



# NitroShure™

Precision Release Nitrogen

## OPTIMIZING RUMEN PRODUCTIVITY

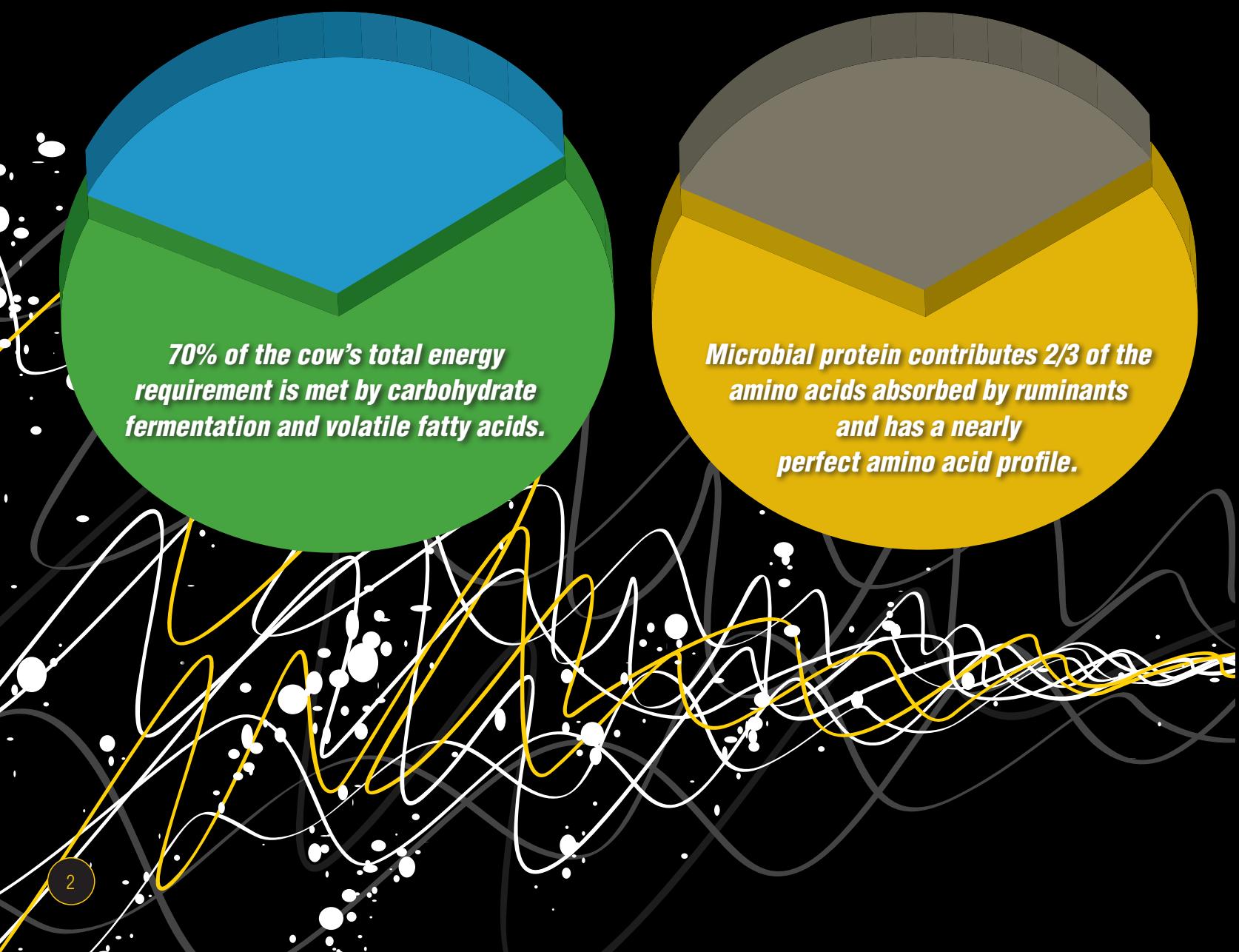
**BALCHEM™**  
Real People. Real Science. Real Results.

