Upping the antioxidant status

by Dr Mike Varley, Research & Technical Manager, SCA NuTec.

Any fast growing young animal or breeding female in either gestation or lactation will inevitably have large physiological turnover of body cells and physiological processes.

This demand not only incurs extra nutrient inputs in terms of protein, energy, amino acids, calcium and phosphorus, but involved in the metabolism is the production of increased so-called free radicals as an almost byproduct of the oxidative processes.

Free radicals

Free radicals are molecules containing unpaired electrons that can quickly take place in further biochemical processes, but which involve cell damage and increased cell death rates.

To counterbalance this damage the animal attempts to generate or utilise from the diet anti-oxidant factors that serve to mop up and neutralise these free radicals and to limit the damage.

Antioxidant molecules are varied and diverse in nature and many vitamins, for example, have a strong antioxidant function.

Vitamin E in its many guises is probably the most researched as an antioxidant fat soluble vitamin and this is used widely for its ability to prevent oxidation and rancidity in high fat feedstuffs. It is also a powerful immuno-stimulant in its own right and these properties are exploited widely.

Vitamin C is also highly functional in this way and is increasingly used for its properties.

There are also some powerful antioxidant responses from various mineral dependent enzyme systems such as selenium and zinc dependent enzymes and there is no doubt that the organic and highly available forms of these minerals can also provide strong antioxidation functions.

There are also a range of compounds such as the polyphenols and flavonoids – derived from natural plant materials but which also have strong antioxidant functions.

What is now obvious from research carried out in this area, is that there are very significant synergies between these various forms of antioxidants.

Stronger response

Using multiple antioxidant factors provides a much stronger antioxidant response in the animal and there are at least three phases of antioxidant protection, whereby the body defends itself against free radical attack.

If the first phase defence system fails then the second phase activity comes into play and so on until the free radical is eliminated.

SCA NuTec have, therefore, deployed this knowledge and research to construct a new range of in-feed antioxidant products under the new banner Nu-Shield.

For young fast growing and often disease challenged animals such as a post-weaned piglet, this technology can offer enhanced protection over and above other in-feed elements that may be used.

Similarly, for lactating or pregnant sows or challenged growing pigs this new technology has an essential place. ■

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Weighing up when to wean

by Dr Mike Varley, Research & Technical Manager, SCA NuTec.

The question of age to wean has not been raised in detail since the 1970s. At this time there was detailed research carried out and it pointed to a three week weaning age as the best time to achieve maximum overall productivity.

There is no doubt that, at the time, this was right. As the farrowing index – that being the number of litters per sow per year – increased to high levels coupled with an increasing litter size from hyperprolific sows, this three week weaning age was adopted all around the swine producing world.

The 'optimum' weaning age in the 70s depended on a wide array of high quality feed materials being in good supply at acceptable prices.

These included fish meals, milk powders and processed cereal products and were essential to successfully rear three week old piglets.

A different era

We are now in a very different era and, for a number of reasons, weaning age should be revisited.

Early weaning is not so easily accepted now on welfare grounds. But this reason apart, the whole economics of pig production have changed.

The pig price to feed cost ratio is actually the principal determinant of the optimum weaning age.

When we look at this for various industries around the world, whether in Chinese huan, US dollars, Thailand bahts or US dollars, there are very significant differences in this ratio.

Higher feed costs, seen in many countries at the moment, and lower pig prices make it more economical to shift the optimum weaning age upwards – possibly weaning nearer 30 days old.

This has ramifications on housing systems, feed inputs and costs and even labour inputs and capital requirements.

Nutritional changes

From a nutritional standpoint, weaning later requires some changes. The sow feeding programme requires attention.

Longer lactations could result in more weight loss in lactation and the feed specification may have to be reviewed.

As far as the weaned piglets are concerned, this is perhaps less problematic and a piglet at 30 days of age rather than 20 days of age has a stronger and better educated immune system, more mature enzyme functions, and the transition to a high dry matter feedstuff for the piglet is far easier.

