


Modulation of neutrophilic inflammation in the mammary gland  
Pascal Rainard (INRA)


EADGENE SABRE  
CUTTING EDGE GENOMICS FOR SUSTAINABLE ANIMAL BREEDING

Conference on Genomics for Animal Health  
Utrecht, NL 4th-8th June 2007



Modulation of neutrophilic inflammation  
in the mammary gland

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Food Quality and Safety


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Neutrophils are necessary for the defence of the MG

- Chronic to gangrenous mastitis with neutropenia
- Delay in neutrophil recruitment is associated with hyperacute *E. coli* mastitis
- High neutrophil concentrations in milk prevent infection (natural or induced)
- High neutrophils concentrations coincide with low bacteria concentrations in milk, and vice-versa

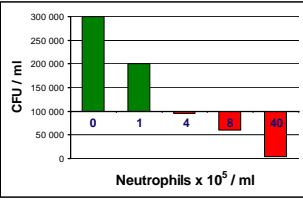
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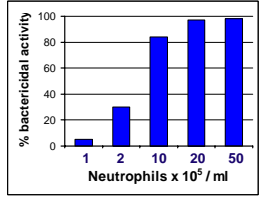
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A critical neutrophil concentration is necessary

*Staphylococcus epidermidis*




*Staphylococcus aureus*



After Li Y. et al. PNAS (2002) 99:8289-94

After Herbelin et al. J Dairy Sci (1997) 80:2025-34

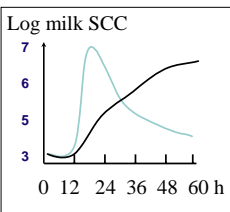
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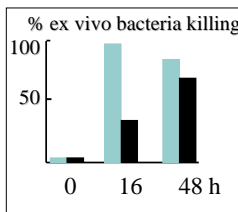


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Swiftiness of neutrophil influx is crucial

Inoculation at 0 h with *Streptococcus agalactiae*





Log milk SCC

% ex vivo bacteria killing


0 12 24 36 48 60 h

0 16 48 h

Cows ■ Immunised ■ Control

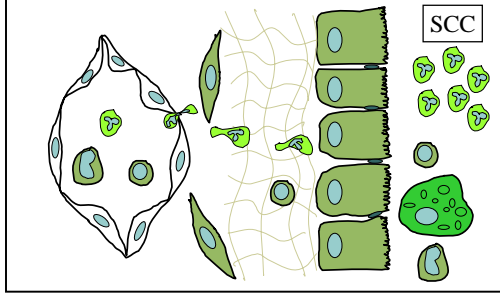
Rainard et al. (1991)

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Migration path of leucocytes in the MG



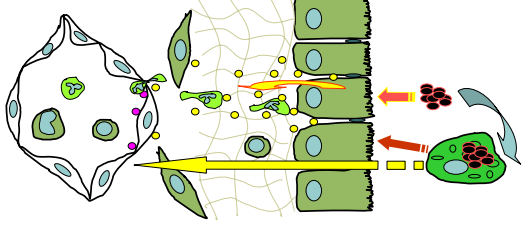
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Innate recruitment of neutrophils

