



REDUCING PROBLEMS in transition cows using protected choline

by Orffa Additives B.V., Lien Vande Maele

The onset of lactation is a critical period in a high-performing dairy cow and good management during the transition period is very important to prepare the cow for a productive lactation. Nutritional adaptations can help for a good start.

FAT METABOLISM IN COWS

At the end of gestation and after calving, every cow experiences a negative energy balance. As a result, they will use their body reserves and break down fat (and muscle) tissue as a source of energy.

When fat is mobilised from the adipose tissue (see Figure 1), the triglyceride structure is broken down and non-esterified fatty acids (NEFA) are transported through the blood to the liver, where they are further metabolised.

The capacity of the liver for creating energy by

complete oxidation of NEFA is limited. If oxidation is not complete, ketones are formed, which will appear in the blood, urine, and milk. High ketone levels can result in clinical disease (clinical ketosis) with symptoms of decreased feed intake, milk drop, weight loss, and nervous symptoms. More common is a subclinical presentation of ketosis; ketone levels are elevated, but clinical symptoms are less obvious. Subclinical ketosis is often a herd problem and leads to important economic losses due to reduced milk yield, reduced reproductive results, but also by direct costs associated with the higher susceptibility to diseases.

Non-esterified fatty acids can also be removed from the liver again in the form of very low density lipoproteins (VLDL). Choline is essential for the synthesis of VLDL and, therefore, plays a crucial

Figure 1 Fat metabolism in the dairy cow

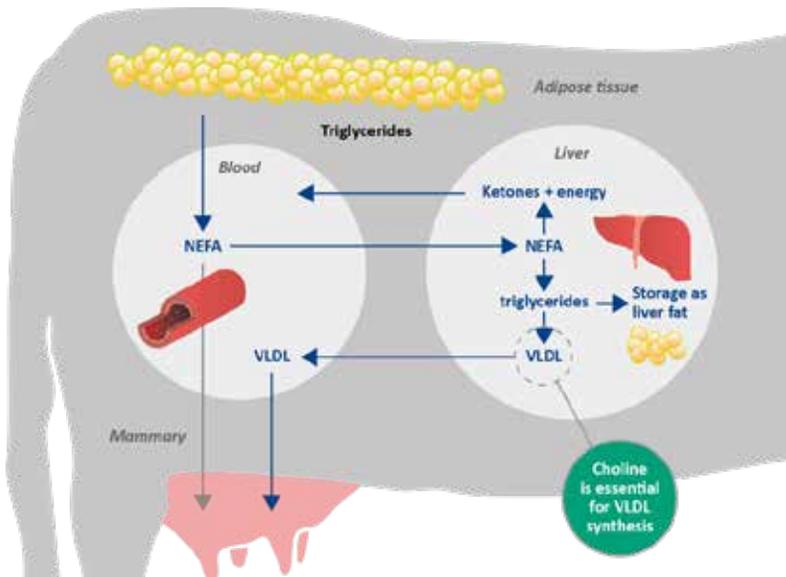
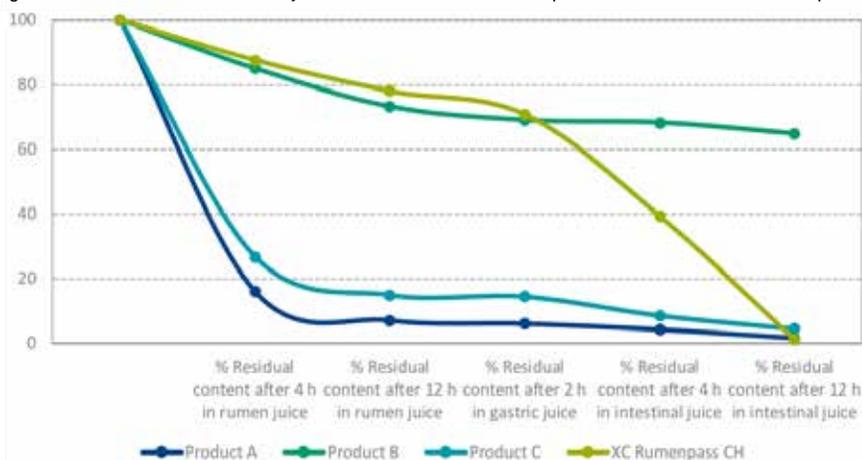


Figure 2 *In vitro* rumen stability and intestinal release of protected choline chloride products

role in fat metabolism. If the transport out of the liver is unsuccessful, an accumulation of fat leads to fatty liver disease and impaired liver function.

CHOLINE CAN BE OF HELP

Because choline is so important in the synthesis of VLDL and as a methyl donor, a good choline supply is required for optimal working of the liver and for the good health of transition cows.

Choline is not considered an essential nutrient in the diet of cows; however, if metabolism is very fast, typical for high-producing cows in the beginning of lactation, endogenous choline production might be inadequate. In this case, supplementation of bioavailable choline can optimise the (liver) metabolism and maximise milk production. Both the prevalence of (subclinical) ketosis and of fatty liver disease can be reduced with the preventive use of protected choline chloride, reducing costs caused by these metabolic diseases.

ONLY BIOAVAILABLE WHEN PROTECTED AGAINST RUMEN DEGRADATION

When choline chloride is added to the feed, the present microbiota in the rumen degrades it almost completely. This means unprotected choline will not be bioavailable for the ruminating cow and is useless to support its metabolism. To bypass the rumen, choline chloride can be protected by a layer of fatty acids. Rumen microbes are incapable of digesting this fatty acid layer, and only in the small intestine do the digestive lipase enzymes break

down the protection and release choline available for absorption and support of the animal's metabolism. Attention should be paid to the quality of the coating, as there is a lot of difference among products in protection of the choline chloride against rumen degradation and in release at intestinal level (see Figure 2).

POSITIVE EFFECTS IN DAIRY COWS

Trials with protected choline chloride (Excellent Rumenpass CH – Orffa) in dairy cows demonstrate a reduction of subclinical ketosis at herd level, measured by lower ketones in milk or urine. Cows, after calving, show an improved and faster recovery. Also, the loss in body condition score of supplemented cows seems less severe. As a result, milk yield improves with approximately a 7% increase in milk production, most pronounced in cows with a higher lactation number. Impact on milk composition in the performed trials is not clear, although in some a reduction of the fat percentage minus protein percentage level could be seen, which is indicative for the reduced risk on (subclinical) ketosis.

CONCLUSION

Choline chloride has proved to have beneficial effects, but only if it is well protected against ruminal degradation. Supplementation leads to higher milk yield and prevents metabolic disorders like ketosis and fatty liver. In nutritional strategies to lower problems in transition cows, protected choline certainly deserves its place.