WEANER DIETS – WITHOUT ZINC OXIDE

Lisbeth Shooter & Nicolai Weber, Livestock Innovation

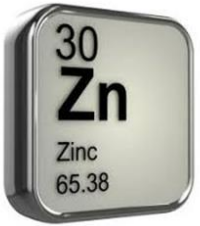
Congress for pig producers, 2017

SEGES Svineproduktion

THE PROBLEM

- Why use zinc for weaned pigs?
  - The most efficient and cheapest way to prevent post-weaning diarrhoea
  - Affects gut flora

- Post-weaning diarrhoea treated with antibiotics in many countries
- One of the main reasons for antibiotic treatment



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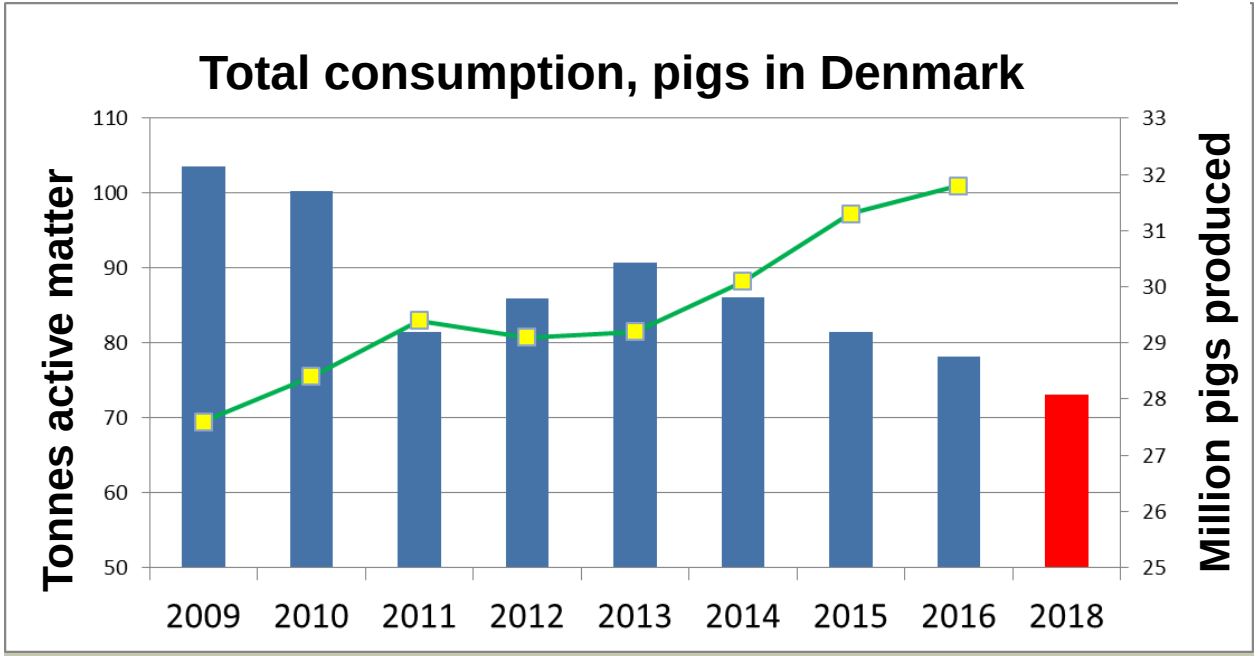
THE AIM IS A FUTURE WITHOUT ZINC AND…



