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An innovative treatment method of zinc oxide to help reducing postweaning diarrhoea in piglets

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BACKGROUND AND OBJECTIVES



EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

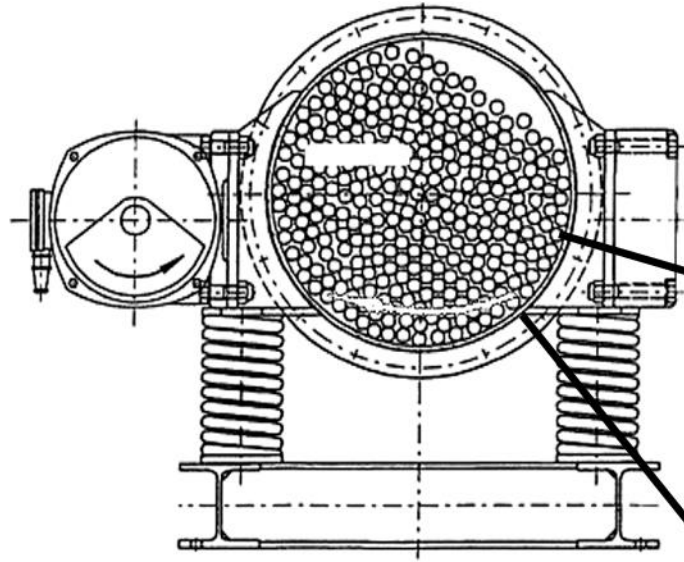
On 16 March 2017, the European Medicines Agency (the Agency) completed a review of the safety and effectiveness of veterinary medicinal products containing zinc oxide to be administered orally to food-producing species. The Agency's Committee for Medicinal Products for Veterinary Use (CVMP) concluded that the **overall benefit-risk balance for veterinary medicinal products containing zinc oxide to be administered orally to pigs is negative**, as the benefits of zinc oxide for the prevention of diarrhoea in pigs do not outweigh the risks for the environment. The CVMP recommended the refusal of the granting of the marketing authorisations and the **withdrawal** of the existing marketing authorisations for veterinary medicinal products containing zinc oxide.




AIM OF THE STUDY

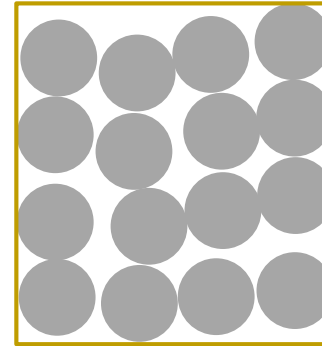
**To find a way
to use the potential of zinc oxide
in reducing postweaning diarrhoea
within the legal feed regulations**

MATERIAL AND METHODS

PRINCIPLE OF MECHANICAL ACTIVATION

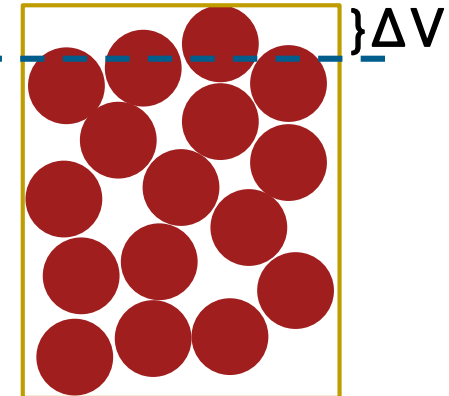


-  Grinding medium
-  Solid
-  High energy zone

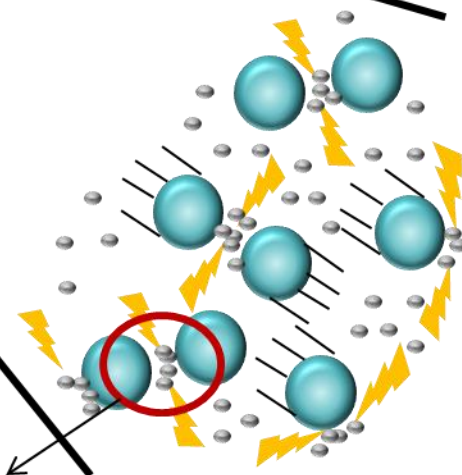


ZnO (feed grade)

