

Reduced protein as an alternative to medicinal zinc

Niels J. Kjeldsen

Senior Specialist, MSc, PhD Animal Science

Livestock Innovation, SEGES Danish Pig Research Centre

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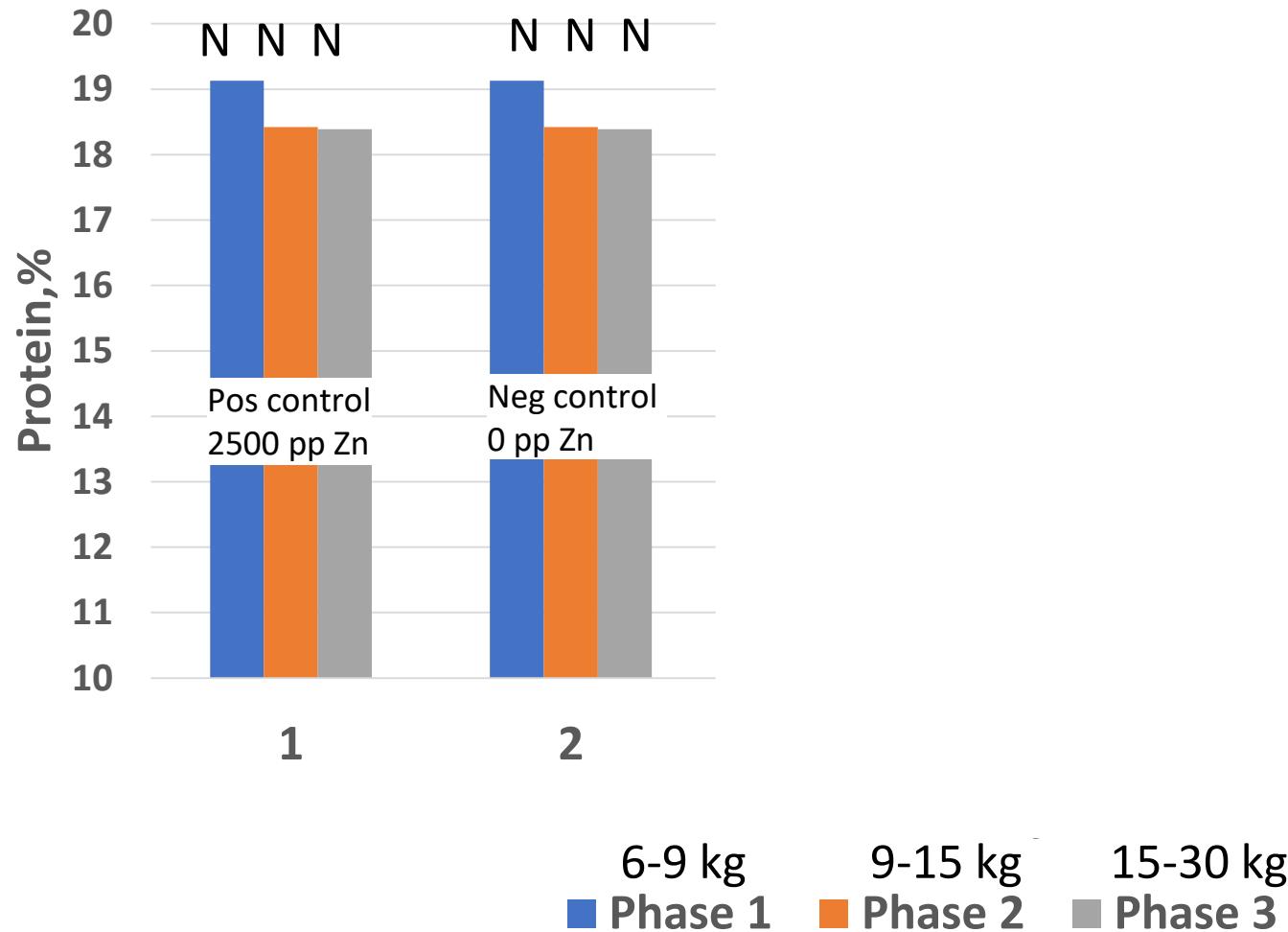
Aim of the study

