PRELIMINARY RESULTS FROM A GENETIC ANALYSIS OF CLINICAL MASTITIS DATA FOR HOLSTEIN CATTLE IN CZECH REPUBLIC

L. Zavadilová, M. Štípková, V. Zink

VÚŽV, v.v.i.

INSTITUTE OF ANIMAL SCIENCE
PRAHA UHŘÍNĚVES

VÚŽV, v.v.i.

Objective

- **analyze data on clinical mastitis (CM)**
  - **Heritability**
  - **Genetic correlations with production and SCS**

- **determine their suitability for mastitis resistance breeding value prediction**

Animals definition

- ✓ **10 294 cows**
- ✓ **22 812 lactation**
- ✓ **17 606 mastitis cases**

- ✓ **7 Holstein herds**

  150 (3) 200 (1) 500 (2) 900 (1)
- ✓ **Time period 2000 and 2012**

Traits definition

- ✓ **CM1 - the number of CM cases per lactation**
- ✓ **CM2 - the number of *days* of CM per lactation**
- ✓ **CM3 - CM considered as an all-or-none trait with values of 0 (no CM case) and 1 (at least 1 CM case)**

- **305-d milk yield (MY305)**
- **average lactation somatic cell count (SCC)**

Frequency of cows with clinical mastitis (CM) as a function of the 10 d interval of days of lactation
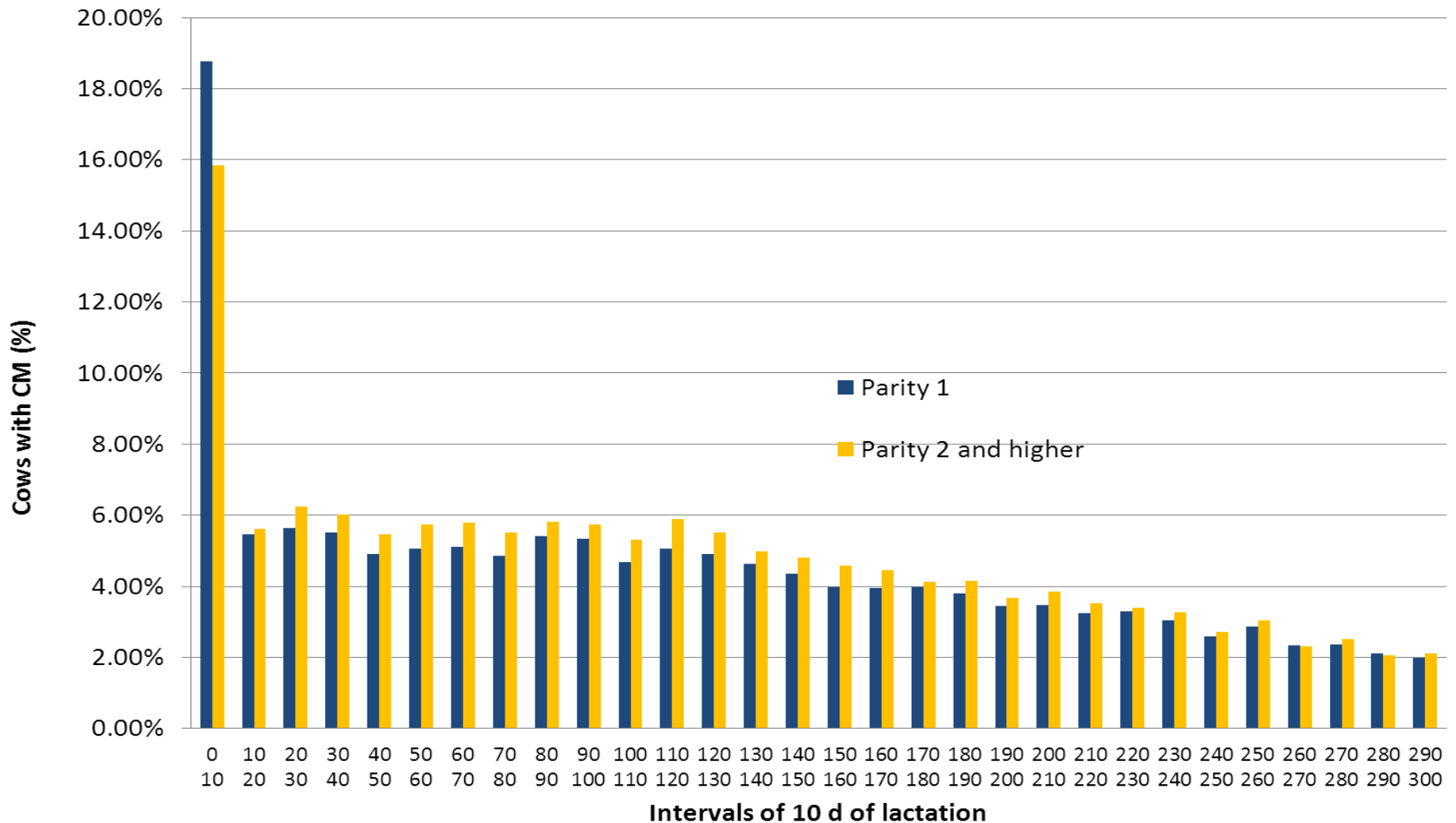
Linear animal model

