

Enhancing mastitis resistance in dairy cattle

Terhi Iso-Touru, Daniel Fischer, Minna Kyläniemi, Johanna Vilkki

Natural Resources Institute Finland, FIN-31600 Jokioinen

The aim of this project is to improve animal welfare by reducing mastitis incidences. This would lead to reduced use of antibiotics in livestock production and benefit farmers economically.

MASTITIS

Mastitis, inflammation of the mammary gland, is the most costly disease in dairy cattle (Fig 1.) and also a major animal welfare concern.

Mastitis can be expressed as mild sub-clinical, acute (clinical) or chronic inflammation of the mammary gland; caused by various bacteria (e.g.: *Staphylococcus aureus*, *Escherichia coli*, coagulase-negative staphylococci CNS, *Streptococcus dysgalactiae*, *Streptococcus uberis*), which activate the mammary immune system in a variety of ways, and thereby influence the severity of the disease.

Mastitis resistance in cattle is a complex trait, with low to moderate estimated heritabilities and so far the studies have not been able to identify the causal mutations (e.g. Schulman et al. 2009).

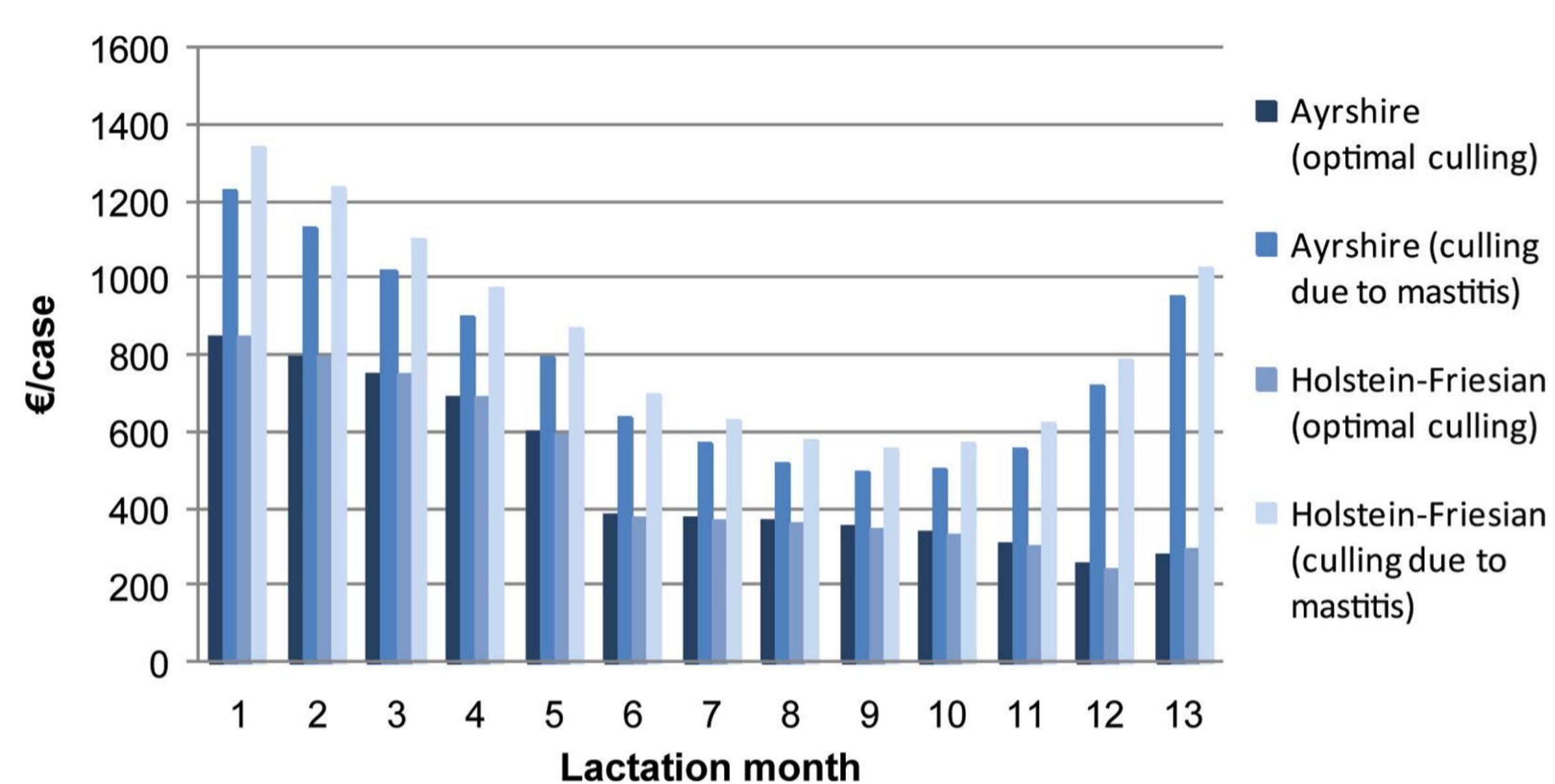


Figure 1. The costs of the first clinical mastitis case in the third lactation (figure from Heikkilä et al. 2012).

