Evaluation of accuracy of diagnostic tests from repeated measurements without a gold standard – application to tests for FMD virus and simulation results

Bas Engel, Jantien Backer & Willem Buist

Central Veterinary Institute, Wageningen University Research, Lelystad, The Netherlands

Email: Bas.Engel@wur.nl

Accuracy of diagnostic tests is commonly expressed in terms of sensitivity (probability that a true positive individual tests positive) and specificity (probability that a true negative individual tests negative). When true disease status of individuals is unknown (absence of a gold standard), evaluation of accuracy of diagnostic tests is still possible employing a latent class model. However, the analysis will often be hampered by ambiguity with respect to true disease status and problems with identifiability of parameters.

Here we discuss the analysis of test data of individuals that are repeatedly tested in time by several (possibly) dependent diagnostic tests. The model was developed for data from vaccinated cattle that were experimentally infected with foot-and-mouth disease (FMD) virus. At any time that tests were performed, the true disease status (defined as sero-conversion status) was unknown. The model extends a model developed for single data per individual (Engel et al., 2006).

The Bayesian analysis that incorporates prior information about prevalence and specificity of tests was performed with Markov chain Monte Carlo as implemented in the WinBUGS package. Results from analyses of the FMD data and of simulated data will be discussed.

References