**Increase of product enthalpy
by 18 kJ/kg**



**micronised ZnO
(mZnO)**



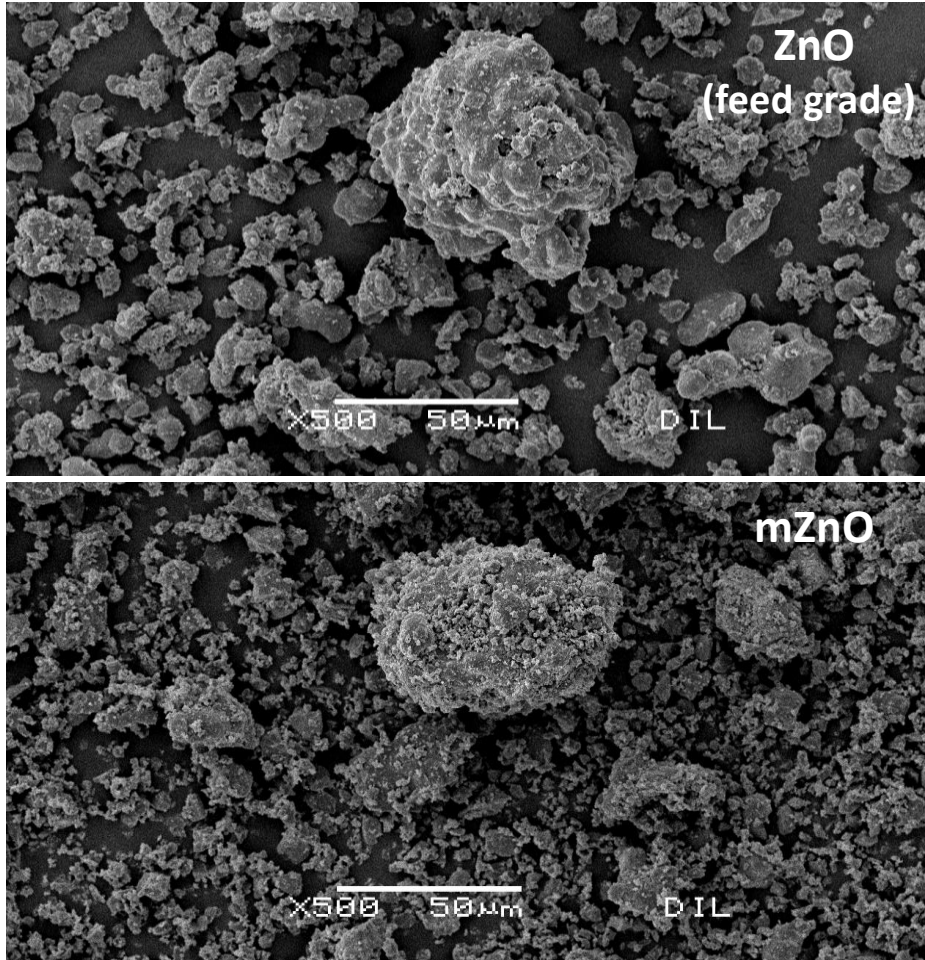
Collision zone,
solid fraction is
involved

