Pathogen specific response of the bovine mammary gland to lipopolysaccharide from E. coli and lipoteichoic acid from S. aureus

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Introduction

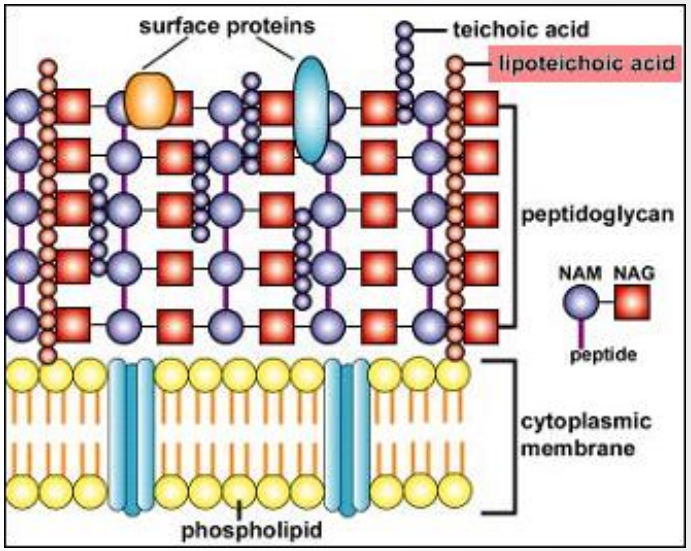
- Mastitis – common disease, economic losses
- Pathogens
- E. coli and S. aureus
- gram-positive, gram-negative
- Endotoxins

Aim of the study

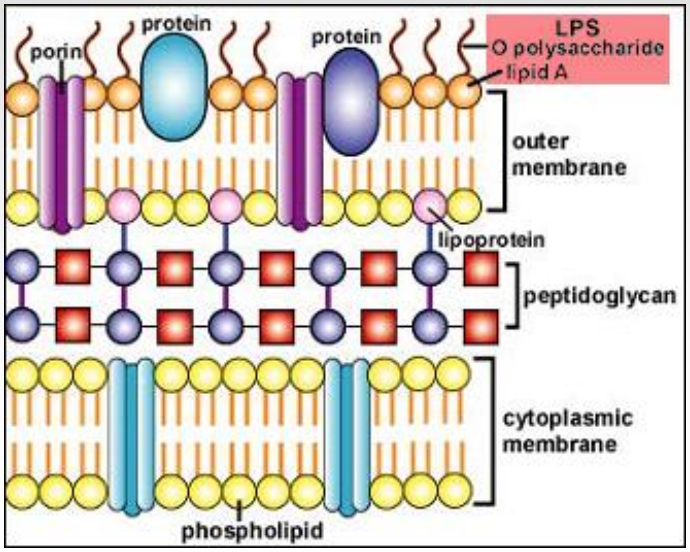
Immune response of the bovine mammary gland towards cell wall components of different pathogens

- LTA from S. aureus
- LPS from E. coli

LTA vs. LPS



- LTA (Lipoteichoic acid):
  - in Gram-positive bacteria like *S. aureus*
  - component of the capsule (murein capsule)
  - *S. aureus* causes subclinical mastitis

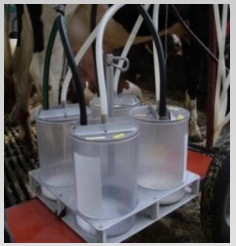


- LPS (Lipopolysaccharide):
  - in Gram-negative bacteria like *E. coli*
  - component of the outer membrane
  - *E. coli* causes mainly clinical mastitis