# PRECISION FEEDING EQUIPMENT

In an era of lower milk prices and escalating input costs, success depends on efficiency. The ruminant animal is the model of efficiency when it comes to the ability to convert fibrous feeds, low-quality protein and non-protein-nitrogen into valuable nutrients; microbial protein and energy in the form of volatile fatty acids. Microbial protein contributes about one-half to two-thirds of the amino acids absorbed by ruminants and has a nearly perfect amino acid profile – similar to that which is found in milk and meat products. Volatile fatty acids (VFA's), the result of carbohydrate fermentation, provide approximately 70% of the total energy requirement for ruminants. The primary VFA's (acetate, propionate, and butyrate) are used by the microorganisms for reproduction and growth, with the balance of the production being used by the ruminant itself. Improving carbohydrate digestibility increases energy available for milk production.

Maximizing rumen efficiency and the output of microbial protein and VFA's is the most significant factor impacting feed input costs and milk production. Rumen efficiency is influenced by many factors; carbohydrate type and nitrogen availability being highly important.

The role of nitrogen in microbial protein synthesis is well known but underestimated. Using Balchem's Precision Release Nutrient technology, your cows receive a more consistent and sustained level of nitrogen to the rumen; maximizing microbial protein output.



A cross-section diagram of the rumen showing its internal structure. Two large, semi-transparent circular callouts are overlaid on the diagram. The left callout is green and contains the text: "70% of the cow's total energy requirement is met by carbohydrate fermentation and volatile fatty acids." The right callout is yellow and contains the text: "Microbial protein contributes 2/3 of the amino acids absorbed by ruminants and has a nearly perfect amino acid profile." The background features stylized white and yellow lines representing microbial pathways and nutrient flow through the rumen environment.

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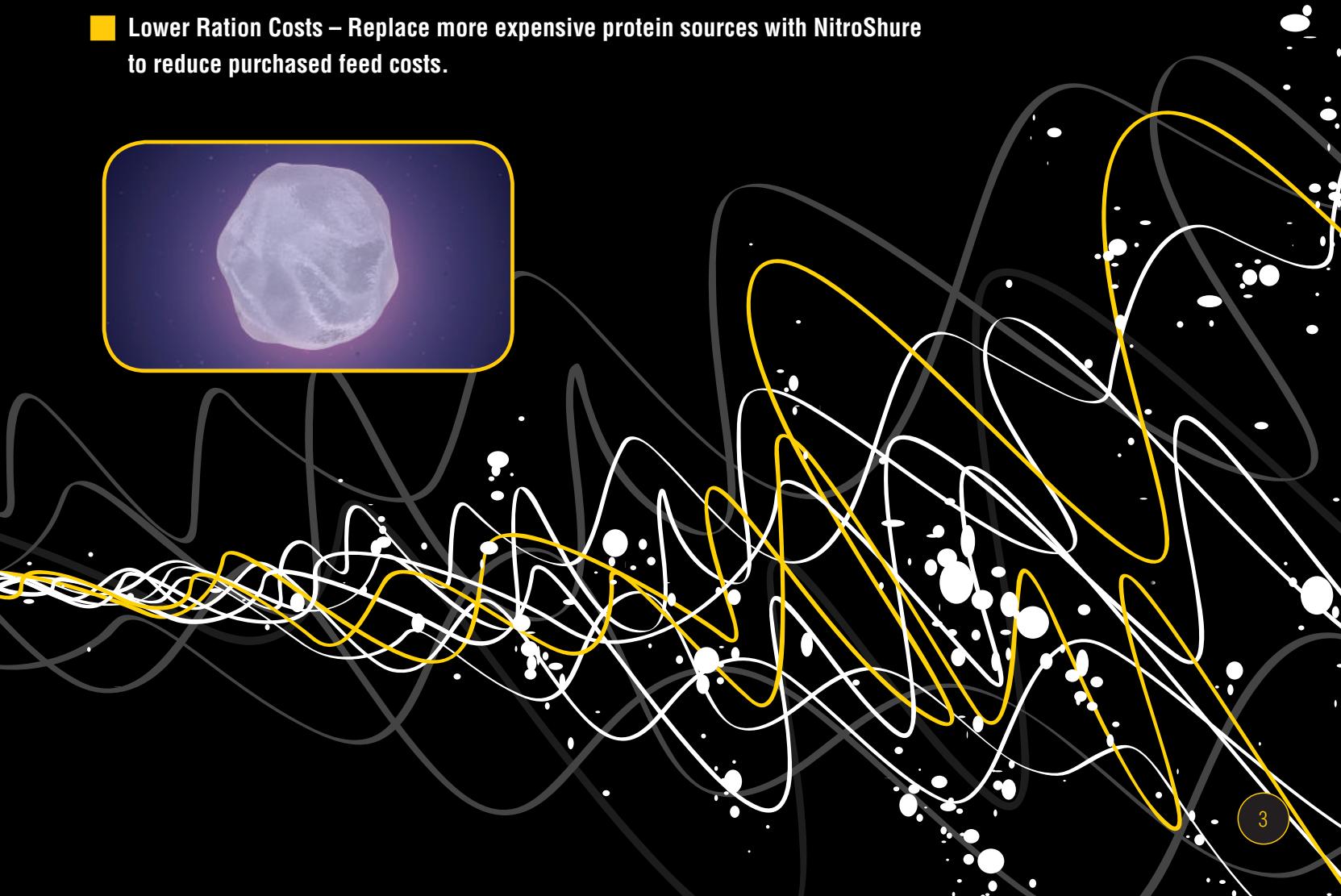
**Microbial protein contributes 2/3 of the amino acids absorbed by ruminants and has a nearly perfect amino acid profile.**

