Creatine in animal feeds - 10 Key facts.

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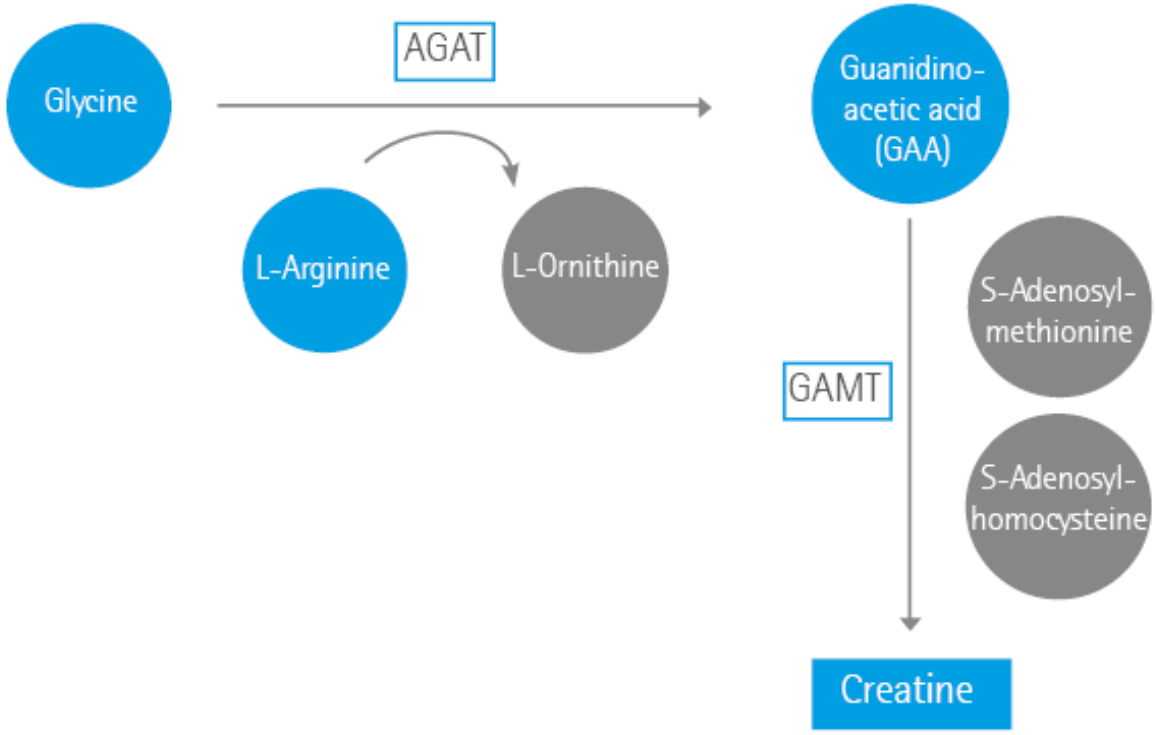
Guanidinoacetic acid **(GAA) as a source of creatine**

1. Creatine is a naturally occurring component in the body of animals and is a critical component in energy metabolism.
2. In contrast to other nutrients, creatine is stored in the muscle and directly reloads ATP for energy supply to the muscle. This is particularly important during periods of high energy demand and prevents the formation of reactive oxygen substances which have a negative effect on performance.
3. Therefore, creatine is of primary importance in places with high energy need, such as skeletal muscle, heart, brain, sperm, and immune cells.
4. Despite its importance, it is estimated that only 66% of the daily creatine requirement can be synthesised by the animal while the remainder is required from the diet.
5. While creatine is a natural constituent in meat or fish, creatine does not readily withstand heat treatment during rendering and therefore may be lacking in conventional animal diets. In vegetarian rations, creatine supply is further reduced, and this deficit of creatine may reduce performance accordingly.
6. Guanidinoacetic acid (GAA) is the direct endogenous precursor of creatine in all vertebrates. The body can produce GAA from the amino acids, glycine, and arginine (figure 1.) or it can be provided via feed (Creamino® is what we know).
7. Creatine is produced from GAA acquiring a methyl group from the transmethylation cycle via S-Adenosyl Methionine (SAM), (Figure 1.).
8. In muscle, creatinine is formed from creatine by an irreversible non-enzymatic dehydration and loss of phosphate. This constant loss of creatine is proportional to muscle mass and must be replaced by resynthesis of creatine. **Without constant replacement of creatine, muscle mass is reduced.**
9. It has been estimated that creatine synthesis is responsible for 33% of the body's demand for methyl groups (from betaine, choline, or methionine).
10. Therefore there is a direct link to adequate methyl donors (betaine is the best source) supply and creatine production.

