

Reduced levels of zinc for weaners --consequences and new knowledge

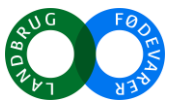
Jan Dahl and Hanne Maribo
Danish Agriculture & Food Council and COPA-COGECA

Outline of the presentation

Background

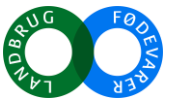
Consequences of the reduced level of zinc in pig-feed

New knowledge



Background

- Scientific Opinion on the potential reduction of the currently authorised maximum zinc content in complete feed <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2014.3668>:
 - “Zinc is an essential micronutrient for all living organisms”
 - “There are many regions in Europe where zinc levels are far above background”
- Scientific Opinion on the safety and efficacy of zinc compounds (E6) as feed additives for all animal species (zinc acetate, dihydrate; zinc chloride, anhydrous; zinc oxide; zinc sulphate, heptahydrate; zinc sulphate, monohydrate; zinc chelate of amino acids, hydrate; zinc chelate of glycine, hydrate <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2015.4058>
 - “The use of the zinc compounds under assessment does not pose an immediate concern for the agricultural soil compartment. However, there is a potential environmental concern related to drainage and the runoff of zinc to surface water, with acidic sandy soils being the most vulnerable.”
- To mitigate long term, negative environmental effects, EFSA proposed lowering the levels of zinc in feed for pigs



Overview

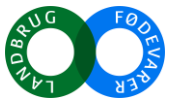
On 16 March 2017, the European Medicines Agency (the Agency) completed a review of the safety and effectiveness of veterinary medicinal products containing zinc oxide to be administered orally to food-producing species. The Agency's Committee for Medicinal Products for Veterinary Use (CVMP) concluded 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.

Result

Zinc in diets (mg/kg)	6-9 kg	9-28 kg	28-110 kg	Total excretion % (per pig (g))
Before June 2022	2500	150	100	100% (31)
Law today	150	150	120	74% (23)

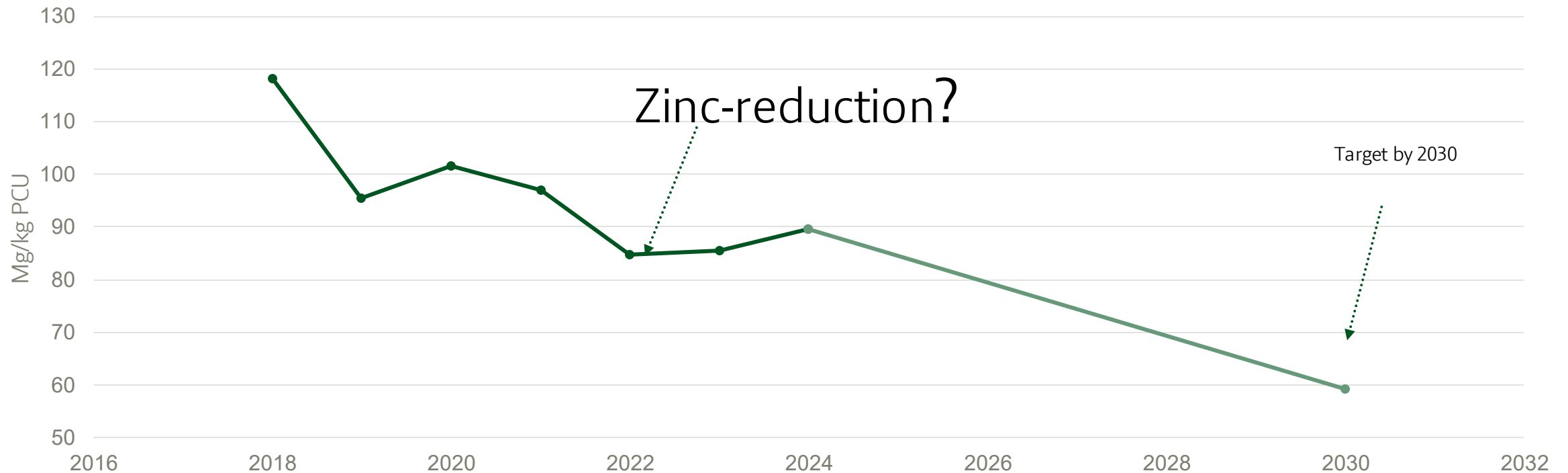
Commission Implementing Regulation (EU) 2016/1095 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R1095>

