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FIRST GENETIC ANALYSES OF CLAW DISORDERS IN NORWEGIAN RED

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CLAW HEALTH

- Increased focus in Norway due to increased number of free stalls
- Important for animal welfare but also affects the farmers economy
- Corkscrew claw (scored together with conformation traits) is included in the leg and conformation index in Norwegian Red
- Recording of claw health at claw trimming from 2004
 - Possible to calculate genetic parameters

RECORDING OF CLAW HEALTH

- At claw trimming recording of:
 - Date at claw trimming
 - ID of animal
 - Normal claws or one or more of 9 different claw disorders
 - Other disorders or remarks
 - Claw trimmer ID
- Recorded to the Norwegian Dairy Herd Recording System
- Not mandatory

CLAW DISORDERS

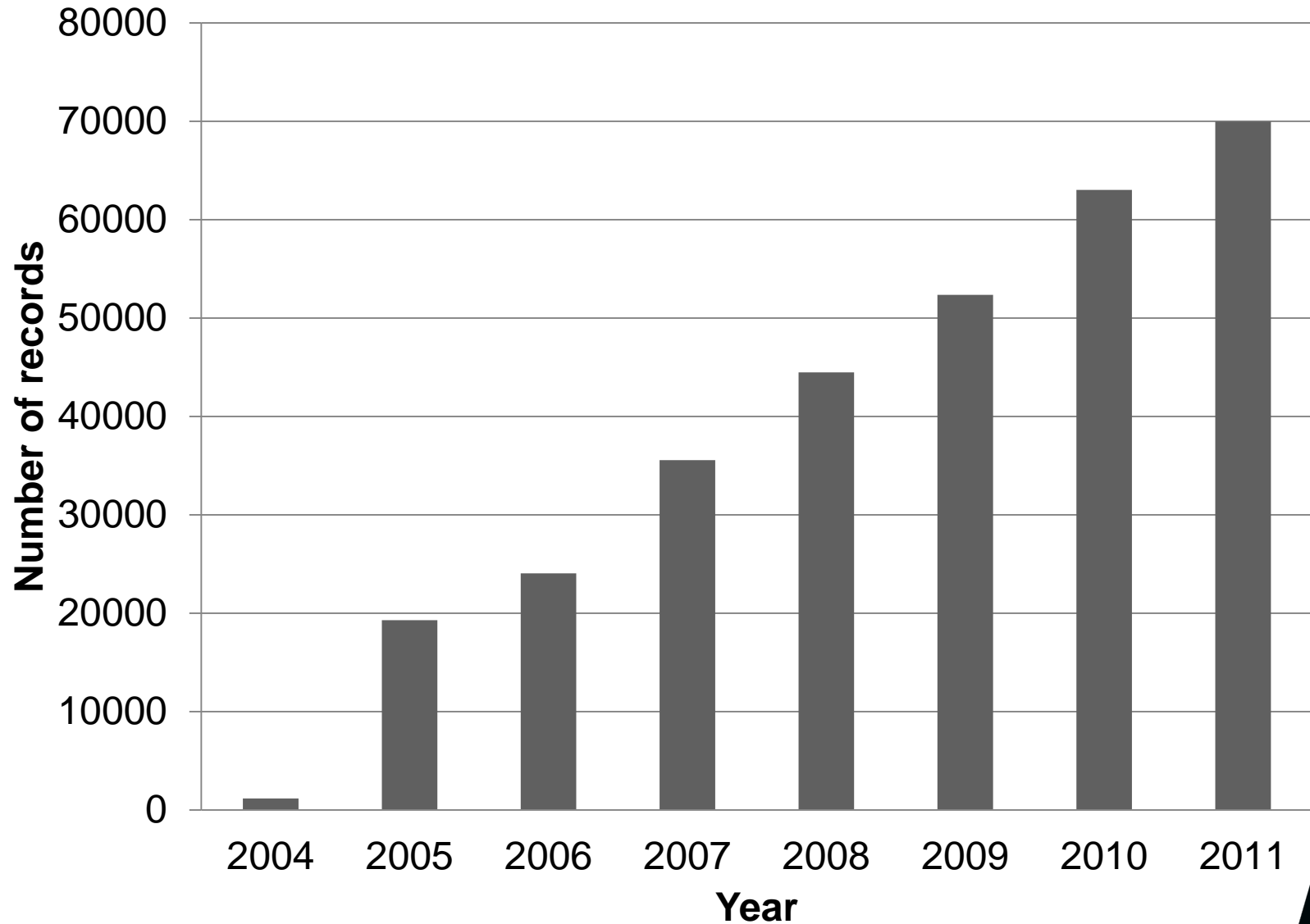
- Lameness
- Acute trauma
- Corkscrew claw
- Heel horn erosion
- Dermatitis
- Interdigital phlegmon
- Sole ulcer
- White line disorder
- Haemorrhage of sole and white line

