## **Application**

The optimal utilisation of nutrients and the reduction of mineral interactions that inhibit nutrient digestibility in monogastric livestock can provide significant improvements in production efficiency.

## **Introduction**

Phytate is the principal storage form of phosphorus (P) in feed material and has been shown to reduce mineral availability due to the chelating effect of its phosphate groups. The objective of the study was to determine how Marine mineral complex MMC, compared to limestone affects Ca-P interaction in monogastric nutrition leading to more available Ca and P. MMC is a marine derived Calcium-rich feed component sourced from *Lithothamnion glaciale* and delivers 74 additional minerals.

## **Method**

The study involved subjecting diet formulated with MMC or limestone and phytate as the only P source into an *in vitro* digestion simulation system to measure calcium and phosphorus released. The *in vitro* trial includes assessing the effect of different levels of calcium from MMC and limestone, different commercial phytases, and varying inclusion rate of phytase on Ca-P interaction. Also, an *in vivo* trial to evaluate digestible Ca and P in the ileum and faeces of pigs fed diet formulated with either MMC or limestone was performed. In both trial, calcium and phosphorus concentrations were analysed using an inductively coupled mass spectrometer. Statistical analysis of data was done on sigma plot version 12 software.

## **Results**

The *In vitro* results showed a significant (P<0.05) increase in available phytate P for MMC (15%) compared to limestone (9%) and positive control (4%) diet formulated with phytate as the only P source in the presence of a technical grade phytase. The available calcium was not significantly affected. Reducing the level of calcium in the *in vitro* simulation caused a significant reduction in the available P in diet formulated with limestone compared to MMC at similar level. The *in vitro* study also showed that the type and inclusion rate of commercial phytases added to feed will affect Ca and P availability significantly. The *in vivo* trial involved feeding piglets a basic diet supplemented with MMC, limestone and Monocalcium phosphate (MCP) in four different proportion as follows: Diet A; 11.5% limestone, 0% MMC, and 1.7%MCP, Diet B; 6.9%Limestone, 0%MMC, and 1.7%MCP, Diet C; 4.63%Limestone, 2.5%MMC, and 1.8% MCP, Diet D; 5.39%Limestone, 2.5%MMC and 0%MCP. A total of thirty-two (32) piglets (initial body weight; 10kg) were divided into four groups and fed either of the four diets. The level of digestible phosphorus in the ileum of pigs fed diet B and D were comparable but significantly (P<0.05) higher than those fed diet A and C. While the total tract digestible phosphorus was significantly (p<0.05) higher in pigs fed diet B compared to those fed diet A, C and D. Those fed diet D was significantly higher compared to piglets fed diet A and B. Ilea digestible calcium was greater in pigs fed diet B compared to those fed diet A, C and D. However, there was no significant differences in the total tract digestible calcium in pigs fed diet B, C and D. Those fed diet A showed significantly lower total tract calcium compared to the other treatments. The *in vivo* data also suggested that most of the calcium from MMC are absorbed after the ileum as shown by increased total tract digestible calcium in pigs fed diet formulated with MMC.

## **Conclusion**

In conclusion, our invitro result showed that MMC reduces Ca-P interaction allowing more phytate P to be available which could lead to safe removal of inorganic P source. This correlate with the in vivo findings when more P is made available in diet formulated with MMC without MCP.