

Diets that keep your cows agile for high milk quality

What if we could formulate diets for dairy cows that can help the cow to adapt to challenges in the diet and her environment? We could expect greater and more consistent performance in response to diet formulations.

by Gwendolyn Jones,
Anco Animal Nutrition
Competence GmbH.
www.anco.net

If the Titanic had had the pre-sense and adaptive cruise technology developed by Audi, it would have been able to anticipate the iceberg and reduce or avoid its impact. Hollywood would be short of one of its great movies, but the Titanic might still be cruising around today or at least would not be at the bottom of the North Atlantic Ocean. This forms the base for the development of a gut agility activator.

Agile version of Titanic

More than 100 years ago the Titanic sunk, after colliding with an iceberg during its maiden voyage. Technologies that exist today to predict collisions and automatically adapt speed and change direction could have easily prevented such a disaster.

Responsive and adaptive technologies are leading the development for increased agility in how we and machines are operating today. Agility in this context is the capacity to anticipate and adapt to changes or challenges quickly for competitive advantage and to minimise damage to performance and efficiency.

Agile dairy cow

We formulate diets of dairy cows to meet nutrient requirements for expected performance outcomes. However, many times the expected outcomes are not reached, due to the cow facing challenges through the diet or her environment, which could not be predicted in the diet

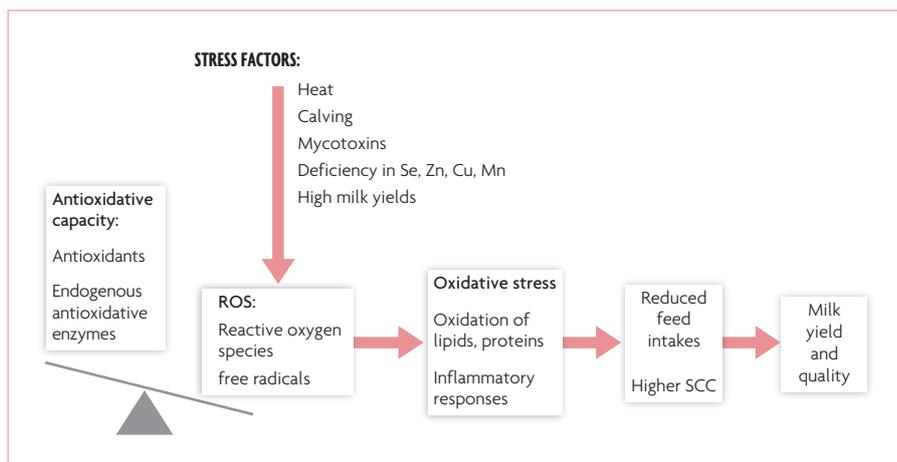


Fig. 1. Oxidative stress is defined as the imbalance between pro-oxidants and anti-oxidative capacity (in favour of pro-oxidants, ROS).

formulation, but affect her performance, efficiency or even her health.

Depending on the cow's own coping and defence mechanisms she will be affected to a greater or lesser extent. Some cows may be genetically more 'agile' than others and able to cope with stressors more efficiently. To those who are more like the Titanic or are under high performance pressure and limited in their agility, dietary and environmental stressors will be more detrimental for performance and health. This begs the question for cost-effective nutritional means to improve the cow's agility.

Feeding for agility

Knowing which challenges or stressors to anticipate is winning half the battle. Determining their potential impact and the detrimental reactions they can cause to the efficiency and performance of the dairy cow helps to find predictive ways to mitigate the consequences.

Common stress reactions in the dairy cow to stressors in the feed and in the environment, are oxidative stress, inflammation, shifts in rumen microflora and efficiency at the cellular level and reduction in feed intake. They will all lead to wasted energy and increased maintenance energy or a reduction in

energy intake, which again will have consequences for milk yield and quality.

A greater understanding of the underlying mechanisms can advance our ability to formulate dietary concepts to interfere with the way cows adapt in a predictive manner for more consistent and profitable outcomes.

Antagonistic DMI adaptation

The understanding of the regulation of dry matter intake (DMI) is very important in ruminant nutrition, due to its importance for milk production. More recent research shows that certain gut peptides or gastrointestinal hormones play a role in DMI regulation in ruminants.

