Summary of research funded December 2022

Three new research grants were awarded in December 2022.

The development of ruminant mammary organoids to facilitate the study of mammary gland biology in vitro

Moredun Research Institute

Intramammary infections of ruminant livestock impact animal health, welfare, and the economics of the dairy industry worldwide. A major hurdle to studying the ruminant mammary gland is the lack of in vitro tools to perform research on the mammary response to infection under laboratory conditions. The proposal is to develop ruminant derived three-dimensional culture models (“organoids”) which represent the internal cellular structure of the mammary gland. Firstly, to establish a tissue bank from non-lactating and lactating sheep and cow at different ages and various stages of the lactation cycle. Secondly, to identify a panel of ruminant epithelial cell-type specific antibody markers using the tissue sections from lactating and non-lactating cows and sheep. Thirdly, to use the panel of basal and luminal epithelium-specific antibody markers to define the structural and cellular organization in mammary epithelial organoids. The proposal is to induce lactation by hormonal stimulation of the organoids and characterize the response by gene expression and proteomic analysis. Finally, to demonstrate the utility of ruminant mammary organoids as a model for intramammary bacterial infection. This will provide a well characterized laboratory tool in support of the development of new mastitis control measures.

The fungal milk microbiome of dairy cattle and its implications on mastitis

SRUC

Fungi are a known cause of mastitis in cattle. Despite this, fungal milk communities associated with development of intramammary infections are under researched. Mastitis is one of the most common and costly diseases in dairying, particularly due to decreased production in

subclinical cases. Commonly, broad-spectrum antibiotics are used in treatment and may lead to an unbalanced milk microbial community (microbiome), potentially allowing for overgrowth of mastitis-causing fungi. This research aims to explore the microbiome associated with healthy and mastitic (clinical and subclinical) milk, with a focus on fungi and bacterial-fungi interactions, and implications of repeated antibiotic usage. This work will contribute to a knowledge gap in dairying, by i) identifying potential milk microbiome biomarkers relating to health status, ii) providing evidence for pre/probiotic development, iii) exploring whether repeated antibiotic usage impacts upon microbiome communities and reoccurrence of mastitis. This knowledge could help farmers and industry in tackling a global issue.

Identifying critical control points for colostrum contamination and Mycoplasma prevalence in first milking colostrum from Scottish dairy herds.

University of Glasgow

Colostrum fed to newborn Scottish dairy calves is highly contaminated. Bacteria in colostrum have the potential to cause disease and prevent calves from absorbing antibodies from their gut after birth, so calves are more likely to get sick and to die. Bacterial contamination may come from a number of different sources including the: cow's udder, collection bucket, storage bucket and calf feeder. It is important that buckets and feeders are scrupulously cleaned after every use, but many farmers fail to do this. The project aims to identify the main source of contamination for first milking colostrum to allow farmers to focus their attention on these 'critical control points' which will have implications for calf health and welfare. In addition, the prevalence of Mycoplasma which causes significant disease in newborn calves will be ascertained. Recent UK work has focussed on bulk milk samples and concluded that contamination is low, but prevalence in colostrum is unknown.