Can we use bacteria isolated from bulk tank milk to monitor changes in antibiotic susceptibilities in dairy herds?

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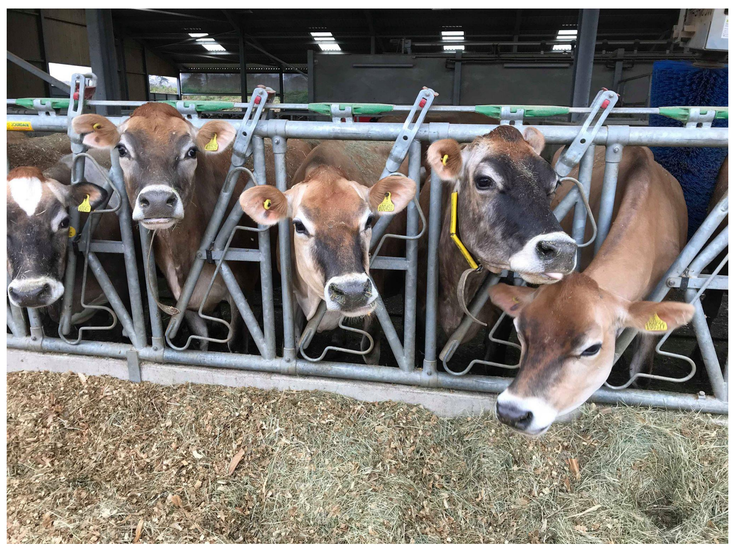


Rationale

- Antimicrobial resistance (AMR) occurs due to selective pressures on bacteria because of improper or overuse of antimicrobial agents
- Monitoring of bacteria in bulk tank milk (BTM) may be a method for detecting changing patterns in AMR on dairy farms
- This relies on the assumption that this will be due to changes in antimicrobial use (AMU) or farm management practices
- On farm surveillance of AMR may help inform the veterinarian or farmer of the efficacy of antimicrobial products, ensuring effective treatment, as well being important for maintaining good public health

Hypothesis

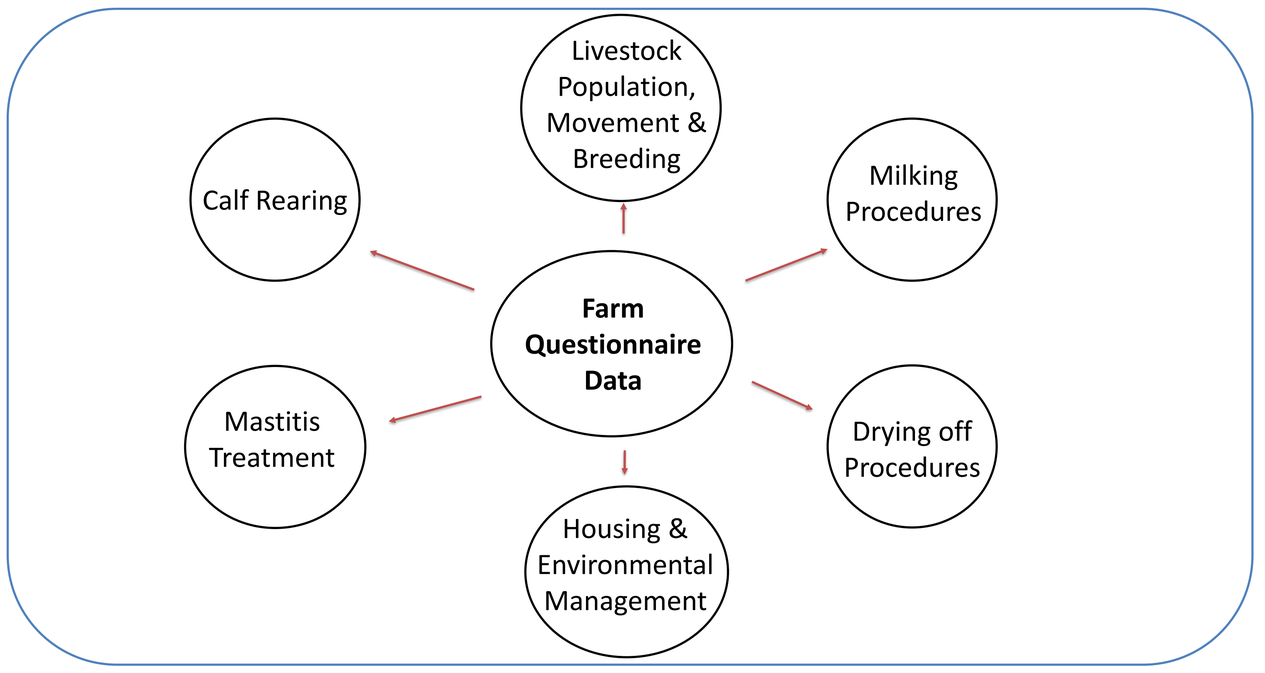
"On farm antibiotic use and farm management practices contribute to changing patterns of antimicrobial resistance."

