FEEDS & FEEDING

A TECHNICAL PUBLICATION OF THE ANIMAL NUTRITION ACADEMY
Volume 2 – Issue 6

Feeding protected choline to transition dairy cows

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This issue explains why rumen-protected choline has become one of the most discussed transition cow additives, why ordinary choline may not always be sufficient, and why commercial responses differ greatly among dairy herds.

Choline is a B-complex vitamin, although it behaves differently from most such vitamins. Dairy cows can synthesize limited amounts from other nutrients. Under normal physiological conditions, this endogenous production, together with choline derived from feed and rumen microbes, contributes to the animal's requirement. But, adequacy depends not only on supply but also on demand. During periods of exceptional metabolic stress, the cow's need for choline may exceed what normal metabolism is able to provide.

Protected choline has become almost synonymous with transition cow nutrition. Numerous studies have reported improvements in milk production, metabolic health, and liver function, yet field responses remain inconsistent. Some herds achieve considerable returns, whereas others observe little to no measurable benefit. This inconsistency does not mean the additive is unreliable. Rather, it reflects differences in cow biology, transition management, and herd risk.

Protected choline is a nutritional tool designed to support one of the most metabolically challenged organs in the dairy cow: the liver. Understanding when the liver needs additional choline is far more important than simply knowing that choline is an essential nutrient.

Why protected choline?

The obvious question is why dairy nutritionists invest in expensive rumen-protected choline instead of simply adding conventional choline chloride to the ration. The answer lies in rumen fermentation. Free choline is rapidly degraded by rumen microorganisms before much of it reaches the small intestine, where the cow absorbs nutrients. Although rumen microbes can synthesize certain choline-containing compounds, this supply is unlikely to satisfy the sharply increased demand during transition. The objective is therefore not to feed the rumen, but to deliver intact choline beyond it.

Choline supports liver function

Protected choline is often promoted as a milk additive, but milk production is only the visible outcome of its biological role. Choline is used for the synthesis of phosphatidylcholine, a major component of very-low-density lipoproteins (VLDL). These compounds allow the liver to package and export triglycerides that accumulate when body fat is mobilized after calving. If this export system becomes inadequate, fat accumulates within the liver, reducing its capacity to support normal metabolism. The practical consequence is greater susceptibility to fatty liver, ketosis, reduced appetite, and poorer overall transition performance.

Transition period requirement
Few periods in dairy production expose a cow to greater metabolic stress than the weeks around calving. Dry matter intake naturally declines before parturition just as energy demand begins to rise. Shortly after calving, milk production accelerates much faster than feed intake, forcing cows into negative energy balance. Thus, body fat is mobilized, non-esterified fatty acids flood the bloodstream, and the liver becomes responsible for processing this sudden influx of energy reserves. During this temporary but intense metabolic bottleneck protected choline is most likely to provide true value.

Not every cow responds equally
One reason commercial responses differ is that not all cows experience the same degree of metabolic pressure. Over-conditioned cows generally mobilize more body fat and therefore place greater demands on liver function. High-producing multiparous cows often experience deeper negative energy balance than first-lactation animals. Cows carrying twins, animals with a previous history of ketosis, and herds with elevated fresh-cow metabolic disease also tend to benefit more consistently. Protected choline therefore behaves less like a universal production additive and more like a targeted nutritional intervention whose value increases as transition risk increases.

Choline cannot replace management
Like many successful feed additives, protected choline performs best when it supports a well-managed system rather than compensating for a poorly managed one. Also, it cannot fully compensate for poor fresh-cow dry matter intake, which remains the primary driver of transition success. Nutritionists should therefore view protected choline as one component of an integrated transition program alongside proper body condition management, comfortable housing, controlled-energy dry cow diets, adequate mineral nutrition, and careful monitoring of fresh-cow health.

How should success be measured?
Many feeding decisions are judged almost entirely by changes in milk yield, but protected choline should be evaluated more broadly. Increased milk production is certainly welcome, yet improvements may also appear as lower ketosis incidence, better appetite after calving, fewer displaced abomasums, improved reproductive performance, reduced early culling, or greater persistence through early lactation.

In brief, protected choline is used because ordinary choline seldom survives rumen fermentation in sufficient quantities to satisfy the increased demands of the transition cow. Its greatest value lies in supporting liver function during a period of intense fat mobilization rather than directly stimulating milk production. Responses are generally strongest in cows facing greater metabolic pressure. Like many effective nutritional interventions, protected choline works best when biology creates the need and management allows the additive to express its full value.

DAIRY EDITION | 23 July 2026

Originally distributed through the Feeds & Feeding newsletter at LinkedIn. Archived permanently by Animal Nutrition Academy at www.animalnutritionacademy.com

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