The Science Behind

An interview

with Prof. Gerhard Breves

Director of the Department of Physiology, University of Veterinary Medicine, Hannover

1. You have been researching the ruminant physiology, in particular the digestive system, for many decades now. What makes it so special and important?

The special feature of microbial processes in the forestomach region of ruminants is the fact that rations with a high crude fibre content can be converted to high quality food such as milk and meat for human nutrition. This is based on fermentative degradation of plant carbohydrates to short chain fatty acids (SCFA) which are absorbed and can be used for a variety of intermediary processes. The quantitative contribution of microbial fermentation on overall energy metabolism of the host animal is high and can reach proportions between 60 and 70%. The synthesis of microbial protein and water-soluble vitamins is a further feature which results in a high supply of amino acids and other essential compounds to the host.

The capacity of ruminants to use roughages for production of high-quality human food is unique and this ability is of major relevance with regard to growing world population.

ABOUT THE AUTHOR

Prof. Gerhard Breves

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Gerhard Breves graduated from the University of Veterinary Medicine, Hannover, and wrote his doctorate thesis at the respective Department of Physiology. After holding a postdoc-position in Hannover, he moved to the Institute of Animal Nutrition at the Federal Agricultural Research Station in Braunschweig, Germany.

In 1990 he was appointed as a Professor in Veterinary Physiology at the Justus-Liebig-University Giessen, Germany. Since 1997 he has been the Director of the Department of Physiology at the University of Veterinary Medicine in Hannover.

His major research focus is gastrointestinal physiology in ruminants and monogastric animals with a special emphasis on comparative aspects of rumen and hindgut microbial metabolism, as well as mechanisms and regulation of epithelial transport processes. This includes both, functional and molecular characterisation of nutrient and electrolyte transport systems.

2. We all are aware that the livestock system contributes to the emissions of greenhouse gases and that the methane that is produced during ruminant digestion is a major part of it. One approach to tackle this problem is Mootral. In your lab experiments it significantly reduces the production of methane by up to 95%. Can you describe the way Mootral works?

In our studies, the **Ru**men **Si**mulation **Tec**hnique (Rusitec), a well-established in-vitro technique for studying rumen microbial metabolism, has been applied to measure the effects of Mootral on rumen metabolism. This semi-continuous technique allows us to measure rumen metabolism for several weeks under conditions which are similar to the in-vivo situation.

In our experiments we could demonstrate that Mootral resulted in increases in SCFA production rate and changes of the microbial community of archaea. Since the archaea are the relevant group of microbes which can produce methane through reducing carbon dioxide by utilizing reduction equivalents originating from microbial fermentation, this has to be assumed as the major mechanism of how methane production is reduced in response to Mootral. Interestingly, this was not associated with any negative effects on rumen metabolism.

3. Do you see other benefits for Mootral besides the methane reduction?

In high yielding cattle, energy requirement for milk production exceeds dietary energy intake. Thus, a negative energy balance is a common feature in high producing cows which may exist for many weeks of lactation. Since methane production and emission mean energy losses to the host animal, each approach to reduce methane production can be beneficial to the host animal. This has been shown in other studies with Mootral in lactating dairy cows. This, however, has to be studied in more detail.