Genomic Evaluation in Australia

M.E. Goddard and B.J. Hayes
University of Melbourne and
Department of Primary Industries, Victoria
Australia

Australia have a data set of 1498 progeny tested Holstein and 364 progeny tested Jersey bulls that have been genotyped for the Illumina 50k SNP chip. The Holstein data set will expand by about 1000 bulls in the near future. There are also another >1000 Holstein bulls genotyped with other SNP chips that are not currently being used but might be in the future. From this dataset we have estimated a prediction equation. To test the accuracy of this process we have estimated the prediction equation based on 1098 Holstein bulls (training set) and used it to predict the most recent 400 Holstein bulls (validation set). The prediction equation uses deregressed EBVs as the dependent variable and fits a model containing all available SNPs and a polygenic term with covariances described by the A matrix. The prediction for bulls in the validation set using the estimated SNP effects are combined with a conventional EBV, based on the EBVs of the bull's parents, to generate a GEBV. The correlation between this GEBV and the actual EBV on the bulls in the validation set was 0.65 for protein yield for instance.

Several methods of estimating the prediction equations have been investigated. For most traits there is little difference between methods in the accuracy with which they predict the EBV of animals in the validation set. However, for fat% methods that assume a non-normal distribution of SNP effects give a substantially higher accuracy than BLUP which assumes all SNP effects are drawn from the same normal distribution. This is not surprising since we know there are QTL of moderate effect for fat%. The simplicity of the BLUP method makes it appealing to implement in the first instance while more complex methods are being investigated.

Currently we have prediction equations for Holsteins and Jerseys for production and conformation traits. ADHIS plans to release official GEBVs for these in 2010. In the meantime Department of Primary Industries, Victoria (DPI), as part of a research collaboration, is calculating GEBVs for young bulls owned by the AI Cooperative Genetics Australia. These have been based on a small subset of SNPs genotyped in the DPI laboratory. It is anticipated that in the future GEBV will be available for bulls and cows of all ages. This will use the Illumina 50k SNP chip and possibly smaller and larger marker panels.