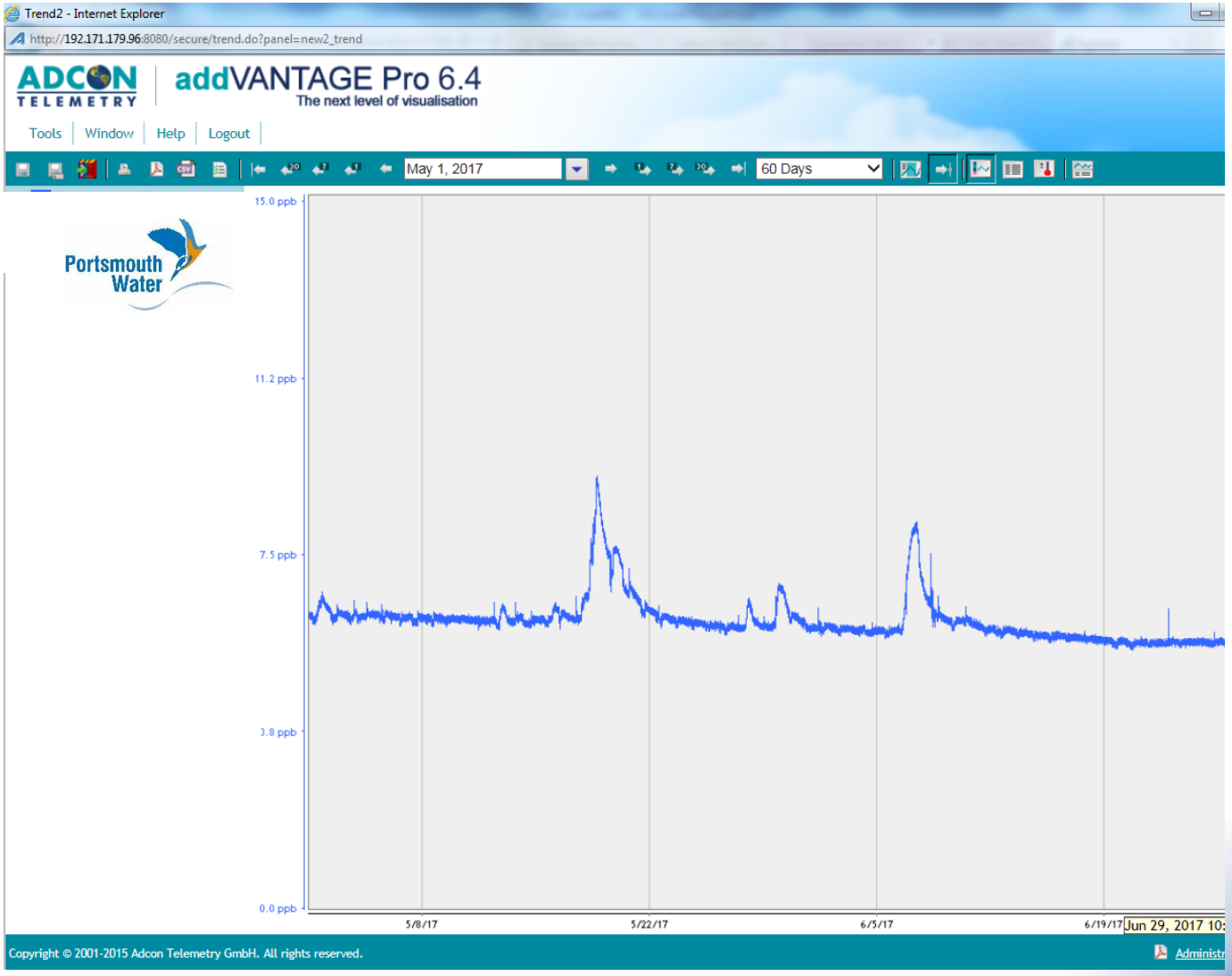


An indicator of TTCs

- TLF significant predictor of TTC presence/absence
- TLF significant predictor of number of TTCs

- TLF significantly related to distance from pit latrine
- Turbidity and SRS unrelated to TTC contamination

