Postpartum Dysgalactia Syndrome in sows: Estimation of variance components and heritability

R. Preißler[1,3], D. Hinrichs[3], K. Reiners[2], H. Looft[2] and N. Kemper[1]

[1] Animal Hygiene and Reproduction Physiology, Institute of Agricultural and Nutritional Sciences (IANS), MLU Halle-Wittenberg, Germany

[2] PIC Germany, Schleswig, Germany

[3] Institute of Animal Breeding and Husbandry, CAU Kiel, Germany

Introduction

The Postpartum Dysgalactia Syndrome (PDS) represents one of the most important diseases after parturition in sows. A genetic predisposition for susceptibility to PDS has been discussed in literature, and average heritability of 0.10 was estimated, but current studies on an extensive data base with a trait definition that is not only based on temperature measurement are lacking.

Objectives

The aim of this study was, therefore, to estimate variance components for PDS using a threshold liability model on the basis of a data set with profound post parturient clinical examinations over a two-year period.

Animals and Methods

→ six farms with similar management conditions, animal health and hygiene standards

→ 2,001 parities from 1,680 sows and their four- to five-generation pedigrees, including altogether 13,735 animals

→ 1,680 sampled sows: 335 purebred (Landrace (L) n = 155, Large White (LW) n = 180) and 1,345 crossbred (n_{LxLW} = 176, n_{LWxLW_Duroc} = 583, n_{LxL_Duroc} = 501, n_{others} = 85)

→ The following single trait threshold model was used for the estimation of variance components:

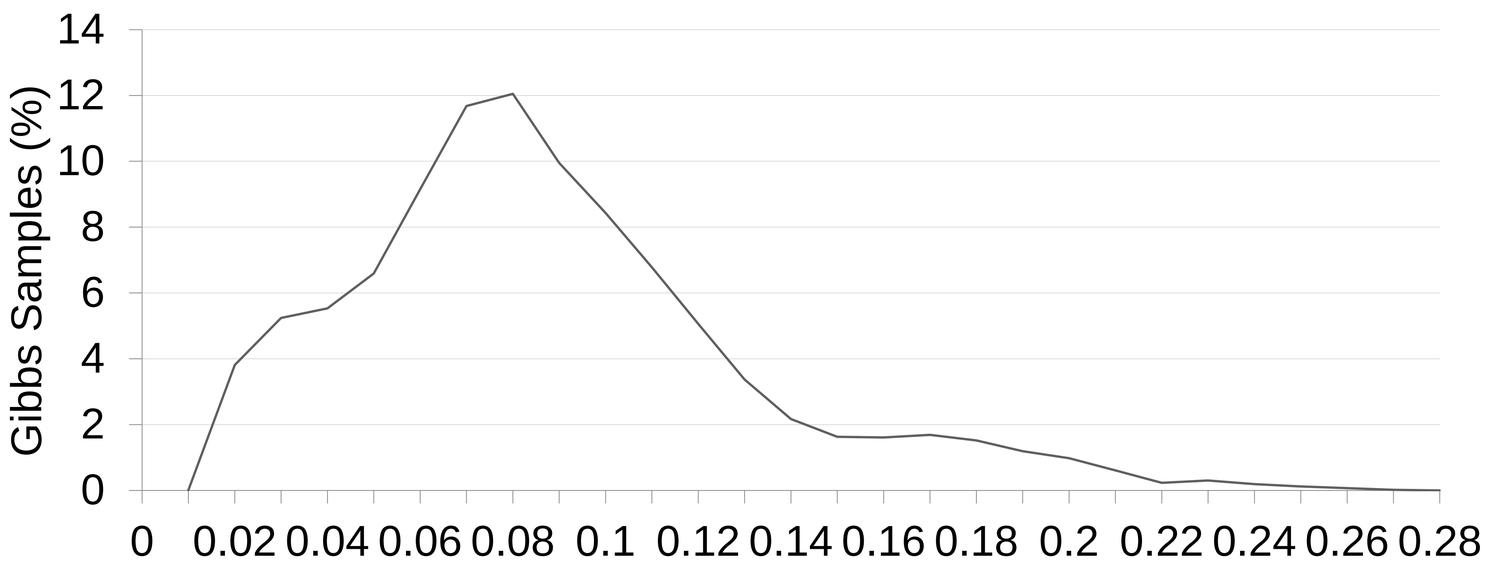
$$\lambda_{ijkl} = breed_i + season_j + parity_k + sow_l + e_{ijkl}$$

where

λ_{ijkl}	= threshold liability value for PDS (affected = 1, unaffected = 0)
$breed_i$	= effect of breed (i = 1, …, 6)
$season_j$	= effect of season (j = 1, …, 4)
$parity_k$	= permanent environmental effect of parity number (k = 1, …, 11)
sow_l	= animal effect of the sow (l = 1, …, 1,680)
e_{ijk}	= residual effect.

→ Genetic and statistical analysis was performed using the FORTRAN program LMMG_TH (Reinsch, 1996) and the statistical software SAS (SAS Institute Inc., Cary, North Carolina, USA).

Results



→ Posterior mean of additive genetic variance: 0.10 with a standard deviation (s.d.) of 0.06

→ Estimated variance for permanent environmental effect of parity number: 0.03 (s.d. 0.06)

→ Heritability for PDS: mean = 0.09, s.d. = 0.03, range from 0.01 up to 0.28 (Figure 1)

Figure 1: Posterior distribution of the heritability (x-axis) for susceptibility to PDS

Conclusions

A threshold liability model was applied for variance components estimation. Besides linear models as traditional approaches, threshold models were recently used for analysis of bovine mastitis as a binary disease trait (Heringstad et al. 2001; Hinrichs et al. 2005).

The estimated heritability for PDS of 9% in our study emphasizes the importance of optimizing hygiene and management conditions as well as considering the genetic background of PDS. For mastitis in cows, it was shown by Heringstad et al. (2003), that even a low heritability for susceptibility to mastitis is promising for selective breeding and for on-going research on genetic variation.

References: Heringstad, B., R. Rekaya, et al. (2001): Bayesian analysis of liability of clinical mastitis in Norwegian cattle with a threshold model: Effects of data sampling method and model specification. *J. Dairy Sci.* **84**, 2337-2346.
Heringstad, B., G. Klemetsdal, et al. (2003): Selection responses for clinical mastitis and protein yield in two Norwegian Dairy Cattle selection experiments. *J. Dairy Sci.* **86**, 2990-2999.
Hinrichs, D., E. Stamer, et al. (2005): Genetic analyses of mastitis data using animal threshold models and genetic correlation with production traits. *J. Dairy Sci.* **88**, 2260-2268.
Reinsch, N. (1996): Two Fortran programs for the Gibbs Sampler in univariate linear mixed models. *Arch. Tierz.* **39**, 203-209.

geMMA

Animal Hygiene and Reproduction Physiology, Institute of Agricultural and Nutritional Sciences (IANS), Martin-Luther-University Halle-Wittenberg, Theodor-Lieser-Str. 11, D-06120 Halle/Saale
www.tierhygiene-halle.de
Regine Preißler (regine.preissler@landw.uni-halle.de),
Prof. Dr. med. vet. Nicole Kemper (nicole.kemper@landw.uni-halle.de)

Funded by the Federal Ministry of Education and Research (BMBF).

FUGATO