

The importance of nutritional factors and the physiological background for the development of liver abscesses in veal calves and young bulls - Perspectives for organic beef production

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Background

In organic meat and dairy production one aim is to obtain a high level of animal welfare. In spite of this there is a higher incidence of liver abscesses among organic dairy cows compared to non-organic cows (8% versus 5%). Furthermore, recent data suggest that already as heifers, this difference exist, and suggest that the rearing period also can cause liver abscesses to develop. This is an ethical problem in conflict with the aim and if left unresolved, it can become an image and marketing problem for organic farming. Liver abscesses are not only an ethical problem but also causes an economic loss due to lower animal performance and condemnation of the liver. In veal calf production the public demand for animal welfare has also increased in recent years. Veal calves are most highly exposed with, on average, 11% of liver abscesses. In order to reduce the level an economical penalty was introduced in 2003 for veal calf and young bulls having liver abscesses.

Liver abscesses are mainly related to high grain and low roughage (i.e., physical structure) feeding, which is common for veal calf and young bull production. Predisposing factors for the development of liver abscesses are generally accepted to be rumen parakeratosis due to rumen acidosis (the ruminitis- liver abscess complex). In organic farming the roughage intake must comprise a minimum level of 50-60% of dry matter in the feed ration, which theoretically should secure a moderate energy level and keep a healthy and stable rumen environment. However, compared to conventional production, the amount of grain and the starch level of the ration is often higher in organic dairy production.

This project is mainly focused on feeding studies of calves and young bulls in order to establish a larger basic knowledge on how the liver abscesses can be prevented by nutritional means. However, in the experiments feed rations relevant to organic production in general (i.e., heifers and dairy cows) are also tested. Since it is not allowed to use antibiotics and probiotics in the EU to reduce rumen acidosis, the focus is mainly on how to compose and feed the ration to prevent acidosis and liver abscesses without reducing the production level.

Objective

The aim is to investigate

- The effect of starch level and roughage intake on feed intake, animal performance, rumen wall condition and development of liver abscesses in young bulls
- The physiological changes in the rumen and the blood of veal calves (4 and 7 months old) under different feeding regimes (i.e., the effects on rumen fermentation, rumen epithelia, nutrient transport mechanisms and degradation of nutrients)
- The possibility to identify the presence of an abscess in the liver either by ultrasound or by blood measurements

Progress - 2004

- Ph.d course in "Generalized Linear Models and Survival Analysis", Biometry Research Unit, Danish Institute of Agricultural Sciences, Spring 2004, 9 ETCS. The course is passed.
- Study tour to the United States in connection with participation in the ICPD, Michigan State University and the ADSA/ASAS joint meeting, St. Louis. During the stay a meeting with Professor Nagaraja, Kansas State University was established and results from our experiments were presented and discussed.
- Participation in the ISRP meeting, Copenhagen, September.
- Theater and poster presentation at the EAAP meeting, Bled, Slovenia, September.
- Ultra sonographic examinations of livers have been carried out regularly on 72 bulls throughout the year.
- Visual evaluation of rumen material from 72 young bulls raised on concentrates or on roughage-based rations with or without a finishing ration.
- Ph. d course in "Animal Nutrition & Physiology", Department of Animal Science and Animal Health, KVL, Autumn 2004, Block A: 4 ECTS, Block B: 11 ETCS. The course is running in autumn/winter 2004.
- Several articles prepared in Danish.
- A manuscript for a scientific journal is under preparation
- Planning of experimental activities with ruminal-fistulated calves to take place in 2005

Progress - 2005

- Experiments with fistulated bull calves were carried out in the spring
- Theater presentation at the EAAP meeting, Uppsala, Sweden, June
- Laboratory analysis in the autumn
- Writing scientific papers on the results from the production experiments
- Oral presentation at the 2nd Young Scientist symposium, Warsaw, Poland, 12.-13. September
- Participation in the SOAR Summer School on Globalisation, 3 –7th. October