# ALS RUMEN EFFICIENCY

NitroShure™ Precision Release Nitrogen uses Balchem's proprietary encapsulation technology to provide a more consistent nitrogen supply to rumen microbes, maximizing microbial protein yield, improving dry matter digestibility and increasing carbohydrate digestibility while providing greater flexibility in formulating high performance dairy rations.

**NitroShure™**  
Precision Release Nitrogen

- Improve Digestible Protein Yield and Quality – Replace low-quality proteins with NitroShure. Balancing nitrogen release with available carbohydrates in the rumen leads to improvements in high-quality, microbial protein production.
- Improve Fiber Digestion and Dry Matter Utilization – Microbial mass and activity are increased when available carbohydrates and nitrogen are balanced, resulting in greater dry matter utilization, fiber digestion and volatile fatty acid production.
- Create Ration Space – Replace less dense sources of protein with NitroShure to create approximately 2 pounds of dry matter space in the ration. The additional space can be used to increase dietary levels of forage, non-fiber carbohydrate or other key ration ingredients to improve milk and milk component production.
- Lower Ration Costs – Replace more expensive protein sources with NitroShure to reduce purchased feed costs.

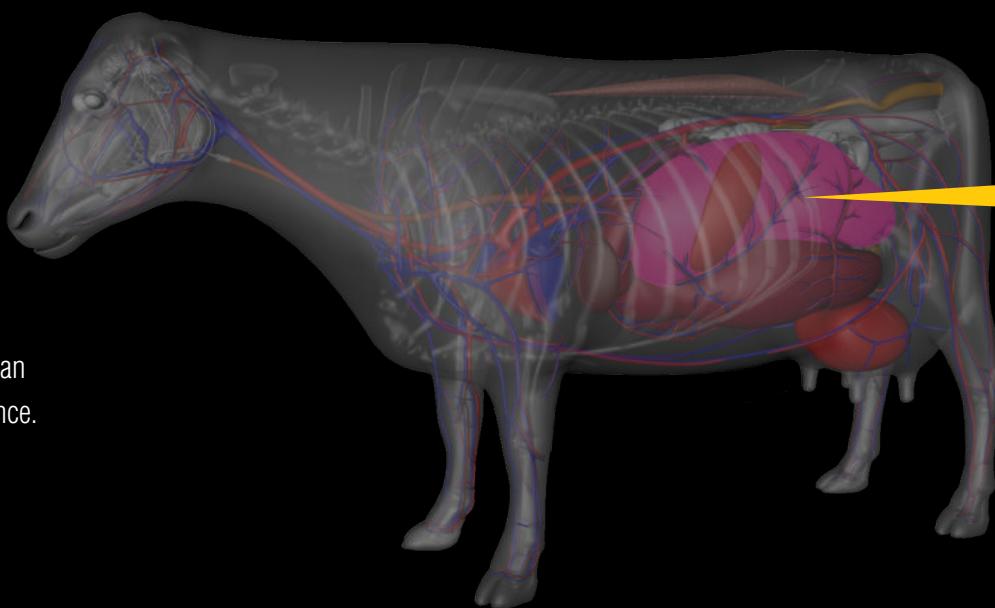


# REAL SCIENCE

## NITROGEN'S ROLE IN MAXIMIZING RUMEN EFFICIENCY

Increasing microbial growth and efficiency allows the cow to get the most nutrition out of her ration. When you maximize the microbial population, you increase the amount and quality of the protein available to the cow. At the same time, carbohydrate digestion is improved. Thus providing more energy as well.

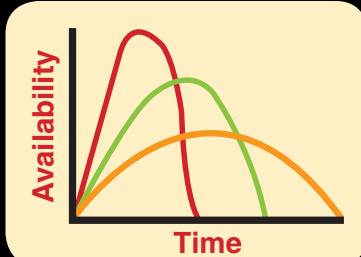
By optimizing rumen microbial protein synthesis you can reduce nutrient input costs and improve cow performance.



- When nitrogen and carbohydrate availability are in balance and accessible to rumen microbes, the overall microbial population and biomass increases.