- Comparison of four strategies for reducing protein post-weaning with positive (2500 ppm Zn) and negative (0 Zn) control groups
- Hypotheses:
 - Medicinal zinc reduces diarrhoea treatment days by 35% compared to no zinc
 - Reduced protein same effect - but
 - will lower daily gain (6-30 kg)

Trial design

- 6 treatment groups
- Approx. 75 replicates (pens) per treatment group
- 6,800 weaner piglets age 25-27 days, weight 5.5-9.0 kg
- Experimental herd
- DanBred pigs
- Pelleted feed

Trial design



N=norm, L=low, H=high, VL=very low, M=middle

Feed composition

- Same level of soybean meal in all groups in each phase
 - Phase 1 (6-9 kg): 7%
 - Phase 2 (9-15 kg): 14%
 - Phase 3 (15-30 kg): 21%
- Reduction of protein in the diet
 - Reducing soy protein concentrate, potato protein and fish meal

Strategy - diarrhoea treatments, days



- First two pigs with diarrhoea were treated individually (3 days)
- > 2 pigs, all pigs in the pen were treated (5 days)

Results: Diarrhoea treatments, days, 6-30 kg

Group	1 NNN + Zn	2 NNN	3 LNN	4 LLH	5 VLHH	6 VLMH
Treatments, days per pig						
Total, 6-30 kg	2.08 ^b	4.19 ^a				
Phase 1, 6-9 kg			Difference groups 2 and 1: +2 treatment days = 50%			
Phase 2, 9-15 kg	1.57	2.83				
Phase 3, 15-30 kg	0.47	1.11				

N=norm, L=low, VL=very low, H=high, M=middle

Results: Diarrhoea treatments, days, 6-30 kg

Group	1 NNN + Zn	2 NNN	3 LNN	4 LLH	5 VLHH	6 VLMH
Treatments, days per pig						
Total, 6-30 kg	2.08 ^b	4.19 ^a	3.75 ^a	3.10 ^b	3.68 ^a	3.24 ^a
Phase 1, 6-9 kg	0.04				0.11	0.17
Phase 2, 9-15 kg	1.57	2.83	2.39	1.77	2.10	1.65
Phase 3, 15-30 kg	0.47	1.11	1.31	1.20	1.47	1.42

N=norm, L=low, VL=very low, H=high, M=middle

Results: Productivity



Production results, 6-9 kg (6,800 piglets)

Group	1 N+Zn	2 N	3 L	4 L	5 VL	6 VL
Daily gain, g/day	184 ^a	184^a				
Feed conversion, Kg feed/kg gain	1.20 ^a	1.21^a				

N=norm, L=low, VL=very low

Production results, 6-9 kg (6,800 piglets)

Group	1 N+Zn	2 N	3 L	4 L	5 VL	6 VL
Daily gain, g/day	184 ^a	184 ^a	177 ^a	173 ^a		
Feed conversion, Kg feed/kg gain	1.20 ^a	1.21 ^a	1.28 ^b	1.32 ^b		

N=norm, L=low, VL=very low

Production results, 6-9 kg, (6,800 piglets)

Group	1 N+Zn	2 N	3 L	4 L	5 VL	6 VL
Daily gain, g/day	184 ^a	184 ^a	177 ^a	173 ^a	148 ^b	143 ^b
Feed conversion, Kg feed/kg gain	1.20 ^a	1.21 ^a	1.28 ^b	1.32 ^b	1.43 ^c	1.47 ^c

N=norm, L=low, VL=very low

Production results, 6-30 kg (6,800 piglets)

Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 VLHH	6 VLMH
Daily gain, g/day	520 ^a	519^a				
Feed conversion, Kg feed/kg gain	1.43 ^a	1.44^a				

