

Can farmers grow pigs like mushrooms?

by Klaus Hoffmann, Chemoforma Ltd, Augst, Switzerland and John Barber, John Barber Nutrition, Thirsk, UK.

The performance of modern livestock has improved significantly over the last decades and it will certainly improve further in the future. However, there are limitations in performance because although genetic potential is increased this potential is rarely achieved due to slower progress in nutrition and health. The aim of the producers to achieve ever higher numbers of pigs per sow per year and faster growth rates is still a challenge for feed producers, suppliers of feed additives or supplements and also for the farm management.

Table 1 illustrates that the number of piglets per sow per year has drastically improved just like the feed conversion ratio (FCR) over the last 30-40 years. For farmers these are the most important parameters for successful and profitable animal husbandry and meat production.

The needs of the sow

Nutritionists are aware of the needs of the sow to allow for this increase in performance. The energy of the feed needs to be adjusted, essential nutrients have to be added in appropriate quantities and the amounts of different vitamins and minerals needs to be adapted to the augmented performance. Sows are not only the target for nutritional improvement. Piglet nutrition is of equal or even more importance for the general performance of a farm.

Some important factors impact early on piglet growth and development. Amongst them are the weaning weight, the feed intake, the

Weight at 70 days old	Daily weight gain (g)	Age at 110kg live weight
26	837	170.4
28	846	166.9
30	854	163.7
32	862	160.5
34	870	157.4

Table 2. The effect of weight at 70 days old on subsequent finisher performance up to 110kg.

quality of the diets, the environment or housing conditions and the general health of the piglets.

The optimisation of all parameters should allow a piglet weight of 30kg at an age of 70 days.

The weight at 70 days is in direct correlation to the time the animals need to reach 110kg of liveweight, as shown in Table 2.

The growth in early stages of life of the piglets is dependent on various parameters. The birth weight is of utmost importance as it directly reflects the development of the piglets at farrowing.

Higher birth weights can only be achieved when the sows are properly fed according to the increased demand in protein, energy and essential nutrients during pregnancy.

In the last month of pregnancy and during lactation the energy and nutrient requirements increase rapidly. Only if the demand is met by the specific diets, can the birth weight of the piglets be assured.

The amount and quality of the milk produced by the sows directly benefits the development and growth of young piglets. The diet administered to the sows during lactation directly correlates with the aspired growth rates and weight gains of the piglets.

Moreover, the loss in weight of the sows must be limited to ensure successful insemination and adequate litter sizes for the next pregnancy.

To target 30kg liveweight at 70

days the feeding of the piglets after weaning must be carefully adjusted.

The first four weeks post weaning are of utmost importance for subsequent performance in later stages of life. As feed intake is critical at this stage there must be enough room for piglets to feed at once.

Adequate supply of water

The water supply is of equal importance for high pig performance. All pigs should be able to have access to the water at once. Studies have revealed that the water consumption directly correlates with the feed intake and the daily weight gain of the piglets.

Piglets with unhindered access to unlimited supply of water eat more.

This leads to an increased growth rate to accomplish the target of 30kg of liveweight at 70 days of age.

Moreover, the health status of the piglets must be carefully monitored and supported if necessary. Handling or manipulations of the piglets, like labelling or vaccinations, must be coordinated to minimise stress.

Stress is known to reduce performance and increase susceptibility to bacterial, viral or parasite infections.

At the end of the day, the energy and nutritional balance of the feed for sows and piglets, as well as good management and handling, are the key functions for profitable and successful animal production.

The challenges of higher feed prices, demand for higher numbers of animals and increased health concerns in animal production has led to a new class of nutrients, the so-called nutraceuticals or, more popular, nutraceuticals becoming more important in animal nutrition.

These components affect several parameters required for profitable production in the livestock industry and are therefore becoming more important nutrients in animal feeds.

The condition for an additive to be a nutraceutical implies that the active ingredient(s) is/are demonstrated to have a physiological benefit and/or provide protection against diseases in target species. The keyword for the future in the livestock industry will be 'functional feed'.

Nutraceuticals do not usually fit into the classical definition of essential nutrients.

Nutrients required for normal systemic functioning that cannot be synthesised by the organism and, therefore, must be obtained from a dietary source, are classified as being essential.