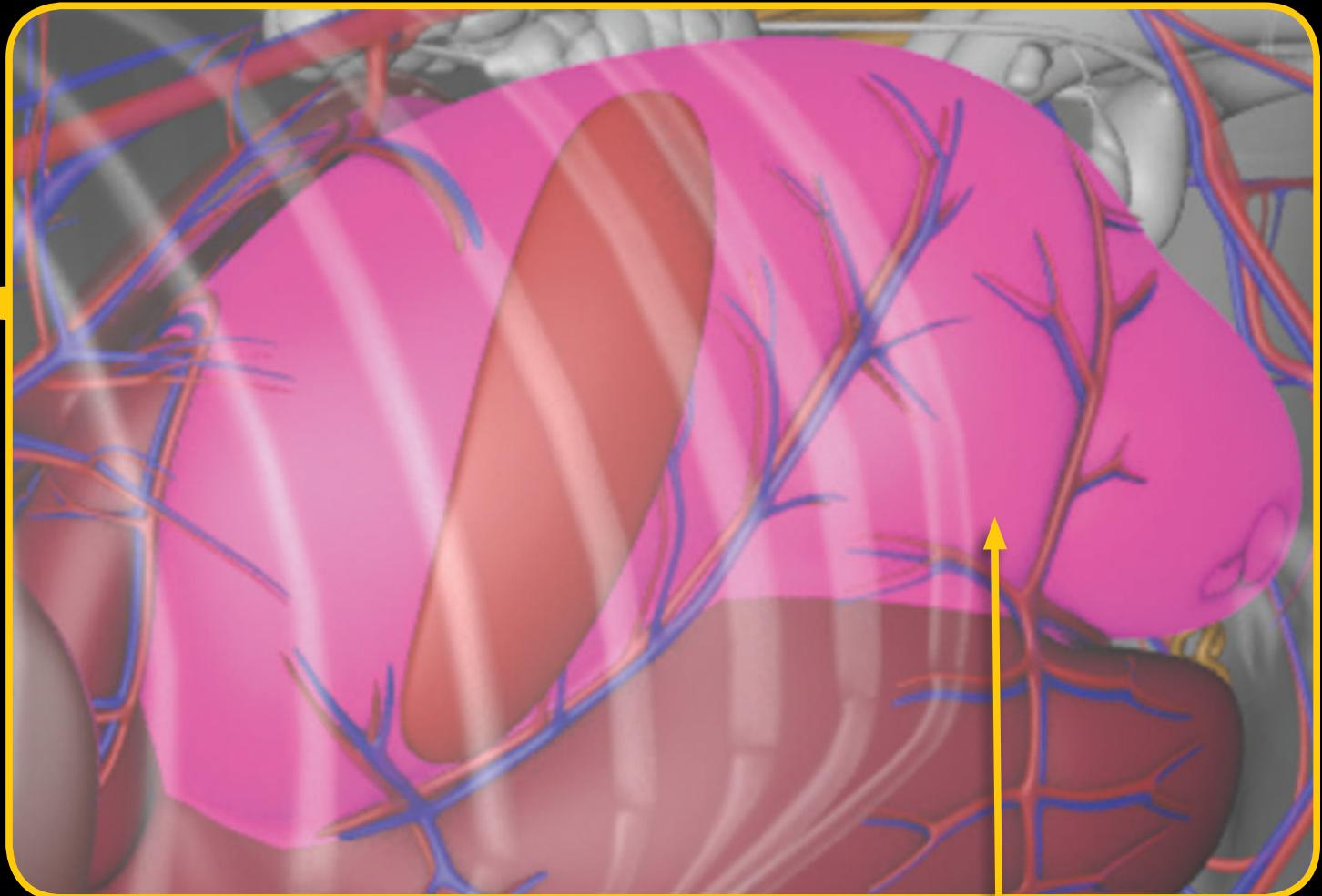


- To achieve this “balanced state” you must include a variety of feedstuffs, ranging from fast to slow degradation rates of dietary protein and carbohydrate. Synchronizing nitrogen with carbohydrate availability is essential for optimized microbial yield.

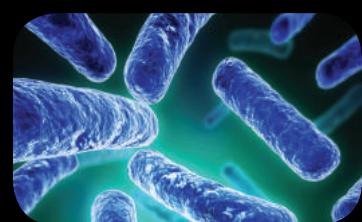


- High-quality nitrogen sources are essential for the most efficient rumen function. NitroShure™ Precision Release Nitrogen replaces other high cost or low-quality protein sources and combines the benefits of urea with Balchem's precision release technology to better balance nitrogen with carbohydrate availability.

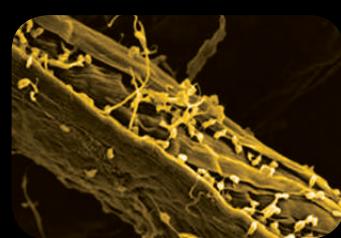




**5.** Rumen bacterial protein is the highest quality protein available to the cow; the amino acid composition is similar to that of milk and very close to what the mammary gland requires for milk and milk protein synthesis.



**4.