How to prevent *Staphylococcus aureus* mastitis

You have "Good" bacteria!

"Good" bacteria can be used as alternatives to antibiotics.

$662
Annual costs of mastitis on Canadian dairy farms per cow

48 %
Prescribed antibiotics used to treat mastitis infections in Canadian dairy cows

13 %
Clinical mastitis (CM) caused by *S. aureus* in Canada

62 %
Prevalence of multidrug-resistant *S. aureus* from Canadian dairy farms

Environmental Health

ONE HEALTH

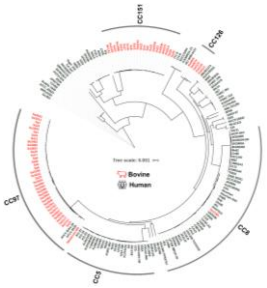
Human Health

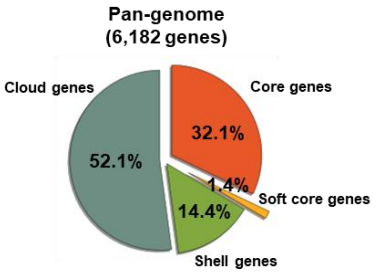
Animal Health

Sustainable agriculture without antibiotics

Comparative genomics

- Investigating phylogenetic tree, pan-genome, and genetic features of *S. aureus* originated from bovine and humans





Key finding: *S. aureus* carried host-specific genes, virulence genes, and antibiotic-resistant genes, and the horizontal gene transfer of these elements can be limited due to lineage-specific genetic barrier called restriction-modification systems.
https://www.jenniferronholmlaboratory.com/presentations

Antagonism

- Developing a new reliable screening method using a highly stable plasmid encoding a reporter gene
- Screening anti-*S. aureus* bacteria

Traditional assay

Growth-inhibition
Quorum-quenching

Newly developed assay

Simultaneously monitoring in co-culture condition

Key finding: Commensal bacteria such as *Bacillus* spp. and *Staphylococcus* spp. in bovine intramammary glands were highly antagonizing *S. aureus* either in growth or quorum-sensing.
https://doi.org/10.1186/s12866-021-02265-4

Metagenomics

- Conducting a longitudinal study on milk microbiome
- Studying the correlation between somatic cell counts (SCC) and bacterial abundance

Bacteria highly prevalent in milk samples with low SCC
Staphylococcus xylosus
Staphylococcus epidermidis
Aercococcus urinaeequi

Key finding: Milk microbiome restored after *S. aureus* clinical mastitis within two weeks. Some bacterial groups were highly prevalent in milk samples with low SCC (< 200,000 cells/mL).

Prophylactics/Therapeutics

- Applications of good bacteria with the antagonistic activity toward *S. aureus* in future

Live bacteria

Probiotics

Active biomolecules

Drugs

Academical
Moving closer to post-antibiotic era

Biological
Understanding bacterial symbiosis

Industrial
Reducing the burden of clinical mastitis