



The benefits of betaine – does the source matter?

Betaine is a very interesting functional nutrient in animal feed, with a valuable vitamin-like effect. Dietary betaine will beneficially influence liver metabolism, as it is the most efficient donor of methyl groups in the liver, important for a good functioning transmethylation cycle.

Additionally, betaine will protect cells against osmotic stress. This prevents dehydration and inactivation of cells during conditions such as heat stress. Thanks to this complimentary double function, supplementing animal diets with betaine results in improved performance and health.

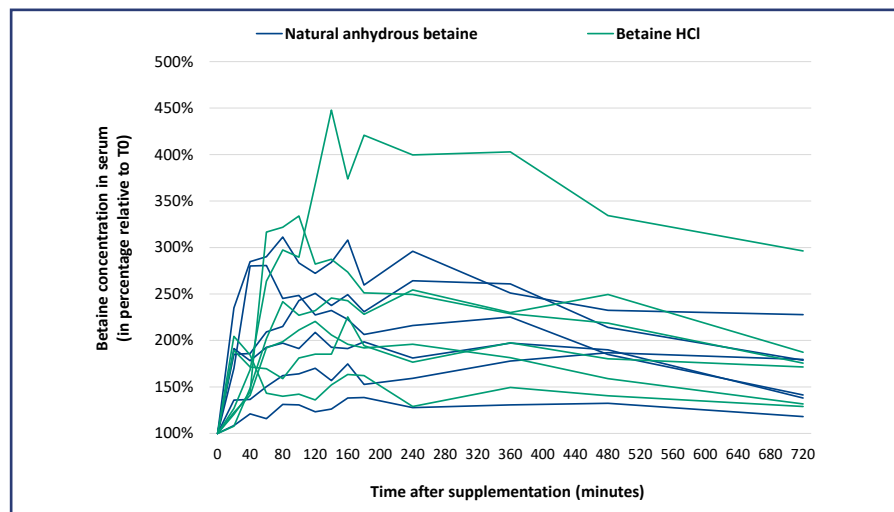
Solubility of betaine

Available products for betaine supplementation to animal feed consist either of anhydrous betaine sources or betaine in hydrochloride form (betaine HCl). Furthermore, anhydrous betaine products can either be of synthetic origin or naturally derived from sugar beets.

Both molecular forms – anhydrous betaine and betaine HCl – are fully soluble in water. The solubility of anhydrous betaine is higher compared to betaine HCl (157g versus 60g in 100mℓ, respectively). Still, as you only need 1,666mℓ water to dissolve 1g of betaine HCl, in practice all supplemented betaine HCl will easily be dissolved in the intestinal digesta after ingestion. The solubility difference is therefore practically irrelevant.

When betaine HCl is dissolved, dissociation will occur. Betaine has a pKa value of approximately 2,33 and thus at physiological pH levels, the molecule will be present in dissociated form as zwitterion (a molecule that has both a positive and negative charged region). *In vitro* research confirmed that betaine molecules appeared under identical form under simulated gastric conditions, independent of the source (anhydrous or HCl). As the same molecular form will enter the small intestine, where betaine can be absorbed by the present transporters,

Figure 1: Individual profiles of the relative increase in the betaine level in the serum of pigs, after supplementation with betaine HCl (green lines) or natural anhydrous betaine (blue lines), show high variability.



the nutritional value of both betaine sources will be equal.

In a trial with pigs, it was demonstrated that absorption of betaine is very rapid. Within 20 minutes of a single oral supplementation of 3g betaine from either betaine anhydrous or betaine HCl, an increase in betaine in the blood was measured. For both sources of supplemented betaine, a very similar betaine serum profile could be observed, although variability between individual pigs can be high (Figure 1).

Statistical analyses of pharmacokinetic parameters showed no differences between both sources. Consequently, the nutritional value of betaine from betaine HCl can be considered equal to anhydrous betaine (natural or synthetic).

Top products = high performance

For the animals' metabolism betaine is betaine, and it does not recognise the dietary source where it originally came from. As a comparison, a similar conclusion can be made about lysine. This amino acid can also be supplemented in the form of lysine HCl, which will have no impact on the bio-efficacy or functionality of the amino acid.

Still, considering the source of betaine for animal feed supplementation does matter. It is important to consider the quality of betaine products. The presence of contaminants (e.g. dioxins, heavy metals, GMO) or high levels of impurities such as trimethyl amine (TMA) can negatively impact the benefits of this valuable nutrient.

Moreover, high hygroscopicity of products can affect the practical implementation during feed processing (e.g. blocked dosing equipment, presence of lumps in end-products). Hygroscopicity and the absorption of moisture from the environment will reduce the active betaine content in the product due to the dilution effect, and might negatively influence the stability of other nutrients such as vitamins in the feed.

Orffa offers different premium quality betaine products. Exential Beta-Key is a non-hygroscopic betaine HCl globally recognised for its secured product quality. Orffa helps you choose the best source for your betaine provision.

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