Experimental design

Challenge with LPS or LTA

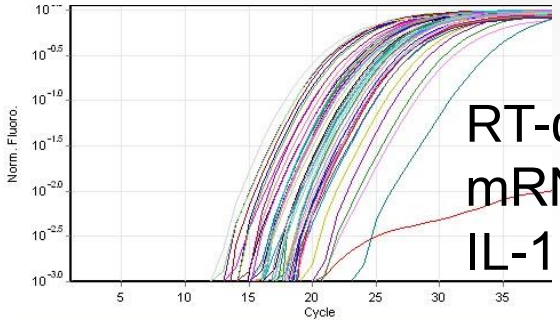
Milk



Mammary tissue

Sampling at 0, 6, and 12 h

SCC



RT-qPCR: mRNA of TNFα, IL-1β, IL-8, Lf

TNFα by RIA

LDH by enzymatic test

Parameters

Milk cells: SCC (Somatic Cell Count)
- first line of defense in the udder
- migration into the udder during infection

TNFα: Tumor Necrosis Factor α
- pro-inflammatory cytokine
- recruitment of leukocytes
- stimulating the production of secondary mediators

LDH: Lactate Dehydrogenase
- secreted during an inflammatory process by leukocytes and damaged cells of the udder's epithelial and interstitial cells

Immune Factors

IL-1β: Interleukin-1β

- pro-inflammatory cytokine
- many effects similar to those of TNFα
- mediates local and systemic inflammatory response

IL-8: Interleukin-8

- chemokine
- recruits neutrophils
- induced by exogenous and endogenous pro-inflammatory stimuli