N=norm, L=low, VL=very low, H=high, M=middle

Production results, 6-30 kg (6,800 piglets)

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Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 VLHH	6 VLMH
Daily gain, g/day	520 ^a	519 ^a	516 ^{ab}	504 ^b		
Feed conversion, Kg feed/kg gain	1.43 ^a	1.44 ^a	1.44 ^a	1.44 ^a		

N=norm, L=low, VL=very low, H=high, M=middle

Production results, 6-30 kg (6,800 piglets)

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Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 VLHH	6 VLMH
Daily gain, g/day	520 ^a	519 ^a	516 ^{ab}	504 ^b	517 ^{ab}	504 ^b
Feed conversion, Kg feed/kg gain	1.43 ^a	1.44 ^a	1.44 ^a	1.44 ^a	1.40 ^b	1.42 ^{ab}

N=norm, L=low, VL=very low, H=high, M=middle

What did we find?

- The best strategy: **Low Low High**
 - Reduced treatment days by 25% (hypothesis was 35%)
- Daily gain reduced by 15 g/day

Why not larger effect on diarrhoea with low protein?

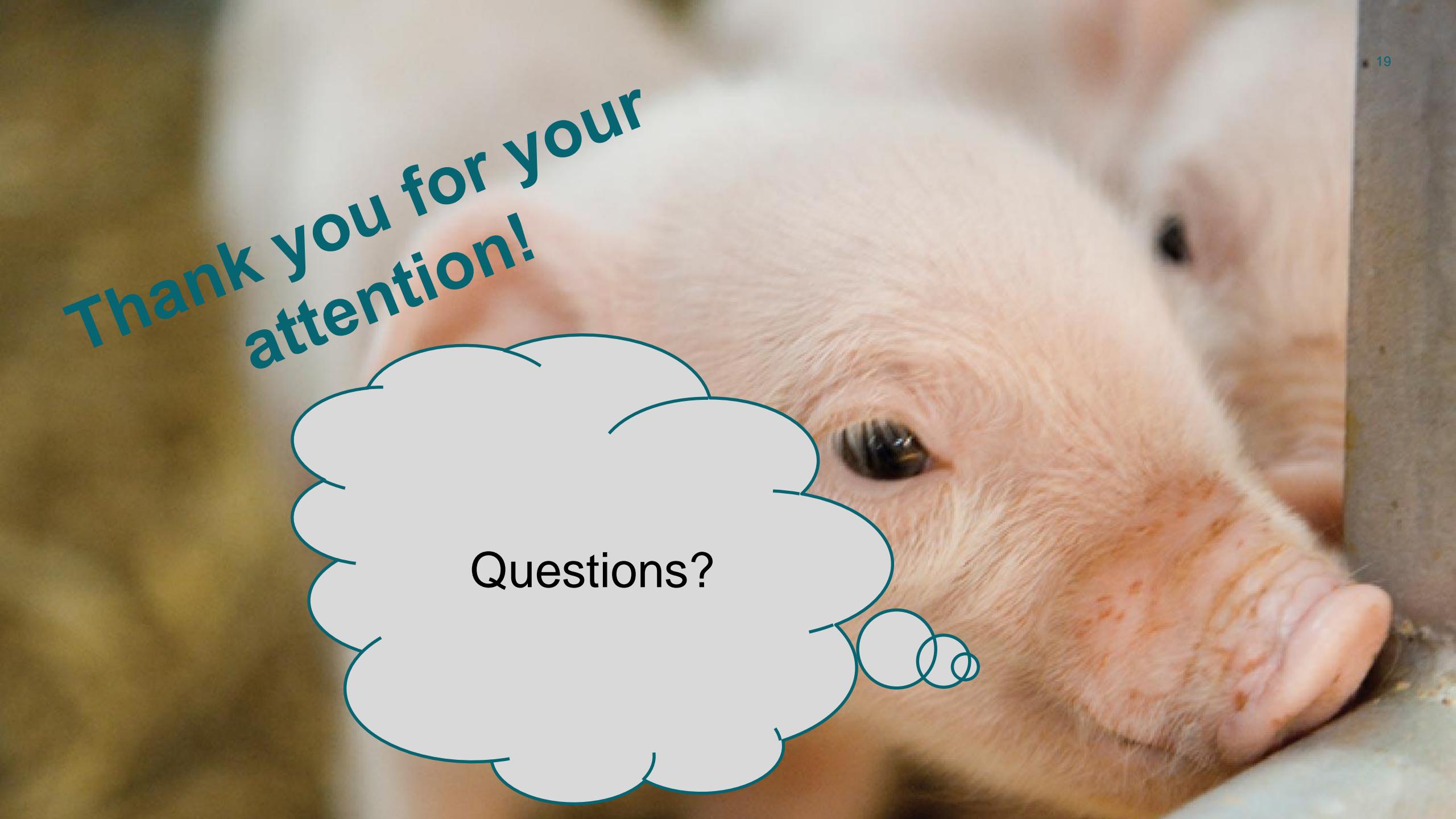
Our protein levels (6-9 kg): **19%, 16.5% and 14%**, respectively

