

# Do your diets have enough building blocks?

**T**HE following question and conversational topic has come up numerous times over the past several years. It plays out like this: I field a call from a nutritionist regarding my thoughts on some nutrition modeling approach. As we delve into deeper nutrition discussion, eventually ammonia nitrogen comes up in the conversation and I'm quickly able to nail down a common thread corresponding to where this inquiry is rooted. We can set that aside, but you're likely wondering what ammonia nitrogen has to do with dairy nutrition. At times, I wonder the same thing.



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## The building blocks

Ammonia nitrogen is part of a beautiful synchronous digestion and metabolism process that takes place in a high-performing dairy cow's rumen. In short, ammonia nitrogen is a building block for amino acids. Amino acids are the building blocks for protein, and microbes need protein to grow in the rumen. Microbial growth and protein are foundational contributors to animal growth, fat and carbohydrate digestion, rumen metabolism, and milk components.

Think of ammonia nitrogen like toy building blocks that your children or grandchildren use to build castles. Without the building blocks, the child's creativity and castles don't come to life. However, the castle doesn't build itself with loose blocks lying around. Ammonia nitrogen in

the rumen is much the same.

Stepping aside from this nutrition building block, the main point within this article is a bit larger than ammonia nitrogen itself. This building block and soluble nitrogen nutrient is part of a much larger balancing act that your nutritionist manages to optimize your herd's performance.

Coming back to microbial protein, which is like the child's castle, microbial growth relies upon energy. Energy is needed first, then the rumen metabolism and synchrony goes forth from there. Without energy, nothing happens.

We may have valuable amino acid or fatty acid supplements in the diet. However, these won't contribute too much if diet energy isn't appropriately balanced or accounted for in the ration. In fact, despite the research detailing how appropriate amino acid balancing and plane of nutrition will improve health and performance, in some cases the supplemental amino acids don't net the expected response.

This has been the subject of discussion several times over with colleagues who are experts in this area. My thoughts often come back to: "What energy or feed hygiene issues are at play that could be causing an energetic misfire in the rumen?" Along these lines, at times, I see us losing sight of the order of operations within dairy nutrition programs. We should ensure to always start our nutrition discussions with energy.

## Sugar and starch come first

Energy is primarily derived from fiber, starch, and sugar. These are carbohydrates that are broken down

and digested by bacteria, protozoa, and fungi in the rumen. The order of operations also applies to energy in and of itself. Sugar and starch digestion happens first and then this primary energy contributes to fiber digestion later, yielding a second wave of energy for the rumen.

Think of this like kindling in the fire pit providing the initial energy to get the larger logs lit and the fire rolling. As fire builders, we need to balance the amount of kindling relative to the larger logs that will sustain the fire for hours to come. Sugar, starch, and fiber interact in the same way.

## Ignite fiber digestion

We need to balance the right amount of digestible sugar and starch with fiber to help ignite fiber digestion within the rumen, but not overload the rumen with fermentation acids and acidosis. Different bacteria digest sugar, starch, and fiber, and they all work in harmony while cross feeding from one another. There are substrates from one species that feed another, and so on.

This phenomena contributes to a synchronous diet metabolism. When nutrient digestion is not smooth or the synchrony from sugar and starch to fiber is broken, the protein metabolism and total diet digestion, dry matter intake, milk production, and milk components all suffer.

This leads me back to the original point — downstream ammonia nitrogen and microbial protein nutrition are always secondary to sugar, starch, and fiber nutrition. We have to understand and optimize carbohydrate nutrition first, and then spend time with the protein

building blocks and amino acids.

## It's been a different year

With this past year's corn silage and grain, the starch digestion has been slower and unique. Added protein supplements in dairy diets are likely reacting differently this year. The synchrony in nutrient digestion may be disrupted with your herd, so take this discussion topic up with your nutritionist.

Coming back to our castle analogy, having enough building blocks to build a castle is important. A child can't build a castle without the blocks, and ammonia nitrogen or amino acid supplements are similar. Your diet should have adequate amounts of these protein building blocks.

However, while researchers have documented how amino acid and protein supplementation can provide a strong return on investment, the rumen needs to ignite with energy first for the protein building blocks to be built into a castle of performance. If your herd seems to be missing a gear, ensure your nutrition program has the fundamentals right, beginning with energy. 🐄

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