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On protein utilisation of feeding pigs

Influences of housing techniques

The correct feeding system is decisive in successful slaughterpig production. The most important point is the supply of essential amino acids according to animal requirements. Nowadays, on ecological and economical grounds, a nutritionally adapted feeding system is preferred. This is strictly oriented to the liveweight development of the animal. Discussed in the following paper is the extent to which the environmental influences should be taken account of in a future feeding concept.

Feeding pigs need energy for maintenance and liveweight gain. For these purposes part of the dietary energy must be converted into adenosintriphosphate (ATP). This conversion requires energy and its efficiency is around 40%. Around 60% of the energy input required for ATP production must be released by the animal as 'worthless' heat into the environment. Where the ambient temperatures are cooler, this heat serves to maintain pig body temperature. If the energy supply from fat and carbohydrates in feed is not enough to maintain body temperature at a constant level, then the pig also uses the protein meant for meat production as energy supplier. The amino group of the amino acids is broken-down and emitted as urea in the urine. The resultant carbon acid runs through the citrate cycle and the breathing chain and then helps produce ATP and heat. The consequences are reduced daily liveweight gain and poorer feed conversion, especially for the component which is dearest of all in the ration: protein. There is higher Nr. content in urine in both absolute and relative terms. Through the resultant lack of available energy, the feeding pig produces a meat-rich carcase over a lengthened feeding period.

Best liveweight gain is reached by the feeding pig at optimum temperatures. The energy supply through dietary fat and carbohydrate and the energy requirements for growth and maintenance remain in balance. The consequence is an optimum feeding process with good feed conservation, high daily liveweight gain and an optimum slaughter carcase of the conformation required by the market.

Heat oversupply encourages fat deposition

Temperatures over the optimum for pighouse interiors lead to a low maintenance requirement. As long as it is ration-fed and can emit the free energy from the break-down of feed for ATP synthesis into the house atmosphere through body radiation and breathing, the pig uses the nutritional components in the feed for synthesis of body tissue. Surplus feed fat and carbohydrate are deposited as depot fat. Together, the result is a very fatty carcase produced with high daily liveweight gain and an efficient feed conversion.

Should the temperature rise further, the animal can give increasingly less heat off into the atmosphere through radiation. There remains only the possibility of releasing the energy as latent heat through breathing. The results are reduced feed intake, in certain cases even a stop to eating, no growth, or even weight loss, the latter occurring as soon as the feeding pig stops eating so that there is no energy produced for maintenance and body tissue must be then utilised for this.

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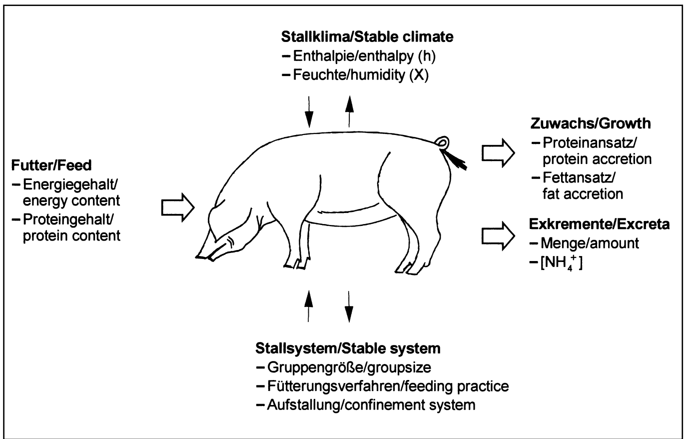

Fig. 1: Interactions in pig fattening

Balancing protein supply

The four identified scenarios occur at different times over the year in every feeding pig house. Help in avoiding the situation, e.g. air conditioning to give optimum ambient conditions the whole year through, can be achieved. Against this are the resultant fixed and variable costs which make feeding pig production, which has struggled for years under difficult economic conditions anyway, completely non-viable. In the meantime, it has become standard in pig enterprises where the all-in all-out system is followed to preheat before housing of growers in cold weather periods and to heat, where required, at least in the conditioning feeding phase. In warm weather, planned through-flows of outside air can keep house climate within the optimum range or, where outer temperatures are especially high, at least at a bearable level for the animals.