Patented EVM Technology

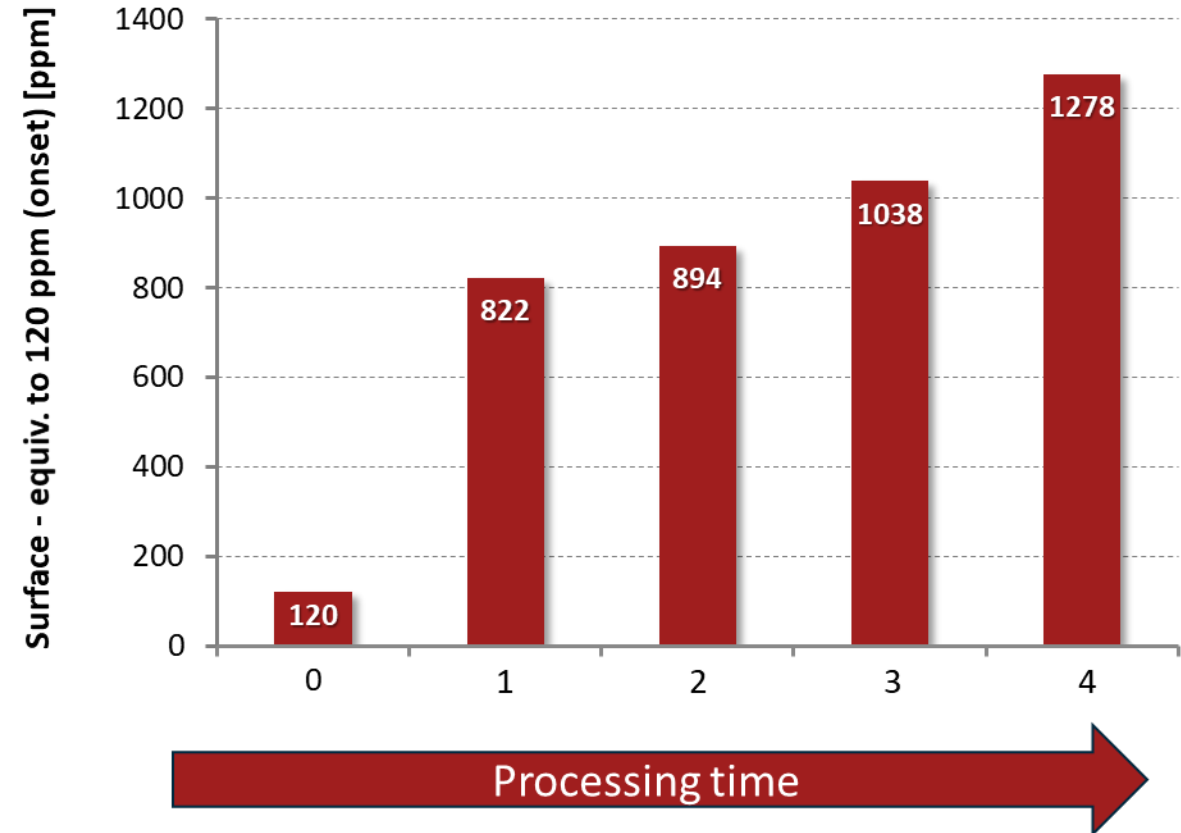
Exentric Vibrating Mill



RESULTS – EFFECT OF TREATMENT



Method: scanning electron microscope; DIL



Method: laser diffraction 20 nm-2 mm (ISO 13320-1); DIL

MATERIAL AND METHODS – *IN VITRO* TRIAL

Test system: Inhibition test in microwell plate

Test strain: *Escherichia coli*

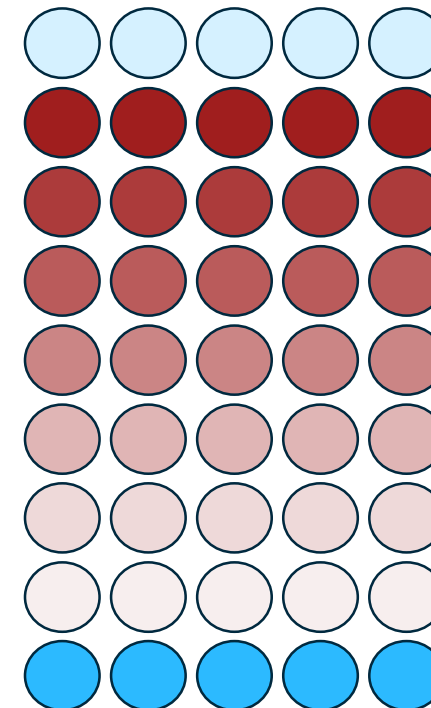
Standardised at OD₆₀₀ = 0.2

Incubation: 24 h, 37°C

Parameter: Turbidity at OD₆₀₀

(MTP-Reader, TECAN Genios)