** Maximizing the bacterial biomass is essential for optimizing carbohydrate digestion; offering greater break-down and utilization of dietary dry matter. Dietary carbohydrates are fermented to produce volatile fatty acids like propionate, acetate and butyrate. Propionate is of particular importance because it is the precursor for glucose production in the liver (via gluconeogenesis).



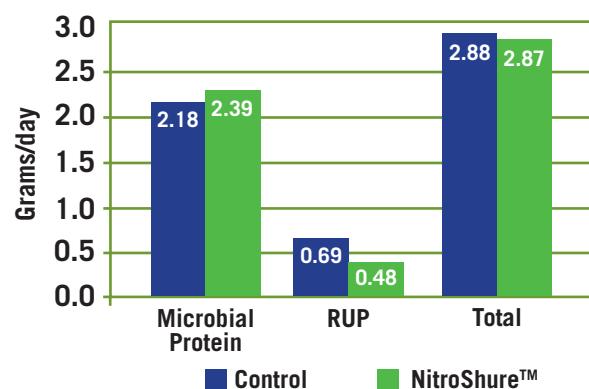
*Image by Dr. Lydia-Marie Joubert.*

# REAL RESULTS

Studies show that rumen ammonia levels vary significantly based on diet and feeding frequency, peaking shortly after feeding then dropping rapidly until the next feeding. Rumen ammonia levels will often drop below levels needed to maintain maximum bacterial growth and DM digestibility for several hours during the day. NitroShure™ Precision Release Nitrogen is proven to fill the gap between fast-release urea and the slower nitrogen release of traditional protein sources to better balance nitrogen and carbohydrate availability in the rumen. Balancing nitrogen and carbohydrate availability can increase rumen microbial populations and fermentation efficiency, improving fiber and carbohydrate digestibility and microbial protein yield.