Infectious

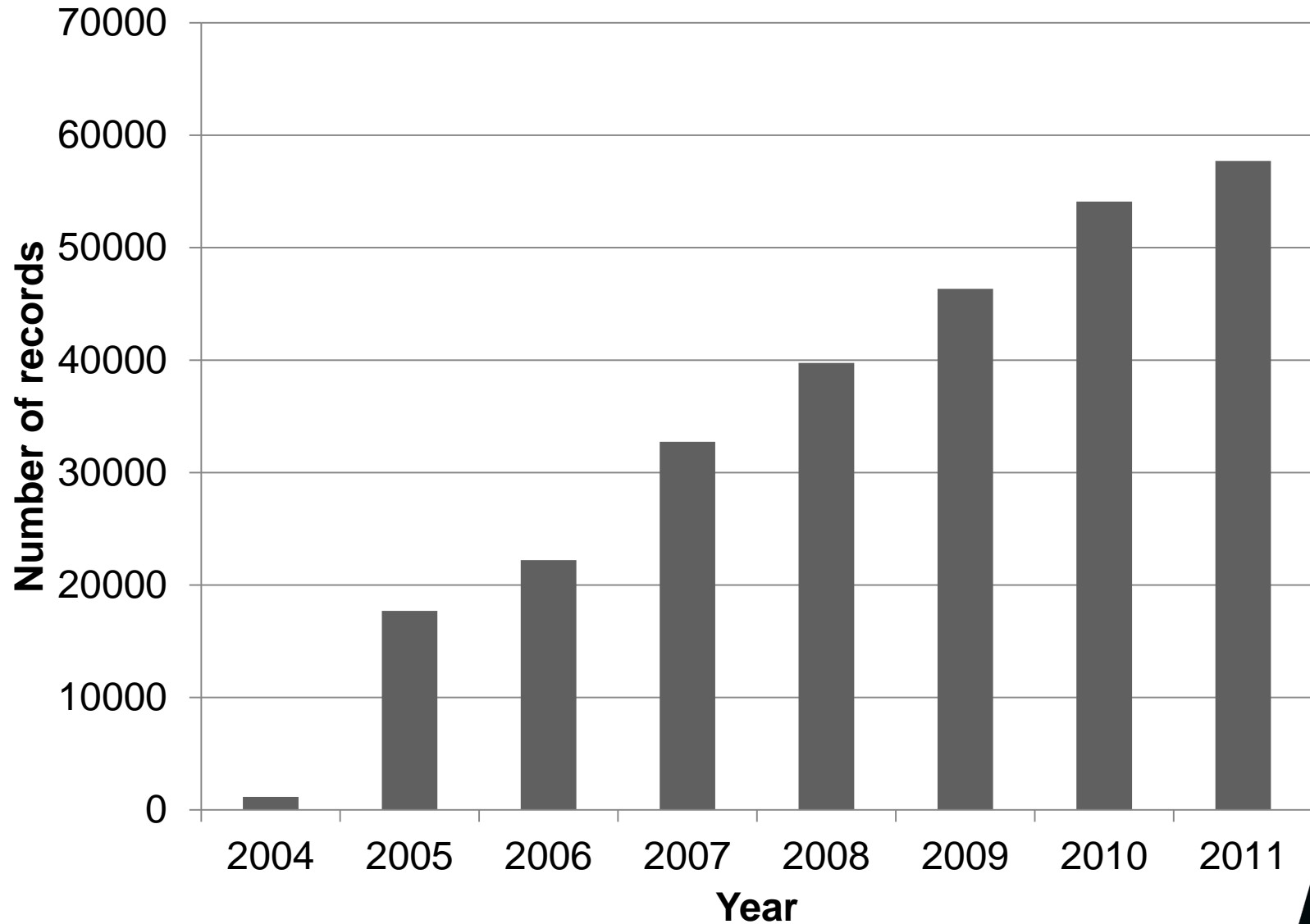
Laminitis-related

Overall

NUMBER OF CLAW HEALTH RECORDS PER YEAR



NUMBER OF COWS WITH CLAW HEALTH RECORD PER YEAR



AIM

Estimate heritabilities of and genetic correlation among single claw disorders and groups of claw disorders using claw health data recorded at claw trimming