An extensive number of controlled research trials and field trials have proven that feeding GAA (Creamino® as a precursor to creatine)

- Spares arginine (up to 149% replacement) in poultry
- Lifts AME (50-100 kcal) in poultry and ME (50-100 kcal) in pigs
- Increases creatine concentration in tissues (all species)
- Improves water holding capacity in pigs and meat quality in poultry and pigs
- Improves weight gain in broilers and pigs and FCR (on average 4-5 points in broilers).
- Increases fertility and hatchability of broiler breeders.
- Increases survival of low-birth-weight piglets



*AGAT = Arginine: glycine-amidinotransferase
*GAMT = Guanidinoacetate-N-methyltrasferase

Figure 1. **Creatine synthesis in the body**

The process of synthesising creatine in the body consumes important nutrients (methyl groups, glycine, and arginine) as well as energy (Figure 2) all of which may combine to limit animal performance. In this process, arginine is the rate limiting factor in GAA production and since arginine cannot be synthesised in the body, it must be provided in the diets of pigs and poultry. Despite this, modern poultry diets are becoming increasingly deficient or limiting in arginine (Figure 3).

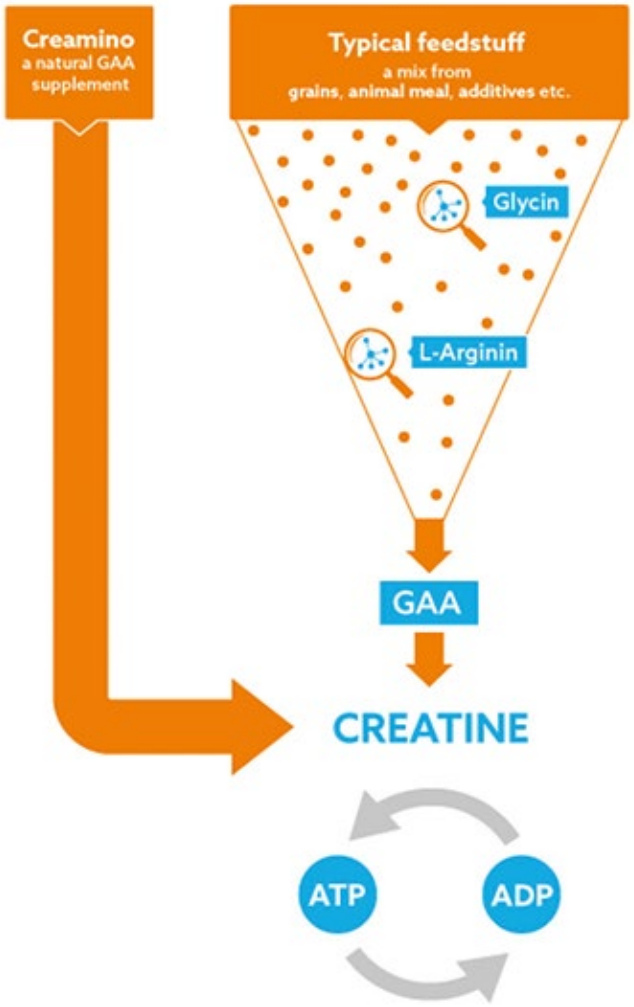


Figure 2. **Guanidinoacetic acid – precursor of creatine formed from Arginine and Glycine**

By supplementing animal diets with Creamino® (GAA) this nutrient costly and performance-limiting process can be skipped, not only does this increase the supply of creatine, there is also a significant arginine sparing effect. This leaves arginine available for other processes (lipid metabolism, egg production etc.) and alleviates its rate-limiting effect. Creamino® improves feed conversion or enables a reduction in the proportion of expensive, energy-rich ingredients (e.g., oil or soya). Further benefits are a notably more robust immune system and therefore a lower mortality rate as well as increased heat tolerance.

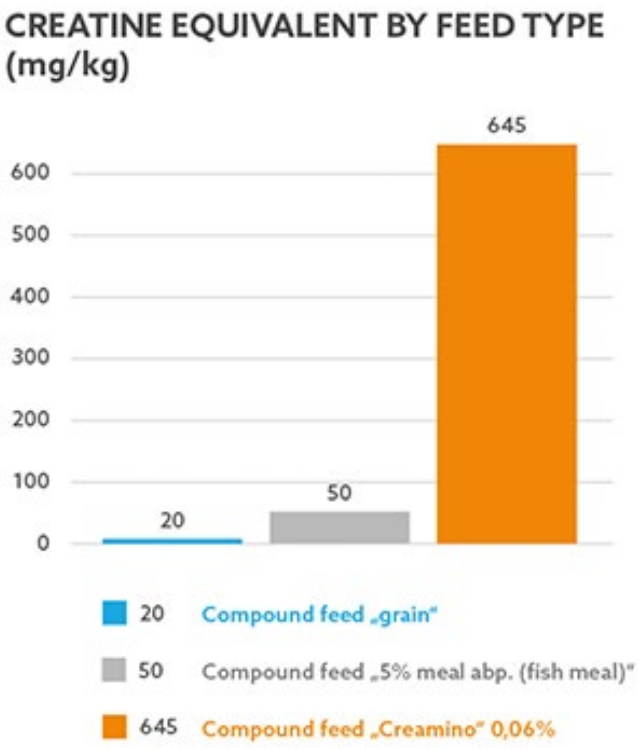


Figure 3. **Creatine content of different animal feeds**

Take home messages

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- Improves weight gain FCR in broilers and pigs (on average 4-5 points in broilers)
- Increases fertility of broiler breeders and hatchability
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If you have any questions, please forward them to david.cadogan@feedworks.com.au