Genetic relationship between clinical mastitis and several traits of interest in Spanish Holstein dairy cattle

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BACKGROUND

❑ Mastitis is one of the main health issues in dairy production:

The losses are not only economic:

- Animal health and welfare
- Milk quality
- Antibiotic usage and the image of the dairy sector

Are important reasons to focus on mastitis control

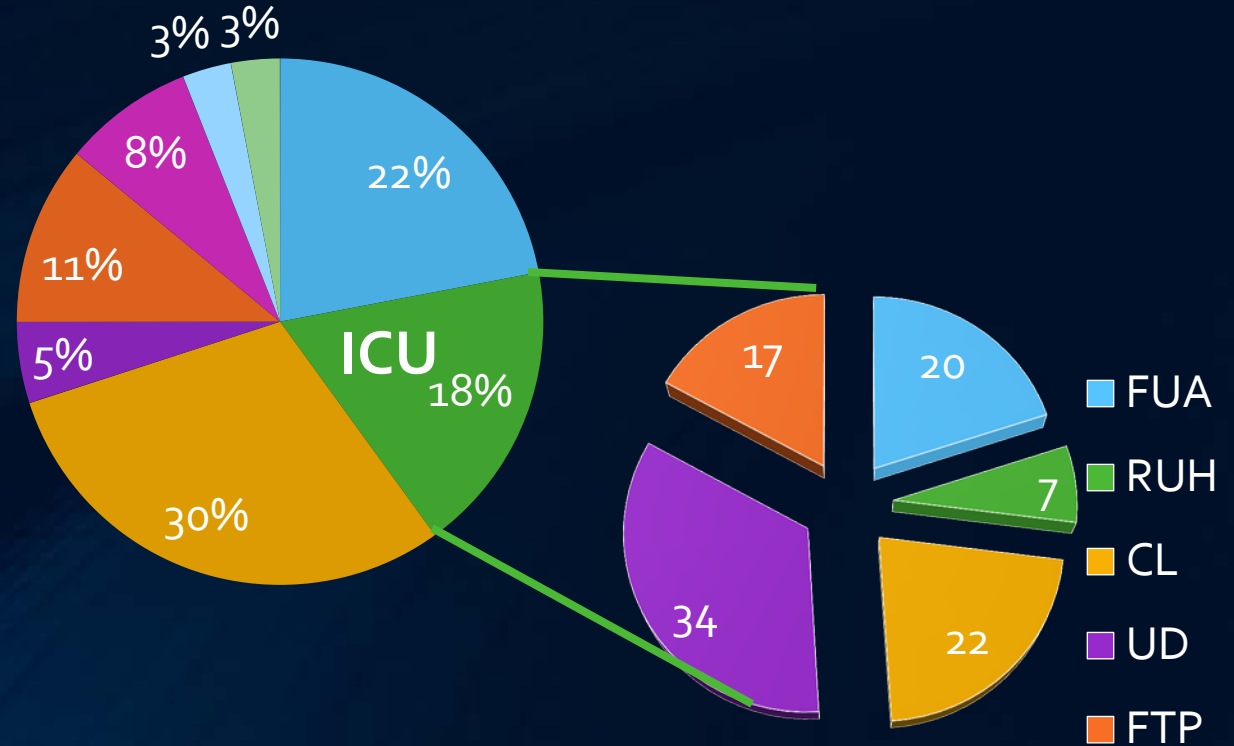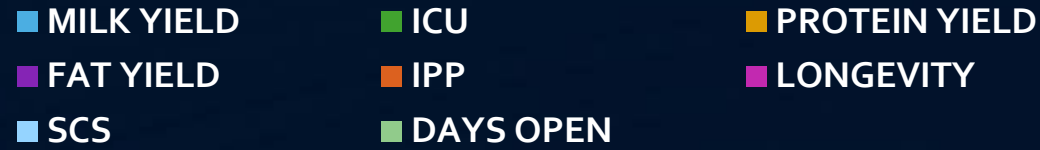❑In Spain, clinical mastitis records are not available on large scale

BACKGROUND

- 3% Somatic cell score

- 18% Udder composite index

ICO is about to be update:
- Mastitis will be included in the breeding goal

- New Udder health index

Legend:
- MILK YIELD
- ICU
- PROTEIN YIELD
- FAT YIELD
- IPP
- LONGEVITY
- SCS
- DAYS OPEN

Main pie chart: 22%, ICU 18%, 30%, 5%, 11%, 8%, 3%, 3%

ICU breakdown: 17, 20 (FUA), 7 (RUH), 22 (CL), 34 (UD), FTP

OBJECTIVE

❑ Estimate genetic parameters of Clinical Mastitis Traits

❑ Association with other important traits in Spanish Holstein population:

➢ Somatic Cell
➢ Production traits
➢ Udder type Traits

➢ Days Open
➢ Milking Speed
➢ Longevity

MASTITIS TRAITS DEFINITION

❏ Clinical Mastitis (CM): Binary   (0/1): At least one event during 305 days of lactation.