In the meantime such essential nutrients have been defined and nutritionists inflexibly include vitamins, amino acids and minerals into diets for sows and piglets in the various stages of growth.

This has already upgraded the performance of sows and piglets over the last decades. However, under farming conditions the genetic potential of the animals is hardly reached. It therefore still remains questionable if there are other nutrients not yet classified as being essential or semi-essential, which might improve performance or productivity on pig farms.

From a physiological point of view, the immune system is one of many systems that must be in balance with other systemic functions. Health impediments tax the organism and the animal's natural drive to survive reduces performance and productivity and thus the financial return to the producer. Sows suffering from latent or apparent health challenges will not achieve litter sizes and farrowing rates that might be accom-

Continued on page 19

Table 1. Changes in sow performance over the last 30 years.

	1970	1975	1980	1985	1990	1995	1999
Litters/sow/year	1.90	2.00	2.18	2.25	2.23	2.25	2.25
Liveborn piglets/litter	10.3	10.4	10.3	10.4	10.7	10.8	11.0
Piglets/sow/year	16.3	17.5	19.8	20.9	21.1	21.6	22.0
Finisher FCR	3.80	3.40	2.90	2.80	2.70	2.58	2.61

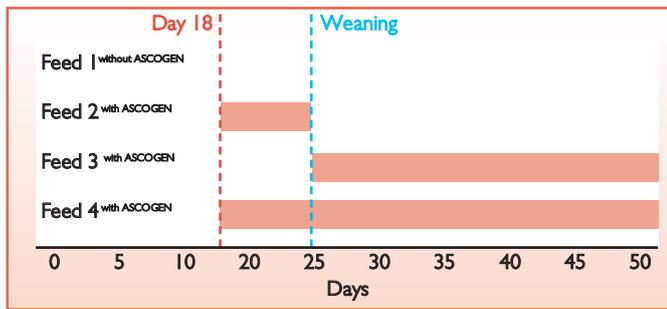


Fig. 1. Setup for a piglet trial with animals suffering from enteric problems.

Continued from page 17
plished from their genetic potential. Likewise the same is true for piglets. Their performance will suffer from challenges of the immune system, such as stress due to handling or vaccination.

According to the definition, nutraceuticals not only directly support the function of the immune system to improve general animal health but also boost performance of the animals. Taking into account the numerous experiments and scientific research on RNA/nucleotides these substances must be regarded as conditionally essential nutrients in modern agriculture.

Building blocks for life

RNA/nucleotides are the building blocks for life and involved in diverse cellular processes. They facilitate an immune response by supporting the crucial proliferation of cells involved in cellular and humoral defence mechanisms. They help to improve the performance, as all cells with rapid turnover are helped in their proliferation. This applies to cells of the intestinal tract, blood cells and cells of the immune system.

RNA/nucleotides are natural substances, which, when purified and balanced accordingly, will not stimulate innate or acquired immunity and cannot be overused.

By providing the resource for unhindered cell proliferation, gene expression and signalling, they quickly and proficiently react to health challenges without creating

undesirable side effects like resistance. The use of RNA/nucleotides is not restricted to species or applications, and their universally successful use and diverse functions in every living organism mean they are regarded and recognised as a management tool to control and diminish stress, improve performance, and modulate disease.

Fortification of feed

The fortification of feed with extra RNA/nucleotides has various effects in sows. When RNA/nucleotides were added to sow feeds throughout the whole cycle, this resulted in an increase in the number of litters per year, the litter size and the number of piglets weaned. The farrowing rate was increased and the number of sows returned to service was reduced. Moreover, the uniformity of the litter was improved. Identical results were obtained upon toxin contamination in the feed.

This clearly indicates that RNA/nucleotides support self-healing processes under challenging situations. The early development of the piglets was facilitated in the trial illustrated in Fig. 1. Four different groups of piglets were used for this trial experiment. Group 1 was the control group receiving a normal piglet diet. In Group 2 the feeding of RNA/nucleotides started seven days before weaning until weaning. Group 3 received RNA/nucleotide fortified feed for 25 days from weaning and Group 4 was fed with the fortified feed for 32 days starting

seven days before weaning. The results of the trial are summarised in Table 3. Although suffering from severe enteric problems the performance of the piglets was improved in all trial groups compared to the control. The effect of RNA/nucleotides was most pronounced when the piglets received the RNA/nucleotides pre weaning.

