

## **G Summary**

### **Effect of Biotin on Intracellular and Intercellular Structures in the Heel Horn of Bovine Claws**

Clinical, morphological, and analytical methods were applied to examine the effect biotin takes on intracellular and intercellular structures in the heel horn of bovine claws. At a dairy farm, supplementary biotin feeding was given to a group of 12 cows; a second group of 12 cows without biotin supplementation served as control group. Clinical examinations of the claws were conducted, and horn samples of the heel horn were taken in the course of claw care operations for morphological evaluation. For the lipid analysis, horn samples were taken of all four claw pairs of each cow and submitted to the Department of Agriculture and Forestry of the University of Aberdeen, Scotland to perform the analysis. Although tried and trusted, the field experiment method applied in this thesis is difficult to calculate in some respects; the experimental groups, for instance, may decrease considerably in numbers as a result of unpredictable circumstances. Still the benefits of a field experiment are outweighing since the cows stay in their familiar surroundings and the sampling is more or less free of stress and pain for the animals. Moreover, the results obtained can directly be implemented in agricultural practice. To verify the biotin supplementation the milk biotin content was determined. The milk biotin content found in these examinations confirmed the group assignment.

The results of the clinical examination showed an improved health condition of the claws in the biotin-supplemented group of cows, whereas the health condition in the group of control cows was unchanged or even deteriorated as compared to the results of the last sampling date. The results found have been substantiated by histological examinations. A special set of evaluation keys was developed for the purpose of light and electron microscope examination of horn cells. These evaluation keys made it possible to establish a sound basis for an improved reproducibility of ultra-structural examinations in histology. The PAS reaction as semi-quantitative proof of glycoproteins and glycolipids did not show any difference between biotin-supplemented and control cows. Neither was it possible

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to establish proof of a biotin effect in the light microscope examinations of semi-thin cross sections. Electron microscope examinations of the ultrastructure showed variances in the intercellular membrane coating material and in the intracellular lipid droplets, thus providing clear evidence of biotin action. The variances established at the horn cells in the histological examinations can be attributed to the metabolic processes involving energy and lipids. So, the lipids analysis showed that the vitamin biotin does have an effect, particularly on simple lipids. But even with complex lipids an increased number of fatty acids with a chain length of C16 and C18 were found.

The result in conclusion is that biotin does have a noticeable effect on the health condition of bovine claws.