For example, it was proven that cholecystokinin (CCK) has a regulatory effect on feed intake in dairy cattle fed high fat diets. High fat diets increased plasma CCK concentrations and decreased dry matter intake. Blockage of endogenous CCK activity at the CCKA receptor with a synthetic antagonist reversed fat-induced depression of dry matter intake.

Since certain plant extracts are known to have an antagonistic effect to CCK in humans, they may also offer a solution to DMI regulation in ruminants, particularly in the face of fat or DON (deoxynivalenol) in

Continued on page 13

Continued from page 11

the diet, which are known to increase CCK activity and decrease feed intake. They might help to adapt the cow's normal response to these dietary factors to a more favourable one in terms of DMI and milk production.

Rumen function optimisation

Any diet factors that affect rumen fermentation can change milk fat and protein levels. Any reduction in rumen microbial protein production from nutrition or feeding management imbalances will reduce milk protein by way of less microbial protein for the cow to digest and depress fat by limiting VFA (volatile fatty acid) production in the rumen.

Scientific literature indicates that certain essential oils and their components can have a positive effect on rumen fermentation and microbial protein synthesis.

This has been particularly the case when diets with high concentrate levels were fed and rumen pH was low.

Considering the fact that the mycotoxin DON in diets can also affect rumen fermentation and microbial synthesis negatively and the capacity of rumen microbes to detoxify DON decreases with high concentrate diets, certain essential oils

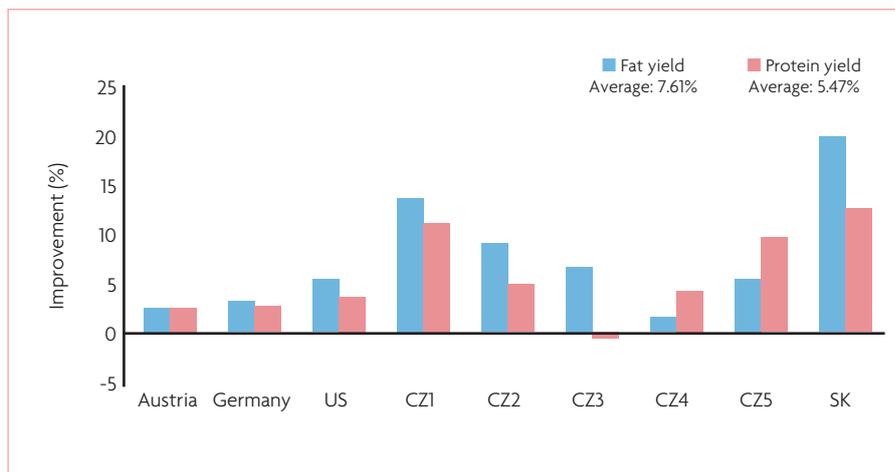


Fig. 2. Percent improvement in milk fat and protein yield on dairy farms in response to a gut agility activator.

and their components may be used to adapt rumen function to dietary challenges and also reduce the impact of DON on rumen function.

Antioxidative capacity boost

There are several factors in the feed and in the environment, that can cause oxidative stress in the dairy cow (Fig. 1). Adding antioxidative components from herbs and

spices to the diet can help to increase the antioxidative capacity of cows, neutralising the damage of reactive oxygen species (ROS) or free radicals that would otherwise occur.

This can mean a huge boost to the cow's agility, since oxidative stress is a very common stress reaction to many stressors the cow will encounter throughout her productive life. Certain antioxidative components from herbs and spices can enhance the antioxidative capacity of the dairy cow.

As oxidative stress has been associated with higher somatic cell counts (SCC) and a reduction in feed intake, this can translate into beneficial effects for milk quality and milk solid yield, particularly if the cow is facing challenges. The safety value for performance and cost-efficiency of the diet improves.

Results to be expected

The results to be expected from diets designed to increase the agility of the dairy cow by nutritional means were tested by adding a gut agility activator to dairy cow rations in several different countries in field and research conditions (Fig. 2).

The gut agility activator contained an adaption formula comprising bioactive substances from herbs and spices with known positive effects on antioxidative capacity, rumen efficiency and appetite regulation.

Milk fat and protein yields were increased in most cases, due to improved milk fat and protein contents, without negative impacts on milk yield and in some cases milk yields were even increased.

In addition to that, improvements to SCC were seen on dairy farms with higher levels of SCC and milk yields. The results suggest that further developing the concept of cow agility by nutritional means is a way of gaining greater control on milk profits from diet formulations. ■