



In Vitro Analysis of Two Commercially Available Rumen Protected Choline Products

Introduction

Choline plays an important role in the metabolism of fat from the liver. In transition dairy cows, supplemental choline can positively impact production and health. Rumen protected choline products have been developed to protect degradation of the choline in the rumen, allowing more choline to be intestinally available to transition dairy cows.

Objective

An *in vitro* evaluation was conducted on samples of two protected choline products available in the market, CholiPEARL® (Kemin Industries, Des Moines, IA) and ReaShure® Choline (Balchem Corporation, New Hampton, NY) to compare rumen escape and intestinal release rates at different time points of rumen exposure.

Materials and Methods

Two-gram samples of each product were compared using a modified three step *in vitro* model at an outside lab.¹ The ruminal escape and intestinal digestibility of each product was determined, and the overall intestinally available choline supplied by each product was calculated.

In the *in vitro* model, the extracted rumen fluid is not strained but used in the condition it was collected. This enables the rumen fluid to be delivered to the incubation vessels within 20 minutes of extraction from each of the donor animals limiting the negative effects on ruminal protozoa. A portion of the natural fiber mat is included in the extract to help maintain the integrity of the natural population of fiber-degrading micro-organisms. Each time point in the ruminal phase ran in 4 replicates. In addition, each time point of rumen fluid combined with the gastric and intestinal phases ran in 4 replicates.

Results

Using the model, ruminal escape, intestinal digestibility and the overall intestinally available choline supplied was determined.

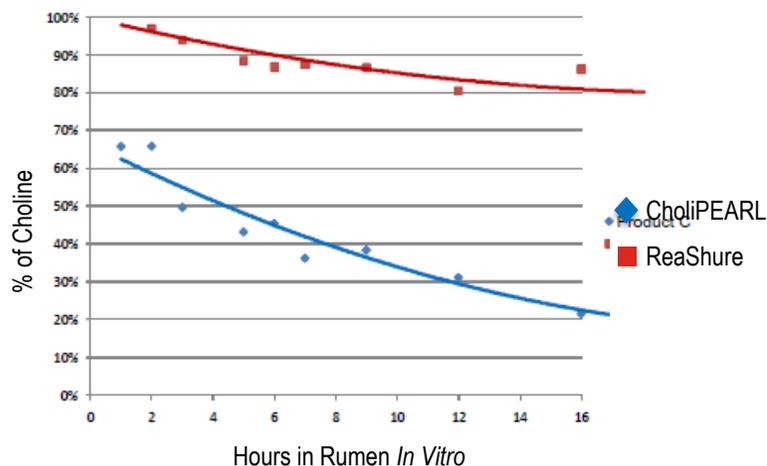


Figure 1. Percentage of Rumen Undegraded Choline

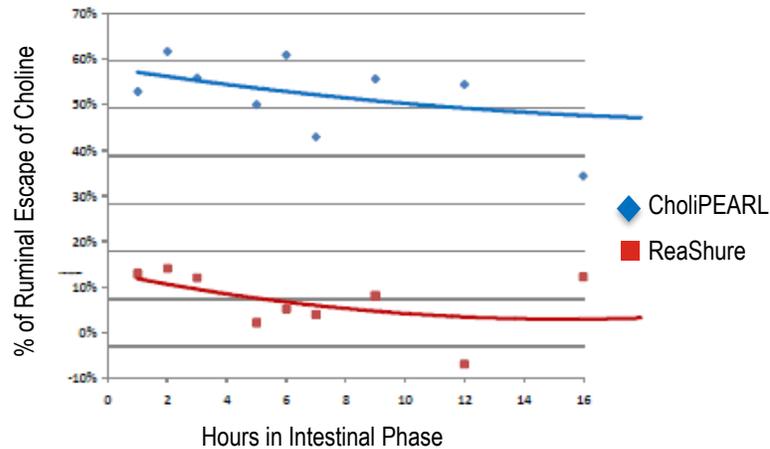


Figure 2. Percentage of Intestinally Available Rumen Undegraded Choline

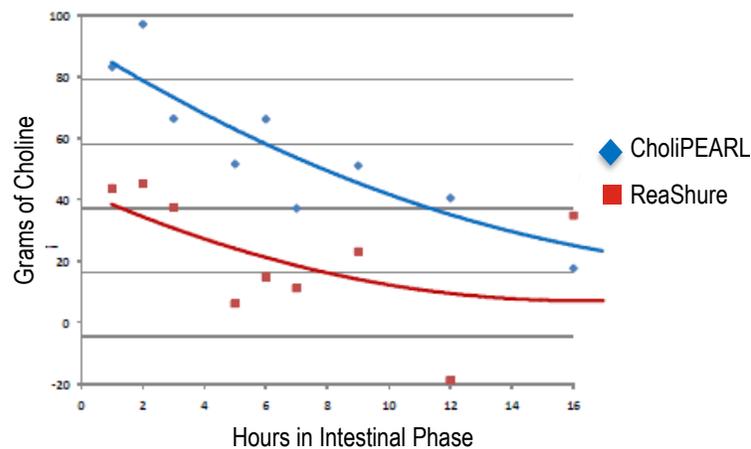


Figure 3. Intestinally Available Choline per Kg Fed*

*Combination of the data and guaranteed choline in each kg of product (choline label guarantee x rumen bypass rate x intestinal release rate = intestinally available per Kg of product fed).

The study demonstrated:

- As the time the product is in the rumen increases, CholiPEARL experienced an increase in degradation; however, ReaShure Choline maintained a relatively high rate of rumen escape through the 16 hours (Figure 1).
- CholiPEARL demonstrated a higher percentage of choline release in the intestinal phase of the model, as compared to ReaShure Choline which had a low intestinal release rate (Figure 2).
- Finally, when considering the amount of choline that escaped the rumen, in combination with the intestinal release rate, CholiPEARL provided a greater amount of intestinally available choline than the competitor (Figure 3).



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Conclusion

When considering rumen protected choline, a superior product contains the most intestinally available choline. Just because a product has a high level of rumen protection does not mean it provides a greater supply of intestinally available choline.

As demonstrated in this study, the encapsulation technology used to protect ReaShure Choline allowed for the product to move through the rumen with less degradation when compared to CholiPEARL; however, due to ReaShure Choline's poor release rate, much of the choline continued through the intestinal tract and was not absorbed. CholiPEARL, on the other hand, demonstrated a high percentage of choline release in the intestine, which the cow is able to utilize. When combined with the label guarantee for choline (23% vs X, respectively), CholiPEARL shows a higher intestinal availability per kg of product fed when compared to ReaShure Choline.

Cost per gram of intestinally available choline can be calculated using the following formula: cost per kg of product / grams of intestinally available choline per kg of product. When economics are applied, CholiPEARL provides a highly competitive source of intestinally available choline.

References

1. Goering, H.K. and P.J. Van Soest. 1970. Forage Fiber Analyses. Agriculture Handbook 379. Agricultural Research Service, USDA, Washington, DC.