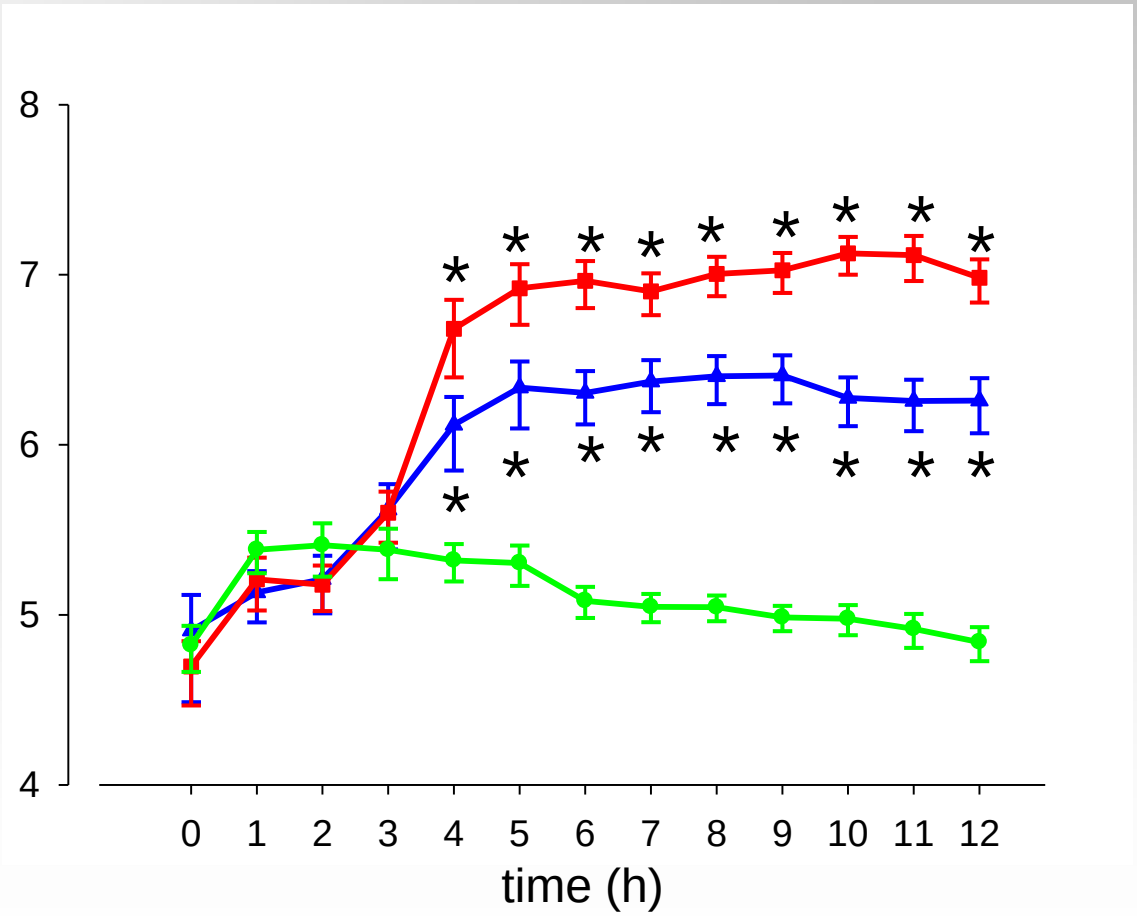
Lf: Lactoferrin

- bactericidal glycoprotein with various properties
- secreted by mammary epithelial cells and milk cells

Results

Milk: Somatic Cell Count

- LTA 10µg (n=8)
- LPS 0.2µg (n=8)
- Control (n=16)