Outline of Study

- A retrospective study examining **antibiotic use** and **susceptibilities of bacteria** isolated from BTM samples going back over a number of years
- Recruited 16 dairy farms which all supplied a farmer owned dairy cooperative
- Farms were visited over a number of weeks by the author to introduce farmers to the study and to carry out an **farm questionnaire** to consider **management practices** and other farm details, but this only captures current practices so less retrospective

Aims

- ✓ Assess importance of changes in antimicrobial susceptibilities over an extended period
- ✓ Investigate potential relationships between AMU and changes in susceptibilities (if any)
- ✓ Identify what role (if any) farm management may have on bacterial susceptibilities
- ✓ Evaluate the importance of any relationships and patterns which may emerge for the dairy industry



Antibiotic Use Data

- 6 years (April 2013-April 2019) of antibiotic product **sales** data for each farm obtained from veterinary clinics & Farmacy (online)
- Sale of product acting as a proxy for on farm use
- Data sorted and refined to determine active ingredients, quantity, concentration and ultimately amount in grams
- Total antibiotic (grams) for each antibiotic class determined for each quarter of the 6 year period

Antimicrobial Susceptibility Data

- BTM samples for the 16 farms for each year from August 2014-19.
- Susceptibility testing performed according to procedure outlined by Thermofisher's **Sensititre Antimicrobial Susceptibility Testing System**
- E.coli & Enterococci selectively cultured and isolated (minimum of 6 isolates each per farm) from milk fat (*E.coli; n*= 499, *E.faecalis; n*= 500, *E.faecium; n*= 264, *E.durans; n*= 48)
- Average **minimum inhibitory concentration (MIC)** of each antibiotic for the 6 isolates plotted