Value at 0 h = blank value,
subtracted from the 24 h value



Negative control

2000 ppm ZnO/mZnO

1000 ppm ZnO/mZnO

500 ppm ZnO/mZnO

250 ppm ZnO/mZnO

125 ppm ZnO/mZnO

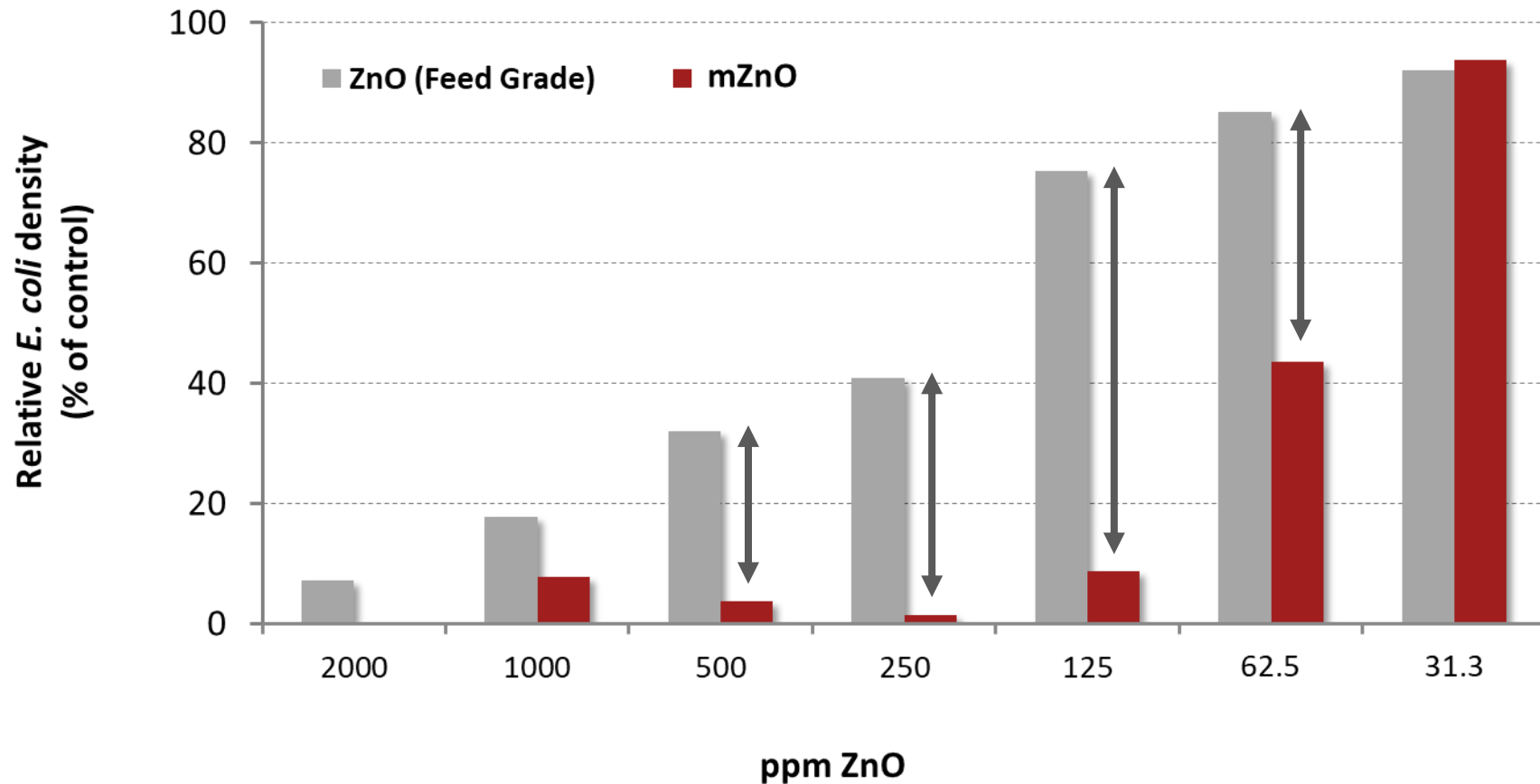
62.5 ppm ZnO/mZnO

31.3 ppm ZnO/mZnO

Positive control

RESULTS – *IN VITRO* TRIAL

Inhibition of *E. coli* growth within 24 h of incubation



MATERIAL AND METHODS – *IN VIVO* TRIAL

Experimental set-up

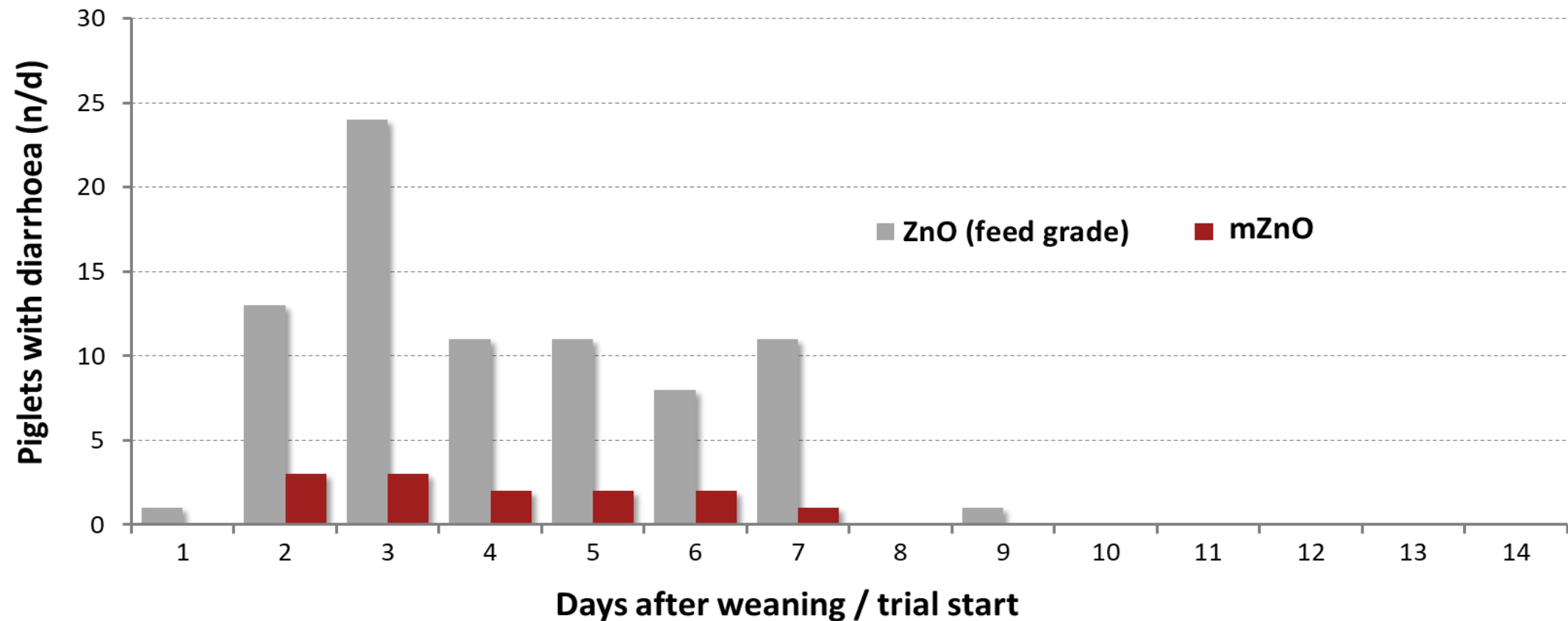
- Animals: 200 weaned piglets
 2 groups à 100 animals (control and mZnO)
 4 replicates per experimental group
- Housing: Groups with 25 piglets per pen
- Diet: Wheat - barley - rye - protein concentrate
 13.6 MJ ME, 17.6 % XP, 3.2 % XF
 fed ad libitum, dry/wet feeder
- Zinc: 160 ppm ZnO (= 120 ppm Zn)
 either as ***feed grade ZnO*** or ***mZnO***
- Observation
 period: 14 days, started with the day of weaning

Parameters

- Performance: Feed intake
 Body weight gain
 Feed conversion ratio
 → measured on pen basis
- Faecal score: Determined daily,
 every single piglet
 1 = normal
 2 = pasty
 3 = watery
 4 = watery with
 abnormal colour } **diarrhoea**