DATA EDITING AND DEFINITION

- Only cows with claw health data
- Herds with less than 10 % or less than 10 normal claws reported during 2004 to 2011 were excluded
- Daughters of Norwegian Red AI sires
- Age at calving within defined intervals
- At least one claw health record per lactation

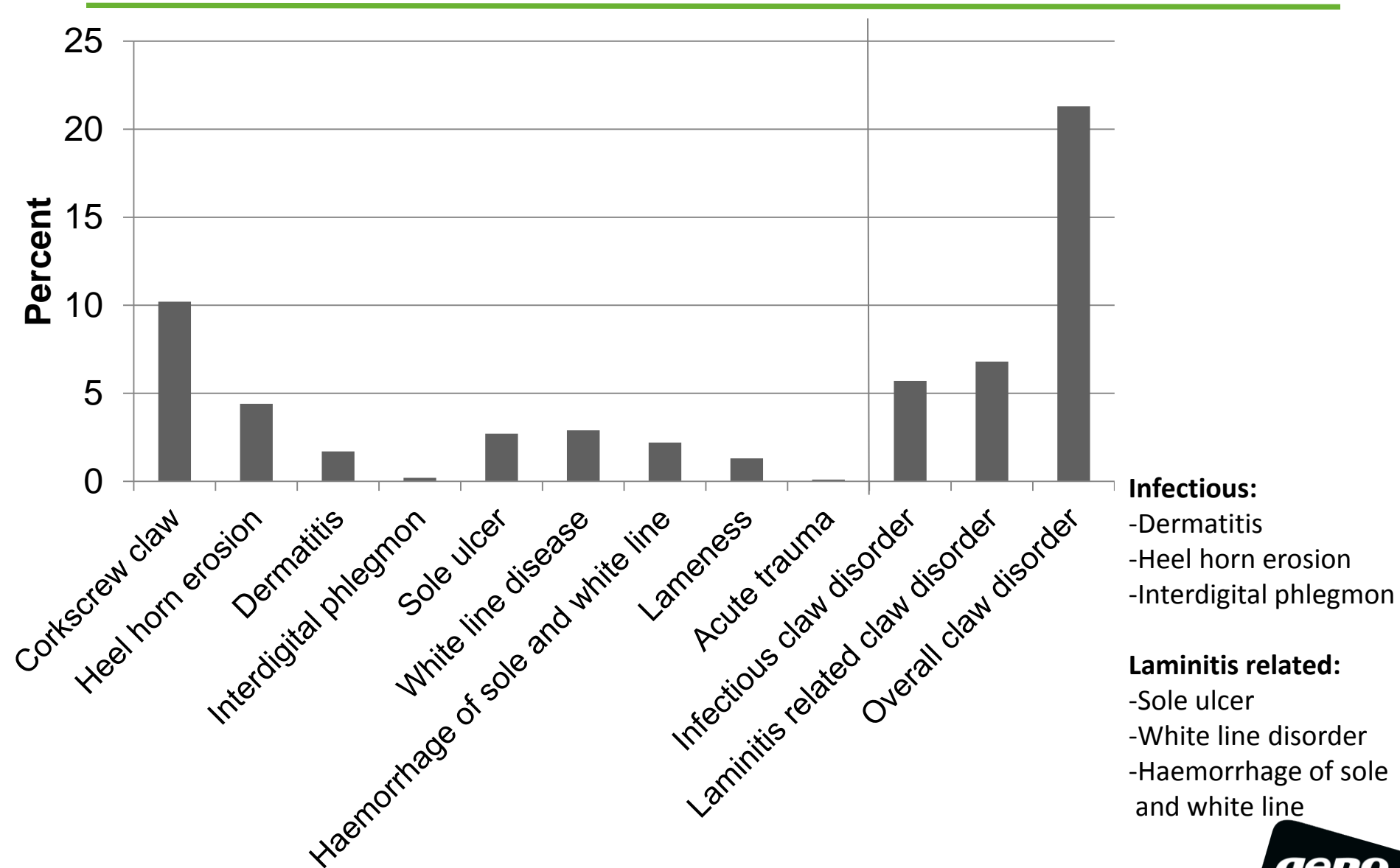
Definition of traits:

