Poster 7

ACUTE PHASE PROTEINS IN MILK: LOCAL PRODUCTION OF MAMMARY ASSOCIATED SERUM AMYLOID A3 AND HAPTOGLOBIN

Eckersall PD[1], Young FJ[1], Nolan AM[1], Knight CH[2], Scott EM[3] *Fitzpatrick JL[1]
[1]*Division of Animal Production & Public Health, University of Glasgow, Glasgow, Scotland*
**now Moredun Research Institute, Penicuik, Scotland* [2]*Hannah Research Institute, Ayr, Scotland*
[3]*Department of Statistics, University of Glasgow, Glasgow, Scotland*

Introduction

The acute phase response, triggered by infection, inflammation and trauma, is an integral part of the innate immune response and is stimulated by pro-inflammatory cytokines with production of acute phase proteins (APP) from the liver. Extra-hepatic synthesis of these proteins has been reported and bacterial infection of the mammary gland causes their secretion in milk from cows with mastitis.

Objective

To relate the pathophysiological changes of the APP haptoglobin (Hp) and serum amyloid A (SAA) and mammary associated SAA3 (M-SAA3) in milk and serum to alterations in the expression of their mRNA in liver and mammary tissue.

Materials and Methods

The concentrations of Hp and SAA or M-SAA3 were determined by ELISA in milk and serum from cows in an experimental model of *Staphylococcus aureus* induced mastitis. The expression of the mRNA coding for these proteins was assessed in both mammary and hepatic tissue from infected animals and the site of synthesis of M-SAA3 protein in mammary tissues was investigated by immunocytochemistry.

Results

The concentration of Hp and M-SAA3 in milk increased within 18 h of *S aureus* infection, with peak concentrations occurring 3 days after infection at concentrations (mean $\pm$ SEM) of 20.9 $\pm$ 11.9 μg/ml and 27.9 $\pm$ 10.1 μg/ml for M-SAA3 and Hp respectively. The increase in the milk concentration preceded the increase found in serum concentrations of both proteins as the first detectable increase of Hp and SAA in serum occurred 24 h post infection. At 48 h after infection of mammary gland with *S aureus* the relative increase of M-SAA3 mRNA (1500 x β-actin) in the mammary tissue was greater than the increase in Hp mRNA expression (20 x β-actin), whereas in hepatic tissue the increase in SAA mRNA (2.5x β-actin) was less than that for Hp mRNA (1000 x β-actin). Immunocytochemistry identified M-SAA3 protein within secretory epithelial cells at significantly higher levels in infected mammary glands than in control tissues.

Conclusion

Inoculation of mammary glands with *S aureus* was associated with local production of APP within a few hours. In mammary tissue up-regulation of mRNA for M-SAA3 was greater than that of mRNA for Hp whereas in the liver the relative up-regulation was reversed.