❏ Number of cases of CM (NCM): Number of episodes per lactation.

Diagnosed different events were considered as different cases when:

➢ Period between diagnosis dates >7 days

➢ Treatment periods do not overlap

OTHER TRAITS

- **LSCS**: Arithmetic mean of monthly test day score during lactation

- **5 Production traits**: 305-d yields for milk, fat, fat content, protein and protein content.

- **9 Udder type traits**: TEXT, FUA, RUH, RUW, CL, UD, FTP, RTP, and TL

- **Days Open**: Calving Interval – 282 days

- **Longevity**: measured as days between first calving and last test-day control recorded

- **Milking speed**: scored in first lactation with scale of three possible scores

(1: fast milking - 3 :slow milking)

DATA USED

❑ **Clinical Mastitis data provided by regional milk-recording from Basque autonomous region, Navarra, and Gerona**

Data reported by Farmers or Veterinarians

Between 2004 and 2011 in 27 herds

Original data**:**21,396 lactations

After edition**:** 17,666 lactations of 9,179 cows

❑**Pedigree information, Calving dates, Production, SCC, Type, and Milking Speed traits were extracted from CONAFE data base**

ANALYSIS MODELS

Model used for CM, NCM, Production traits, LSCS, and DO:

$$y_{ijklmn} = hy1_i + CM_j + LAE1_k + id_l + pe_m + \varepsilon_{ijklmn}$$

For Longevity:

$$y_{ijklm} = hy1l_i + CM_j + LAE1_k + id_l + \varepsilon_{ijklm}$$

For Milking Speed:

$$y_{ijklmn} = hy1l_i + CM_j + LAE1_k + DIM_l + id_m + \varepsilon_{ijklmn}$$

For Type Traits:

$$y_{ijklm} = hvc_i + LS_j + LAE1_k + id_l + \varepsilon_{ijklm}$$

Multivariate REML analysis was performed with VCE 6.0

RESULTS

GENETIC PARAMETERS OF MASTITIS TRAITS

❑ Slightly higher h^2 for NCM than CM

❑ Genetic correlation: 0.93

❑ Repetabilities of CM and NCM were 0.05 and 0.11, respectively

CM	NCM
0.04 (0.005)	0.93
	0.05 (0.007)

RESULTS

GENETIC CORRELATION BETWEEN MASTITIS TRAITS & LSCS

	CM		NCM	
	r_g	s.e.	r_g	s.e.
LSCS	0.85	0.08	0.76	0.07

High genetic correlation between Mastitis traits and LSCS

RESULTS

GENETIC CORRELATIONS BETWEEN MASTITIS & PRODUCTION

	CM		NCM	
	r_g	s.e.	r_g	s.e.
Milk yield	0.34	0.08	0.34	0.05
Fat yield	0.10	0.04	0.12	0.04
Fat content	0.22	0.03	-0.18	0.03
Protein yield	0.32	0.06	0.26	0.05
Protein content	-0.10	0.03	-0.17	0.04

Unfavorable positive correlations were observed between yield traits and mastitis traits

RESULTS

GENETIC CORRELATIONS BETWEEN MASTITIS & UDDER TYPE TRAITS

	CM		NCM	
	r_g	s.e.	r_g	s.e.
Udder Texture	-0.13	0.04	-0.20	0.03
Fore Udder Attachment	-0.10	0.04	-0.15	0.04
Rear Udder Height	0.03	0.03	0.07	0.05
Rear Udder Width	0.32	0.05	0.31	0.06
Central Ligament	-0.11	0.04	-0.06	0.04
Udder Depth	-0.34	0.03	-0.29	0.04
Fore Teat Placement	0.11	0.06	0.10	0.02
Rear Teat placement	0.18	0.07	0.10	0.02
Teat Length	-0.09	0.05	-0.03	0.02

Favorable negative correlations with : UD, FUA, TEXT, CL, and TL

Unfavorable positive correlations with RUW

RESULTS

GENETIC CORRELATIONS BETWEEN MASTITIS & FUNCTIONAL TRAITS

	CM		NCM	
	r_g	s.e.	r_g	s.e.
Days Open	0.34	0.09	0.40	0.10
Longevity	-0.27	0.09	-0.01	0.08
Milking Speed	-0.45	0.08	-0.32	0.07

Clinical Mastitis was associated with:
> **More fertility problems**
> **High culling risk**
> **Faster milking speed**

CONCUSIONS

☐ CM and NCM seemed to be the same trait

☐ LSCS and CM traits were strongly associated, however they cannot be considered as the same trait

☐ Clinical mastitis was associated to high production levels, fertility problems and high culling risk

☐ Higher udders, with tighter fore attachment and good texture were associated with lower Clinical mastitis incidence

☐ Faster milking speed favors higher risk of clinical mastitis

☐ Udder health index must include besides mastitis, LSCS, UD, FUA, TEXT, CL, TL, & MS