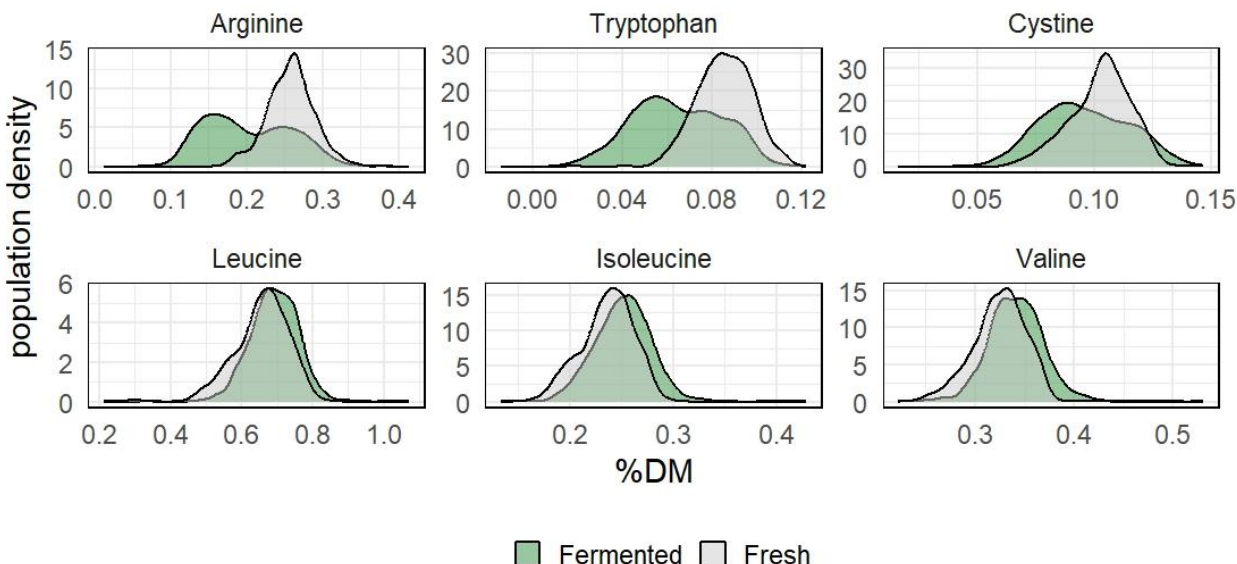




Over the next few months, you'll notice additional amino acids appearing in NIR reports for the NASEM Complete and CNCPS 6.5+ packages. Arginine, threonine, tryptophan, and cystine are important variables in swine and poultry diets. While they generally aren't considered limiting in dairy diets, they have interesting behaviors in silages and other attributes that could make them useful measurements for dairy in the future.

Ensiling impacts amino acids differently

(>1,500 alfalfa samples by NIR)



Ensiling's impact on amino acids

The process of ensiling alfalfa and corn silage results in a significant reduction in some amino acids (arginine, tryptophan, and cystine) while others are mostly unaffected (phenylalanine, alanine, isoleucine). Attributes of these individual amino acids may explain why:

Arginine – When microbes metabolize arginine, the pathway produces ATP directly, giving the microbes more energy than they could get from other options. Arginine also continues being degraded at lower pH levels than other amino acids because it is preferred by acid-tolerant organisms like lactic acid bacteria.

Cystine – The oxygen-free environment inside a silo makes it easy to break the sulfur bond that holds cystine's primary components together. Once that bond is broken, its components are attractive targets for microorganisms.

Isoleucine, leucine, and valine – These branched-chain amino acids are less impacted by ensiling because microbes must go through a more complicated process to degrade them. Interestingly, lactic acid bacteria have a limited ability to create enough of these amino acids for

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their own needs, so they absorb and incorporate them into microbial protein, effectively preserving them to be used by the cow instead of degrading them.

Could these amino acids become important in dairy diets?

Maybe, but the evidence is mostly around transition cow supplementation and the link to silages is weak.

Arginine – A recent [study](#) showed that supplementing rumen-protected arginine to transition cows resulted in over 5 lbs. of additional colostrum produced per cow. It's unlikely that arginine concentration in silage has much impact on dairy performance because most arginine in forages is degraded in the rumen anyway. Still, it's a precursor for nitric oxide which regulates blood flow, potentially making it important for transition cows due to its impact on mammary blood flow, placental blood flow, and nutrient transfer to the fetus.

Tryptophan – Through its function as a precursor to serotonin, tryptophan participates in calcium mobilization around calving and mammary calcium transport. Some studies have shown an impact of supplementing other serotonin precursors to transition cows, but not tryptophan itself.

Cystine – Like arginine, cystine is very reactive in the rumen, making it unlikely that its concentration in silage has much impact on the amount a cow absorbs directly. Cows do have the ability to convert methionine to cysteine (the primary component of cystine), so it's plausible that increasing cystine concentration could spare methionine for milk protein production.

Threonine – In pigs and poultry, threonine requirements increase during intestinal disease or stress. The same principles could matter in dairy cows, but direct evidence is limited.

For now, these additional amino acids should be viewed as useful information rather than new dairy formulation targets. We do not have evidence that the lower concentrations of arginine, tryptophan, or cystine observed in silages limit milk production or rumen function. However, measuring them consistently will help us better understand how fermentation changes feed protein and evaluate whether they become useful in future dairy models.