Genetic evaluation of mastitis in France

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Clinical Mastitis (CM)

Economic issue →

- High veterinary costs
- Lower milk production and milk price
- A major culling reason

Indirect selection through Somatic Cell Scores (SCS)

Since 1997 in France

Genetic correlations with CM = 0.6 – 0.7

Not the same trait

Need a direct evaluation of mastitis

Clinical Mastitis (CM)

Mastitis during the lactation ? 0=no / 1=yes

- Data collected since 1995, but better quality since 1998
- Reported monthly to milk recording technician by the farmer

Trait definition for genetic evaluation =
a CM case during first 150d of lactation
First three lactations

Genetic evaluation development

Genetic evaluation developped since June 2011 for the Brown Swiss breed

- Genetic parameters estimation
- Data editing
- Statistical model and evaluation

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- Pre-adjusted record ➔ Multi-trait evaluation
  Genetic correlations
- Combined EBV publication

Genetic parameters

Same parameters as the Holstein breed

About 300,000 lactations (L1 to L3)
Take into account repeated data.

Genetic standard deviation	0.0412
Heritability %	1.8
Repetability %	5.5

Low heritability but genetic variability exists

Data editing

1= mastitis event ?

0= healthy cow **or unreported case**

We must **to be sure that 0 = healthy cow**

Data selection (lactations)

Number of CM herd * year (min 1)
Number of CM herd * region (min 3 %)
Knowns parents, lactation <= 3 etc..

Official Data Oct 12

233 179 L.

↓

88 738 L.

7 907 L. (9%) with CM

Statistical model

Caracteristics:

- repeated data (several lactations per cows)
- heterogeneity variances (lactation * year)

Effects
- **herd x year** interaction
- **month of calving x year** interaction
- **age at calving x parity x year** interaction
- **genetic effect**
- **permanent environment effect**
- residual

Multitrait evaluation

Pre-adjusted record computed for each recorded cow

- Record – estimates of non genetic effects
- For each cow, average over 1-3 lactations + weight

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Multi-trait model (Ducrocq, 2001)
Combining different traits (14)

➔**Selection on the others traits taken into account**

Genetic correlations in Brown Swiss

	SCS	Long	CM	FerC	FerH	RLS	FU	UD	UB	TL
Milk Y										
SCS			0.66							
Long			0.38					-0.45		
CM										
FerC					0.63					
FerH										
RLS										
FU								0.57	0.70	-0.36
UD									0.55	
UB										

ρ >0,35 <-0,35

Genetic correlations in Brown Swiss

	SCS	Long	CM	FerC	FerH	RLS	FU	UD	UB	TL
Milk Y								-0.35		
SCS		0.35	0.66							0.35
Long			0.38	-0.30	-0.31	0.30	-0.32	-0.45	-0.35	0.35
CM										
FerC					0.63					
FerH										
RLS										
FU								0.57	0.70	-0.36
UD									0.55	
UB										

ρ >0,35 <-0,35 0,25-0,35 -0,25-0,35

Genetic correlations in Brown Swiss

	SCS	Long	CM	FerC	FerH	RLS	FU	UD	UB	TL
Milk Y			0.20	-0.24				-0.35		
SCS		0.35	0.66		-0.19		-0.20			0.35
Long			0.38	-0.30	-0.31	0.30	-0.32	-0.45	-0.35	0.35
CM				-0.17						
FerC					0.63			0.19		
FerH										
RLS										
FU								0.57	0.70	-0.36
UD									0.55	-0.18
UB										-0.25

ρ					
	>0,35	0,25-0,35	0,15-0,25		
	<-0,35	-0,25-0,35	-0,15-0,25		

Genetic correlations in Brown Swiss

	SCS	Long	CM	FerC	FerH	RLS	FU	UD	UB	TL
Milk Y	0.00	-0.10	0.20	-0.24	0.00	0.00	0.00	-0.35	0.00	-0.05
SCS		0.35	0.66	-0.10	-0.19	0.00	-0.20	-0.15	-0.10	0.35
Long			0.38	-0.30	-0.31	0.30	-0.32	-0.45	-0.35	0.35
CM				-0.17	-0.05	0.00	-0.12	-0.02	0.00	0.00
FerC					0.63	0.00	0.05	0.19	0.10	-0.14
FerH						0.00	0.00	0.00	0.00	0.00
RLS							0.00	0.00	0.00	0.00
FU								0.57	0.70	-0.36
UD									0.55	-0.18
UB										-0.25

ρ							
	>0,35	0,25-0,35	0,15-0,25		-/+	<0,15	
	<-0,35	-0,25-0,35	-0,15-0,25			>-0,15	

Routine evaluation

Results
Genetic evaluation of October 2012

Routine evaluation - univariate

	Brown Swiss
Before edits (lactations) herd*year editing region*year editing	**233 179** 153 780 13 393
After edits	**88 738**
% mastitis first 150d	8.91
Nb Cows in the evaluation	**40 173**
Pedigree	66 967
Number of bulls	**1 439**
Bulls born after 1990	**549**

Official evaluation October 2012

Routine evaluation - univariate

	Brown Swiss	Holstein
Before edits (lactations) herd*year editing region*year editing	**233 179** 153 780 13 393	26 millions
After edits	**88 738**	**6.9 millions**
% mastitis first 150d	8.91	14.2
Nb Cows in the evaluation	40 173	
Pedigree	66 967	
Number of bulls	**1 439**	**71 800**
Bulls born after 1990	**549**	Holstein