Online indicator of TTCs



Meeting the unicef criteria

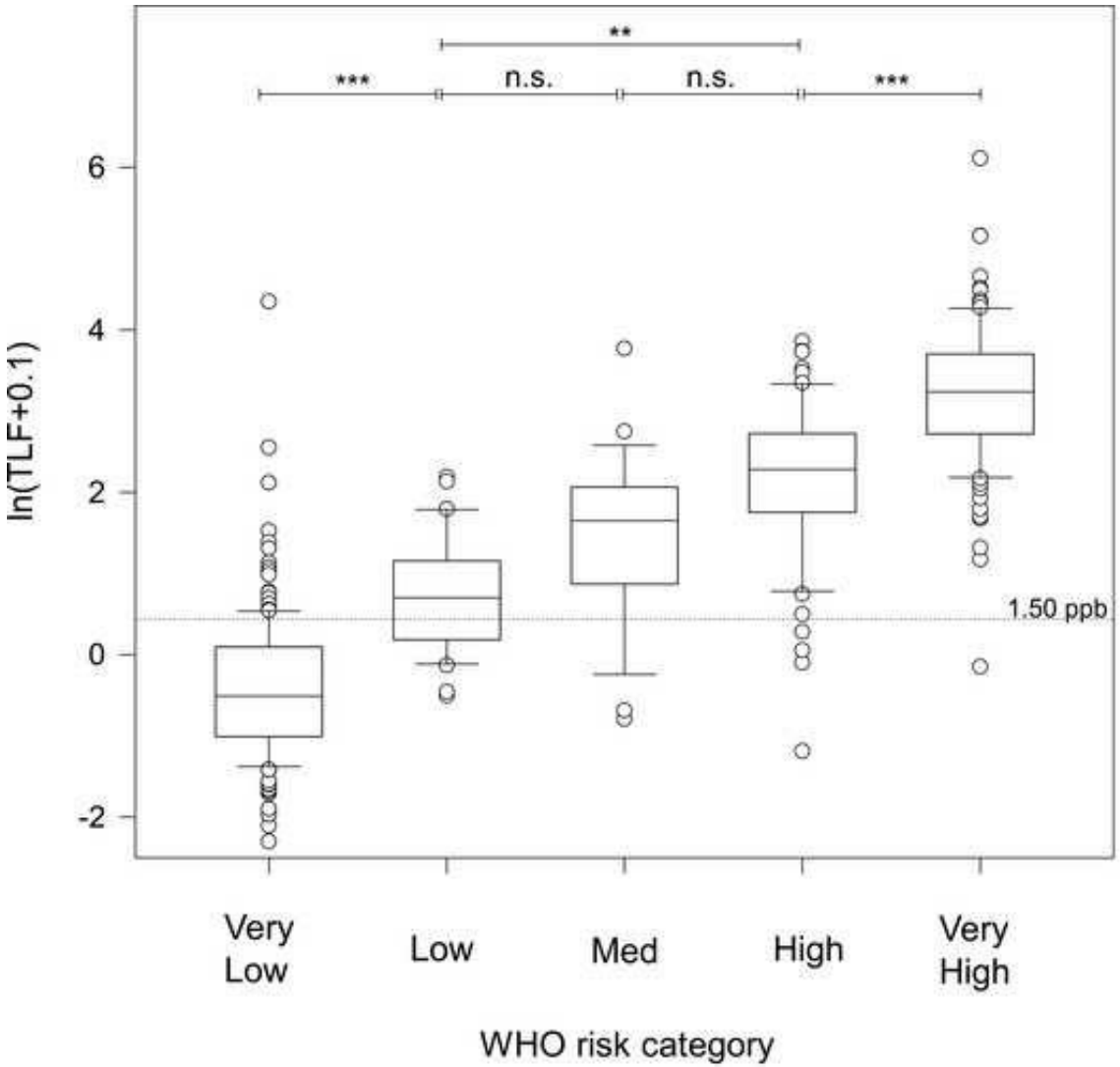
UNICEF Sep 2016 initiative to accurately determine faecal contamination as rapidly as possible - set criteria for technology

- ✓ Rapid result - instantaneous
- ✓ The technology is portable, low-power and ‘field ready’
- ✓ Limit of detection appears 10 TTC colony forming units (cfu)/100mL
- ✓ False-negative error rate of 10%

False-positive error rate of 15% - above 10% limit

- ✓ TLF can distinguish between some WHO TTC risk groups

Current TLF-TTC relationship



Going forward with AfriWatSan?

- Current published data n=382 from 3 environments. Will it work everywhere?
- False-positives?
- Why is there a TLF-TTC relationship?
- Is TLF just an indicator of total bacteria as opposed to specifically TTCs?

References

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