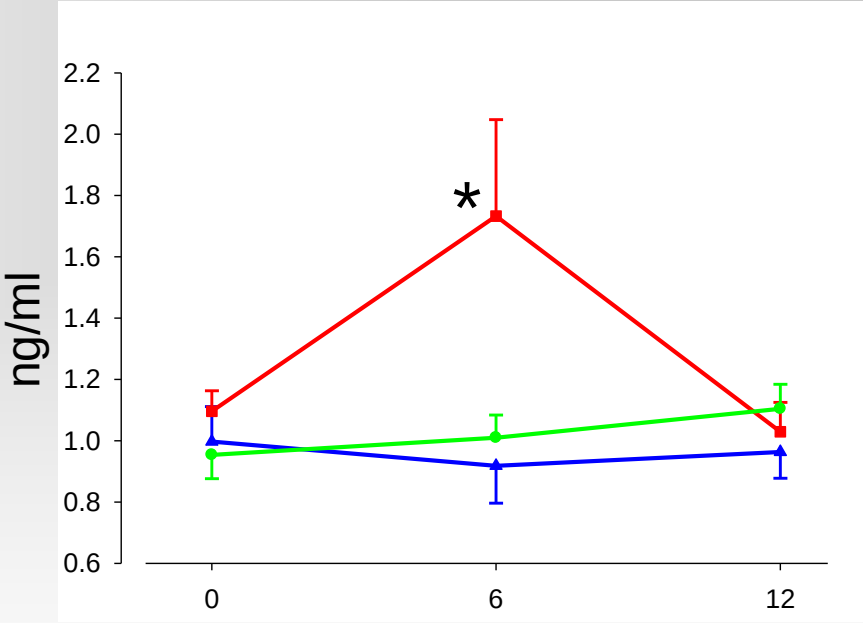


* Means differ significantly ($p \leq 0.05$) to time 0 h

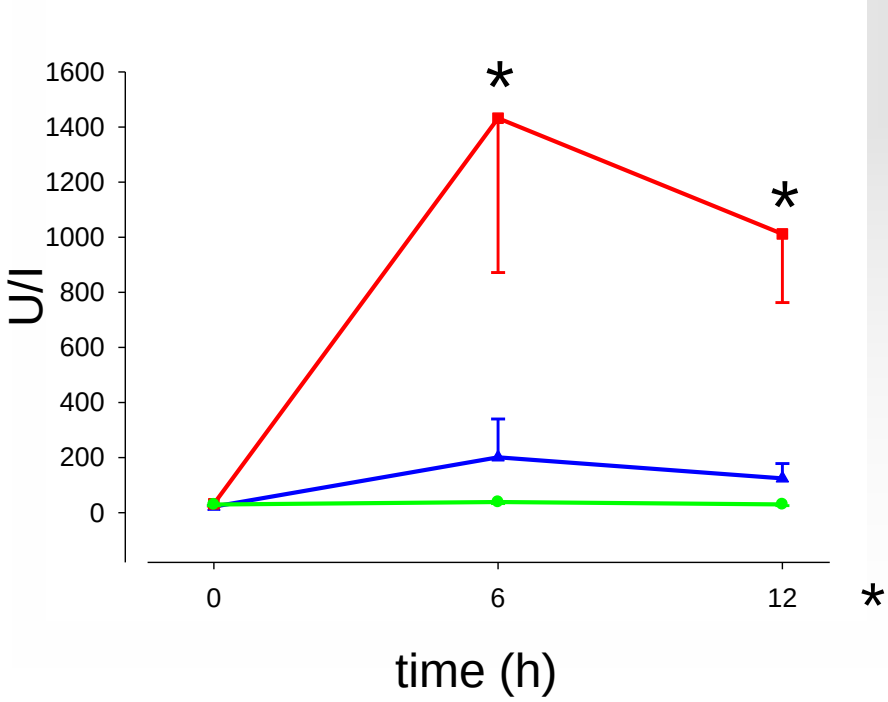
Milk: TNFα and LDH

- LTA 10µg (n=8)
- LPS 0.2µg (n=8)
- Control (n=16)

TNFα



LDH



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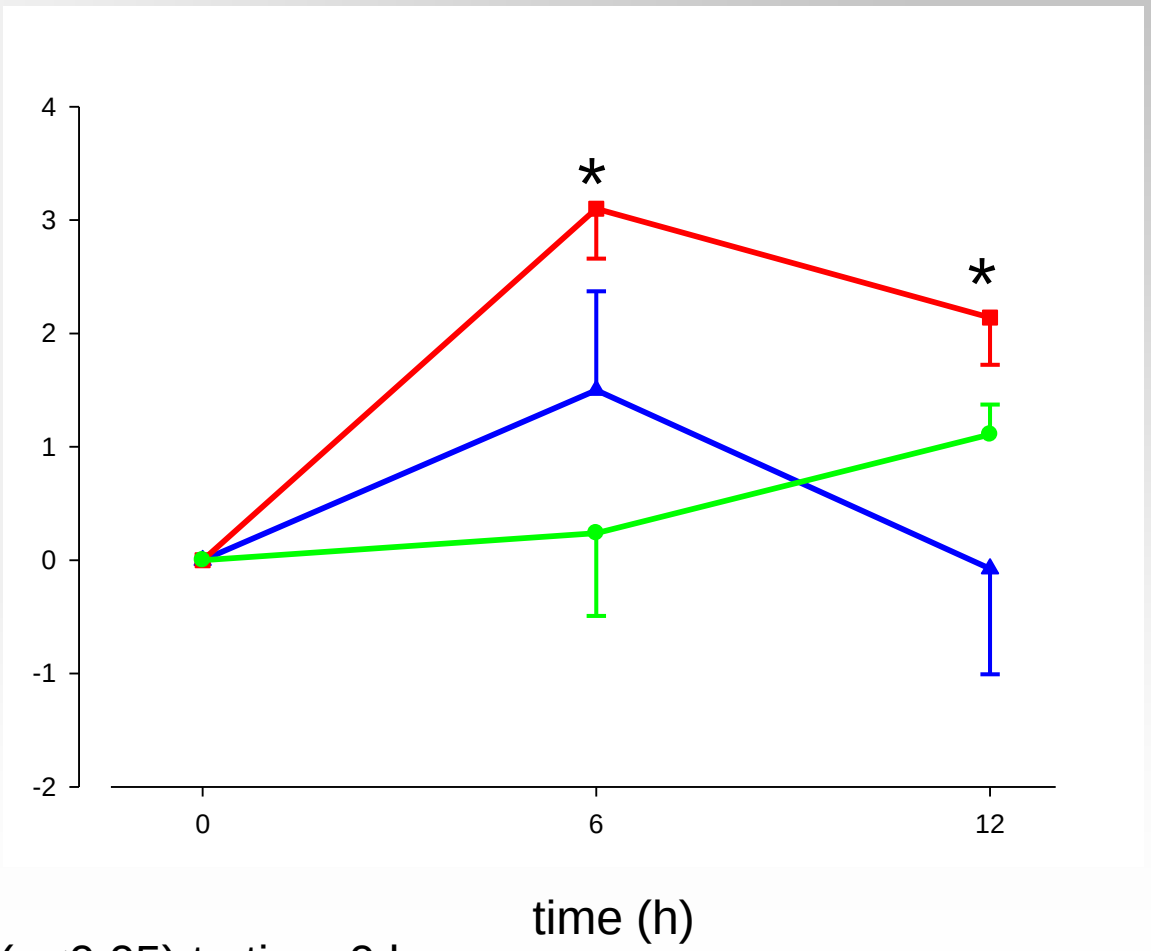
Mammary tissue: TNFα

