

## Session 18

## Theatre 2

### **Estimation of genetic variation in macro- and micro-environmental sensitivity**

*Mulder, H.A.<sup>1</sup>, Rönnegård, L.<sup>2,3</sup>, Fikse, W.F.<sup>2</sup>, Veerkamp, R.F.<sup>1</sup> and Strandberg, E.<sup>2</sup>, <sup>1</sup>Animal Breeding and Genomics Centre, Wageningen UR Livestock Research, P.O. Box 65, 8200 AB Lelystad, Netherlands, <sup>2</sup>Swedish University of Agricultural Sciences, Department of Animal Breeding and Genetics, Box 7023, SE-75007 Uppsala, Sweden, <sup>3</sup>School of Technology and Business Studies, Högskolan Dalarna, SE-79188 Falun, Sweden; herman.mulder@wur.nl*

Genetic variation in environmental sensitivity means that animals genetically differ in their response to environmental factors. Some factors (e.g. temperature) are known and called macro-environment, whereas other factors are unknown and called micro-environment. We assume that genetic variation in sensitivity on macro- and micro-environmental level is expressed as genetic variation of the slope of a linear reaction norm and in environmental variance, respectively. The objectives of this study were to develop a statistical method to estimate genetic parameters for macro- and micro-environmental sensitivity and to investigate bias and precision of the estimated genetic parameters. A reaction norm model to estimate genetic variance in macro-environmental sensitivity was combined with a structural model for residual variance to estimate genetic variance in micro-environmental sensitivity using a double hierarchical generalized linear model in ASREML. A dairy cattle population was simulated and results indicated that designs with 100 bulls with at least 50-100 daughters are required for estimation of all genetic parameters with sufficient precision. When the number of daughters increased, the standard deviations of estimates across 100 replicates decreased substantially, especially for the genetic variance of the slope of the reaction norm and the genetic variance in environmental variance. The standard deviations of estimated genetic correlations were quite large (0.1-0.4). No bias was observed in all parameters. It is concluded that genetic parameters for macro- and micro-environmental sensitivity can be estimated with sufficient precision in designs with 100 bulls with 50-100 daughters each.