

Introduction to meta-analysis  
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**EADGENE** European Animal Disease Genomics Network of Excellence for Animal Health and Food Safety

## Mastitis Workshop: Biology and Meta-analysis

15th October 2009, Muséum National d'Histoire Naturelle, Paris, France



Introduction to meta-analysis

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## WP8 'Operational Genomics' and EADGENE

Emerging policies | Inputs from industry | Structural Genomics | Population Genomics | Functional Genomics

**OPERATIONAL GENOMICS:**  
DEVELOPMENT OF PLANS AND TOOLS FOR INTEGRATION AND DEVELOPMENT OF RESULTS TOWARDS APPLICATION

**Phase 1**  
Ranking infectious animal diseases according to their role in threatening the safety and quality of animal-derived food

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## Ranking infectious animal diseases

List and scores of infectious cattle diseases

Pathogen/disease	Industry concern	Economic impact	Public concern	Zoonotic potential	Animal welfare	International trade	Disease score	Genetic variation	OG rank within species	OG rank across species
<b>Mastitis</b> ★	3	3		1	2		9	3	4.5	7.5
bovine leukaemia	2	2			3		7	2	3.2	6.2
gastrointestinal parasites	2	2			2		6	2	3	6
paratuberculosis	3	3	1	2			9	1	2.5	5.5
bovine TB	2	1	1	3	1		8	1	2.3	5.3
bacterial pneumonia	3	2			2		7	1	2.2	5.2
<i>E. coli</i>	3	3	3	3	1		13		2.2	5.2
FMD	3	3	2			2	11		1.8	4.8
Brucellosis	2	2	1	3	1	2	11		1.8	4.8
BR	2	2					4	1	1.7	4.7
<i>Salmonella</i> spp.	2	2	3	3			10		1.7	4.7
AVD	3	3			3		9		1.5	4.5
Leptospirosis	2	2			1		8		1.3	4.3

Ref: G. Davies, S. Genini, S. C. Bishop and E. Giuffra 2009 An assessment of opportunities to dissect host genetic variation in resistance to infectious diseases in livestock. *Animal*, Volume 3-3: 415-436

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## Identify, propose and design an 'operational genomics' project

Overview of the kind of data potentially available

- Gene expression analysis (microarrays – ARK Genomics)**
  - At least three pathogens (*E. coli*, *S. uberis*, *S. aureus*), used for challenges of bovine mammary gland
  - Biopsies of mammary gland (by different procedures), primary bovine mammary epithelial cells and macrophages.
  - S. aureus* used to infect sheep (dendritic cells) and goat (SCC).
- To be implemented in the future by**
  - New microarray dataset from EADGENE and SABRE (new arrays, designs...)
  - QTL data on bovine and sheep: sheep (EADGENE) and bovine (SABRE)
  - Microarray raw data and QTL mapping data from model species and livestock (literature).

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## Operational genomics project = meta-analysis of mastitis datasets

Group(s)	Pathogen(s)	Challenge system	Sample type
RI/RIBFA	<i>S. aureus</i> / <i>E. coli</i>	Udder (cattle)	Udder tissues
NSVS	<i>S. aureus</i>	Macrophages (cattle)	Primary cells
ID L/RIBFA	<i>S. uberis</i>	Udder (cattle)	Udder tissues
UNIMI/PTP	<i>S. aureus</i>	Udder (goat)	Leucocytes
INRA	<i>S. aureus</i>	DC (sheep)	Primary cells

Meta-analysis is 'A combination/integration of data across studies addressing the same biological question' (R. A. Fisher, 1944; W. G. Cochran, 1953)


**OUR GOAL** has been to identify commonalities in the whole heterogeneous dataset: more power to identify relevant gene pathways, and to possibly point to candidate biomarkers for future applications

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- EADGENE and SABRE Coordination staff: Caroline Channing and Sandrine Ayuso
- The PTP's guys: Sem Genini, Gert Sclap, Bouabid Badaoui



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**Speakers of the afternoon**

**Raffaele Calogero - Turin University, Italy**  
Oncoantigens as anti-tumor vaccination targets: the chance of a lucky strike?

**Peter Sorensen - University of Aarhus, Denmark**  
Combining QTL and gene expression studies to identify important genes and genetic pathways underlying resistance to mastitis in Danish Holstein cattle

**Bouabid Badaoui - PTP, Italy**  
EADGENE's mastitis meta-analysis results



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