



**Phosphorus (P) is an important mineral involved in the health and welfare of pigs. It is a key structural mineral within bones and teeth (associated with calcium) and in the framework of DNA and RNA, as well as being critical in metabolic energy systems and the structural integrity of all cellular membranes. A constant supply of P is therefore required to support every area of pig production.**

The P requirement of pigs has been debated over many years and has been the subject of many trials. Recommended levels have been published by numerous authors and breeding companies, but the accuracy of these recommendations is still open to debate.

To complicate matters further, P recommendations come as either 'total phosphorus', 'digestible phosphorus' or 'available phosphorus'. Most nutritionists now work to 'digestible phosphorus', but this will differ country by country.

Each individual feed ingredient has a degree of P associated with it. For example, wheat has 0.32%, barley 0.34%, extracted rape meal 1.14% and hipro soya 0.62%. However, not all of this P is digestible to the animal as it is bound within the phytic acid molecules of the plant. Indigestible P is excreted, contributing to a background environmental pool on the land. Total P levels in rearing diets are subject to Environment Agency Audit and should be seen to reduce in content over subsequent rations.

Traditionally, in commercial pig diets, P comes from inorganic sources such as Dicalcium Phosphate or Monocalcium Phosphate, where we know how much P is physically being presented to the animal. But over the last 15-20 years, commercially available phytase enzymes have been on the market to liberate P from phytic acid, increasing the digestible P component from the feed and reducing the reliance on additional inorganic mineral sources.

## Current position

- Phosphorus is a critical component in feed for the health and wellbeing of livestock
- Phosphorus is available as inorganic salts and in organic form from the vegetable raw materials in feed
- Excess and undigested P is excreted, adding to environmental pollution, particularly the eutrophication of water systems
- Understanding the P requirements of pigs is difficult, with different recommendations from numerous authors and breeding companies published
- Phosphorus requirements are published as either total, digestible or available P, each with its own method of description
- Phytase enzymes will reduce the addition of inorganic salts by liberating P from the organic phytic acid molecule of the feed
- Phytase enzymes have different units of activity (FYT, FTU or OTU) depending on descriptive analysis and are regulated by the EU
- Understanding the relationship between animal requirement, feed material supply and phytase activity is essential in reducing excess P excretion
- As pigs grow, P requirement in the feed decreases, therefore phase feeding will offer the best solution to optimal P management.

## Problems

Phytases are derived from both fungal and bacterial fermentation processes by a number of commercial suppliers, under license in the EU. There remains confusion in the industry as to the description and efficacy of these products.

The industry needs a better understanding of the relationship between phytase enzyme and substrate in order to better evaluate efficacy and value. We currently have three units of activity FTU (eg Natuphos), FYT (eg Ronozyme) and OTU (Optiphos) and this needs to be harmonised for clarity.

Dose response curves for individual raw material substrates against a harmonised unit of measurement will give greater depth when formulating diets.

As P levels in feed materials can differ by variety and region, book values as published, for example, by INRA or CVB, will be inaccurate on a farm by farm basis. For improved accuracy (particularly home-mixers using own grain), P levels in cereals can be analysed on a seasonal basis. Levels from imported or pooled materials will be harder to determine.

Phosphorus requirements vary between genotypes. Each commercial breed of pig will effectively have different P requirements during each stage of production. Within the EU there are at least six major pig breeding companies, each potentially having differences in P requirements, so a unified recommendation is not possible.

Further information on this subject can be found in BPEX *Research into Action* sheet 25.

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