COMPARISON OF MILK ANTITRYSIN, ALBUMIN, N-ACETYL-β-D-GLUCOSAMINIDASE, SOMATIC CELLS AND BACTERIOLOGICAL ANALYSIS AS INDICATORS OF BOVINE SUBCLINICAL MASTITIS

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ABSTRACT


Thirty-two quarters, five of which harbored subclinical mastitis, were examined daily for one month. The usefulness of milk antitrypsin, BSA (bovine serum albumin), NAGase, somatic cells and bacteriological analysis in differentiating the inflamed quarters from the healthy control quarters was analysed. Inter-quarter evaluation clearly improved each indirect mastitis parameter; NAGase and antitrypsin were better indicators of differences between infected and non-infected quarters than BSA or the somatic cell count.

INTRODUCTION

Bovine mastitis is a result of colonization of the mammary gland by pathogenic bacteria. This leads to alterations in the composition of milk.

As bacteriological testing of the quarters is troublesome and subject to error (contamination etc.), many indirect tests based on changes in the composition of milk have been introduced for screening purposes (Kitchen, 1981).

The diagnostic efficiency of any indirect test used to identify mastitis depends on the differentiation of "mastitic" milk samples from "non-mastitic" as accurately as possible.

Most cases of mastitis run as a chronic subclinical form. Many surveys have shown that 40% of milking cows suffer from chronic mastitis, which means that these cows harbour bacteria in one or more quarters (Tolle, 1971, Giesecke and Viljoen, 1974). The identification of these quarters is of major importance in mastitis control programmes.

The present investigation was carried out to compare the
precision, sensitivity and specificity of four indirect tests with the results of bacteriological examination, and to determine which test identifies most accurately the known "mastitic" quarters during a one-month follow-up period.

MATERIAL

Each quarter of eight Ayrshire cows was monitored daily for one month at the Hautjärvi research farm of the College of Veterinary Medicine. Five of these cows were in mid-pregnancy and three were in their oestral cycles. Three cows were known to have chronic subclinical mastitis in one or more quarters (five quarters infected). A total of 960 quarter-based pre-milking samples was collected daily during the follow-up period. Bacteriological analysis and cell counting were carried out on the day of each sampling and the milk samples for BSA, antitrypsin and NAGase determinations were frozen at \(-20^\circ\text{C}\) for later analysis (all analysed in the same batch).

METHODS

Bacteriological content was analysed daily in all the samples using the Scandinavian standard methodology as suggested by Klastrup (1975).

Somatic cell counting was performed using the Coulter Counter method (Tolle, 1971) with the Somafix and Somaton reagents (Coulter Electronics Ltd).

Antitrypsin was determined using the colorimetric procedure of Sandholm (1983) with a commercial kit (Eflab Mastitis Test, EFLAB, P.O.Box 106, Helsinki 81, Finland). In this colorimetric test, the whey sample is mixed with a standard amount of trypsin and the excess trypsin activity measured using n-benzoylarginine-\(p\)-nitroanilide (BAPNA) as the substrate. The increased trypsin-inhibitor capacity indicates leakage of \(\alpha\)-protease-inhibitor from blood into the milk compartment due to increased permeability during inflammation (Sandholm et al., 1984).

BSA was determined using the radial immunodiffusion technique of Mancini et al. (1965) (Giesecke and Viljoen, 1974).

NAGase was determined essentially as described by Kitchen et al. (1980) using 4-methyl-umbelliferyl-N-acetyl-\(\beta\)-D-glucosaminidine as the substrate solution (2 mM in 0.25 M citrate buffer, pH 4.6). The incubation time was 15 min at \(37^\circ\text{C}\). When the