

Team studies calcium requirements for weanling pigs

September 29 2016

Two recent studies from the University of Illinois have helped determine how much calcium growing pigs require, and illuminate the mechanisms by which they absorb it.

Calcium must be fed in adequate amounts and in the right balance with phosphorus to optimize pig performance. "We can use different measures to determine requirements for calcium," says Hans H. Stein, professor of animal sciences at Illinois. "Different amounts may be needed to maximize growth performance, mineral deposition in bone, or calcium and phosphorus retention."

Stein, in conjunction with other researchers from the U of I and AB Vista Feed Ingredients, conducted two experiments to determine responses to graded levels of calcium in diets fed to pigs from 11 to 25 kilograms. In both experiments, pigs were fed diets containing different levels of standardized total tract digestible (STTD) calcium, ranging from 0.32 percent up to 0.72 percent. All diets contained 0.36 percent STTD phosphorus.

Pigs fed diets containing 0.48 percent or more STTD calcium had the greatest concentrations of bone ash, bone calcium, and bone phosphorus.

However, on measures of growth performance, average daily gain started to decline at 0.54 percent STTD calcium, and gain:feed ratio started to decline at 0.50 percent STTD.

The optimal levels of dietary STTD calcium for retention of calcium and phosphorus were at or above 0.60 and 0.49 percent respectively.

Taken all together, the different measures point to an STTD calcium requirement of 0.49 percent or less for growing pigs from 11 to 25 kilograms.

"Based on these results, the requirement for STTD calcium for 11 to 25 kilogram pigs is likely around 1.35 times the requirement for STTD phosphorus," says Stein, adding that further experiments need to be conducted to verify this value.

The researchers also studied the expression of certain genes involved in transcellular transport of calcium at the different levels of [dietary calcium](#). Transcellular transport requires more calcium channel proteins, calcium binding proteins, and energy than passive paracellular transport, so the latter is preferred if enough calcium is available to be absorbed that way.

As the [calcium levels](#) in the diets increased, the mRNA expression of genes for the calcium channel proteins TRPV5 and TRPV6, calcium binding proteins CALB1 and S100G, and the vitamin D receptor protein VDR decreased in the kidneys.

Expression of genes for TRPV6 and VDR, as well as plasma membrane protein ATP2B1, also decreased in the jejunum as dietary calcium increased.

"The main site for regulation of [calcium balance](#) appears to be in the kidneys," Stein says. "When dietary calcium is adequate and luminal levels of [calcium](#) are high enough to allow for paracellular transport, transcellular uptake in the kidneys and jejunum is reduced."

Funding for this research was provided by AB Vista Feed Ingredients, Marlborough, UK.

More information: The paper, "Requirement for digestible calcium by eleven- to twenty-five– kilogram pigs as determined by growth performance, bone ash concentration, calcium and phosphorus balances, and expression of genes involved in transport of calcium in intestinal and kidney cells," was published in the August issue of the Journal of Animal Science. It was co-authored by Caroline González-Vega, Yanhong Liu, Joshua McCann, Carrie Walk, and Juan Llor. The full text can be found online at www.animalsciencepublications.com/doi/10.1093/jas/skz332

Provided by University of Illinois at Urbana-Champaign

Citation: Team studies calcium requirements for weanling pigs (2016, September 29) retrieved 27 April 2024 from

<https://phys.org/news/2016-09-team-calcium-requirements-weanling-pigs.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.