Ban on the use of medicinal zinc



Consequences

Use of antibiotics in the animal production in the EU (including all species, ESVAC)



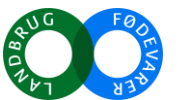
Denmark

The effect of the discontinued use of zinc oxide on antimicrobial usage in Danish pig farms

Josefine Ostefeld Nielsen^{*}, Frank Møller Aarestrup, Vibe Dalhoff Andersen, Håkan Vigre

The National Food Institute, Technical University of Denmark, Lyngby, Denmark

The most significant effect of the zinc oxide ban was seen for weaners, where AMU increased by ~5 % on average in the first 5 months post-discontinuation, followed by a ~17 % increase after >5 months.



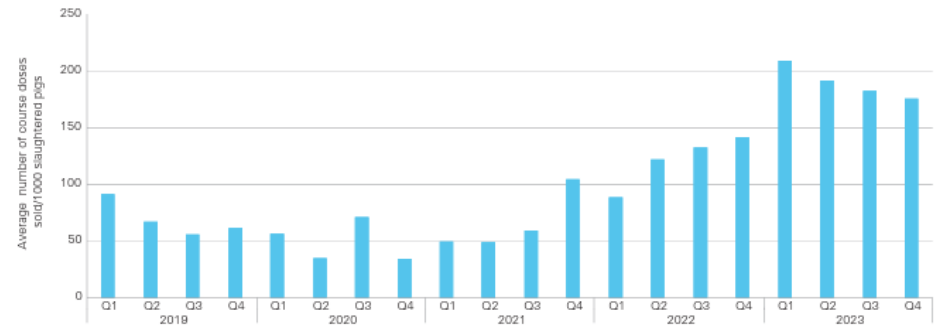
2024

SWEDRES | SVARM

Sales of antibiotics and occurrence of antibiotic resistance in Sweden

In 2015 and 2024 the sales of antibiotics for pigs (pet pigs included) were 2 732 and 3 316 kg active substance, respectively, or 11,7 and 13,5 mg/kg slaughtered pig. The apparent increase is largely explained by an increased need to treat post-weaning diarrhoea after the 2022 withdrawal of products with high levels of zinc oxide formerly used for prevention. The sales of relevant products, containing neomycin,

Figure. Quarterly (Q) sales of products for group medication of diarrhoea in weaner pigs (ATC-code QA07AA), expressed as course doses for pigs (12 kg, 3 days) divided by number of pigs slaughtered five months later.

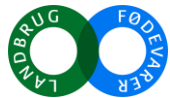
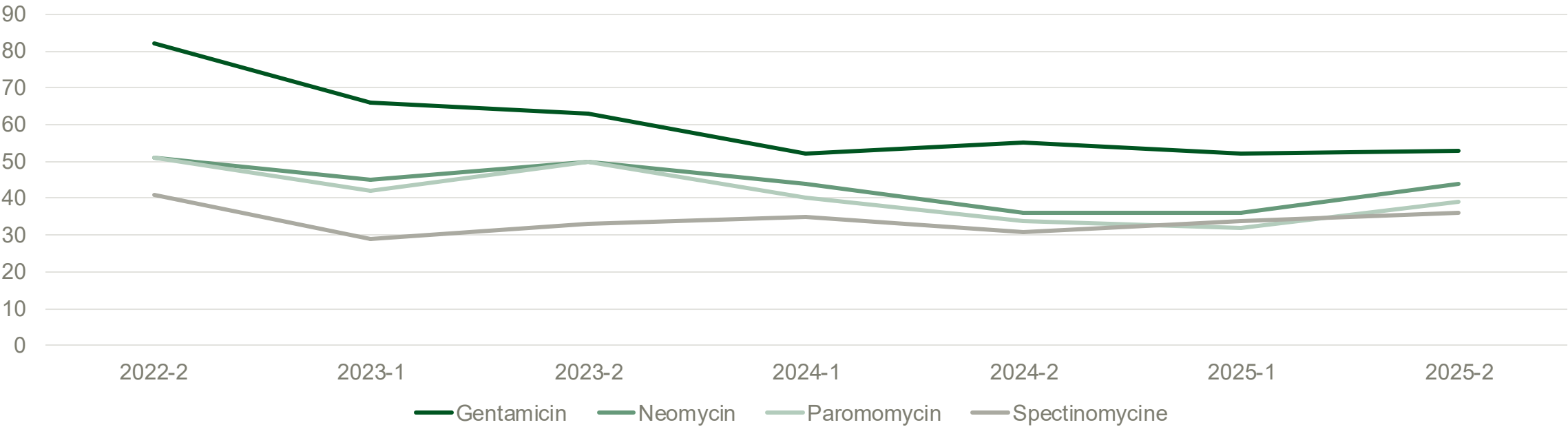


