Study on the usefulness of tear components in respiratory disease of Japanese Black Calves

Abstract of Doctoral Thesis

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Abstract

This study conducted a series of experiments to investigate whether changes in tear properties are useful as an index for detecting the acute inflammatory stage of respiratory diseases, which have a large economic loss for Japanese Black breeding farmers.

In Chapter 2, the Schirmer Tear Test I method of clinically healthy calves is used to measure tear volume (STT I value) and total protein concentration in tear fluid, and the factors affecting the tear volume were examined. The STT I value of clinically healthy calves was 18.9±2.9 mm/min (n=263). The total protein concentration in tears of clinically healthy Japanese Black calves from 15 to 90 days of age was 1.18±0.30 mg/ml (n=38). It was suggested that age and ammonia concentration are related to fluctuation of tear volume.

In Chapter 3, the STT I value (22.2±3.0 mm/min) and total protein concentration in tears (1.85±0.47 mg/ml) of calves (n=63), which are in the acute inflammatory stage of respiratory diseases, are described. It was measured and significantly higher than that of clinically healthy calves. Therefore, the protein components in tears were subjected to qualitative analysis by two-dimensional electrophoresis and Liquid Chromatography-Mass spectrometry (LC-MS/MS). 1,329 spots of protein in tears of clinically healthy calves were obtained, and spots showing a significant increase in calves in the acute inflammatory stage of respiratory disease were identified using LC-MS/MS. Although it was not identified, the amino acid sequence suggested that it may be an immunoglobulin L chain. Then, when the immunoglobulin concentration in the tear fluid was evaluated including digestive diseases typical of calves, the IgA concentration in tears of respiratory disease calves was significantly increased compared with clinically healthy calves (0.31±0.32 mg/ml, n=32) and gastrointestinal disease calves (0.07±0.04 mg/ml, n=6). The increase in tear fluid and IgA in tear fluid observed in calves with respiratory diseases was considered to be caused by irritation to the conjunctiva and cornea, which are the upper respiratory tract and ocular mucosa, caused by respiratory diseases. Furthermore, when tears were collected over time in two calves evaluated as clinically healthy calves, high IgA levels in tears were observed before the onset of external symptoms of respiratory disease.

If it is possible to observe the area around the eyes and treat in the early stages of respiratory disease during feeding management, reduce the number of treatment days, prevent the spread of infection, and reduce the number of injuries and injuries of livestock mutual aid. It is thought that it can contribute to connection, improvement of productivity and stabilization of farm management.