In each lactation a cow was defined as either healthy (0) or sick (1) for each single claw disorders and three groups of claw disorders

DATASET

	Before editing	After editing
Claw health record	389,251	243,158
Cows	213,583	141,659
Sires	1,978	1,904
Herds	7,252	6,156

FREQUENCY OF CLAW DISORDERS AFTER EDITING (% OF ALL CLAW HEALTH RECORDS)



THRESHOLD SIRE MODEL

Systematic effects:

- Lactation number
- Calving year and month
- Time for claw trimming (months after calving)
- Claw trimmer

Liabilities of the trait

$$\boldsymbol{\lambda} = \mathbf{X}\boldsymbol{\beta} + \mathbf{Z}_h\mathbf{h} + \mathbf{Z}_s\mathbf{s} + \mathbf{e}$$

Random herd effects

Random sire effects

Residuals

\mathbf{X} , \mathbf{Z}_h and \mathbf{Z}_s are the corresponding incidence matrices

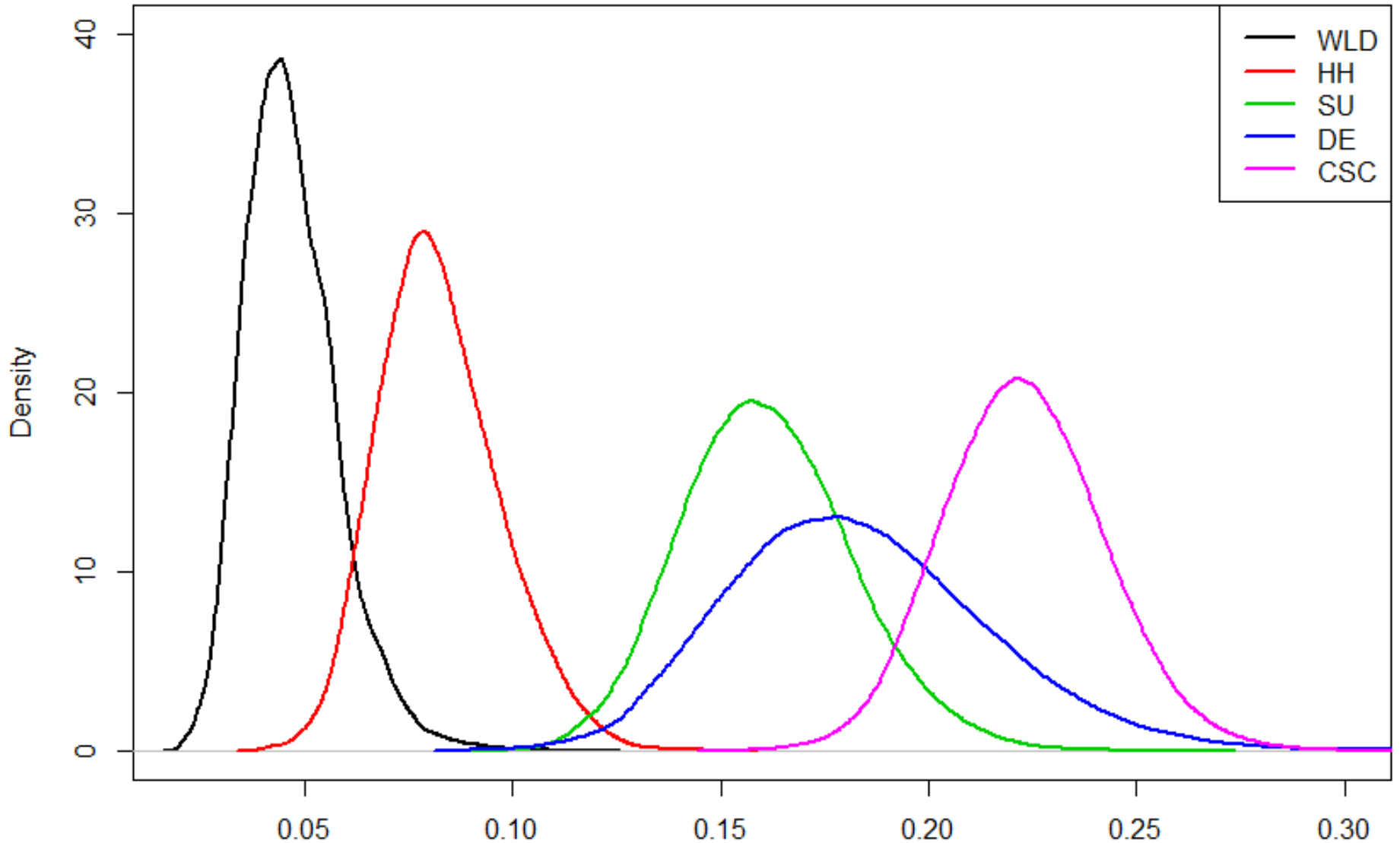
ANALYSES

- Univariate analyses for all 9 single claw disorders and the 3 groups of claw disorders
- Multivariate analyses for:
 - Corkscrew claw, heel horn erosion, dermatitis, sole ulcer and white line disorder
 - Corkscrew claw, infectious claw disorders and laminitis related claw disorders
- Analyses using RJMC in DMU (Madsen and Jensen, 2008)

POSTERIOR MEAN AND STANDARD DEVIATION (SD) OF HERITABILITY OF LIABILITY FROM UNIVARIATE MODELS

Trait	Heritability	
	Mean	SD
Corskscrew claw	0.23	0.02
Heel horn erosion	0.09	0.02
Dermatitis	0.20	0.03
Sole ulcer	0.18	0.02
White line disorder	0.06	0.02
Haemorrhage of sole and white line	0.07	0.01
Interdigital phlegmon	0.14	0.06
Lameness	0.04	0.01
Acute trauma	0.04	0.02
Infectious claw disorders	0.11	0.02
Laminitis related claw disorders	0.11	0.02
Overall claw disorders	0.15	0.02

POSTERIOR DISTRIBUTION OF HERITABILITY OF LIABILITY FOR FIVE CLAW DISORDERS



