Comparison of blood and milk non-specific immune parameters in heifers after calving in relation to udder health

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Abstract - A practical protocol to study udder immune status in field conditions was planned with the aim to assess different non-specific immune parameters in milk samples from dairy heifers during the periparturient period. Five herds located in northern Italy were selected and overall 39 heifers were enrolled in the trial. Milk samples were taken at 7, 14, 21, 28, 45, 60, and 75 days after calving. The parameters assessed were N-acetyl-β-glucosaminidase (NAGase), lysozyme, respiratory burst (RB), somatic cell counts (SCC) and serum protein profile. SCC and NAGase were higher in the first sampling after calving, while lysozyme showed large variations during the observation period without a definite trend. The levels of RB observed in the first two weeks after calving, even if lower, were not statistically different from the values observed in samples taken over the following weeks. This study confirmed that the levels of immune components in milk are different from what is observed at blood level in the same cow. A significant decrease in RB in milk polymorphonuclear leukocytes (PMN) post-calving was not observed; milk PMN from healthy cows showed low RB levels, while the values from infected quarters were significantly higher. Significant differences between healthy and infected animals were also observed for milk NAG, lactoglobulin and albumin. These data suggest that udder immune response could be influenced both by the cow immune status and by external factors such as pathogens and management. Therefore, the reduction in immune defences, particularly in heifers, is not unavoidable and methods to boost PMN activity should be explored.

Key words: heifers / periparturient period / blood milk / non-specific immunity

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Efficient heifer calves exhibited higher specific immunoglobulin M than inefficient calves. Throughout the test, efficient heifer calves had elevated potassium and phosphorus, and reduced alkaline phosphatase (ALP) compared to inefficient heifers. Assessments of blood analytes and performance were made in heifer calves and pregnant heifers. Residual feed intake, a measure of feed efficiency, was used to categorize each population of heifers as either efficient or inefficient. We hypothesize that the evaluation of blood parameters in heifers of distinct developmental stages will broaden the understanding of the biology underlying feed efficiency. This may lead to the identification of blood constituents that could serve as proxies for feed efficiency. Animal health and well-being play vital roles in achieving this potential, and one disease that can influence future productivity is heifer mastitis caused by Staphylococcus aureus, the coagulase-negative staphylococci (CNS), and the environmental streptococci (Streptococcus uberis, Streptococcus dysgalactiae). The greatest development of milk-producing tissue in the udder occurs during the first pregnancy, so it is important to protect the heifer mammary gland from pathogenic microorganisms to ensure maximum milk production during the first and future lactations. A greater focus on heifer mastitis began in the mid 1980s after several dairy producers in Louisiana complained to university researchers that a large percentage of their heifers were freshening with clinical mastitis. Hypocalcemia impacts fresh cow health, future milk production, and reproductive performance. Studies also have shown that immune function is compromised in dairy cows with low blood calcium concentrations. Cows with lower blood calcium concentrations within the first day after calving are more likely to have a displaced abomasum, ketosis (and fatty liver), retained placenta and resulting metritis, and mastitis. Some studies have shown a decrease in feed intake and rumination and corresponding higher non-esterified fatty acid (NEFA) concentrations after calving. Early studies showed a decrease in dry matter intake in heifers fed anionic salts, but other more recent studies have not shown this decrease.