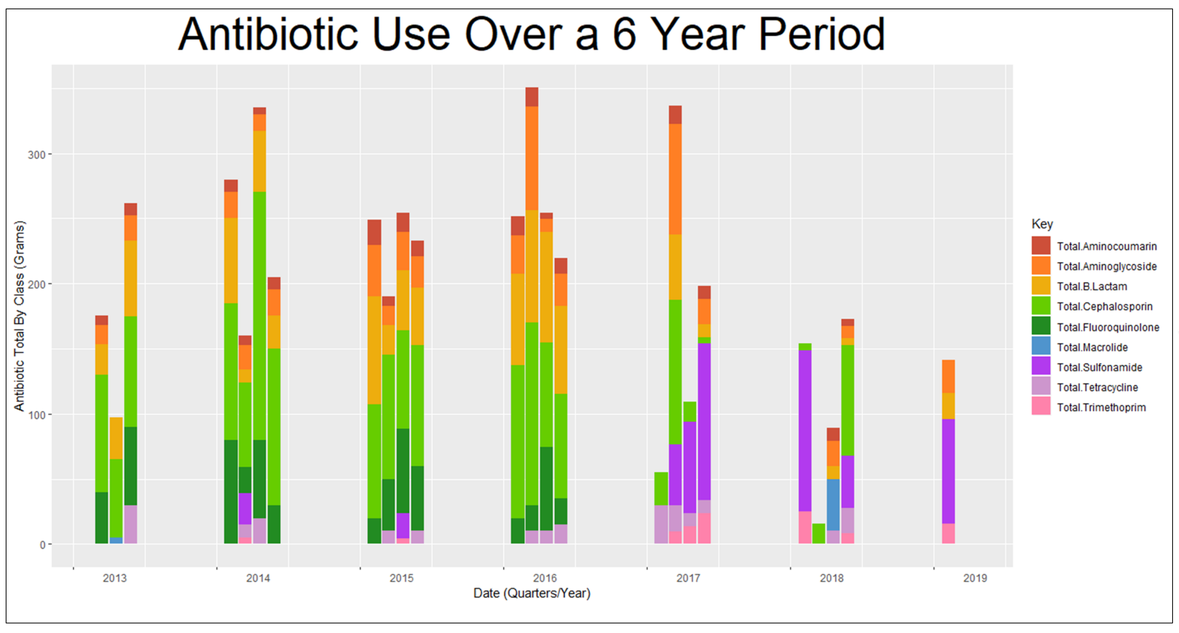


Figure 1; Antibiotic use (grams) per quarter/year for each antimicrobial class

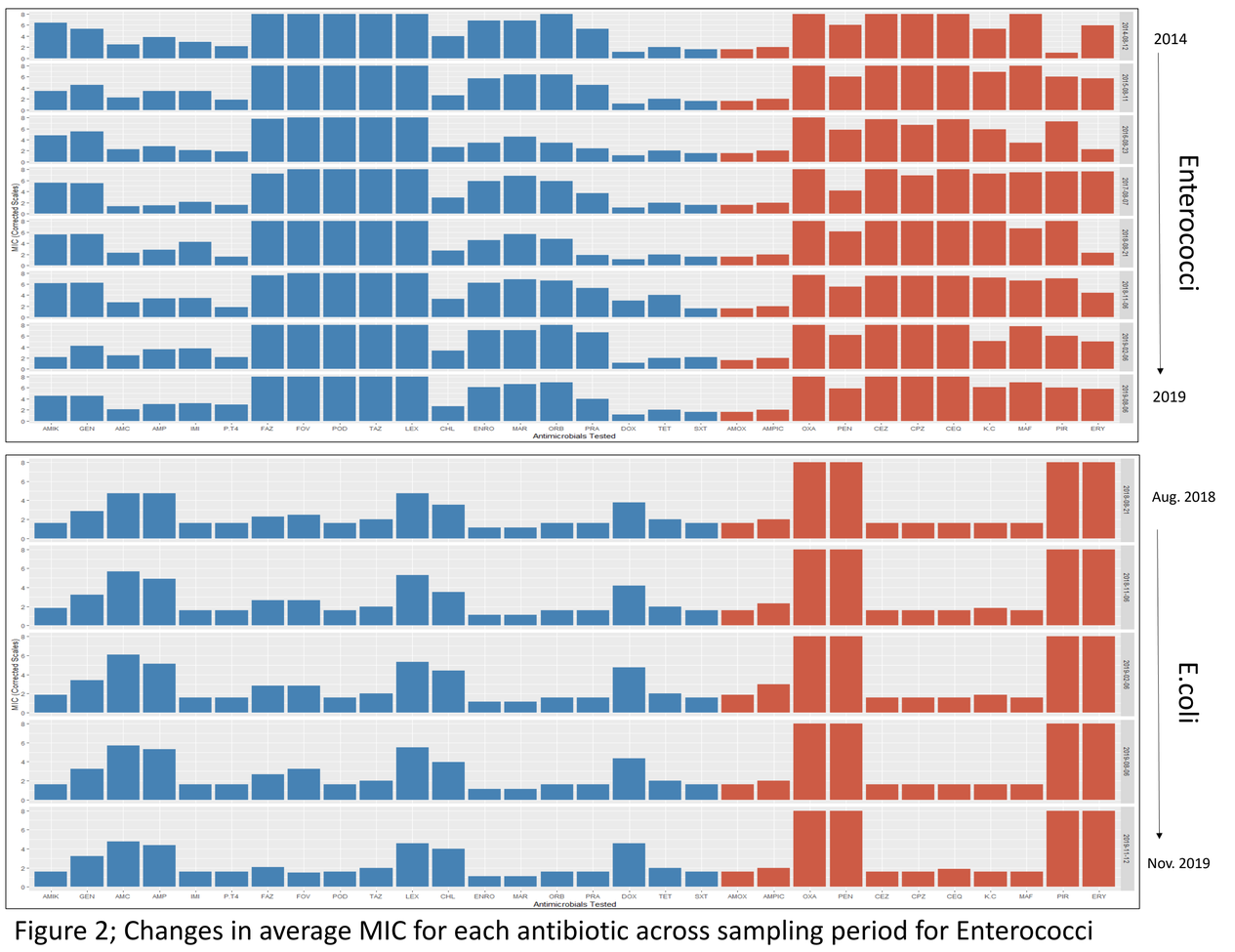
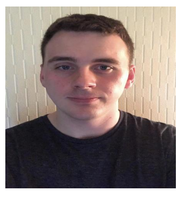


Figure 2; Changes in average MIC for each antibiotic across sampling period for Enterococci (top) and E.coli (bottom)

Outcomes

- Surprisingly, changes in AMU are not reflected in AMR patterns – some relationships do exist but this is not uniform across all farms
- Perhaps E.coli & Enterococci are not good indicators of resistance in BTM?
- Further work to be carried out assessing impact of farm management

Can we confidently monitor changes in AMR at the farm level?



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