The withdrawal of high dose zinc products occurred between the second and third quarters of 2022.

Antimicrobial resistance in Hemolytic E. coli – DAFC-laboratory

(gris.dk/services/laboratoriet/gris/resistensopgoerelser)

% sensitive isolates



Conclusion - consequences

- Documented increase in antibiotic use for weaned pigs in at least two countries (both countries in the lower use group in the EU)
- Indications of increased resistance in clinical isolates from pigs in at least one country (Denmark)

New knowledge – Zinc-norm revisited

Zinc in diets (mg/kg)	6-9 kg	9-28 kg	28-110 kg	Total excretion % (per pig (g))
Before June 2022	2500	150	100	100% (31)
Law today	150	150	120	74% (23)

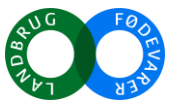
Commission Implementing Regulation (EU) 2016/1095 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R1095>



Problems (Advisory report, Weaned and older pigs nutritional need for zinc., Århus University

chrome-extension://efaidnbmnnnibpcajpcgclefindmkaj/https://pure.au.dk/ws/files/339079139/Rapport_behov_for_zink_-_grise_310823.pdf

- The EFSA recommendation does not take into account, that the low daily intake of feed for newly weaned pigs will result in zinc-deficiency
 - A newly weaned, 7 kg pig has to eat 312 gram feed to achieve the recommended intake (48.6 mg, <https://www.nationalacademies.org/publications/13298>)
 - A number of studies indicate feed intake to range from <50 gram to 235 gram per day (**Determination of the Optimal Level of Dietary Zinc for Newly Weaned Pigs: A Dose-Response Study.** <https://pmc.ncbi.nlm.nih.gov/articles/PMC9219510/>)
- This effect will potentially be worse for the smallest, most vulnerable pigs



Literature

- **Official report from Danish Centre for Food and Agriculture, Århus University: Weaned and older pigs nutritional need for zinc under Danish production conditions.** chrome-extension://efaidnbmnnnibpcajpcgglefindmkaj/https://pure.au.dk/ws/files/339079139/Rapport_behov_for_zink_-_grise_310823.pdf
- **Peer reviewed**
 - **Determination of the Optimal Level of Dietary Zinc for Newly Weaned Pigs: A Dose-Response Study** Sally V Hansen, Natalja P Nørskov, Jan V Nørgaard, Tofuko A Woyengo, Hanne D Poulsen, Tina S Nielsen. *Animals (Basel)*. 2022 Jun 15;12(12):1552. doi: [10.3390/ani12121552](https://doi.org/10.3390/ani12121552)
 - **Determination of the optimal dietary zinc content for pigs between 10 and 30 kg body weight** Sally Veronika Hansen, Aurégane Graffagnino, Mette Skou Hedemann, Tina Skau Nielsen, Tofuko Awori Woyengo *Journal of Animal Science*, Volume 101, 2023, skad360.
 - **Growing–finishing pigs do not need additional zinc in a phytase-supplemented wheat–barley–soybean meal-based diet**, Tina Skau Nielsen, Sally Veronika Hansen, Tofuko Awori Woyengo. *Canadian Journal of Animal Science*. Volume 105, 19 March 2025, Pages 1-7



The trial

Trial 1. PPM ZnO in weaner diet day 0-21

Added ZnO	Analyzed level in feed
100	153
450	493
950	1022
1450	1601
1950	2052
2450	2407

