Session 07 (Poster Presentation 013)

Conformation selection in the German shepherd dog

K.F. Stock, M. Dammann, O. Distl

Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, 30559 Hannover, Germany
(Correspondence: Kathrin-Friederike.Stock@tiho-hannover.de)

Objective

Identification of the selection strategy that maximizes the proportion of dogs fitting the breeding standard regarding conformation and does not interfere with selection for skeletal health in the German shepherd dog

Background

- allowed ranges of body measures defined in most dog breeding standards (FCI), including the German shepherd dog (GSD)
- advantages of homogeneity of litters with respect to conformation
- withers height (WH) and body weight (BW) in GSD breeding dogs of both sexes close to the upper limits
  → conformation selection compatible with already established breeding strategies

Material and methods

- body measurements from GSD breeding approvals in Germany (1994-2005)
- conformation data for 36,038 dogs from 26,155 litters
  → variance within litters: sub-sample of 17,154 dogs from 7,282 litters with ≥ 2 dogs with conformation data
- traits:
  - withers height (WH),
  - body mass index (BMI) with BMI = BW[kg] / WH[m]²,
  - variances of WH and BMI within litters (vWH, vBMI)
- information on canine hip dysplasia (CHD) for about 90% of dogs with conformation data
- estimation of genetic parameters (Gibbs sampling[1)]): bivariate linear animal models (WH, vWH; BMI, vBMI)

$$y_{ijkl} = \mu + F_i + r_j + a_k + e_{ijkl} \quad with$$
$$F_i : SEX^*, AGE, BYEAR, BMONTH, REG, RDIV, IBC, LS, pAPP^\#, pMALE^\#,$$
$$r_j : judge, kennel, dam(kennel);\ ^*WH, BMI;^\# vWH, vBMI$$

- expected selection response: selection of parents using relative breeding values (RBV; standardization: 100 ± 20)
  → body measures in offspring of parents with RBV < 120 when compared to offspring of all parents

Tables 1 and 2: Distribution of conformation traits in the study population of German shepherd dogs

Conformation trait (body measure)	Males (n = 14,416)	Females (n = 21,612)
Withers height (WH)*	64.37 ± 0.89 (59.0 - 66.0)	59.22 ± 0.94 (54.0 - 61.5)
Body mass index (BMI)	88.00 ± 6.38 (61.0 - 114.7)	82.75 ± 6.48 (58.3 - 120.0)

*GSD breeding standard for WH and body weight (BW):
WH (tolerance ± 1cm) ♂ 60-65cm, ♀ 55-60cm; BW ♂ 30-40 kg, ♀ 22-30kg

Conformation trait (variance within litter)	Males (n = 7,136)	Females (n = 10,018)
Withers height (vWH)	8.50 ± 6.60 (0.0 - 40.5)	6.39 ± 6.60 (0.0 - 40.5)
Body mass index (vBMI)	40.32 ± 51.62 (0.0 - 728.9)	37.67 ± 50.38 (0.0 - 728.9)

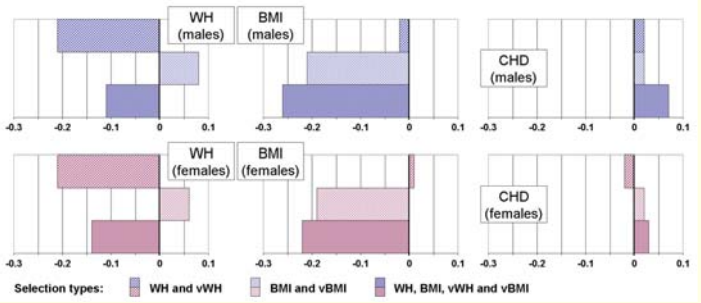
Conclusions

- limited WH and BMI variation in approved breeding dogs
- genetic determination of conformation traits
  → possible genetic evaluation and RBV-based selection for conformation traits and their homogeneity within litters
- compatibility of selection for desirable conformation and skeletal health (CHD)

Results

- moderate heritabilities of body measures and their variances within litters (h^2 = 0.19-0.41)
- negative correlation of -0.2 between RBV for WH and BMI
- maximum decrease of means for WH and BMI < 2% across selection scenarios
- most efficient reduction of WH and vWH without negative side effects on CHD: selection of sires and dams using RBV for WH and vWH

Figures 1 to 6: Expected selection responses (changes of means expressed in standard units) in male and female offspring when selection of sires and dams is based on genetic evaluation for conformation.



[1)] MTGSAM – Van Tassell CP, Van Vleck LD (1996). Multiple-trait Gibbs Sampler for Animal Models: Flexible programs for Bayesian and likelihood-based (co)variance component inference. J Anim Sci 74: 2586-2597.