Other trials:

- Yue et al (2008): Sign. effect from **23-19%**, NS **19-17%**
- Heo et al. (2010): Sign. effect from **25-19%**
- Halas et al. (2007): Sign. effect from **24-18 %**
- Kim et al. (2011): Sign. effect from **23-18.5%**
- SEGES (2006): Sign. effect from **21-18%**
- SEGES (2017): Sign. effect from **21-18%**

Conclusion

- **Medicinal zinc** diarrhoea treatment days reduced by **50%** compared with no zinc
- **Low protein** reduced diarrhoea treatment days by **25%**
 - But zinc is better
- **Low protein = low productivity**
 - Partial compensation with subsequent high protein
- Reduced protein plays a role in the solution
- New SEGES recommendation: **17.5% protein for phases 1 and 2**

A close-up photograph of a light brown or tan-colored dog's face. The dog has dark eyes and a small black nose. A white, cloud-shaped speech bubble is overlaid on the left side of the image. Inside the bubble, the text "Thank you for your attention!" is written in a teal, sans-serif font, and the word "Questions?" is centered below it.

Thank you for your
attention!

Questions?

SMALL, MEDIUM AND LARGE PIGS AT START - ACROSS GROUPS

Size of pigs	Small	Medium	Large
Number of pens	184	182	192
Weight at start, kg	5.8	6.6	7.6
Daily gain, g (6-30 kg)	495	523	521
Feed conversion, FUp/kg gain (6-30 kg)	1.62	1.63	1.64
Treatments, days per pig, index	100	125	125

Ingredients

Group	1+Zn NNN	2 NNN	3 LNN	4 LLH	5 XLHH	6 XLMH
6-9 kg	Norm	Norm	Low	Low	Extra Low	Extra Low
Soybean meal	7.0	7.0	7.0	7.0	7.0	7.0
Vilosoy	7.7	7.7	0.9	0.9		
Potato protein	4.0	4.0	4.0	4.0	1.6	1.6
Fish meal	2.0	2.0	2.0	2.0		
Whey powder	6.0	6.0	6.0	6.0	6.0	6.0
Barley	20.0	20.0	20.0	20.0	20.0	20.0
9-15 kg	Norm	Norm	Norm	Low	High	Middle
Soybean meal	14.0	14.0	14.0	14.0	14.0	14.0
Vilosoy	3.0	3.0	3.0		3.6	
Potato protein	3.0	3.0	3.0	1.2	4.0	2.9
Barley	20.0	20.0	20	20	20	20
15-30 kg	Norm	Norm	Norm	High	High	High
Soybean meal	21.0	21.0	21.0	21.0	21.0	21.0
Potato protein	1.3	1.3	1.3	2.5	2.5	2.5
Barley	20	20	20	20	20	20