Trial 2 PPM ZnO from 10-30 kg

Added ZnO	Analyzed level in feed
0	80
30	92
60	117
120	189
240	318

Trial 3. PPM ZnO from 30 kg

Added ZnO	Analyzed level in feed
0	30
40	70
80	110

Risk of diarrhoea with low Zn for weaners

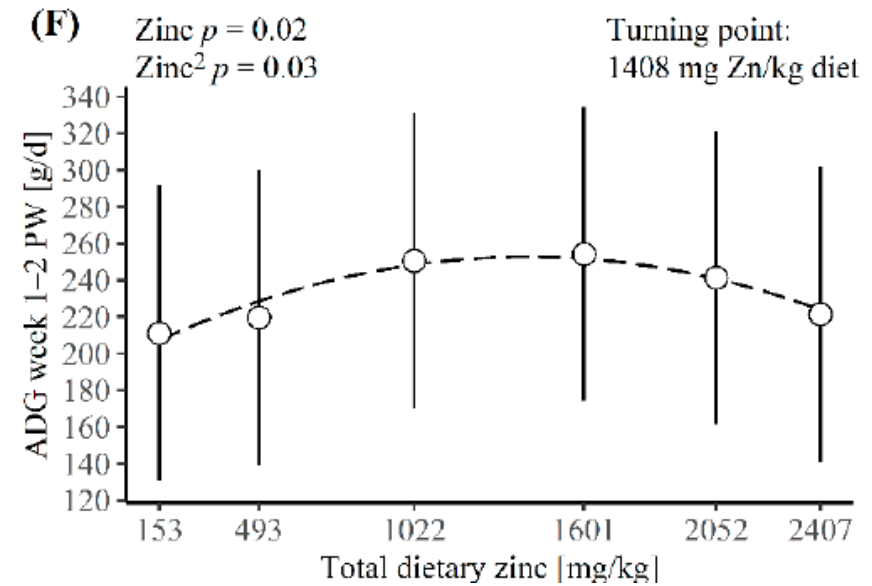
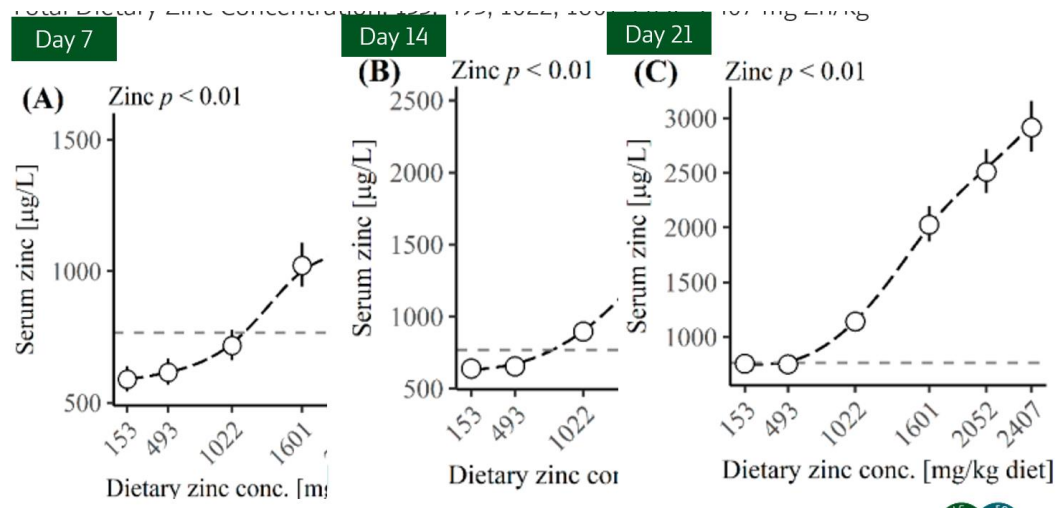
- Relative risk of diarrhea second and third week post weaning
 - Pigs divided in two groups depending on serum zinc level higher or lower than weaning level
- The initial serum Zn concentration at weaning was similar for the six dietary treatment groups (767µg/L)

	≤767µg/L	>767µg/L	Relative risk
Serum Zn day 7			
Pigs (N)	87	85	
Days with diarrhea (day 7-13)	126	81	1,52 (1,18-1,96)
Serum Zn day 14			
Pigs (N)	54	111	
Days with diarrhea (day 14-20)	182	142	1,60 (1,34-1,92)