METHODS

We will create cell lines from primary bovine mammary epithelial cells (pbMECs) and challenge cells *in vitro* with two common mastitis pathogens to study the innate immune response (Fig. 2).

We will use RNA-Seq, miRNA-Seq and ATAC-Seq data from challenged cells to find candidate regions for regulation of immunological responses together with genome wide association (GWA). By overlapping data from the two approaches, we will be able to distinguish between causative and neutral variants in the candidate regions. Causative variants can be used for selecting cattle population that is more resistant to mastitis.

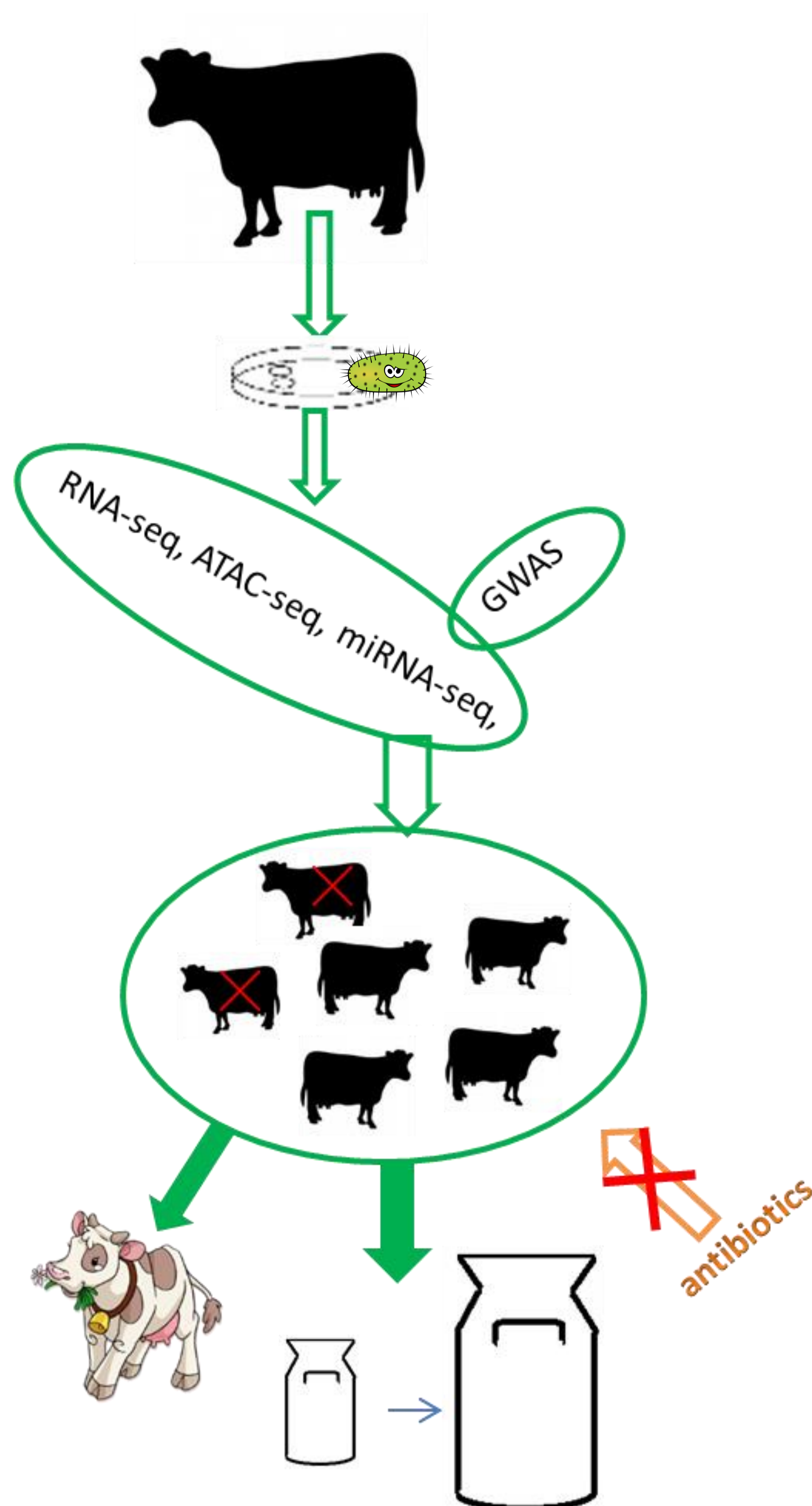


Figure 2. Schematic presentation of the project.

References

- Heikkilä, A-M, Nousiainen, J., Pyörälä, S. Costs of clinical mastitis with special reference to premature culling. J. of Dairy Science. 2012. 95:1, 139-150.
- Schulman NF, Sahana G, Iso-Touru T, et. al. Fine mapping of quantitative trait loci for mastitis resistance on bovine chromosome 11. Anim Genet. 2009;40:509-15.