Therefore, the feeding of fortified diets should start before weaning, despite low pre weaning feed intake.

The feeding of RNA/nucleotides at this stage enhances the development of the intestine leading to an increase in the active surface of the intestinal tract. This facilitates the digestion of feed and the uptake of nutrients. The feed conversion ratio is thus improved. Moreover, the development of the immune system is supported.

regulatory systems and organs is facilitated upon RNA/nucleotides.

The benefits of RNA/nucleotides are dose dependent as shown in a dose response trial experiment (Fig. 2). The final weight, the daily weight gain (DLWG) and the improvement of the feed conversion ratio (FCR) are dependent on the dosage of the RNA/nucleotides in the feed.

The more RNA/nucleotides are added to the feed, and thereby are nutritionally available for the animals, the more pronounced the effects.

RNA/nucleotides do not fit into the classic definition of essential or semi-essential nutrients.

Nevertheless, the fortification of feed with these building blocks of life boosts the performance of sows and piglets. The negative effects of stress are quenched and health challenges or vaccinations did not necessarily

	Feed intake (kg)	FCR	DLWG (g)
Feed 1: control feed	8.80	1.42	325
Feed 2: seven days before weaning	9.75	1.12	395
Feed 3: 25 days after weaning	9.63	1.36	355
Feed 4: seven days before + 25 days after	10.0	0.90	430

Table 3. Comparison of feed intake, feed conversion ratios (FCR) and daily weight gains (DLWG) of piglets in control and trial groups.

Piglets are born without an active immune system. After farrowing the defence is enabled by maternal antibodies present in colostrum and milk. The concentration of antibodies in the milk is progressively reduced.

Simultaneously, the internal immune system of the piglets needs to be developed. Usually this development is not finished at weaning dropping the piglets into an immunological gap, as the supply with maternal antibodies is suddenly stopped but the internal immunity is not yet fully established. At this stage most farmers are faced with health problems and diarrhoea in the piglets. This can be reduced remarkably as the development of

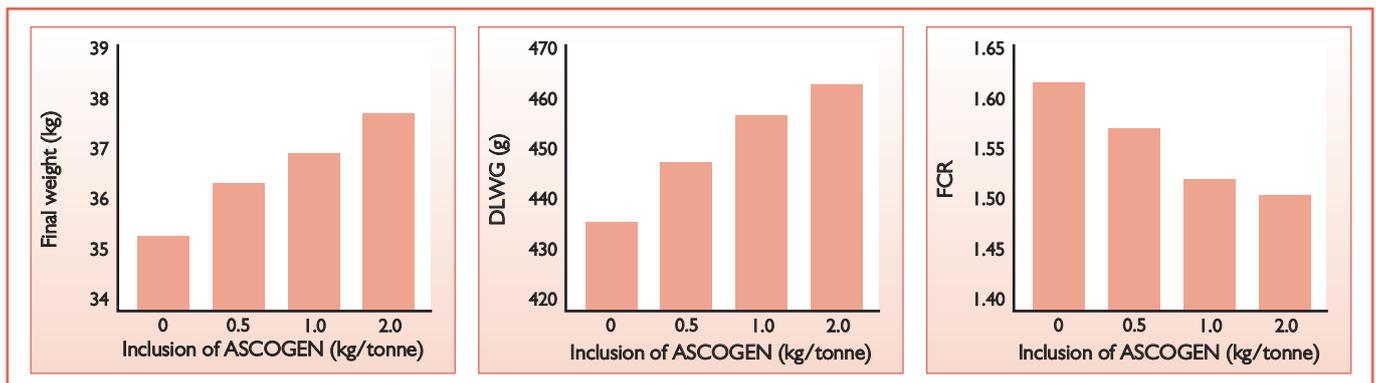
lead to reduction in performance and financial losses for the producers.

Management tool

RNA/nucleotides must be regarded as a management tool to maintain general health, enhance development and performance and manage the deleterious effects of stress.

Yes, pigs can grow like mushrooms if feed producers and farmers follow the recommendations of nutritionists and vets. However, the return on investment of nutraceuticals and other feed additives must be carefully examined with regard to the conditions on the farm. ■

Fig. 2. Dose dependent effects of RNA/nucleotides on performance of piglets.



All trials and results presented in this article were achieved with products from Chemofarma Ltd.