

Effects of inbreeding on sperm quality in Fleckvieh (Simmental) bulls



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Summary

- Inbreeding coefficients of AI bulls are quite low
- All sperm quality traits are affected by inbreeding depression
- Neither the actual inbreeding level nor the inbreeding depressions seem to be alarming
- Monitoring of inbreeding effects on male fertility traits is recommended

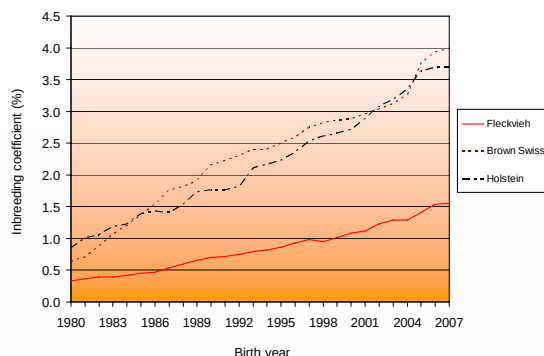


Photo: Oberösterreichische Besamungsstation GmbH Hohenzell

1. Why this topic?

- Fleckvieh is the main cattle breed in Austria (80 %)
- 96 % of all cows are artificially inseminated
- low number of bulls with a high number of offspring
- increasing level of inbreeding
- increasing importance of male fertility

Figure 1: Increase of inbreeding coefficients (in %) in different Austrian cattle breeds (source: C. Fuerst, ZuchtData)



2. The goal

Quantifying and qualifying the effects of inbreeding on male fertility of AI bulls

3. Data

- Data from 2 AI stations in Austria
- Years 2000 to 2006
- 30,000 ejaculates from 715 bulls
- Traits: volume, concentration, motility, number of spermatozoa per ejaculate and percentage of viable spermatozoa
- Complete pedigree data

4. Methods

- Calculation of inbreeding coefficients (PEDIG)
- Pedigree analysis – average complete generation equivalent (PEDIG)
- Calculation of partial inbreeding coefficients
- (Co)variance analyses (SAS PROC MIXED)
- Separate analysis for the AI stations

(Co) variance analyses:

- **Random effect:** bull
- **Fixed effects:** bulls' age class at collection, bull handler, semen collector, interval in days since the last collection, number of collection within day
- **Linear continuous effect:** inbreeding coefficient
- **Interactions:** age and interval, age and month
- **Random residual**

5. Results

Table 1: Inbreeding coefficients of the AI bulls

AI station	Ø F	max. F	F > 0	F > 5%	F > 7%
A (N=317)	1.16%	7.47%	305 (96.2%)	4 (1.3%)	1 (0.3%)
B (N=398)	1.47%	7.55%	396 (99.5%)	8 (2.0%)	3 (0.8%)

Table 2: Effect of 10% increase in inbreeding on sperm quality traits for bulls at AI station B

Trait	Regression coefficient F
Volume (ml)	-1.53**
Concentration (10 ⁹ /ml)	-0.13
Number of spermatozoa (10 ⁹)	-2.40**
Viable spermatozoa (%)	-2.72*
Motility (F)	0.20
(F ²)	-0.08**

Significance levels: * = P < 0,05, ** = P < 0.01