

ZINC OXIDE IN PIGLET DIETS

1. What does the literature say about zinc homeostasis?

BY THE ANIMINE TECHNICAL TEAM. WWW.ANIMINE.EU

Welcome to the first in Animine's series of articles, which will review scientific literature on the effects of the pharmacological dosage of zinc oxide (ZnO) in weaned piglet diets. In the European Union, medicated ZnO will be totally banned from June 2022. It is interesting to note that abroad there is also a growing number of countries following this tendency, such as China, where the supplementation of pharmacological levels of ZnO is already restricted.

The pharmacological dosage of ZnO is well known for its effect on diarrhoea reduction and improved weight gain of weaned piglets. However, even after decades of use, there is still no consensus on its modes of action. This series of articles will review existing scientific literature with a particular focus on its key effects and mechanisms.

It will be also inspired from the latest outcomes of the ZincoSupp research network supervised by Animine. This ambitious scientific programme, involving several renowned universities, addresses the suppression of pharmacological ZnO, while studying the proper supplementation of the potentiated zinc source, HiZox.

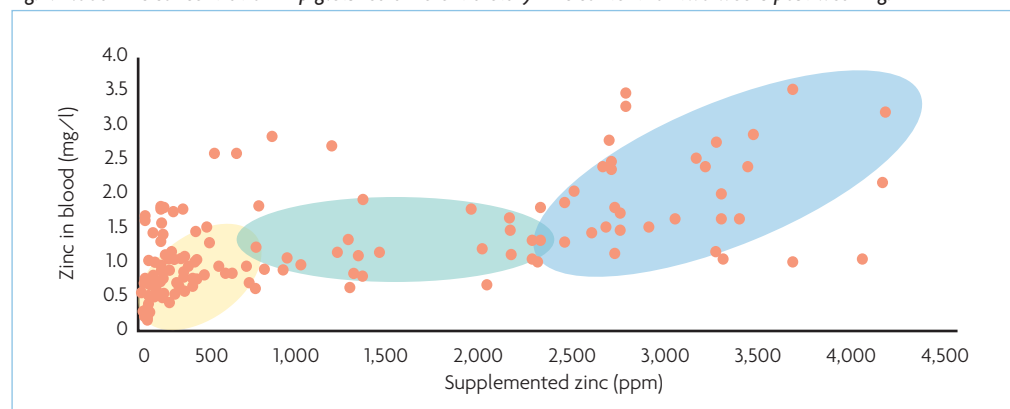
Effect of dietary ZnO concentration on blood zinc levels

An exhaustive literature review was performed from the AniLib database. Out of 151 publications on the pharmacological use of ZnO in weaned piglets, 38 containing data on blood zinc concentration at the end of the study were selected for the purpose of this review.

As shown in Fig. 1, zinc supplementation below requirements (estimated to be at 100mg/kg, NRC 2012) can lead to low blood zinc levels. Although the majority of the observations indicated low zinc in the blood in this range, some trials observed a high concentration of zinc in the blood of piglets.

This could be due to a high zinc status at weaning due to the intake of zinc-rich creep feed before weaning.

Fig. 1. Blood zinc concentration in piglets fed different dietary zinc content for two weeks post weaning.



References of selected papers:

Acta Agriculturae Scandinavica	1995
Archives of Animal Nutrition	2011, 2013, 2014
Animal Feed Science and Technology	2017, 2018
Asian Australian JAS	2014, 2020
Asian Journal of Animal and Veterinary Advances	2012, 2013, 2018
British Journal of Nutrition	2014
Canadian JAS	2019
Journal of Animal Physiology and Animal Nutrition	2006
Journal of Animal Science	1970, 1993, 1996, 1999, 2001, 2002, 2009, 2013, 2019
Journal of Animal Science and Biotechnology	2020
Journal of Nutrition	1985, 2004
Journal of Trace Elements in Medicine and Biology	2018
Journal of Veterinary Diagnostic Investigation	2019
Journées de la Recherche Porcine	2003, 2005
KSU Swine Day	1998, 2008
PLOS one	2017
WUR report	2016

An increase in blood zinc levels, from 0 to 1.3mg/L, with higher ZnO supplementation dosages, from 200 to 500mg/kg, is also observed in dose-response behaviour. The supplementation of ZnO from 500 up to 2,000mg/kg zinc in the complete feed, seems to reach a plateau on blood levels, maintaining homeostatic regulation and buffering excess dietary zinc.

When the zinc supplementation exceeds 2,000mg/kg zinc, the homeostatic regulation capacity of piglets is bypassed increasing the blood zinc concentration. At such high levels, a higher variability of blood zinc concentrations is also observed. This might be related to weaning age and individual feed intakes. The higher the ZnO supplementation, the higher the feed consumption, resulting in a higher risk of piglet toxicity due to bypassed homeostatic regulation. ■