In other words, with the appropriate feed programme a later weaned piglet will experience much less growth check after weaning than the piglet weaned at 21 days and overall daily gain to the end of the nursery period can potentially be improved.

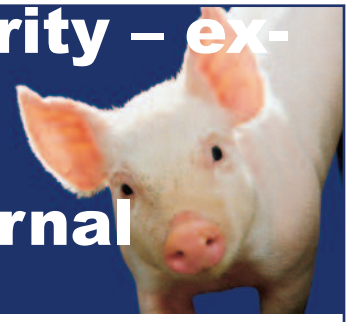
Under the spotlight

As costs and prices fluctuate and margins are tight it is well worth keeping weaning age under the spotlight.

If the individual farm business is accounted carefully, then the balance between production parameters, costs and all fixed and variable inputs will elucidate the optimum for the business.

If this is carried out in detail and at regular intervals many farming businesses would probably be very surprised indeed with the outcome! ■

Biosecurity – external and internal



by Dr Mike Varley, Research & Technical Manager, SCA NuTec.

There is a current focus on biosecurity in pig production and this is certainly not before time!

As I understand it, this means keeping the external environment of the pigs free from any other organisms (bacteria, viruses) that can cause harm or loss of production.

This process should start at the farm gate and beyond and extend all through the production systems and buildings on the farm.

Biosecurity means not only keeping external pathogens from entering the farm but also means controlling or eliminating those that are already present.

Of importance to this is the application of batch systems and all in all out management that allows the complete cleaning, washing, drying, disinfection and hopefully resting that will facilitate a very significant depletion of bacterial and viral counts to reduce the challenge to the incoming pigs themselves.

This will bring improvements in animal performance in general and this effect will be even greater after a depopulation-repopulation exercise.

Of critical importance is the strict adherence to all of the elements cited above. Cleaning must be thorough (disinfectant cannot sterilise organic matter if left in the pen), washing must also be effective with appropriate chemical detergents to make this effective.

Drying is also essential before liquid disinfection and the use of the correct disinfectants is also necessary.

The use of dry bedding conditioners can also help considerably with this process. It is crucial to build all of these actions into the system at the planning stages to allow enough accommodation space to do this correctly.

Only when all this has happened do you have a chance of a fast growing healthy batch in the next production cycle.

What is also often forgotten is that biosecurity also means security in the internal environments of the sows, piglets and growers.

The stomach and intestines of all animals are, in effect, a very complex system of bacterial fermentation – many of which are not harmful but some of which are.

We therefore need to manage and control this 'internal environment' to reduce the outgoing bacterial contamination into, as well as onto, other pigs in the pens.

We can do this by careful feed formulation and we can also do this nowadays by using factors such as appropriate essential oil blends that will kill pathogenic strains of bacteria in the gut but which will leave behind the beneficial bacteria such as the lactobacillus strains.

All of this will promote positive biosecurity for the whole farm unit and the effects on animal performance will pay back dividends. ■

Antioxidants in mainstream nutrition

by Dr Mike Varley, Research & Technical Manager, SCA NuTec.

The real value of antioxidants in pig creep diets came to the fore when PMWS was at its worst. Their use in diets has moved from niche to mainstream for good reason and they are an important part in the package for those looking to ensure optimum pig performance.

Antioxidant properties

We hear a lot about antioxidants in livestock and human nutrition. Traditionally Vitamin E would be considered, however trace elements and many plant based ingredients are increasingly being found to have antioxidant properties.

All cells in the body are under constant turnover and replication. This essential process is much faster in the young growing animal.

As each cell 'turns over' it is under threat from many damaging influences in the body, and in particular the so-called free-radicals that are the products of the oxidation of cell fragments within body tissues.

Antioxidants help to control these free radicals and prevent them causing damage to other tissues and the immune system.

Critical balance

The balance between the processes of oxidation and the prevention of oxidation (antioxidation) is critical in controlling cell integrity and health.

