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Betaine for pig production: 8 key facts

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1. **What is Betaine and how is it produced?**
    a. Betaine is a naturally occurring molecule present in many plant and animal species. Natural betaine is the most widespread osmolyte in nature but is also the most direct and efficient methyl group donor for animals.
    b. Natural betaine (Betafin is the brand we know) is produced through chromatographic separation from sugar beet. Synthetic betaine is produced through a number of chemical reactions in industrial production plants in China.

2. **Betafin as osmoprotectant**
    a. Prevents dehydration and helps to maintain ionic balance, especially important during weaning, transport, heat stress, pathogen challenge.
    b. Natural betaine is highly compatible with enzyme function, protects enzymes and membranes from osmotic inactivation within the cell.
    c. Promotes energy efficient osmoregulation, saves energy for growth.
    d. Due to improved water balance, natural betaine helps the gut epithelia to maintain barrier against pathogens.

3. **Betafin and energy sparing**
    a. Pigs have a high maintenance energy requirement with visceral organs consuming 40-50% of total energy demand.
    b. Na/K pump contributes 30-60% of the energy consumption in the gut epithelium and the liver. Natural betaine reduces the reliance on these ion pumps to maintain cell osmolarity and therefore cell function, sparing energy.
    c. Disease challenges and less digestible feed ingredients are likely to increase the requirement for ion pumps and therefore energy. Natural betaine has positive effects in these circumstances.
    d. Betafin improves the conversion of dietary energy into lean tissue in pigs and appears to enhance fat utilization, the latter due to its methyl donor role.

4. **Betafin and methylation**
    a. Natural betaine is the best methyl donor because it can be directly used in the transmethylation cycle without needing conversion, unlike choline. It also spares methionine and reduces homocysteine (which is toxic). Natural betaine contributes three methyl groups to the transmethylation cycle plus glycine. Glycine is an important non bound amino acid.

5. **Betafin and carcass quality**
    a. Natural Betaine is lipotropic. It promotes lipid mobilization of very low-density lipoprotein (VLDL) from the liver through methyl donation to form phosphatidylcholine.
    b. Another methyl donor role of natural betaine is in the synthesis of carnitine, which promotes use of lipids for energy production.
    c. Natural betaine may also help lipid oxidation by stabilizing mitochondrial volume and respiration.
    d. A large number of trials show that Betafin supplementation may reduce backfat accumulation in pigs. This effect especially takes place when energy intake restricts lean gain.

6. **Betafin and piglet performance**
    a. Piglets commonly have digestive disorders post weaning, e.g. due to
        i. infection of E.coli, Eimeria spp. (coccidia), Salmonella, transmissible gastroenteritis
        ii. poor capacity to digest some feed ingredients.
        iii. high sensitivity to antinutritional factors, damaging gut epithelia
    b. These problems are coupled with impaired osmotic balance, typically leading to dehydration and hyperkalaemia (Cornelius et al. 1968). Natural betaine improves water balance and prevents potassium accumulation allowing the piglet's transition through weaning to be more effective. The most common outcome is improved ADG but lower mortality and improved FCR are also outcomes that are associated with the use of natural betaine in piglet feeds.

7. **Betafin and sow performance**
    a. Sows have a negative energy balance during lactation, showing up as loss of weight and fat stores. Environmental factors such as heat or disease challenge, commonly reduce feed intakes and further strain the sow´s energy and nutrient balance. Natural betaine addition to lactation diets has been shown to significant increase the number of piglets born in the following litter, and a tendency for higher litter weights at weaning. These benefits are mostly associated with the energy sparing role of natural betaine.
    b. As a methyl donor natural betaine significantly improves DNA expression leading to foetal programming and improved breeder performance.

8. **Betafin and elevated immune challenge**
    a. Methyl donors play a critical role in programming the immune function and the animal's response to disease. Natural betaine has been shown to assist pigs when challenged with enteric and respiratory disease.

For further information please do not hesitate to contact me at mal.mottram@feedworks.com.au. In the meantime, you may wish to read my other documents on natural betaine.

- The best methyl donor for animal feeds.
- Betafin – Comparing natural and synthetic betaine.