ANAFI

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INTERBULL

Alternative use of Somatic Cells Counts in genetic selection for mastitis resistance: a new breeding value for Italian Holstein breed

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LATTeco

INTERBULL

Interbull Open 3: R&D in (inter)national evaluations: Implementation of new traits in dairy and beef cattle.

CONTEXT

- Mastitis is one of the major diseases in dairy herds
- It induces economic costs for breeders mainly due to worsening of milk quality and increase of health care cost
- Somatic cell count (SCC) is an indicator of both resistance and susceptibility of cows to intramammary infections

IDENTIFICATION OF MASTITIS

- ✓ DIRECT MEASURES corresponding to the diagnosis of inflammation with a positive bacteriological examination and observation of clinical cases
  - Accurate
  - Repeated and expensive tests on a large scale

- ✓ INDIRECT MEASURES linked with inflammation of the udder
  - Somatic Cell Count (SCC)
  - Electrical conductivity of milk

MASTITIS RECORDING SYSTEM

- Mastitis is not widely implemented in disease-recording systems in many countries
- Lactation-mean SCC or test-day SCC are generally used as indirect mastitis indicators
- Other traits derived from SCC have been suggested as alternatives to improve/implement genetic evaluations for mastitis resistance, such as :
  - maximum SCC
  - standard deviation of SCS
  - SCC peaks pattern (ex: Canada & The Netherlands)

WHAT HAPPENS IN THE WORLD

…INTERBULL DATA…and udder health data

- Two type of EBVs are considered by Interbull:
  - Somatic cell score (SCS)
  - Udder health (MAS) → as trait
    → when missing same as SCS field

- **In total 29 countries send SCS info**
  - **Only 5 countries** provide udder health (MAS) info (Canada, Scandinavian countries, France, The Netherlands and Italy)

WHAT HAPPENS IN THE WORLD

Country	Udder health index	h^2 «Udder health index»	h^2 «Clinical Mastitis»
DFS	$0,25*CM_{11}+0,25*CM_{12}+0,30*CM_2+0,20*CM_3$	6%	3 - 7%
France	$0,60*SCS + 0,40*CM$	15%	2%
The Netherlands	$0,40*SCM+0,60*CM$	9%	6%
Canada	$^1/_3\ CM_1 + {}^1/_3 CM_2 + {}^1/_3\ SCS$	15%	3 - 5%
Italy	Predicted traits for CM	15%	3%

