

Nature of the traits resulting from mastitis
Pascal Rainard (INRA)

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**From Infection to Inference:
Interpreting animal health and disease data**



Nature of the traits resulting from mastitis

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Definition of mastitis

- Mastitis = inflammation of the mammary gland
- Categories of mastitis
 - Infectious vs non-infectious
 - Clinical vs subclinical
 - Short-lived vs chronic
- Most frequent pathogens
 - *Streptococcus uberis*, *Escherichia coli*
 - *Staphylococcus aureus*, *Streptococcus dysgalactiae*
 - Coagulase-negative staphylococci

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Categories of mastitis traits

- Clinical signs
- Excretion of bacteria
- Changes in milk composition
 - Metabolic shift of mammary tissue
 - Inflammation

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Systemic clinical signs: example of scoring

Rectal temperature (°C)	37.8 – 39.3 39.3 – 39.8 > 39.8 or < 37.8	0 1 2
State of dehydration (enopthalmos)	None Mild Moderate Marked	0 1 2 3
Rumen contractions (nb/min)	2 or > 2 1 0	0 1 2
State of depression (attitude)	None Mild Marked	0 1 2

Mastitis score: moderate (3 – 5), severe (> 5)

Wenz et al.(2001) JAVMA 218-567

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Local clinical signs

Quarter firmness	None Firm Very firm	0 1 2
Quarter swelling	None 1.5 times 2 times	0 1 2
Quarter pain	None present	0 1
Secretion characteristics	Normal Clots or flakes Serum-like with flakes	0 1 2

Mastitis score: mild (1 – 2), moderate (3 – 4), severe (5 - 7) From Wenz et al. (2001)


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Clinical episodes of chronic infections

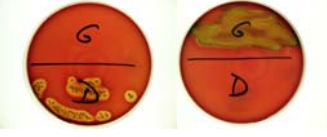
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Excretion of bacteria: technical pitfalls

- Aseptic sampling
- Culture methods
- Interpretation of results



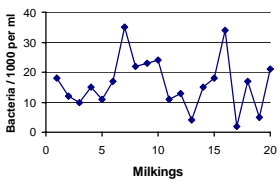
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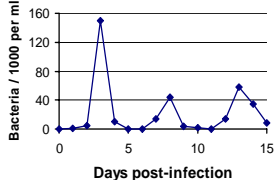
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Excretion of bacteria: irregular kinetics

Chronic *S. agalactiae* mastitis



Induced *S. aureus* mastitis



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Origins of changes in milk composition

- Reduction of milk synthesis
 - α & β caseins, β lactoglobulin
- Local synthesis of defensive proteins
 - Defensins, acute phase proteins (SAA3)
- Inflammatory response
 - Exsudation of plasma (serumalbumin)
- Tissular damage
 - NAGase

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Main changes in milk composition

- Decreases

Milk yield	- (--)
Lactose	-
β casein	---
β lactoglobulin	---
Ca ⁺⁺	---
Mg ⁺⁺	---

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Main changes in milk composition

- Increases

Conductivity	+
Serum albumin	++
Protease peptone	++
Sodium, chloride	++
NAGase	+++
SCC	++++

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Indicators most responsive to infection

- NAGase
- Acute phase proteins:
 - Haptoglobin
 - Serum Amyloid A3 (SAA3)
- Somatic cell count (SCC)

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