N=norm, L=low, H=high, XL=extra low, M=middle

(6 groups, 72 replicates, 5,000 piglets)

Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 XLHH	6 XLMH
	Pos control + 2.500 ppm medicinal zinc	Neg control - medicinal zinc				
6-9 kg						
Protein ¹⁾ / Lysine	Norm, 145 / 10.6	Norm, 145 / 10.6	Low, 125 / 10.0	Low, 125 / 10.0	Extra Low, 105 / 10.0	Extra low, 105 / 10.0
9-15 kg						
Protein ¹⁾ / Lysine	Norm, 144 / 10.6	Norm, 144 / 10.6	Norm, 144 / 10.6	Low, 126 / 10.0	High, 151 / 11.1	Middle 136 / 11.1
15-30 kg						
Protein ¹⁾ / Lysine	Norm, 143 / 10.6	Norm, 143 / 10.6	Norm, 143 / 10.6	High, 150 / 11.1	High, 150 / 11.1	High, 150 / 11.1

¹⁾ = gram digestible per FUp

Results, 6-9 kg (6,800 piglets)

Group	1 N+Zn	2 N	3 L	4 L	5 XL	6 XL
Pens (replicates)	73	187	73	75	73	77
Daily gain, g/day	185	184	177	171	145	145
Feed intake, FUp/day	0.25	0.26	0.26	0.26	0.24	0.25
Feed conversion, FUp/kg gain	1.41	1.42	1.50	1.55	1.69	1.72

N=norm, L=low, XL=extra low

Results, 6-15 kg

Group	1 NN+Zn	2 NN	3 LN	4 LL	5 XLH	6 XLM
Daily gain, g/day	347	340	337	307	326	297
Feed intake, FUp/day	0.52	0.52	0.51	0.49	0.49	0.47
Feed conversion, FUp/kg gain	1.50	1.53	1.53	1.61	1.50	1.59

N=norm, L=low, XL=extra low, H=high, M=middle

Results, 9-15 kg

Group	1 NN+Zn	2 NN	3 LN	4 LL	5 XLH	6 XLM
Daily gain, g/day	427	428	428	387	422	392
Feed intake, FUp/day	0.66	0.67	0.66	0.64	0.63	0.61
Feed conversion, FUp/kg gain	1.56	1.57	1.55	1.65	1.49	1.57

N=norm, L=low, XL=extra low, H=high, M=middle

Results, 6-30 kg (6,800 piglets)

Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 XLHH	6 XLMH
Daily gain, g/day	520	519	516	504	517	504
Feed intake, FUp/day	0.84	0.85	0.84	0.82	0.83	0.81
Feed conversion, FUp/kg gain	1.63	1.64	1.64	1.64	1.60	1.62
Production value PV, same feed price, index	101	100	99	97	102	98
Dig. protein /pig, index	100	100	99	97	99	96

N=norm, L=low, XL=extra low, H=high, M=middle

Results, 6-30 kg

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Group	1 NNN+Zn	2 NNN	3 LNN	4 LLH	5 XLHH	6 XLMH
Daily gain, g/day	520	519	516	504	517	504
Feed intake, FUp/day	0.84	0.85	0.84	0.82	0.83	0.81
Feed conversion, FUp/kg gain	1.63	1.63	1.64	1.64	1.60	1.62
Production value PV, same feed price, index	101	100	99	96	102	97
PV, current feed price, index	100	100	100	97	97	96
Feed price per FUp, DKK	2.06	2.05	2.03	2.04	2.13	2.07

N=norm, L=low, XL=extra low, H=high, M=middle

Diarrhoea treatments, 6-30 kg

Group	1 NNN + Zn	2 NNN	3 LNN	4 LLH	5 XLHH	6 XLMH
Treatments, days per pig						
Pen treatments, %	28	49	47	36	45	39

N=norm, L=low, XL=extra low, H=high, M=middle