- ✓ **Herd – 7**

- ✓ **Parity – 1, 2, 3, ≥ 4**

- ✓ **Year of calving - 2000-2012**

- ✓ **Season of calving – 4**

- ✓ *Permanent enviromental effect of cow* **10 294**
- ✓ *Additive genetic effect* **25 359**

Variance components and heritabilities

	CM1	CM2	CM3
Variances			
Additive	0.19	8.1	0.019
PE	0.13	6.4	0.012
Residual	1.49	68.2	0.193
Heritability			
	0.10	0.10	0.09

CM1 – no CM cases

CM2 – days of CM

CM3 – 0 or 1

Variance components and heritabilities

	CM1	CM2	CM3
Variances			
Additive	0.19	8.1	0.019
PE	0.13	6.4	0.012
Residual	1.49	68.2	0.193
Heritability			
	0.10	0.10	0.09

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Additive genetic correlations

Trait	CM1	CM2	CM3
CM1		0.90 **	0.97 **
CM2			0.93 **
MY(305)	0.23 **	0.24 **	0.29 **
SCS(305)	0.80 **	0.79 **	0.83 **

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Additive genetic correlations

Trait	CM1	CM2	CM3
CM1		0.90 **	0.97 **
CM2			0.93 **
MY(305)	0.22 **	0.23 **	0.23 **
SCS(305)	0.80 **	0.79 **	0.83 **

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Breeding value and ranking of sires

- ✓ **equal equation**
- ✓ **linear animal model**
- ✓ **the same dataset**

- ✓ **univariate** models
  - • **CM1, CM2, CM3 and SCS(305)**
- ✓ **bivariate** models
  - • **CM trait and SCS(305)**

Breeding value and ranking of sires

- ✓ **Spearman rank correlations between breeding values**

- ✓ **for 139 sires**
- ✓ **with reliability of breeding value over 50% for all estimated breeding values.**

Spearman rank correlations between breeding values

CM1 x CM2		0.87
CM1 x CM3		0.84
CM2 x CM3		0.81
CM1scs x CM2scs		0.92
CM1scs x CM3scs		0.88
CM2scs x CM3scs		0.88

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Spearman rank correlations between breeding values

CM1 x CM2		0.87
CM1 x CM3		0.84
CM2 x CM3		0.81
CM1scs x CM2scs		0.92
CM1scs x CM3scs		0.88
CM2scs x CM3scs		0.88

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Spearman rank correlations between breeding values

CM1	x	SCS(305)	0.53
CM2	x	SCS(305)	0.55
CM3	x	SCS(305)	0.59
CM1scs	x	SCS(305)	0.70
CM2scs	x	SCS(305)	0.71
CM3scs	x	SCS(305)	0.77

CM1 – no CM cases

CM2 – days of CM

CM3 – 0 or 1

Spearman rank correlations between breeding values

CM1 x SCS(305)	0.53
CM2 x SCS(305)	0.55
CM3 x SCS(305)	0.59
CM1scs x SCS(305)	0.70
CM2scs x SCS(305)	0.71
CM3scs x SCS(305)	0.77

CM1 – no CM cases
CM2 – days of CM
CM3 – 0 or 1

Range of breeding values

	Absolute value	SD
CM1	0.34	4.99
CM2	2.13 d	5.85
CM3	0.10	4.95
CM1scs	0.34	5.04
CM2scs	2.14 d	5.64
CM3scs	0.10	5.11

CM1 – no CM cases

CM2 – days of CM

CM3 – 0 or 1

Range of breeding values

	Absolute value	SD
CM1	0.34	4.99
CM2	2.13 d	5.85
CM3	0.10	4.95
CM1scs	0.34	5.04
CM2scs	2.14 d	5.64
CM3scs	0.10	5.11

CM1 – no CM cases

CM2 – days of CM

CM3 – 0 or 1

Conclusion

- ✓ **suitable** for genetic evaluation
- ✓ **linear animal model** including the permanent environmental effect of the cow
- ✓ Traits
  - CM1 – no. CM cases
  - CM2 – days of CM
  - CM3 – 0 or 1

Acknowledgments

Thank you for your attention

INSTITUTE OF ANIMAL SCIENCE
PRAHA UHŘÍNĚVES