Boost piglet growth by 24% with nano-coated trace minerals

by R&D, Framelco, The Netherlands.

Farmers continuously need to increase their production efficiency while maintaining decent profit margins. Furthermore, they have to keep up with constantly changing legislation.

Minerals, and more specifically trace minerals, have proven to play a fundamental role in animal nutrition, yet environmental regulations – which have reduced the maximum allowed in feed mineral levels – cause considerable constraints (see Fig. 1).

To ensure that diets meet the ideal mineral requirements of today's animal, Framelco have developed a technology to nano-coat trace minerals.

Conventional minerals have been available on the market in the form of oxides, carbonates and sulphates.

These trace elements are often unstable during feed processing and feed digestion. Furthermore, these (sometimes toxic) traditional minerals also have a poor palatability.

Many different producers have tried to overcome the above-mentioned hurdles by developing so-called chelates. Chelates are minerals bound to polysaccharides or amino acids and are commonly referred to as organic minerals.

Until recently, it was evident that the trace minerals, which were offered on the market, did not provide an optimal bioavailability, which resulted in increased mineral residues in litter and thus increased environmental hazards. Above all, pig producers were not able reach an optimal production efficiency.

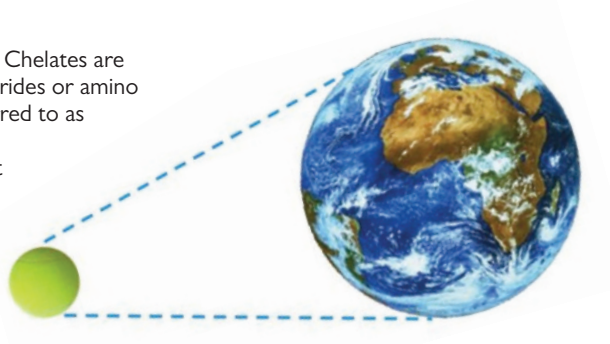

Fig. 2. One nanometer to a tennis ball is what a tennis ball is to planet earth.

FRA Easy Minerals

As the market demanded an improved and new generation of trace elements Framelco initiated the development of its nano-coated minerals, also known as the FRA Easy minerals.

These FRA Easy Minerals consist of nano-sized (see Fig. 2) minerals embedded in a matrix of medium chain fatty acid salts. This coating technique and coating material ensures stability during feed processing.

Next to that, interaction with other components will not occur, as the minerals remain protected inside the fat matrix until they reach the beginning of the small intestine. The Framelco nano-coating technology is safe and keeps the environmental impact to an absolute minimum.

Fig. 1. Environmental regulations – which have reduced the maximum allowed in-feed mineral levels – have led to considerable constraints.

Nano-coating technology

The in-house Framelco technology to produce nano-coated minerals consists of two 'easy' steps.

First, the minerals are split in nano-sized minerals. This is done by combining heat, pressure, water and micro-ingredients.

Second, a mixture of different types of fat is added resulting in nano-sized minerals (15-50 nanometer diameter) embedded in a matrix of medium chain fatty acid salts (see Fig. 3).

Lymphatic transport

As mentioned earlier the FRA Easy Minerals remain unaltered during feed processing and when they pass through the acidic environment of the stomach. Subsequently, when the FRA Easy Minerals reach the small intestine, lipase enzymes and bile salts gradually dissolve the fat coating.

This process cuts the large fat matrixes

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into smaller fat matrixes allowing the nano-sized mineral to be transported via the epithelial cells directly into the lymphatic system.

The intestinal lymphatic transport system of the FRA Easy Minerals requires far less energy compared to the transport system of conventional minerals and/or chelated minerals. The intestinal lymphatic transport system is commonly used in the human drug and food industry.

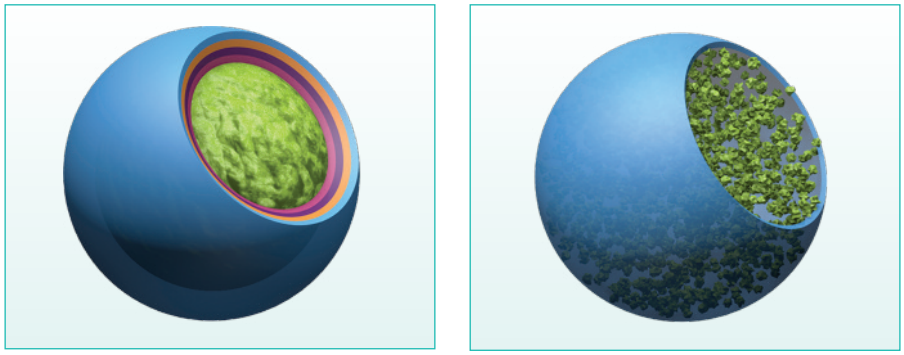

Fig. 3. True encapsulation coating (left) versus FRA matrix nano-coating (right).

German trial

To demonstrate the beneficial effects of applying Framelco's nano-coating technology on minerals, different studies have been conducted in collaboration with research institutes.

Table 1 shows the performance results of an experiment done in Germany where traditional zinc oxide and copper sulphate were replaced by FRA Easy Zinc (nano-coated zinc oxide) and FRA Easy Copper (nano-coated copper sulphate).

Table 1. Performance results with FRA Easy Zinc and FRA Easy Copper in a piglet trial in Germany.

	Control	FRA Easy Minerals	Difference (%)
Average body weight at end (kg)	19.60	23.24	+18.6
Average daily gain (g/day)	304.33	376.94	+23.9
Feed Conversion Ratio	1.75	1.59	-9.1
Feed intake during trial period (kg)	22.34	25.08	+12.3

There was no difference between the zinc and copper content of the control feed and FRA Easy Minerals feed.

During the trial period both feeds were supplemented with 125ppm zinc per ton of feed and 140ppm copper per ton of feed.

The test started at weaning day 0 and lasted for 42 days.

Take note that the nano-coating technology applied on zinc oxide and copper sulphate was the only difference between both groups. The aim of this trial was to show the efficacy of applying the nano-coating technology.

Performance results clearly indicate that the growth rate of piglets in the FRA Easy Minerals group was higher compared to the growth rate of the control group. Average body weight at end of trial was increased by nearly 24% and FCR was improved by more than 9%.

These results were achieved by feeding on average only 28.2g of FRA Easy Copper per piglet and 7.9g of FRA Easy Zinc per piglet.

Furthermore, the on-farm researchers reported an improved skin quality in the FRA Easy Minerals group. This suggests that FRA Easy Zinc and FRA Easy Copper have a positive effect on skin development.

Conclusion

Based on trial data, literature studies and field experiences, we believe that the FRA Easy Minerals are currently best in class in terms of bioavailability in the trace mineral industry.

They allow producers to reach an optimal production efficiency while complying with the regulatory dose levels.

Furthermore, this technology is safe for both humans and animals, and last but not least this technology promotes further sustainability in our industry.

For now, Framelco will continue to further explore the possibilities of applying its nano-coating technology on other feed ingredients. ■