A consequence of this strategy is that, apart from the periods of optimum conditions, the feeding pigs are either oversupplied with protein or are undersupplied. A nutrient adapted rationing of feeding pigs can for this reason not only comprise a nutrient blend aimed at weight gain and maintenance requirements. It must also, as demanded for years by [1], be part of a cybernetic housing model which integrates into feed requirements the environmental factors, know-how, animal behaviour and animal genetics. Only this approach guarantees, even with units with high animal numbers, production according to animal welfare principles acceptable for the stockman and at least sensibly balanced from farm management and labour economy points of view.

Rationed feeding...

In end-effect this means that there is no alternative to fully slatted flooring in modern feeding pig production. And for feeding systems too, alone from labour economy grounds , the rationed feed system is to be preferred. Here, feed distribution takes place at two or three fixed times daily known to both farmer and his staff. The animals adjust their daily rhythm to the feeding times as long as these stay the same. Feeding time awareness can be though the pigs' changed behaviour immediately before and after. In a healthy herd all pigs are standing at the trough after the feed distribution. Unhealthy animals, on the other hand, react apathetically and are therefore speedily and definitely identified.

With rationed dry feed, technical reasons mean the distribution to individual troughs takes place at the same time. The stock inspection is long, especially in large feeding enterprises, and in certain cases the feeding groups at the very end of the inspection walk may be finished feeding by the time the stockperson appears – or replete animals may have already left the trough. Here the correct planning of the inspection tour is difficult in that ill and replete animals are hard to differentiate.

...liquid is best

This problem can be avoided with rationed liquid feeding. Because of the technology involved, the troughs are filled one after the other. The stock inspection then moves from trough to trough in line with the feed distribution and can therefore precisely see whether some animals are hesitant to come to the trough, or are apathetic.

Normally the animals register with liquid feeding the preceding operation which is the rinsing of the pipeline. In secure anticipation of their immediately-following feed they then run excitedly to and fro in the pens and repeatedly to the trough. The clearly-hearable hiss when the feed valves are opened adds to the excitement of the animals still awaiting their feed. This situation leads to increased saliva flow and increased enzyme excretion of the stomach-intestine glands, and of the large appending glands (pancreas and liver). When followed by the feed distribution the resultant intense production of enzymes result in the nutrients being broken down into their basic components with a high degree of efficiency right from the start. The result is a better feed conversion of slaughterpigs on rationed liquid feed. A fact that can be seen in the reports of Verden every year [2]. The reports also confirm the observations of animal behavioural researchers [2, 3] that the ideal group of feeding pigs consists of ten animals and not more than 160 should be kept in a building department.

The inspection round taking place with the feed distribution gives the observing stockperson a quick and secure overview of the feeding animals' health status and simultaneously allows time for the marking of sick animals. Additionally, sensors in liquid feeding troughs enable quantification of feeding pig performance potential from their feeding behaviour. With this recording, groups that show themselves significantly below the herd average can be registered and an appropriate and unmistakable message passed on to the stockperson. With sensor regulated feeding, even the amount of the ration can be determined automatically through the time taken for consumption. The ration creation can then go as far as using housing ventilation and outdoor climate as considerations. It is imaginable that, where the interior temperatures are high in summer, a feed with increased water, but at the same time constant protein content and reduced energy-supply components, could be mixed. Thus, fat production could be avoided through an energy reduction in feed whereby the protein required for optimum growth is retained.

With low temperatures the pig requires additional energy for its maintenance. The proportion of energy carrier in the feed mix should then be increased so that pigs continue to utilise the supplied protein for meat production even under the optimum house temperature, and not waste it as an energy source for maintenance. At the same time, the limited capacity of the pig stomach must be taken account of. Should the ration always be prepared with the same feed components then it is advisable to cut back the water proportion of the ration and to solve any feed transport problem that might occur in the pipelines because of this through the addition of flow-improvers.

Conclusion

In summary it can be stated that an optimum feed conversion must not necessarily go hand-in-hand with an precise-as-possible animal-individual feed distribution technology. The pig is a herd animal which requires the ethologically-valuable group experience of feeding in order to exploit its genetic potential. Alongside firmly established genetically-formed premises of growth, it is also subject to the laws of thermodynamics. These should be paid much more attention to in the design of rations.

Literature

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