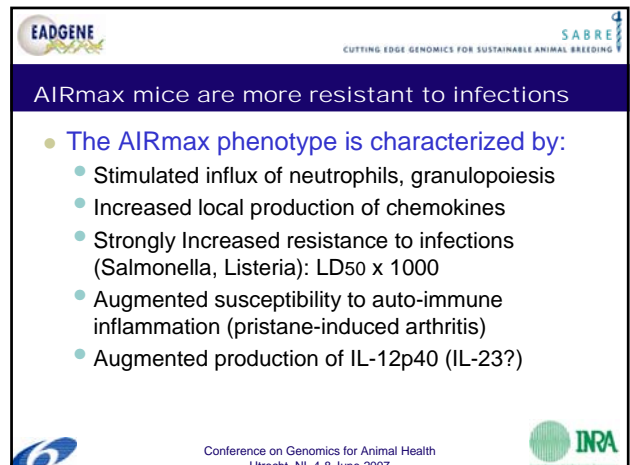
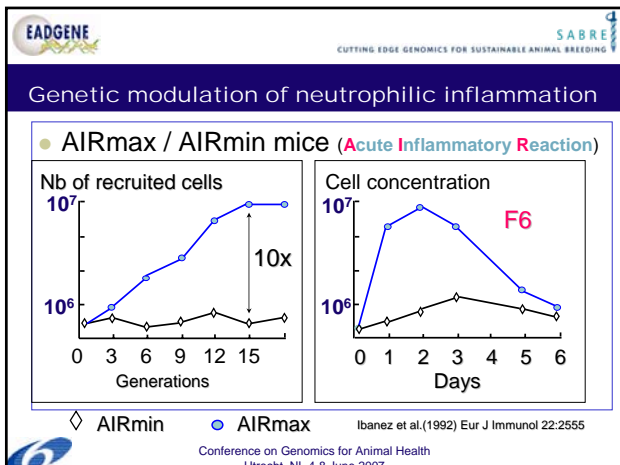
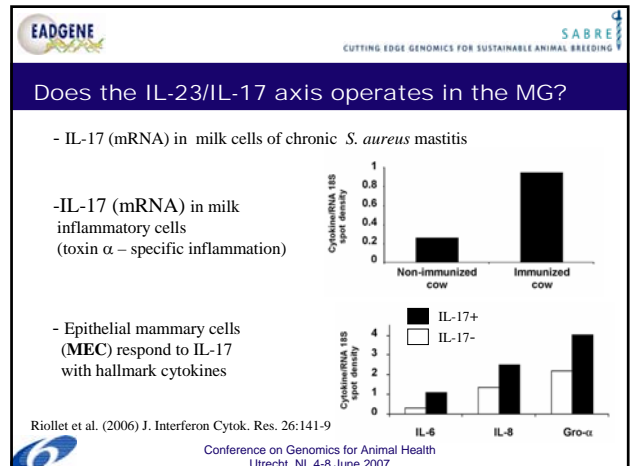
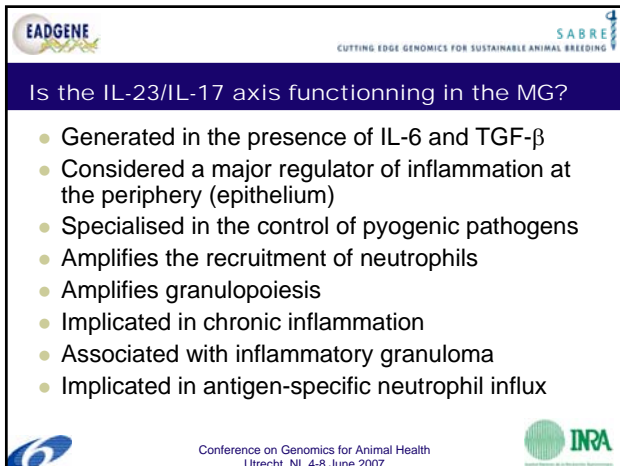
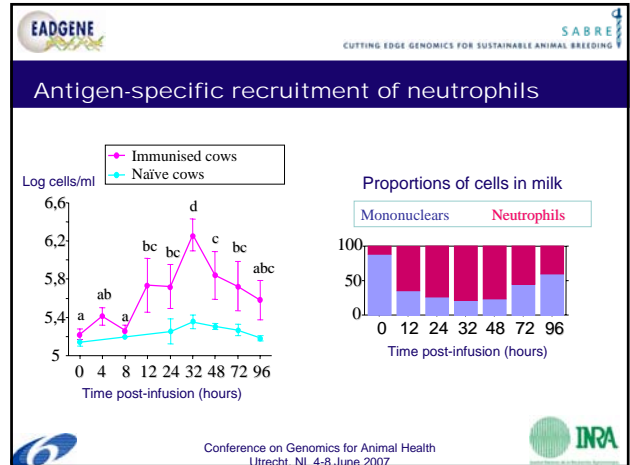
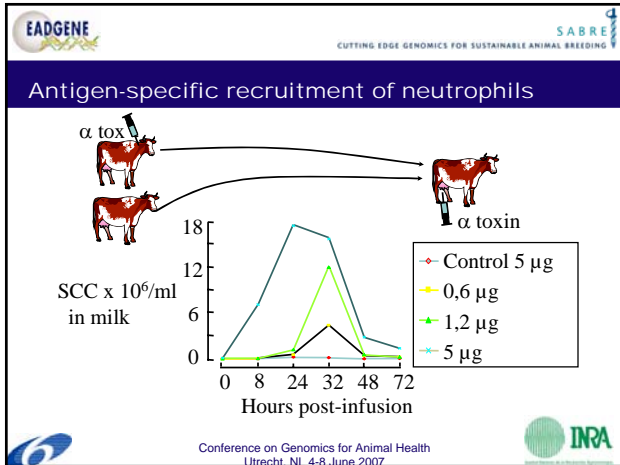


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# Modulation of neutrophilic inflammation in the mammary gland

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### Does selection against mastitis impact recruitment?

- Selection can strongly impact neutrophilic inflammation
- SCC and clinical mastitis are linked to neutrophilic inflammation
- Low SCC cows more susceptible to mastitis?
- No evidence that selection on SCC or clinical mastitis has reduced the capacity to mobilize leucocytes

→ The question is unresolved

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### Neutrophil recruitment can be modulated

- Immunomodulation
  - Specific: vaccination (IL-23/IL-17 axis?)
  - Non specific (IL-23/IL-17 axis?)
- Genetic engineering
  - Overexpression of TLR, CD14?
- Genetic selection
  - AIRmax dairy animals?: double edged sword
  - Check if selection schemes interfere

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### Neutrophilic inflammation deserves consideration

Pus  
is a pass  
to health



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