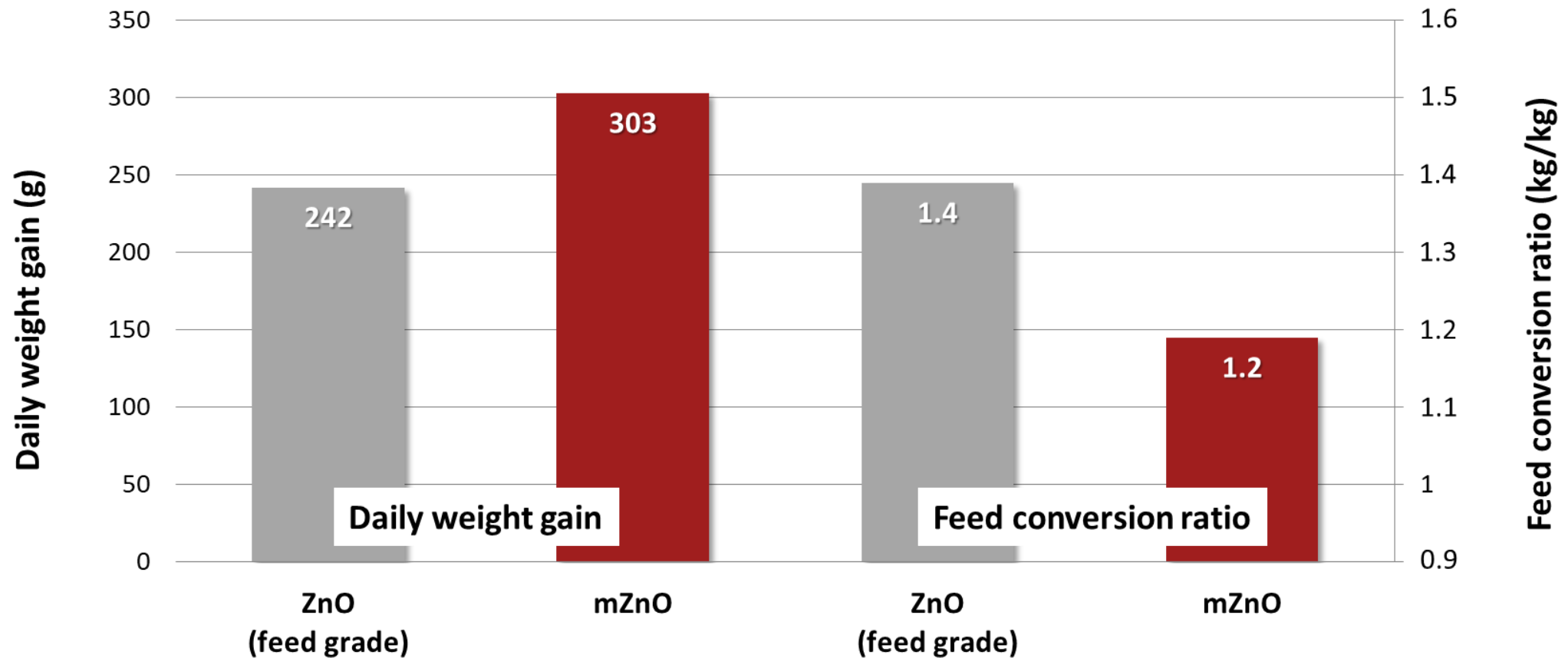
RESULTS – *IN VIVO* TRIAL

Diarrhoea incidence during the first 14 days after weaning



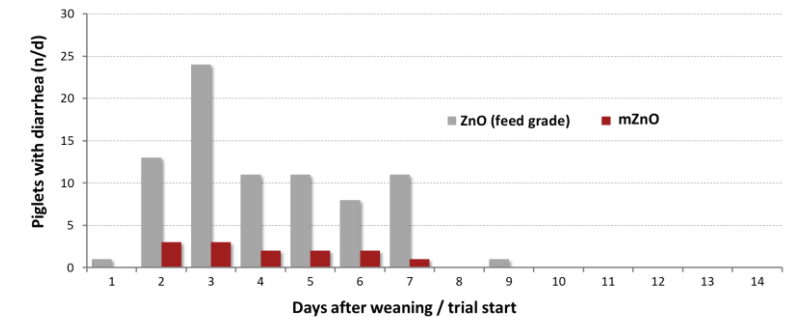
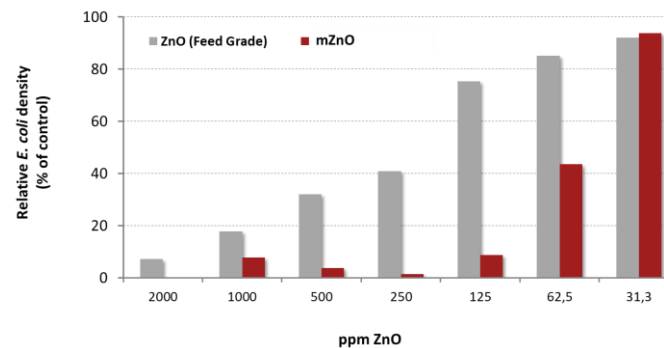
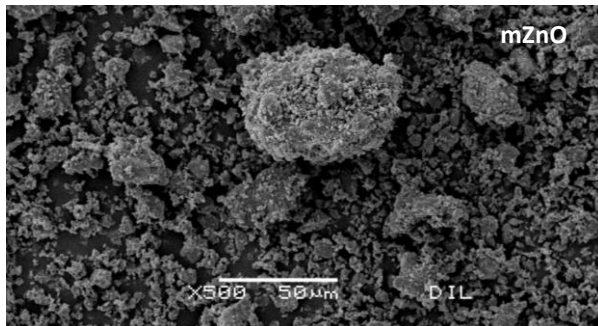
RESULTS – *IN VIVO* TRIAL

