8. SUMMARY

The use of the liver biopsy and liver fat estimation for the herd management of dairy cows

Over a thirteen month period, 1793 liver biopsies and blood samples from dairy cows during the first and third to fifth week of lactation were taken from seven different dairy farms in Sachsen and Thüringen. Liver biopsies were taken monthly from every single farm from up to ten dairy cows out of both stages of lactation. Additional to that on farm 2 liver biopsies were taken from up to ten dairy cows on a weekly basis. The liver fat content of the individual samples was estimated by the copper sulphate test. Liver biopsy samples of one investigation unit were pooled and the liver fat content of the pooled sample was estimated gravimetrically. The serum parameters β-hydroxy-butyric acid, bilirubin, phosphorus, ASAT, GLDH und γ-GT were determined in the laboratory.

Dairy cows in the first week of lactation showed significantly ($p<0,05$) higher liver fat content than those in the third to fifth week of lactation. The liver fat content increased continuously from the time of calving until it reached its peak on the seventh day post partum. From the beginning of the third until the end of the fifth week, the liver fat content then decreased continuously. The average liver fat content in autumn was significantly ($p<0,05$) below the average liver fat content in winter and spring. Those animals who were in their third or a higher lactation showed a significant ($p<0,05$) higher liver fat content than those in their first or second lactation. Liver fat content could be correlated to the following measured serum parameters; ß-hydroxy-butyric acid ($r=0,440$), bilirubin ($r=0,333$), ASAT ($r=0,246$), GLDH ($r=0,156$) and γ-GT ($r=0,182$).

Additionally, liver fat content could be correlated to the 100-day milk yield ($r=0,145$), the milk fat content ($r=0,064$), the milk protein content ($r=-0,175$), service interval ($r=0,059$) and intercalving period ($r=0,069$) revealed significant ($p<0,05$).

For further analysis, the dairy cows were classified into three categories according to their liver fat content: low liver fat content 5-8,5%, moderate fatty liver 12-15,5% and massive fatty liver 19-29,5%. Within these categories significant ($p<0,05$) differences were statistically determined for the 100-day milk yield, the milk fat content, milk protein content and the service interval. Significantly ($p<0,05$) higher liver fat contents were shown in cows diseased with placental retention or ketosis. Animals with a massive or moderate fatty liver revealed a significantly ($p<0,05$) higher death rate.

In all seven dairy farms the liver biopsy and the liver fat estimation were introduced in the herd management program without any concern for the farm management. Additional to that, the results provided helpful information for the farmers and had a positive influence on the evaluation of the herd. The liver fat estimation allowed a convincing evaluation of the milk yield, the reproductive performance, the disease process and the total loss on a dairy farm. The copper sulphate test proved itself as being suitable for use in practice. The best time for taking a liver biopsy is between the sixth and tenth day post partum. At that point of time the full extent of the fat mobilisation is reached and therefore the liver biopsy permits a high diagnostic reliability for feeding management and energy supply of dairy cattle.

Further investigations on the development of the liver fat content during the second week of lactation post partum are recommended.