

Immunity+ and SCS

Immunity+ has a positive association with SCS for both cows and bulls however it has not always been significant given the amount of data available. The low-to-moderate correlation between immune response and SCS indicates that they're not the same traits. Immune response is very important for providing a broader-based resistance to mastitis.

The adaptive immune response traits measured in this research did not have significant associations with SCS. Somatic cell score is a measure of the number of cells present in milk and can be used as an indicator of infection causing mastitis. It is generally composed of neutrophils and macrophages that migrate to the udder to act as a first line of defense against pathogenic microorganisms (Oviedo-Boyso et al., 2007). During a microbial infection, neutrophils are recruited to the mammary gland and form the vast majority of the somatic cells (Kehrli and Shuster, 1994). Neutrophils are considered part of the innate immune system, whereas the immune response traits CMIR (cell-mediated immune response) and AMIR (antibody-mediated immune response) measured in this research are part of the adaptive immune system, mediated by T cells and B cells. Therefore, it is predictable that no significant association would exist between the adaptive immune response traits CMIR and AMIR measured in this research and SCS.

Mastitis is one of the most costly and complex diseases affecting dairy cattle. Its' complexity lies in the multitude of mastitis-causing pathogens which use diverse mechanisms to infect the host and can cause clinical or subclinical mastitis, which is associated with a range of physiological symptoms that affect milk yield and quality. Current breeding strategies to decrease mastitis include direct selection by using clinical mastitis records or indirect selection methods by using traits genetically correlated with mastitis, such as somatic cell score (SCS).

Although selection for lower SCS & clinical mastitis records in coordination with mastitis control programs have been somewhat successful in controlling mastitis, there are caveats associated with both. Selection against clinical mastitis will likely leave cattle susceptible to infection with other mastitis pathogens, since bacteria require unique immune responses for host protection and mastitis pathogens have been demonstrated to change over time and geographically. Further, the heritability of mastitis resistance is low; it was recently demonstrated in Canadian Holsteins to be about 0.02. Breeding for decreased SCS is an alternative, as it is genetically correlated with mastitis and has a higher heritability, of about 0.11. However, SCS tends to be useful for monitoring subclinical cases, and although decreasing bulk tank counts have been associated with a decline in subclinical mastitis, clinical mastitis continues to be a problem in many herds. Since most of the cells that constitute the SCS are cells of the immune system, an SCS that is too low has been associated with an increased risk of clinical mastitis. Breeding for enhanced immune responsiveness, as suggested here, is a solution to provide cows with an overall superior ability to respond to a variety of pathogen types requiring unique responses to provide broad-based disease resistance.

Immune response measured on Semex bulls has been shown to have a -11% correlation (favourable) with SCS proofs on these same bulls (December 2012). This is a low but favourable correlation. It demonstrates the complexity of the immune response system in building resistance to mastitis pathogens, and the limitation of SCS when a more broad-based resistance against mastitis pathogens is sought.