Routine evaluation - univariate

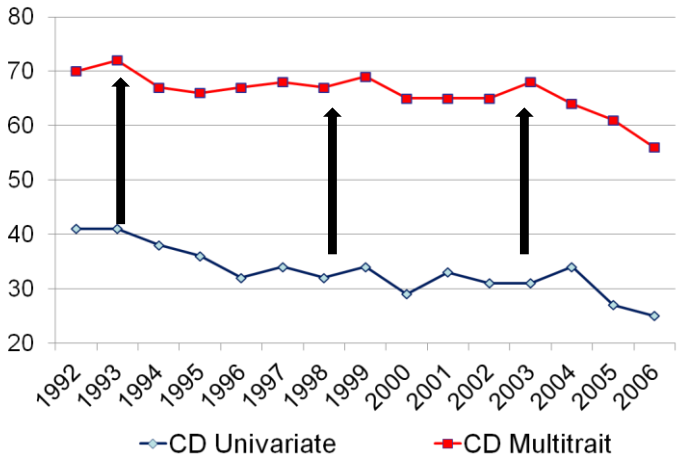
Bulls born > 1990

Univariate	Nb Bulls	Nb daughter/bulls
CD < 30	283	4
CD 31-49	188	30
CD >= 50	**77**	**307**

Univariate	Nb Bulls
Nb daughters with CM	**21 (307)**
% dauhters with CM	8 %
Correlations EBV SCS/CM	**0.45**

Bull reliability

(October 2012) 549 bulls

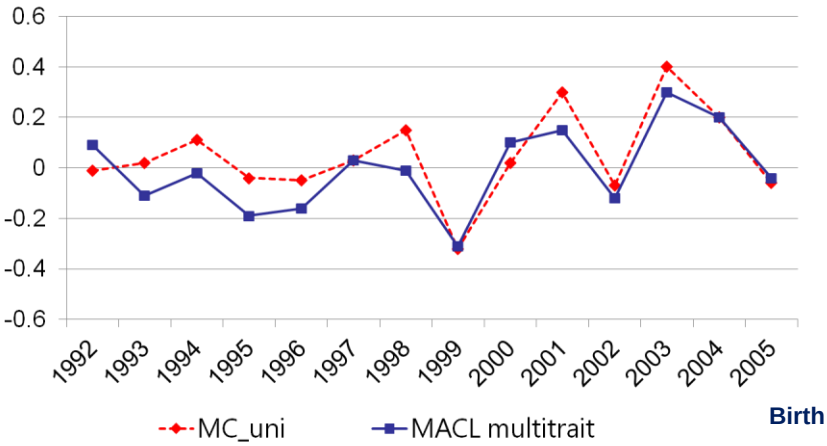


Multi-trait evaluation advantage

Birth year

Genetic Trend – Brown Swiss

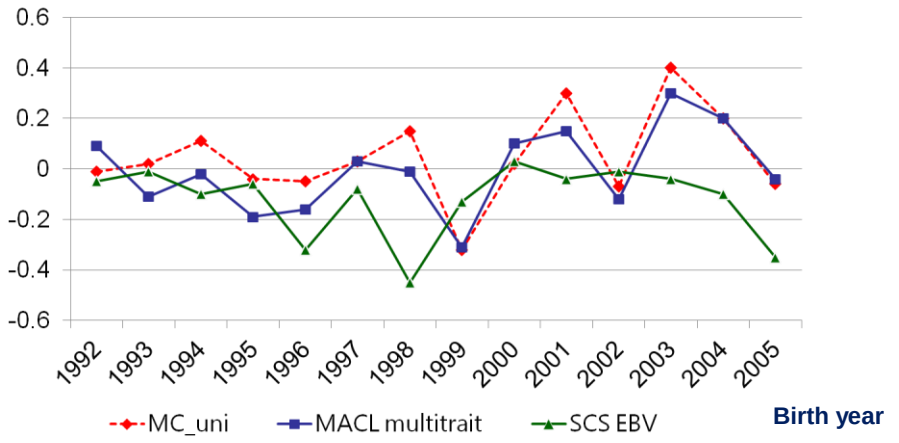
Bulls with reliability >= 30 (n = 240)



Birth year

Genetic Trend – Brown Swiss

Bulls with reliability >= 30 (n = 240)



Publication

Combined EBV Mastitis
Official since June 2011

Udder Health composite
Official since february 2012

Udder Health = 60 SCS + 40 CM

December 2012 - Mastitis
First publication with Interbull

Weights in Total Merit Index (ISU)

February 2013 : next evolution

Udder Health composite will be included in the Total Merit Index (ISU)

Instead of SCS

Production	40
Fertility	20
~~SCS~~ Udder Health	20
Conformation	15
Longevity	5

Conclusion

- **Mastitis data based on voluntary reporting**
  - Needs some edits
  - But consistent with stricter data collection systems
- **Genetic evaluation in two steps**
  - Optimally combines direct information and correlated traits
  - Large reliability increase
- **Another tool to improve mastitis resistance**
  - Complementary to Somatic Cell Score
  - **Included in a more sustainable breeding goal**

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THANK YOU !

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