Danish Agriculture & Food Council
Pig Research Centre

Results trial 1



Conclusion trial 1

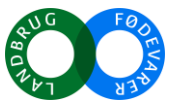
- Serum Zinc-level dropped after weaning in the lowest groups – possibly to levels below the nutritionally optimal level
- Pigs with low Zinc-level post-weaning were at increased risk of diarrhoea

Optimal growth was obtained at 1000 PPM

Trial 2. 10-30 kg

- When supplied with the optimal level post-weaning
- Conclusion
 - Productivity could be maintained at 80 PPM
 - Serum and bone-content of Zinc dropped at levels below 100 PPM

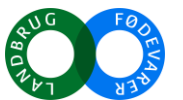
Trial 2PPM ZnO from 10-30 kg	
Added ZnO	Analyzed level in feed
0	80
30	92
60	117
120	189
240	318



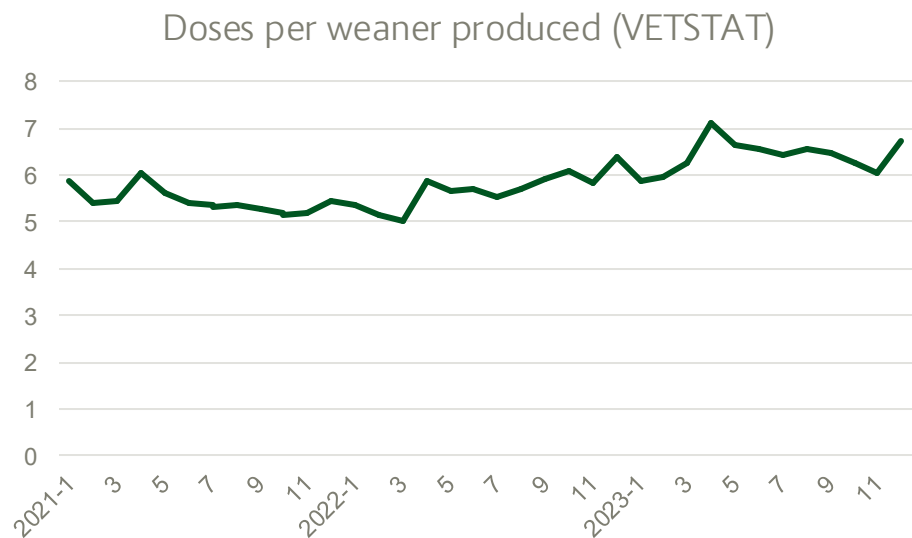
Trial 3. Finishing pigs from 10-30 kg

- Given the optimal levels in the two previous periods, no effect of extra added Zinc
- Cave
 - Other diets may not contain the adequate level of Zinc without added zinc

Trial 3. PPM <u>ZnO</u> from 30 kg	
<u>Added ZnO</u>	<u>Analyzed level in feed</u>
0	30
40	70
80	110

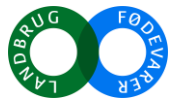


Expected effect of new norm on antibiotic use for weaners in Denmark (Jan Dahl, based on VETSTAT, Denmark)



Year	Doses per weaner produced	Increase
2021	5.46	-
2023	6.39	17 %*

*potential reduction of 17 % by changed Zinc-recommendations
Assumption – treatment-level will go back to 2021-level



Recommendation from Danish Centre for Food and Agriculture, Århus University

Zinc in diets (mg/kg)	6-9 kg	9-28 kg	28-110 kg	Total excretion % (per pig (g))
Before June 2022	2500	150	100	100% (31)
Law today	150	150	120	74% (23)
New recommendation	1400	100	50	51% (16)
% of diet	2	10	88	

Conclusion

- Effect of proposed recommendation from Århus University
 - Lower level of zinc in effluents than both the old norm and the current norm – environmental benefit
 - Better productivity
 - Better health
 - Reduction of antibiotic treatments

Pending results

- Zinc trials testing the Danish results under other climate conditions:
 - Portugal
 - Preliminary results – reduced diarrhoea and no negative effect on productivity
 - Spain
 - Trial is going on now testing: productivity, excretion, microbial resistance, microbiome

