

Summary PhD project Sieglinde Debruyne

The goal of this innovative PhD research is to realize a long-term methane reduction in ruminants, based on nutritional intervention in early life. By treating the ruminant in the pre and/or postnatal stage of life with natural feed supplements, we aim to modify the early microbial colonization of the rumen, so that the methane-producing methanogens are inhibited or less present. In this way, we create a modified, stable rumen microbiota which produces less methane on the long-term. The main hypothesis for this research suggests that it is possible to change a complex microbial ecosystem by a short nutritional intervention during the unstable phase of development. This in turn changes the functionality of the microbiota. This hypothesis is an application of the principle “Early life programming” (ELP). Most of the used feed supplements in this PhD research are kinds of fatty acids known to have antimicrobial effects in the rumen, like poly-unsaturated fatty acids (PUFA) and medium chain fatty acids (MCFA). Also a commercial essential oil blend is tested.

Three main animal trials are conducted in this PhD research.

1. The first is a calve trial, in which female calves of dairy cattle are subjected to a postnatal treatment with either extruded linseed (ca. 50% C18:3) or an essential oil blend, until the age of 4 months old. These calves, together with a control group, are followed-up for growth and feed intake until one month after their first calving (approx. 25 months). Sampling involves taking rumen fluid (in vitro incubations, microbial investigation), saliva and serum (immunological investigation) and in vivo methane measurements in closed circuit respiration chambers on several ages during the trial. In vivo methane emissions are also monitored around calving (1 month before until 1 month after) by the Greenfeed system, and milk production is recorded daily. An important trump of this trial is the duration of follow-up, which is longer than any research in ruminants concerning ELP.
2. The second is a goat trial, in which male kids of dairy goats are subjected to a pre and/or postnatal treatment with medium chain fatty acids (MCFA, high levels of C12:0 and C14:0) from coconut oil, until two weeks postweaning. Does, pregnant with twins, were first split up in two groups. One group was treated with the MCFA (M+), the other group was a control group (M-). Does gave birth to male twins which were also split up into a treated twin (K+) and a untreated twin (K-). The use of twins is essential in this experimental set-up, because this makes the comparison between treatments less biased. Kids are housed in pairs and followed-up for growth and concentrate intake until two weeks postweaning, after which they go into group housing for three months on pasture. Samples are taken of rumen fluid (in vitro incubations, microbial investigation), saliva and serum (immunological investigation) at two ages. At 6 months old, kids are euthanized and valuable samples are taken of the rumen content and rumen wall for rumen development studies (histomorphology).
3. The third trial is a goat trial analogous to the before-mentioned, but with a different kind of natural supplement, i.e. marine micro algae (containing high levels of C22:6). Experimental set-up and sampling is the same as the MCFA trial.