CM=clinical mastitis; SCS=Somatic Cell Score; SCM=Sub-Clinical Mastitis

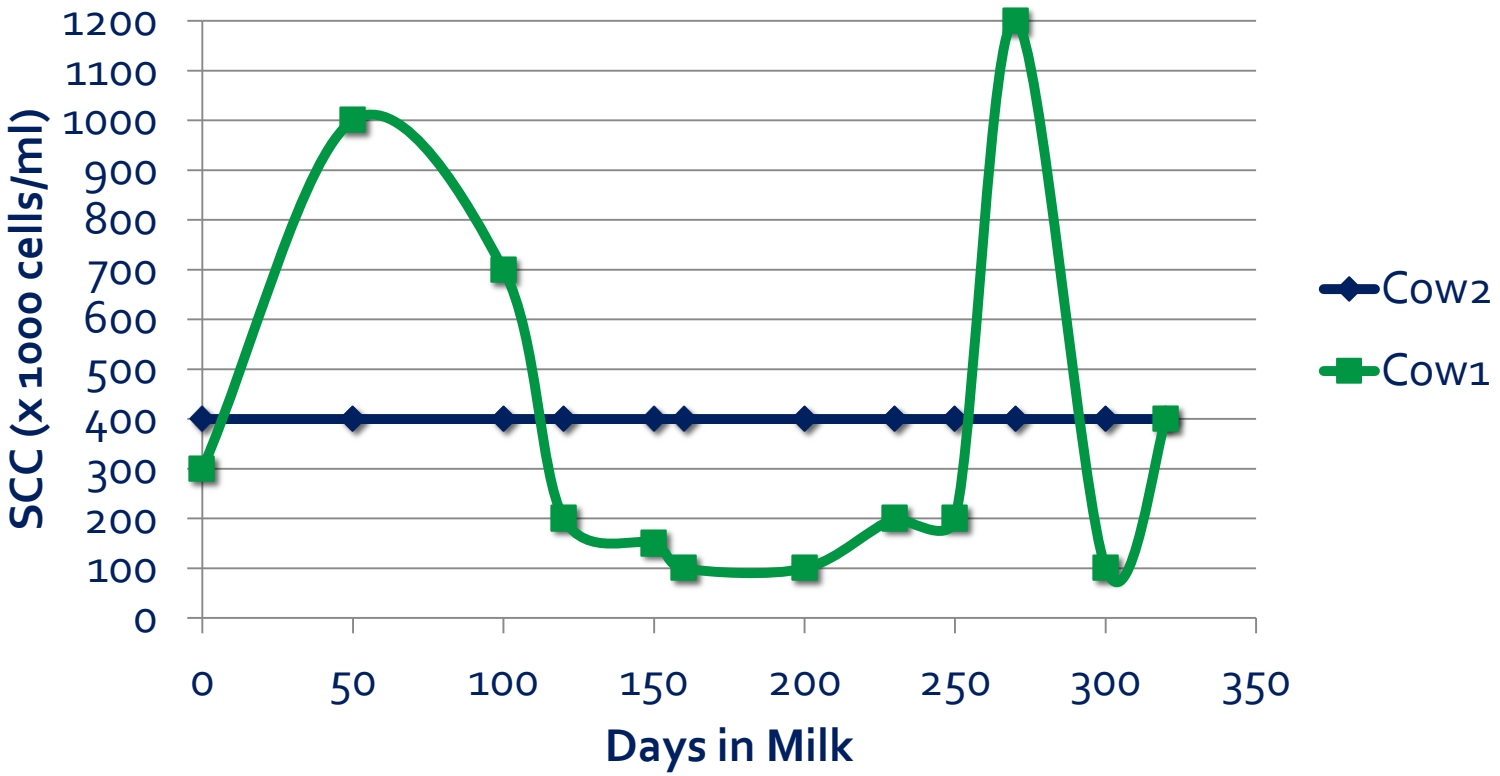
AIM

Setup a new Udder Health Index for Mastitis Resistance using indicators derived from SCC test-day

SCC PATTERN EXAMPLE

……It's important to realize the trend of cells during lactation…

Constant (Cow 2) Fluctuating (Cow 1)



DATA-EDITING

- Only first parity cows (for the moment)
- Cows with at least 3 TDscc records,
- Cows with 1st TD ≤ 60 days after calving
- Cows TDs interval ≤ 70 days

Within lactation SCC patterns have been defined:

- **L** = "Low" (< 100,000 SCC/mL)
- **I** = "Intermediate" (100,000-400,000 SCC/mL)
- **H** = "High" (> 400,000 SCC/mL)

- Several samples distributed in the population were analyzed in order to get an idea of trend repeatability

STEP 1:
NOVEL TRAITS DEFINED TO CAPTURE DIFFERENT ASPECTS OF MASTITIS

TRAIT	Description
SCS_{150}	Average SCS from 5 to 150 days of lactation
$SCS_{151\text{-}305}$	Average SCS from 151 to 305 days of lactation
SCS_{TOTAL}	Average SCS in the entire lactation
INFECTION	(0/1): 1 = cow with at least 1 TD identified as **I** or **H** within lactation
SCS_SD	SCS Standard deviation within lactation
SEVERITY of infection (%)	Ratio between n° TD **H** and the total n° of TD within lactation
PEAK	Presence of peaks **L-H-L** or **L-H-H** within lactation
	0 = no peaks 1 = at least one of the two peaks

STEP 2: VALIDATION ON REAL DATA

- Once indicators traits have been defined, these have been validated on a sample data-set with direct mastitis information

- Those with the strongest genetic correlation with clinical mastitis have been retained.