Piglet performance during the first 14 days after weaning

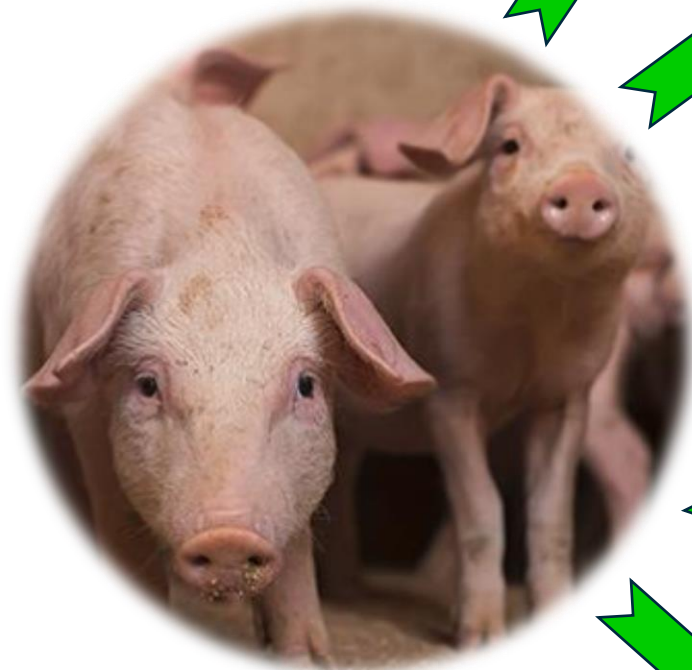


SUMMARY

- The treatment of zinc oxide in the eccentric vibrating mill did change the product
 - ➔ larger surface, higher product enthalpy
- mZnO effectively **inhibits the growth of *E. coli*** in the in vitro model
- mZnO effectively **reduces postweaning diarrhoea** in piglets



CONCLUSION



Dietary composition

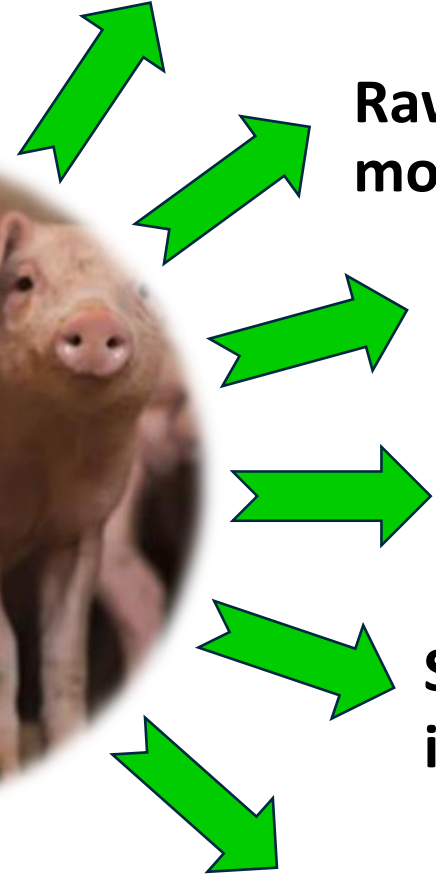
**Raw material quality/
monitoring**

Feed additives

Support of the microbiota

**Strengthening of the
intestinal immune system**

Management tools



THANK YOU FOR YOUR ATTENTION!



**ZERO
ZINC
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SEGES
Danish Pig Research Centre

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