Immunobiology of bovine mammary gland: apoptosis of somatic cells in milk during naturally occurring mastitis

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Abstract

Mastitis remains a major cause of economic losses in dairy herds. It is believed, that the enhancement of natural defense mechanisms in mammary gland may be helpful in the treatment of bovine mastitis. Our study was designed to assess the apoptosis of leukocytes isolated from bovine milk during subclinical staphylococcal mastitis. Milk samples were collected from cows naturally infected with one pathogen – Staphylococcus aureus and from animals with mastitis caused by several pathogens, including S. aureus. It has been determined that the rate of apoptosis was lower in mastitic milk, as compared with control samples, although varied significantly between groups. High percentage of apoptotic cells was detected in milk with high counts of pathogenic bacteria. In all groups the rate of apoptosis was dependent on the bacterial load, although various correlations were identified. Thus, it is postulated, that the rate of apoptosis of somatic cells in mastitic milk is related to the etiology of infection and is determined by the bacterial load.

Key words: bovine mastitis, inflammation, somatic cells, apoptosis

Abbreviations: Br-dUTP, 5-Bromo-2'-deoxy-uridine-5'-triphosphate; CFU, colony forming units; LPS, lipopolysaccharide; MNs, macrophages; PCD, programmed cell death; PFA, paraformaldehyde; p. i., post infection; PMNs, polymorphonuclear leukocytes; TdT, terminal deoxynucleotidyl trasferase; TUNEL, terminal deoxynucleotidyl transferase (TdT)-mediated dUTP nick-end labelling; hsp, heat shock proteins

Introduction

The mammary glands is a very special organ. It has the unique microenvironment and defense mechanisms, including the local immune response. The activity of the immune cells (i.e. polymorphonuclear leukocytes – PMNs, macrophages – MNs, lymphocytes B and T) present in the mammary gland is modified by the various bioactive and immunoregulatory factors, such as cytokines, chemokines, apoptotic signals, heat shock proteins (hsp), as well as immunoglobulins (Ig) and hormones (estrogens, progesterone). Despite vigorous immune response, the mammary gland is very susceptible to invasion by vari-