Progress – 2006

- Laboratory and statistical work carried out
- Paper I: Jørgensen, K.F., Sehested, J. & Vestergaard, M. 2006. Effects of starch level and roughage intake on animal performance, rumen wall characteristics and liver abscesses in intensively fed Friesian bulls. Submitted juli 2006 til *Animal*
- Paper II: Jørgensen, K.F., Nørgaard, P., Kristensen, N.B., Weisbjerg, M.R. & Vestergaard, M. Ruminal fermentation pattern and *in sacco* degradability of NDF in fistulated calves fed different starch levels and two types of roughage. (*In preparation for: Journal of Animal Science to be submitted ultimo 2006*).
- Paper III: Jørgensen, K.F., Nørgaard, P., Kristensen, N.B. & Vestergaard, M. Ruminal SCFA absorption capacity in fistulated calves fed different starch levels and two types of roughage. (*In preparation for: Journal of Animal Science to be submitted ultimo 2006*).
- Paper IV (short communication): Jørgensen, K.F., Kristensen, N.B. & Vestergaard, M. Ruminal fermentation pattern in veal calves when replacing starch by molasses and grass pellets in the concentrate ration (*In preparation. To be submitted January 2007*).
- SOAR Summer School May 2006: Potential of organic farming to contribute to rural development in Europe (4 ects).

Plans 2006-2007

- Thesis to be handed in in December
- Defending the thesis in January or February 2007

Publications

Jorgensen, K.F. and Kjeldsen, A.M. and Strudsholm, F. (8. March 2004) [Leverbylder hos økologiske slagtekøer - resultater fra en spørgeundersøgelse](http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1289.htm) [Liver abscesses in organic dairy cattle- results from a survey]. Online at <<http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1289.htm>>. Accessed 08.03.2004

KvægInfo nr. 1289, Dansk Kvæg|Landscentret, Dansk Landbrugsrådgivning, Skejby Fonden for Økologisk Jordbrug

Jørgensen, K.F. and Kjeldsen, A.M. and Strudsholm, F. (8. March 2004) [Leverbylder hos økologiske slagtekøer - sammenhæng til mælkeanalyser og andre besætningsdata](http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1290.htm) [Liver abscesses in organic dairy cattle- relation between milk data and other herd data]. Online at <<http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1290.htm>>. Accessed 08.03.2004

Kvæginfo nr. 1290, Dansk Kvæg|Landscentret, Dansk Landbrugsrådgivning, Skejby Fonden for Økologisk Jordbrug

Jorgensen, K.F. and Kjeldsen, A.M. and Strudsholm, F. (8. March 2004) [Leverbylder hos økologiske slagtekøer - sammenhæng med race, alder og andre forhold ved den enkelte ko](http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1292.htm) [Liver abscesses in organic dairy cattle- relation between breed, age and other individual cow data]. Online at <<http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1292.htm>>. Accessed 08.03.2004

Kvæginfo nr. 1292, Dansk Kvæg|Landscentret, Dansk Landbrugsrådgivning, Skejby Fonden for Økologisk Jordbrug

Kjeldsen, A.M. and Jørgensen, K.F. and Mortensen, B.Ø. and Steffensen, M. and Pedersen, S.S. (29. March 2004) [Slagtefund hos økologiske og konventionelle slagtekøer](http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1303.htm) [Veterinary registrations on organic and conventional slaughter cows]. Online at <<http://www.lr.dk/kvaeg/informationsserier/lk-meddelelser/1303.htm>>. Accessed 29.03.2004

Kvæginfo nr. 1303, Dansk Kvæg|Landscentret, Dansk Landbrugsrådgivning, Skejby

Jorgensen, K. F. and Larsen, S. B. and Andersen, H. R. and Vestergaard, M. (2004) [Effect of starch level and roughage intake on animal performance, rumen wall characteristics and liver abscesses in intensively fed Frisian bulls](#). Poster presented at Annual Meeting of the European Association for Animal Production, Bled, Slovenia, 5.-9. September 2004; Published in van der Honing, Ynze, Eds. *Book of abstracts of the 55th Annual Meeting of the European Association for Animal Production*(10), page 112.

Jorgensen, K. F.; Kjeldsen, A. M.; Strudsholm, F. and Vestergaard, M., Eds. (2005) [5953: Factors causing a higher level of liver abscesses in organic compared with conventional dairy herds \[Faktorer af betydning for et højere niveau af leverbylder hos økologiske sammenlignet med konventionelle malkebesætninger\]](#) Proceedings of Annual Meeting of the European Association for Animal Production, Uppsala, Sweden, 5.-8. June 2005. *Book of abstracts of the 55th Annual Meeting of the European Association for Animal Production. EAAP Book of Abstracts* no. 11. Wageningen Academic Publisher, The Netherlands.