



# RESEARCH UPDATE

## ZINCO

### Effects of therapeutic zinc oxide (ZnO) on the microbiome, resistome & immune system of pigs & strategies to face ZnO withdrawal

This project is a collaboration between Teagasc & the School of Veterinary Medicine of the Universidad de Córdoba, Spain. It is studying the role of zinc oxide & antibiotics on the intestinal & environmental bacterial populations & the immune system of weaned pigs, which beneficial or pathogenic bacteria are changing in the intestine & what are the effects on piglet health & performance.

#### Background

Weaning is a challenging process for piglets in which bacteria that are normally present in the gut not causing any problem can begin to create digestive problems & diarrhoea. During lactation, the bacteria in the piglet gut evolve in balance so that none outgrow the others. This balance between bacteria helps the piglet to digest food & develop the immune system. However, sudden events like weaning break this balance (dysbiosis) & some bacteria can overgrow resulting in diarrhoea. E coli is the main bacteria involved in post weaning diarrhoea. Feeding piglets with high doses of zinc oxide reduces diarrhoea & improves performance. Despite high doses of zinc effectively dealing with diarrhoea, it can pollute the soil & is associated with an increase of bacterial anti-microbial resistance genes, thus making some antibiotics less efficient. Therefore, the EU Commission is banning zinc use from 2022. Finding alternatives to zinc is vital to help farmers to cope with its ban.

#### Objectives

- To determine the effects of therapeutic zinc oxide & antibiotics on the bacterial populations in the farm environment & in the pig in commercial conditions
- To test new innovative management systems to help farmers adapt to the coming ban of ZnO

#### Study 1. Effects of antibiotics & zinc oxide on intestinal bacterial populations

The first study included a series of trials carried out in Moorepark comparing the microbial populations of pigs raised with or without antibiotics or zinc oxide. The different trials had different cleaning procedures to study the effects of zinc oxide with different background bacterial loads. The use of antibiotics & zinc created a completely different bacterial population in the gut of piglets.

Although there was an important effect of antibiotic & zinc oxide on the presence of E. coli in faeces of weaned pigs at day 7 post weaning, there was also certain variability between batches. In figure 1 we can see E. coli represents more than 75% of the bacteria in the faeces of some piglets in batch 1.

For more information visit [www.teagasc.ie/pigs](http://www.teagasc.ie/pigs)



In batches 2 & 3 the presence of E coli is lower. In any case, the use of zinc oxide (in yellow) or antibiotics (in pink) keeps the population of E coli under control.

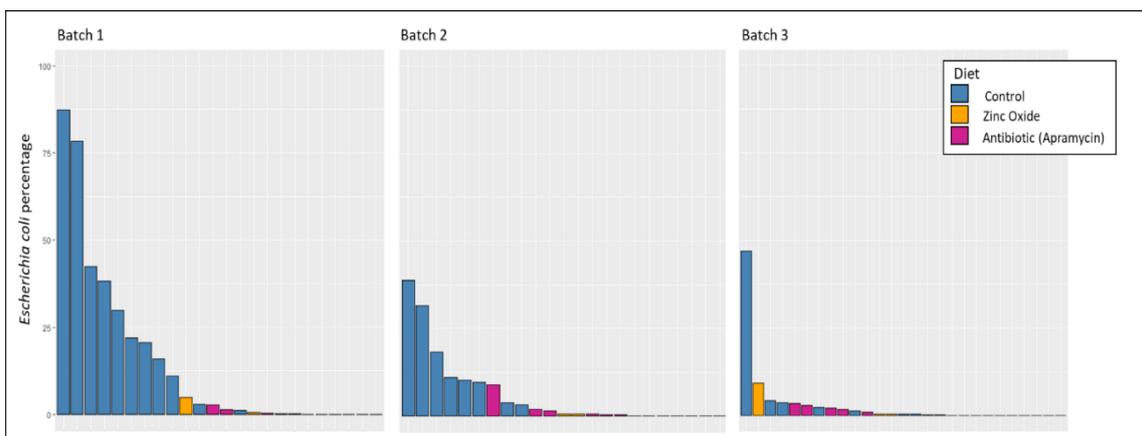


Figure 1. Percentage of E. coli in the faeces of piglets at 7 days after weaning in 3 different trials (batch 1, 2, 3). Each bar represents one piglet.

## Study 2. Characterization of bacterial population & immune system of piglets in farms using zinc oxide & antibiotics

Teagasc is recruiting commercial farms that use or do not use zinc oxide & antibiotics in piglet diets to understand why some farms can remove zinc oxide easily & other farms fail to raise their pigs without zinc oxide or antibiotics in the diet. For this, Teagasc is repeating the same protocol on 10 commercial farms to further explore the effects of zinc on piglets & the environment they live in, focusing on the variability between farms to have a deeper insight of what is happening in real environments.

### Take home message

- Both, antibiotic & zinc oxide are effective to control the overgrowth of E coli in pigs at weaning.
- The number of pathogenic bacteria in pig faeces changes between batches. Knowing which batches are more affected could help control diarrhoea more effectively.

### Juanma Ortiz

PhD student



Juanma Ortiz is the PhD student working on the ZINCO project. He is supervised by Dr Edgar García Manzanilla at Teagasc, Dr Hector Argüello Rodríguez at University of León, Spain, & Dr Juan José Garrido Pavón at University of Córdoba, Spain.

He has previously completed a degree in Veterinary Science & Master's degree in Biotechnology.

Juanma's research interests include pigs gut microbiota, animal health & weaned pigs' immune system.