- LTA 10µg (n=8)
- LPS 10µg (n=5)
- Control (n=13)



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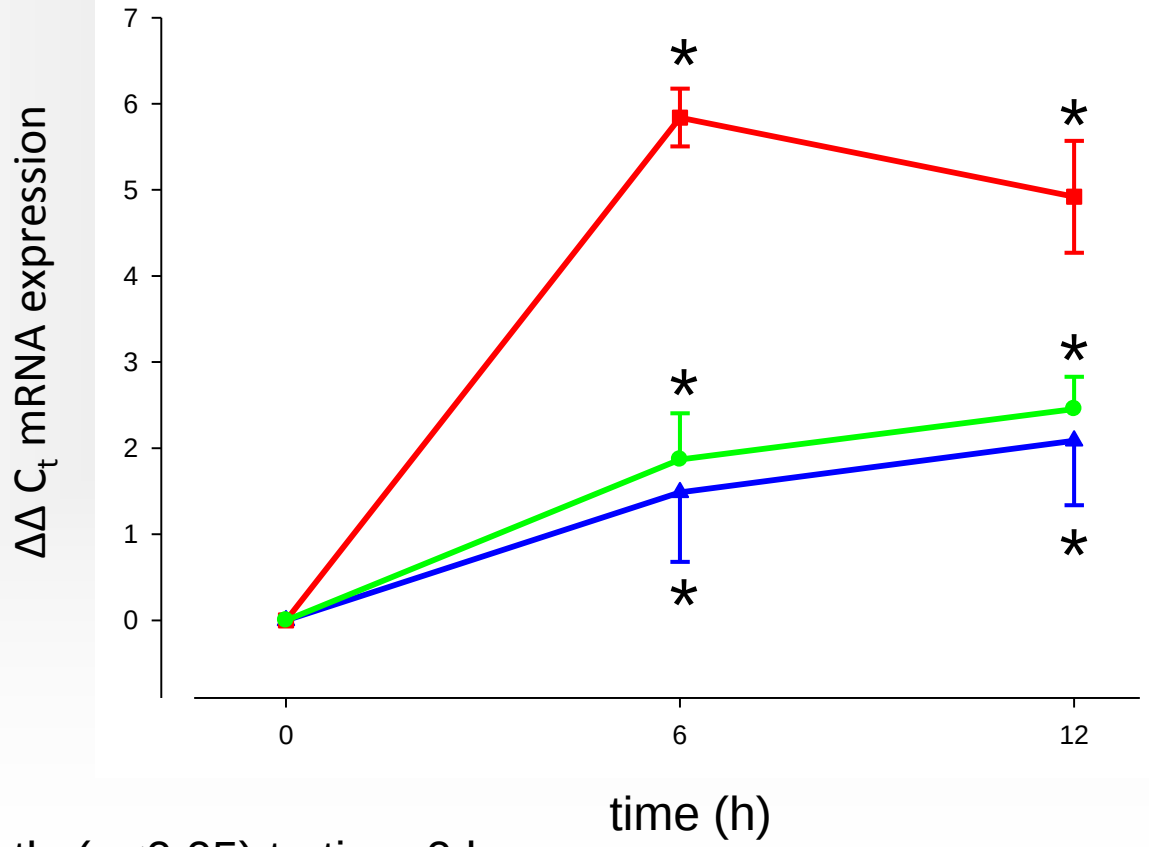
Mammary tissue: IL-1β