POSTERIOR MEAN OF GENETIC CORRELATIONS AMONG SINGLE CLAW DISORDERS

	Heel horn erosion (HH)	Dermatitis (DE)	Sole ulcer (SU)	White line disorder (WLD)
DE	0.65			
SU	0.42	0.19		
WLD	0.22	0.04	0.79	
CSC*	0.13	0.02	0.42	0.04

*CSC= Corkscrew claw

POSTERIOR MEAN OF GENETIC CORRELATIONS AMONG GROUPS OF CLAW DISORDERS

	Infectious	Laminitis- related
Corkscrew claw	0.06	0.31
Infectious		0.24

ASSUMPTIONS AND LIMITATIONS

- A cow has on average 1 claw trimming per year
- Not all cows in a herd are necessarily trimmed
- Not all farmers report normal claws
- Definition of normal claws
 - Include only cows with claw health records
 - Include all cows in herds with claw health records
 - Also cows without claw health records and define them as normal

CLAW HEALTH INDEX

- Sires that got their first official proofs in 2010 and 2011 had on average 34 and 37 daughters with claw health records
 - In comparison: 140 daughters with health data are required for sires to get official breeding values for other traits
- Developing a claw health index for Norwegian Red has started

CONCLUSION

- Claw disorders have low to moderate heritabilities
- Claw disorders can be defined as single claw disorders or as grouped claw disorders
- Claw health data from claw trimming gives opportunity to select for improved claw health in Norwegian Red
- Important to encourage the farmers to report claw health records

A close-up, high-contrast photograph of a horse's eye, showing the eyelashes and the texture of the skin around the eye. The eye is looking slightly to the left.

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THANK YOU!



Breeding for better **lives**