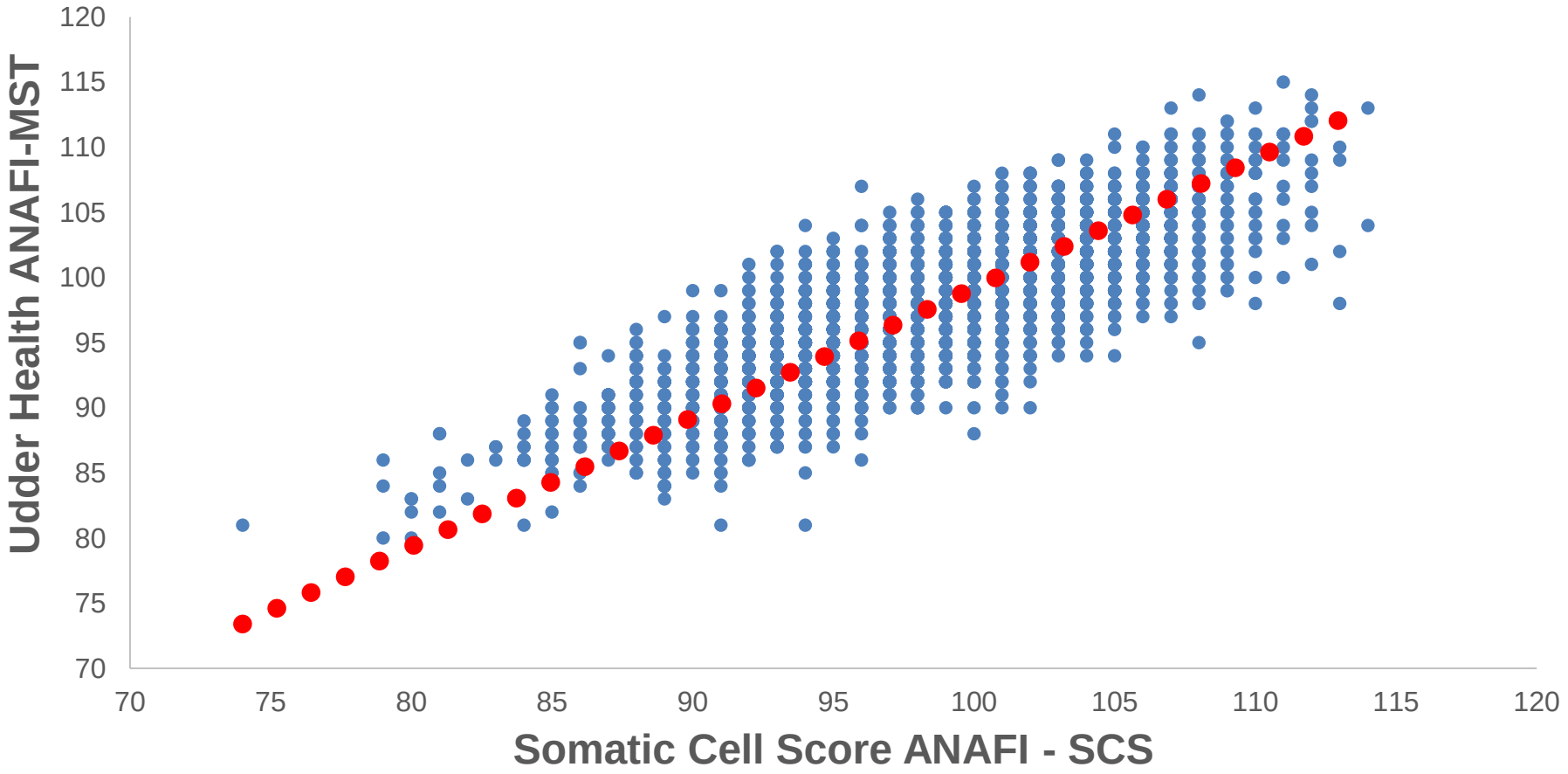
- The new udder health index was built following selection index theory in order to estimate appropriate weights to combine the alternative traits in the aggregate udder health index