If the balance shifts to a high level of oxidation with little inhibition then damaged immunity and poor growth will be the ultimate result for the growing pig and especially so for the post-weaned piglet.

Antioxidants have been included in pig nutrition programmes for some time.

During the height of PMWS in the UK we recommended an increase in antioxidant levels in the starter feed programme.

These were certainly not seen as a cure for the disease but as a nutritional aid to help the piglet get on and fight the syndrome.

Vitamin E, in its various forms, is known to protect the cells particularly the rapidly developing cells of the immune system.

We have good evidence that vitamin E stimulates immune responses and for this reason feed levels have risen in recent years.

Sources of selenium

Selenium, particularly the more available sources of selenium such as the organic chelates, are powerful antioxidants and hence the interest in these for human health promotion and anti-cancer management.

We now also know that antioxidation is most effective when we approach it using many different routes.

For example, Vitamin C is a powerful antioxidant and works via a different mechanism to Vitamin E.

There are also potent antioxidant compounds within some plant extracts and some of these are now being used in pig feeds.

There is now good evidence to support antioxidants being part of mainstream nutrition and this is another important stepping stone in the post in-feed antibiotic era.

We can no longer prop up our management protocols but have to use these new tools to achieve the performance and health status that modern genotypes are capable of expressing. ■

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Starter feeds are special

by Dr Mike Varley, Research & Technical Manager, SCA NuTec.

In many ways, grower finisher pig feed and starter pig feed are as different as chalk and cheese, whereas with the help of a nutritionist and an appropriate premix formulation, most farms can produce their own home mix grower and finisher feeds successfully.

That isn't to say that choice and quality of raw materials are not crucial to the success of the ration and it is a highly technical business, but the information and trained expertise is out there and available.

When it comes to starter feeds however, it is a whole different ball game. In addition to the more complex nutrient specification that is used and the very wide range of different raw materials used to produce the finished feed, there is also the manufacturing processes that can either make or break the success rate.

runs of grower, finisher and sow feeds. The use of more delicate raw materials such as the milk powders containing the necessary protein types and source of lactose for a young post-weaned piglet demands a far different manufacturing approach with very careful control of the temperature and pressure conditions in manufacturing and a critical control of the throughput.

This also demands increased quality control at all stages to ensure that the final finished starter feed is up to the required standard.

SCA NuTec has carried out a number of trials to contrast the differences in manufacturing conditions during the past few years.

Fig. 1. shows results of a trial where the same feed formulation and raw materials were used in a post-weaned piglet trial. The only

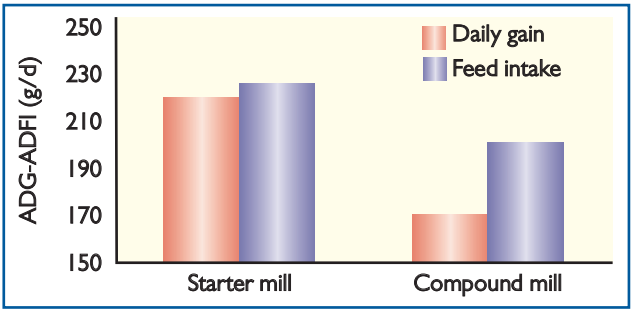

Fig. 1. Post weaning growth.

This is something that we tend to forget about taking it as read.

The actual techniques and production parameters are very critical when it comes to the manufacture of starter feeds and they are very difficult, if nigh impossible, to reproduce by either the home mixing farmer or the compound feed manufacturer.

This latter type of feed producer is geared up to the production of high volumes and long

difference was the manufacturing site. One was made in a specialised starter feed mill and the other in a compound feed mill.

The speciality feed mill gave a 28% increase in average daily gain for post-weaning growth performance and demonstrates the importance of the manufacturing process in this feed type.

Starter feed represents only 3-4% of all feed inputs for a slaughter pig but ensuring they are top quality, from raw materials, formulation through to manufacture will have a significant impact on overall pig performance. ■

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