## Improved digestion gives you more from less.

According to research conducted by Garrett et al., replacing a portion of the soybean meal with a blend of NitroShure, corn and molasses delivered an equivalent amount of protein by generating more microbial mass, representing 286 grams/day more microbial protein in a cow eating 22.5 kg dry matter intake.



NitroShure also increased digestion of dry matter, neutral detergent fiber and total carbohydrate, leading to more total energy available to the cow as a result of improved rumen microbial fermentation.

Digestibility			
Item	Control	NitroShure™	Difference
Dry Matter	60.0%	<b>65.6%</b>	9.3%
Crude Protein	77.6%	<b>84.8%</b>	9.3%
NDF	53.7%	<b>59.4%</b>	10.6%
ADF	52.5%	<b>55.3%</b>	5.9%
Total Carbohydrate <sup>1</sup>	46.6%	<b>50.7%</b>	8.8%

<sup>1</sup> g NDF + g NSC digested per day

EFFICIENCY

In a 2010 study by Highstreet et al., California State University, feeding NitroShure versus urea improved overall lactation performance.



Variable	Control - Urea	NitroShure™	P Value
DM Intake, lb/d (kg/d)	62.6 (28.5)	<b>63.3 (28.8)</b>	NS
Milk Yield, lb/d (kg/d)	103 (46.8)	<b>105 (47.7)</b>	0.14
Fat Yield, lb/d (kg/d)	3.66 (1.66)	<b>3.81 (1.73)</b>	0.01
Protein Yield, lb/d (kg/d)	2.86 (1.30)	<b>2.95 (1.34)</b>	0.01
Milk Fat, %	3.57	<b>3.67</b>	0.01
Milk Protein, %	2.78	<b>2.82</b>	0.01

## **ReaShure®**

Precision Release Choline

## **NitroShure™**

Precision Release Nitrogen

## **NiaShure™**

Precision Release Niacin

## **VitaShure®-C**

Precision Release Vitamin C

## **KeyShure®**

Chelated Minerals

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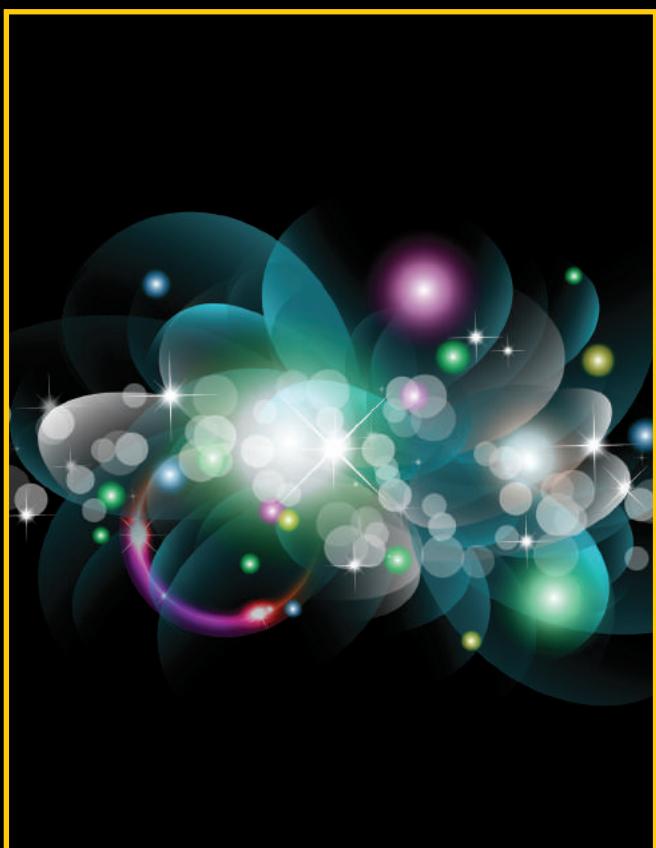
For more ways to improve transition management, visit [www.transitioncow.net](http://www.transitioncow.net). You'll find the summaries of the newest research, blog posts from transition nutrition and management experts and tools to help get your transition cows off to a smoother, faster start.



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