- LTA 10µg (n=8)
- LPS 10µg (n=5)
- Control (n=13)



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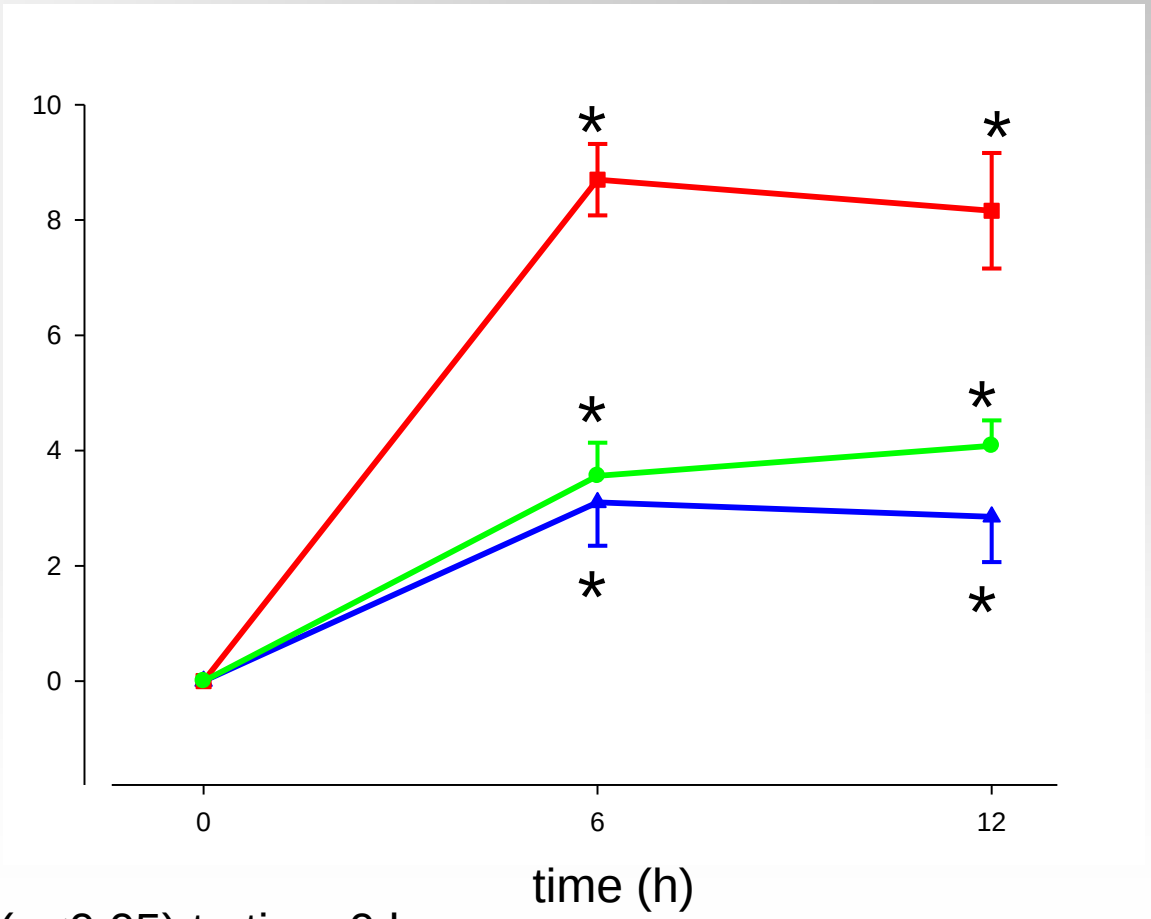
Mammary tissue: IL-8

- LTA 10µg (n=8)
- LPS 10µg (n=5)
- Control (n=13)