RESULTS

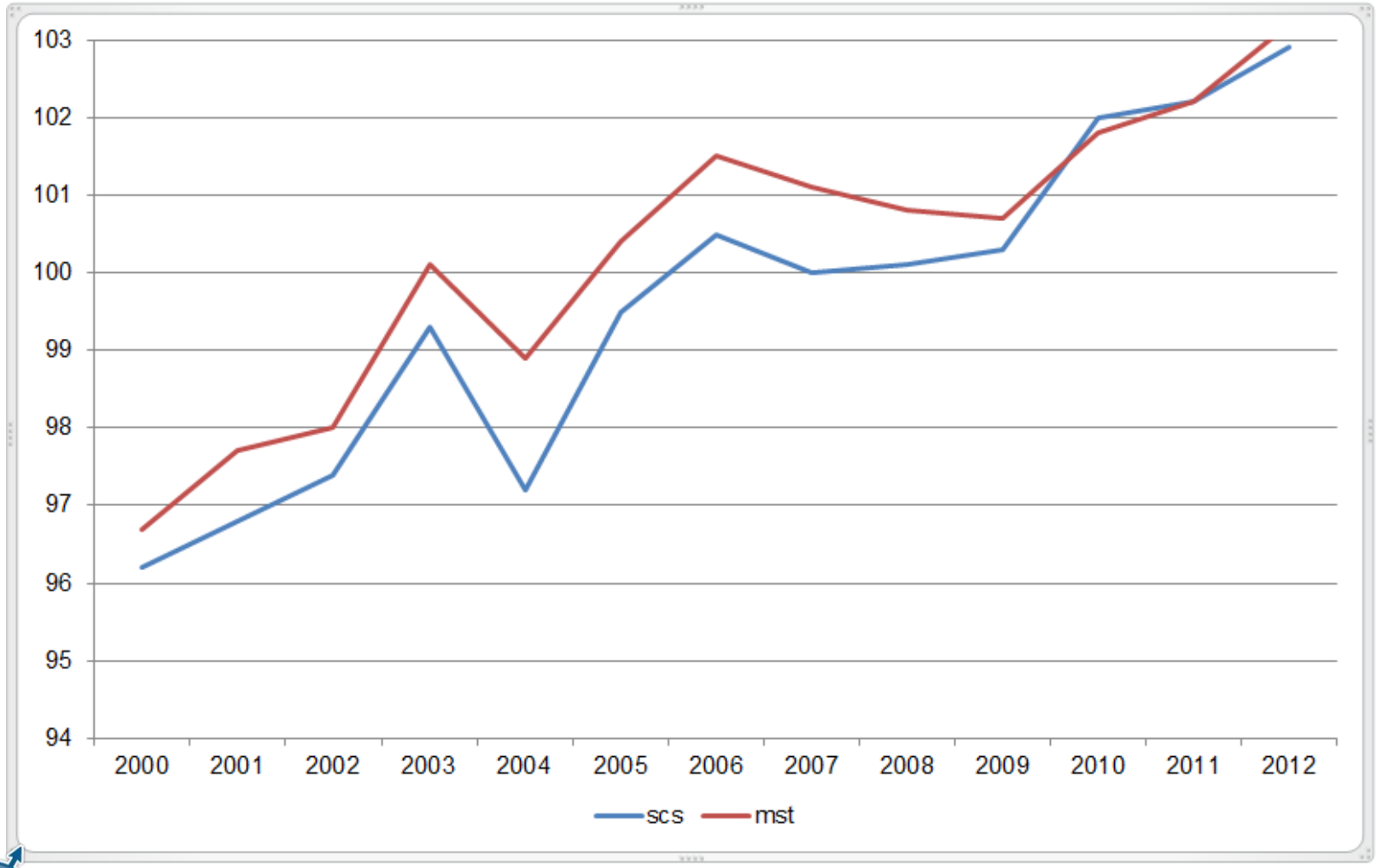
Trait	Mean	SD	h^2	r_g
Clinical mastitis	0,09	0,28	0,03	
SCS150	2,58	1,37	0,06	0,39
SD_SCSt	1,20	0,62	0,02	0,44
Severity of infection	0,11	0,19	0,07	0,41
Peaks pattern	0,10	0,31	0,02	0,51
Aggregate index			0,15	

RESULTS

	Correlation
MST *vs.* SCS	80 %



BULLS GENETIC TREND



CONCLUSIONS

- The new index DOES NOT REPLACE the current SCS Index but it is a new tool to select DIRECTLY for clinical mastitis

- This index has been published for the first time during December 2017 evaluation with mean 100 and standard deviation 5.

- Initially this index will be published only for national and international bulls.

- Currently only first parity cows

FUTURE PERSPECTIVES

- Pluriparous cows and Genomic evaluation → gMace
- Increase mastitis data-set
- Use of differential cells? → Combine all new info

THANKS FOR YOUR ATTENTION!