Genetic Analysis of Reproductive Disorders and their Relationship to Fertility in Fleckvieh Dual Purpose Cattle

A. Koeck[1], C. Egger-Danner[2], C. Fuerst[2] and B. Fuerst-Waltl[1]

[1] BOKU ï University of Natural Resources and Applied Life Sciences ï Dept. of Sustainable Agricultural Systems, Vienna

[2] ZuchtData ï EDV-Dienstleistungen GmbH, Vienna

- **Decreased fertility main reason for involuntary culling of dairy cows**
- **Fertility is a biologically complex trait**
  - Recycle after calving
  - Show heat
  - Successful insemination
  - Embryo survival
  - Resistance to reproductive disorders
- **Fertility index**
  - Non-return rate 56 (NR56)
  - Interval from calving to first insemination (CFI)
  - Interval from first to last insemination (FLI)

- **Denmark, Sweden and Finland consider reproductive disorders**
- **Since July 2006 ĂHealth monitoring in cattleñ in Austria**
  - Ÿ **Recording of diagnoses data from veterinarians**
  - Ÿ **Data used for herd management and development of genetic evaluation for health traits**

ectives

- **Estimate heritabilities for various reproductive disorders with linear and threshold models**
- **Investigate relationships between reproductive disorders and fertility traits (NR56, CFI and FLI)**

- **Austrian Fleckvieh dual purpose cattle**
- **Herds with reliable health recording**
- **Calvings between Jan. 2007 and Nov. 2008**
- **All cows from parity 1 to 5**

- **Metritis (MET)**
- **Silent heat and anoestrus (ESTRUS)**
- **Cystic ovaries (CYST)**
- **Retained placenta (RP)**
- **Puerperal diseases (PUERP)**
- **Uterine prolapse**
- **Abortion**
- **Difficult calving**
- **Calving injury**

} Disease frequencies far below 1 %

Trait	Days after calving	Records	Mean
MET[1]	0 to 150 d	13,958	3.8%
ESTRUS[1]	0 to 150 d	13,958	6.3%
CYST[1]	0 to 150 d	13,958	9.6%
RP	0 to 7 d	22,355	2.6%
PUERP	0 to 30 d	20,986	2.5%
MET/RP/PUERP	0 to 30 d	20,986	6.4%
REPRO[2]	0 to 150 d	15,620	15.7%
NR56		20,578	66.4%
CFI		24,725	69.6 d
FLI		11,262	23.4 d

[1] Only cows that completed at least two-thirds of the opportunity period (100 d)
[2] MET + CYST + RP + PUERP + culling reason included

- **Heritabilities**
  - Linear animal model, VCE
  - Threshold sire model (logit link), ASReml
- **Genetic correlations**

  Linear animal model, bivariate analyses, VCE

roductive disorders

$$y_{ijklm} = \mu + L_i + HYS_j + a_k + pe_l + e_{ijklm}$$

- y_{ijklm} = individual observation (0/1)
- μ = overall mean
- L_i = fixed effect of parity
- HYS_j = random effect of herd*year*season of calving
- a_k = random additive genetic effect of animal or sire
- pe_l = random permanent environmental effect of cow
- e_{ijklm} = residual error term

...ility traits

$$y_{ijklmn} = \mu + YM_i + L_j + HY_k + a_l + pe_m + e_{ijklmn}$$

- y_{ijklmn} = individual observation
- μ = overall mean
- YM_i = fixed effect of year*month of calving or insemination
- L_j = fixed effect of calving age-parity
- HY_k = random effect of herd*year of calving or insemination
- a_l = random additive genetic effect of animal
- pe_m = random permanent environmental effect of cow
- e_{ijklmn} = residual error term

ritabilities

Trait	Linear animal model	Threshold sire model
MET	$0.01_{0.004}$	$0.06_{0.036}$
ESTRUS	$0.01_{0.004}$	$0.01_{0.015}$
CYST	$0.04_{0.009}$	$0.08_{0.027}$
RP	$0.01_{0.004}$	$0.06_{0.038}$
PUERP	$0.02_{0.005}$	$0.14_{0.054}$
MET/RP/PUERP	$0.02_{0.005}$	$0.08_{0.027}$
REPRO	$0.04_{0.009}$	$0.07_{0.020}$

enetic correlations

Trait	MET	CYST	RP	PUERP
MET	**0.01** (0.004)	0.22 (0.235)	1.00 (<0.001)	1.00 (0.001)
CYST		**0.04** (0.009)	-0.01 (0.180)	0.68 (0.114)
RP			**0.01** (0.004)	1.00 (<0.001)
PUERP				**0.02** (0.005)

enetic correlations

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enetic correlations

Trait	MET/RP/ PUERP	CYST	REPRO	NR56	CFI	FLI
MET/RP/ PUERP	**0.02** (0.005)	0.48 (0.137)	0.77 (0.085)	-0.37 (0.228)	0.26 (0.134)	0.77 (0.184)
CYST		**0.04** (0.009)	0.90 (0.037)	-0.70 (0.141)	0.29 (0.166)	0.74 (0.137)
REPRO			**0.04** (0.009)	-0.76 (0.211)	0.42 (0.157)	0.93 (0.071)
NR56				**0.01** (0.004)	-0.23 (0.231)	-0.93 (0.132)
CFI					**0.03** (0.007)	0.52 (0.176)
FLI						**0.01** (0.006)

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- **Data from Austrian project „Health monitoring in cattle“ can be used for genetic selection**
- **Sufficient genetic variation exists for all reproductive disorders, except ESTRUS**
- **Genetic correlations between reproductive disorders and fertility were favourable**
- **For routine genetic evaluation trait REPRO is recommended**

ou for your attention!