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ESTIMATION OF THE SENSITIVITY AND SPECIFICITY OF TWO DIAGNOSTIC TEST FOR THE DETECTION OF ANTIBODIES AGAINST ACTINOBACILLUS PLEURO-PNEUMONIAE SEROTYPE 2 IN PIGS BY MAXIMUM-LIKELIHOOD-ESTIMATION AND GIBBS-SAMPLING

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A model proposed by Hui and Walter (1980) for estimating error rates of two or more independent diagnostic tests in the abscence of a reference test was evaluated in this study. A sample of 2600 pigs for slaughter were bled. The blodsamples were tested for antibodies against Actinobacillus pleuropneumoniae serotype 2 by means of a polyclonal blocking ELISA and the Complement Fixation assay. Sensitivity and specificity of the two tests as well as prevalences in subpopulations of the sample were determined by maximum-likelihood estimation and also by a Bayesian (Gibbs sampling) estimation method.The fit of the models were evaluated by either Peasons Chi-square or the likelihood ratio test. Sensitivity and specificity of the Complement Fixation assay was in the range .89-.93 and .99 respectively. Sensitivity and specificity of the ELISA was 1.0 and in the range .91-.94.

ABSTRACT OF POSTER

Estimation of the sensitivity and the specificity of a new diagnostic test is usually determined by evaluating the new test against a reference test, the gold standard. In order to obtain unbiased estimates of the sensitivity and the specifity of the new test, the sensitivity and the specificity of the gold standard are assumed to be 1. However, this rarely or never holds true. A model for estimating error rates of two or more independent diagnostic tests in the abscence of a reference test has been proposed by *Hui and Walter* (1980). The data for this study was collected in 1987 at a large Danish abbatoir (*Mousing et al.*, 1990). A total of 4800 pigs for slaughter was randomly sampled. Each pig was bled and ear-tagged. Subsequently information regarding the herd of origin was collected. The blood samples were analysed for the presence of antibodies against *Actinobacillus pleuropneumoniae* serotype 2 by means of a Complement Fixation assay (*Casey*, 1965; *Nielsen*, 1982) and a polyclonal blocking ELISA (*Nielsen et al.*, 1991). A subsample of 2600 individual pigs from conventional herds with sufficient information on herd size and serological data from each of the two tests contributed to the analysis. Data were divided into subsamples according to varying percentiles of herd size. Sensitivity and specificity of the two tests as well as prevalences were determined by maximum-likelihood estimation using the model of *Hui and Walter* and also by a Bayesian (Gibbs sampling) estimation method (*Gelfand and Smith*, 1990). The fit of the models were evaluated by either Persons Chi-square or likelihood ratio test as proposed by *Walter and Irwig* (1988). Sensitivity and specificity of the Complement Fixation assay was in the range .89-.93 and .99 respectively which are close to the estimates previously reported: .93 and 1.0 respectively (*Mousing et al.*, 1990). Sensitivity and specificity of the ELISA was 1.0 and .91-.94. The models exhibited varying degrees of fit depending on the number of population subsamples. The estimates obtained in the above analysis are close to the estimates obtained in a more empirical way. The method of *Hui and Walter* and subsequently the Bayesian approach have proved useful in the estimation of sensitivities and specificities of diagnostic tests in the abscence of a reference test. The methods have been referred occasionally in medical reseach but only sparcely in the veterinary field. However, they could presumably be applied more often, as a gold standard is often lacking.

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