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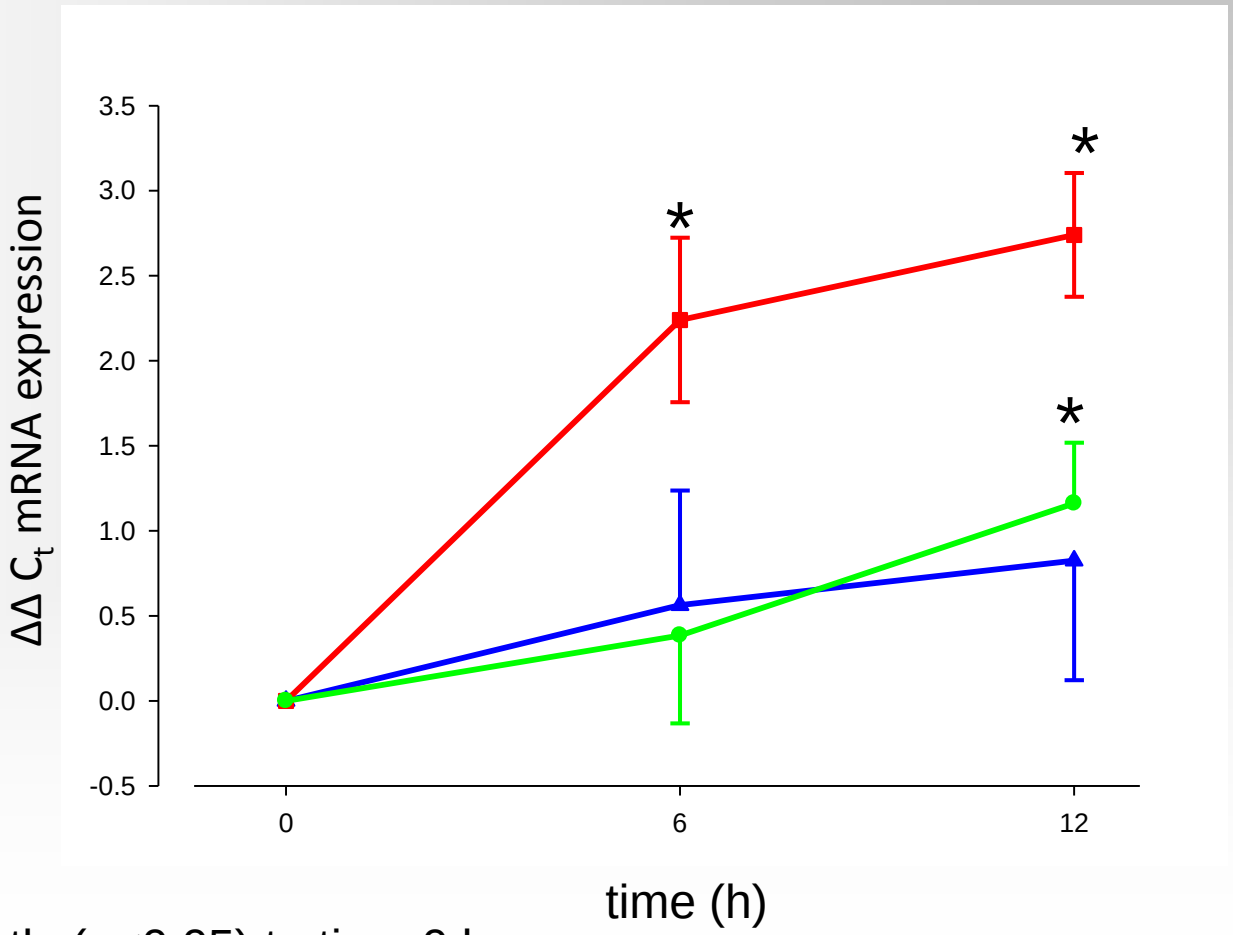
Mammary tissue: Lactoferrin

- LTA 10µg (n=8)
- LPS 10µg (n=5)
- Control (n=13)



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Summary and Conclusion

- LPS induced a stronger response of the measured factors than LTA despite similar SCC response.
- The present results are consistent with earlier investigations which showed a reduced and slower reaction of TNFα and IL-8 towards bacterial infection with S. aureus than with E. coli

Thanks for your attention!

Questions?