Immunogenetic Factors Affecting Infectious Bovine Keratoconjuntivitis (IBK)

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Summary and Implications

The analysis of field data, revealed an estimate of .18 for heritability of resistance to pinkeye and an average decrease in weaning weight of 9.5 kg for infected animals. Tear samples were collected for the 2004 pinkeye season for the analysis of two factors (IgA and Lactoferrin) involved in ocular defense. Significant differences were found between infected and non- infected animals, in the levels of tear fluid IgA.

Introduction

Infectious Bovine Keratoconjunctivitis (IBK), commonly known as pinkeye is an ocular disease characterized by ulceration of the cornea and inflammation of the conjunctiva. It is considered a seasonal disease, with the higher incidence occurring during the summer months. Pinkeye is not a life threatening disease; however it causes significant economic losses to producers, as a result of the decrease in weight of infected cattle. There is no effective treatment for preventing or controlling outbreaks, due to the high rate of mutagenesis of the causative agents. Our objectives are: a) to estimate genetic parameters that could aid in the selection of cattle resistant to IBK and b) to study immunologic components involved in ocular defense mechanisms.

Material and Methods

Data from 2003 and 2004 pinkeye seasons was utilized for the estimation of genetic parameters. The field data was collected at the ISU Beef research farms and kindly provided by other Midwest producers. A linear model including fixed effects of contemporary group, infected groups and linear effects of age at weaning was used to evaluate association of pinkeye to weaning weight. Binary response variables and pedigree information were used to estimate variance components and heritability estimates. In order to evaluate the severity of disease, a scoring system from 0-4 was developed (Figure 1).

Tear samples were collected by swabbing the eyes of the 2004 born progeny (N=90) in order to quantify two proteins involved in ocular defense: IgA and Lactoferrin. An antibody sandwich ELISA was used to quantify these proteins in bovine tears. The analysis of the protein quantification assays was carried out by utilizing GLM, Mixed and Logistic procedures from SAS.

Results and Discussion

The analysis of the field data estimated a heritability (h^2) of .18 for resistance to IBK. This estimate is considered to be of low to moderate heritability, which indicates that slow to moderate progress can be made based on selection of EPD's for IBK resistance. Furthermore the analysis did not detect any difference in incidence between sexes. The effect of infection on weaning weight was evaluated and indicated an average decrease in weaning weight of 9.5 kg in infected cattle.

In order to analyze the data obtained from the ELISA's, we first asked if there was a difference in IgA and Lactoferrin levels between infected and non-infected cattle. Our analysis showed a significant difference ($P<.05$) between the infected and non infected cattle for IgA levels (Figure 2), when both eyes were analyzed together. Significant difference in the levels of IgA was also observed when each eye was analyzed separately. There was no significant difference in the levels of lactoferrin, and no further analysis was carried out. In the third analysis of the data, we evaluated the relationship between IgA levels and severity of infection. The result of this analysis indicated that as the amount of IgA in the tears decreases, the severity of infection is increased (Figure 3). Lastly, we carried out a logistic regression to estimate the probability of infection with different titers of IgA. The analysis indicated a decrease in the probability of infection with increased titers of IgA (Figure 4).
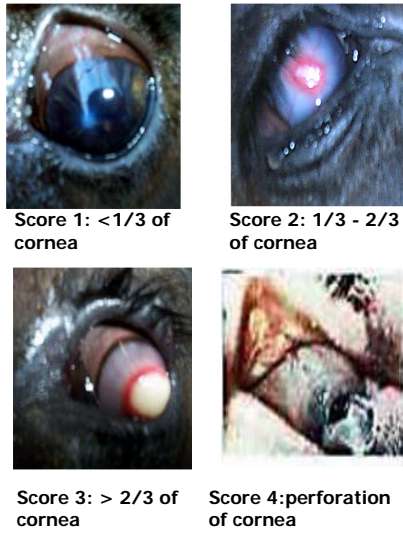
Score 1: <1/3 of cornea

Score 2: 1/3 - 2/3 of cornea

Score 3: > 2/3 of cornea

Score 4:perforation of cornea

Figure 1. Scoring system for severity of pinkeye infections.
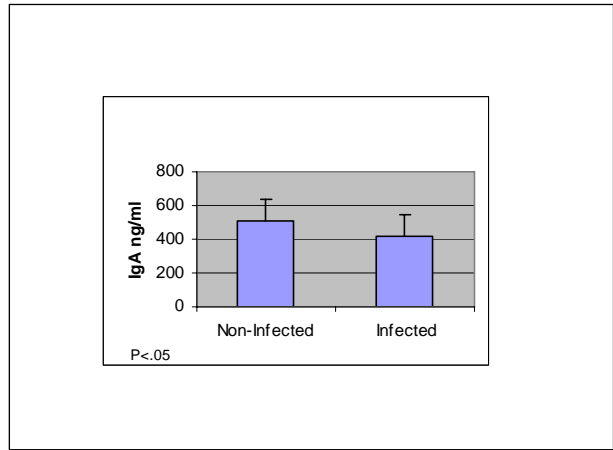

Figure 2. Quantification of IgA levels in bovine tears illustrates the difference between infected and uninfected calves.

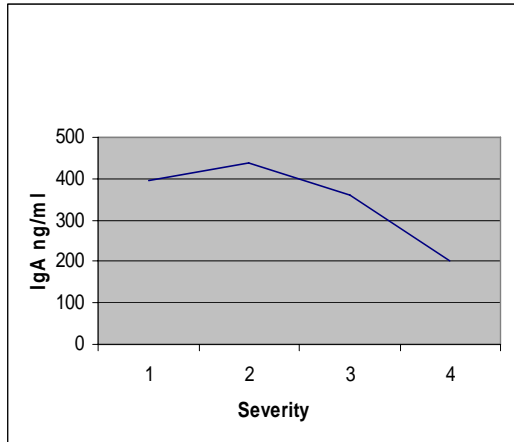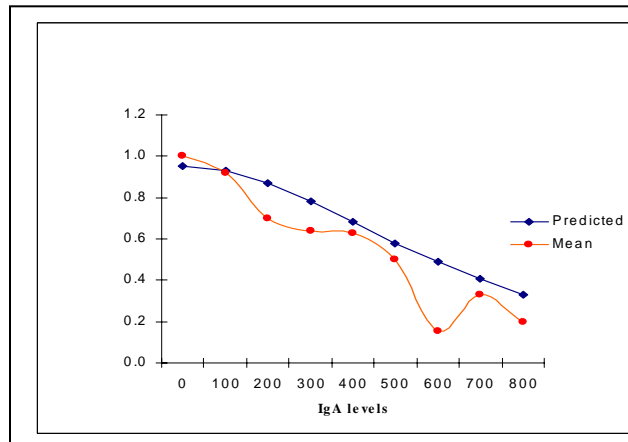**Figure 3. Relationship between IgA levels and severity of infection.**

Figure 4. IgA levels and probability of infection.