

---

# Vitamin D deficiency in Swine



**By Karien Koenders, Veterinarian, Topigs Norsvin**

At this time of year, many people are deficient in vitamin D. At our latitude, we simply don't get enough sunlight to make enough vitamin D in our skin, especially in winter with many gray, cloudy days. The fact that we are often indoors, whether in an office, farm buildings or a car, is also a contributing factor. So how about our indoor pigs? It is becoming increasingly clear that there are also many pigs with a vitamin D deficiency.

To introduce this fascinating but underrated subject in pigs: a piglet is born with a very low level of vitamin D (usually <5 ng/ml)\*. The condition of the sow can influence this. The piglet receives some vitamin D by drinking colostrum, which increases the level in its blood to around 10 ng/ml. However, this drops back to below 8 ng/ml at 21 days. This is not enough for optimal bone development, but the piglet

is able to manage until it is weaned onto feed that contains vitamin D. Then the level in the blood slowly rises to around 15 ng/ml, and around the time of transfer to the meat pig farm the vitamin D level in the blood is often only just below 25 ng/ml. At this stage of their lives, piglets are already growing strongly.

So, what should the level be? Often, 30 ng/ml (OH) vitamin D in the blood is used as a minimum standard, but for optimal development even more is needed: 50 to 80 ng/ml. There is still discussion about the minimum and optimal levels in the blood and optimal daily intake of vitamin D in humans as well. Many scientists advocate an increase in the recommended standard. For those interested in finding out more, I would recommend Gert Schuitemaker's booklet *Nieuw licht op vitamine D* [Vitamin D in a New Light].

## WHAT DOES VITAMIN D DO?

Vitamin D is a fat-soluble substance that has a hormonal effect in the body. Vitamin D plays an important role in the development of bones, but also has many other functions including immunity.

Animals can receive vitamin D through their diet in the form of cholecalciferol (vitamin D3). This then needs to be converted by the liver (25 OH D3) and the kidneys (1.25 (OH)<sub>2</sub> D3). The resulting substance stimulates the absorption of calcium from the intestine. Even if there is enough calcium in the feed, if the vitamin D content is too low, the animal can still not absorb and use enough of this calcium.

Another point to note is that plant-based food contains no vitamin D3 but only the provitamin D2 (ergocalciferol), which still needs to be converted by the body. This is in contrast to animal-based foods that may contain vitamin D3 (e.g. oily fish and eggs). Nowadays our pigs are largely vegetarian, and in addition to this we usually keep them indoors.

The skin can make large quantities of vitamin D from UV sunlight (cholecalciferol from lanosterol). A dark skin tone brings a disadvantage in this respect (in both humans and animals) because pigmentation blocks UV light. Research has shown that (outdoor) sows with black skin had a lower level of vitamin D in their blood than their white counterparts. Pigs kept indoors are entirely dependent on their feed for their vitamin D needs. Their vitamin D requirement also depends on the calcium:phosphorus ratio in the feed.

## VISIBLE PROBLEMS

For me as a veterinarian, the most visible problems are those affecting the legs. We see these especially in young, growing pigs, for example at the end of the piglet weaning period or the beginning of the grower/finisher phase. This is when there is strong bone growth. How do the bones actually grow? The process is fascinating. First of all, extra cartilage is formed in the growth plates of the long bones. This cartilage makes matrix, which then ossifies (with calcium and phosphorus minerals) to create additional bone tissue, making the bone longer.

However, if vitamin D deficiency in young growing animals leads to insufficient mineralization, we see that the ossification process is disrupted. This is also called rickets, and is a well-known phenomenon in humans too.

Rickets can be recognized via autopsy of crippled pigs, if microscopic pathology is carried out. In this case, we see disruption of "endochondral ossification", in other words ossification at the level of the growth plates. OCD (osteochondritis dissecans) is also suspected to be linked to vitamin D deficiency.

What we can see from the outward appearance of a pig with vitamin D deficiency is lameness, difficulty walking, a tendency to sit on their haunches and sometimes crooked legs. Vitamin D deficiency can also lead to swollen joints and a bent spine (humpy back).

## ANIMAL WELFARE

This is, of course, a very undesirable phenomenon in terms of animal welfare and also has a negative impact on technical results. The leg problems that we see may be just the tip of the iceberg, given the many functions of vitamin D in the body. Just think of the developing piglets inside the pregnant sow – for example, there are studies that show an effect of vitamin D on the number of stillborn piglets.

The problem of vitamin D deficiency seems to be increasingly occurring in our modern, highly efficient (read: more sustainable) pigs, which can grow fast on just a few kilos of feed. Improvements in breeding have led to increased growth and improved feed conversion. Our modern pig needs roughly 300 grams less feed to put on a kilo of weight than it did a decade ago. Efficient growth is fine, but we have to make sure that we can give pigs enough nutrients. The animal receives these nutrients via the feed, which is enriched with vitamins on the basis of a given quantity per kilogram of feed. For some vitamins, feed producers are bound by legal standards, which are now out of date because they do not take increased efficiency rates into account. Complete feed is allowed to contain a maximum of 2000 IU/kg of vitamin D. Vitamin D is also sensitive to oxidation due to heat, for example, so care is also needed when storing and manufacturing feed.

## CALL FOR ACTION

Fortunately, there is a solution in the form of a product containing optimally usable vitamin D (25-OH form), which can be used within this standard (of 2000 IU/kg). However, the question remains whether this is enough for our sustainable, efficient pigs at all stages of their lives. It seems that this is not the case!

The phenomenon of vitamin D deficiency has been visible in pig farming for several years. It has also been described in other countries, and in several of these, research has been carried out. It is underpinned by both logic and literature. It can be measured using blood tests and seen via pathology.

That is why I would like to call for a proper look at vitamin D standards. This is a "call for action" to feed producers, veterinarians, specialists and representatives of this sector, to join together and discuss this matter with lawmakers.

Having seen several such cases recently and reread the literature in my collection, I quickly went to the store to buy extra vitamin D to help my family through the winter!

*\*Peer Reviewed Article: Survey of serum vitamin D status across stages of swine production and evaluation of supplemental bulk vitamin D premixes used in swine diets.*

*This article was originally published in DSM FeedTalks, 12 May 2020.*

*The original article was written in Dutch by Karien Koenders.*