

## Ongoing Research & Development Projects

**PROJECT TITLE:** Towards a better understanding of using breeding to control mastitis in sheep and cattle.

**DATE OF COMPLETION:** June 2005.

**PARTNERS:** SLS Group, Texel Society

**FUNDING:** Genesis Faraday 'Spark' award.

**INTRODUCTION:** The purpose of the project was to investigate the opportunities for breeding for resistance to mastitis, to include the use of conventional breeding techniques, molecular genetic markers and other DNA-based technologies. The study was a desk-based review of published literature, and included a modelling component to investigate the economic impact of mastitis in UK sheep flocks.

### FINDINGS:

- There is a dearth of genetic information relating to mastitis in meat sheep breeds. All such published knowledge is in dairy cattle and dairy sheep.
  - The number of mastitis cases in sheep varies considerably, depending on the method by which they were recorded, on the breed and farm. Up to 46% of cull ewes were due to mastitis in one study, whereas others reported between 5% and 12% of all ewes in a flock having mastitis.
  - The onset of mastitis can be at any time during lactation, although the majority of mastitis cases occur up to the first third of lactation. Mastitis that occurs during lactation is largely due to different pathogens than those responsible for mastitis after weaning, which in turn is closely associated with lack of environmental hygiene.
  - The economic impact of mastitis in pedigree flocks was investigated using Markov-chain modelling techniques. Using a set of assumptions about key farm parameters that reflect lowland sheep production, including 10% incidence of mastitis, the economic impact per flock is estimated to be £11 per ewe at risk, or 6% of gross margin (GM)
  - Some of the key parameters used in the model were sensitive to the analysis. These include the risk of getting mastitis, where a 50% increase (to 15%) leads to a £17 (9%) reduction in GM. Of greatest sensitivity of the assumptions tested was the reduced proportion of breeding stock sales if the ewe was mastitic (default setting was 0.33). If this setting was reduced by 50% to 0.165 then GM rose to £185/ewe, corresponding to a mastitis cost of £6/ewe. However, a 50% increase in this assumption reduced GM to £174/ewe (£17/ewe for mastitis).
  - Due to the difficulties encountered from using cases of clinical mastitis (CM) as a breeding goal trait, many dairy breeding programmes currently use the proxy trait, somatic cell count (SCC) as an indicator of resistance to mastitis. SCC is measured in milk, and is positively correlated to CM as well as being an indicator of subclinical mastitis. SCC has a higher heritability (0.04-0.24) than CM (0.001-0.08), which makes SCC a better selection trait for inclusion into breeding programmes.
  - The use of SCC in economic selection indexes for high yielding dairy cattle is critical, to stem the correlated increase in mastitis incidence that otherwise occurs. Even though there are no reports of antagonistic genetic associations among resistance to mastitis and production in meat sheep breeds, it is important that they are estimated if selection to reduce mastitis incidence is desirable.
  - There are several studies on molecular markers and candidate genes for resistance to mastitis in dairy cattle, and some for dairy sheep. The majority of these genetic factors are located in the MHC gene complex, which is responsible for controlling immune mechanisms. Importantly, despite predictions of responses to selection using the marker(s), no reports were found of the impact that the use of these has on reducing mastitis in practice. This may be because either, (a) it is too soon to report the outcomes of using recently-discovered markers, (b) they are not being / not admitting to being used in selection programmes, or c) SCC is a cheaper and effective alternative.
  - The information on markers and candidate genes from the dairy sector can be used along with robust screening methods to detect both clinical and sub clinical mastitis in the Texel breed. Then it is possible to use comparative mapping techniques that facilitate the knowledge cross-over between different animal species for the same or similar traits. It is anticipated that this method will then identify relevant genetic markers that are important for the Texel breed. These markers could be used on their own or integrated in existing breeding programmes. Despite the need to take milk samples from lactating ewes to detect the markers in the initial study, it is possible that their use can negate the need to continue with milk sampling in the future.
-