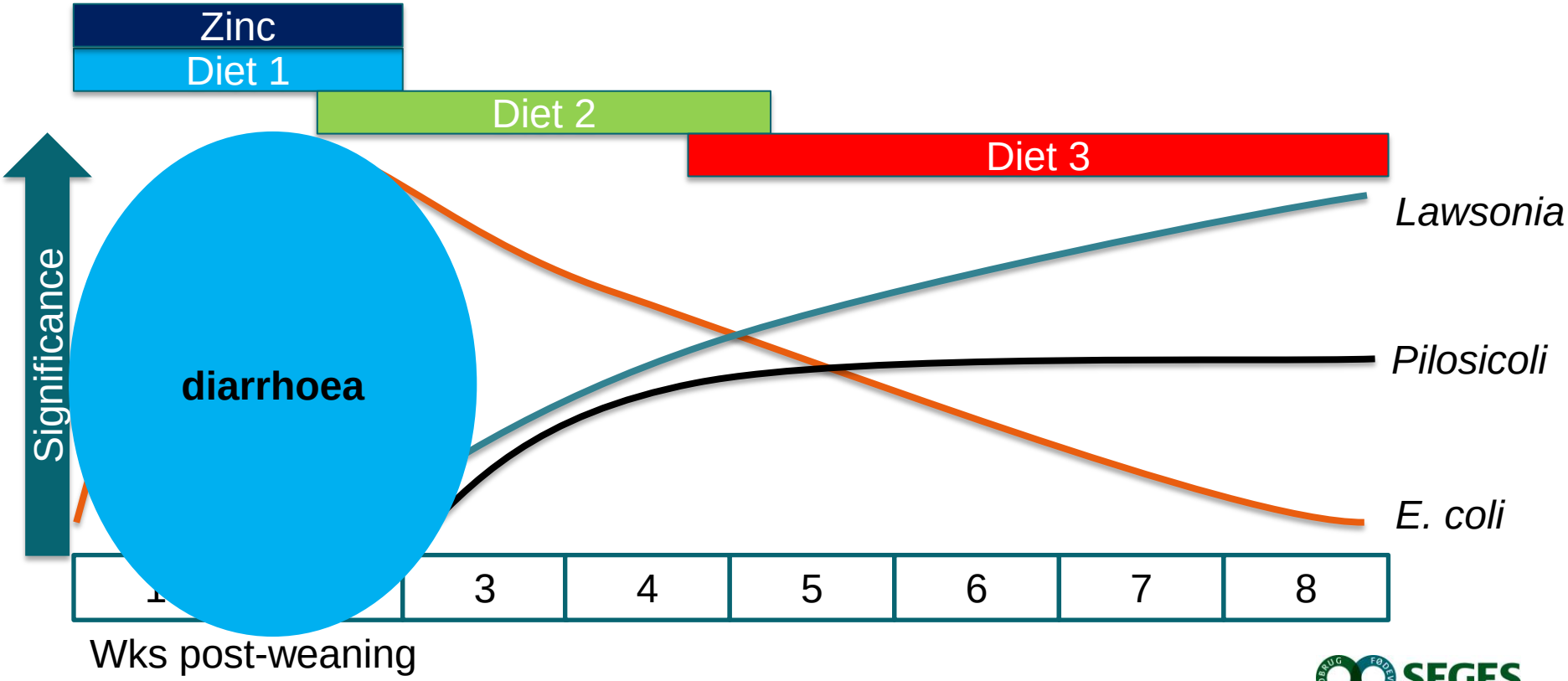
Without an increase in drug use

2009-2016:

Antibiotic ↓ 25%

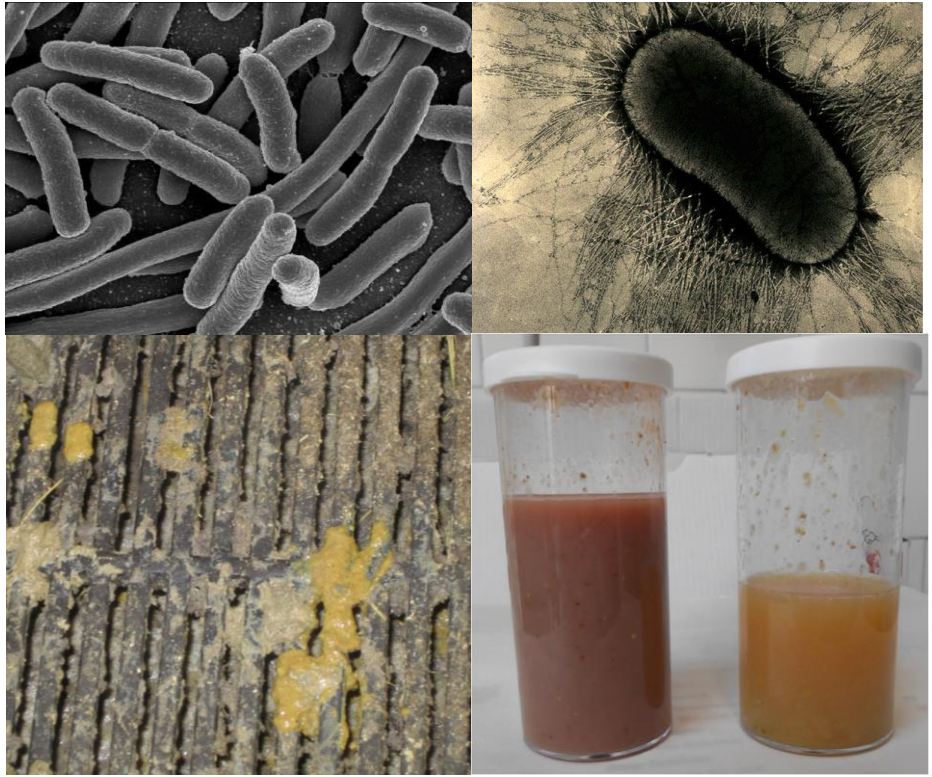
Production ↑ 11.6%

INTESTINAL DISEASES IN DANISH NURSERY PIGS



POST-WEANING DIARRHOEA

- Toxin-producing *E. coli* (F4/F18)
- Requires proliferation
- Toxins impact small intestine
- Exceeds colon capacity = diarrhoea



FACTORS, POST-WEANING DIARRHOEA

Predetermining

- Genetics
- Passive immunity
- Weaning age
- Starvation, weaning

Contributing

- Immediate environment
- Stocking density
- Feeding strategy
- Composition of feed
- Co-infections

Necessary

- Toxin-producing *E. coli*

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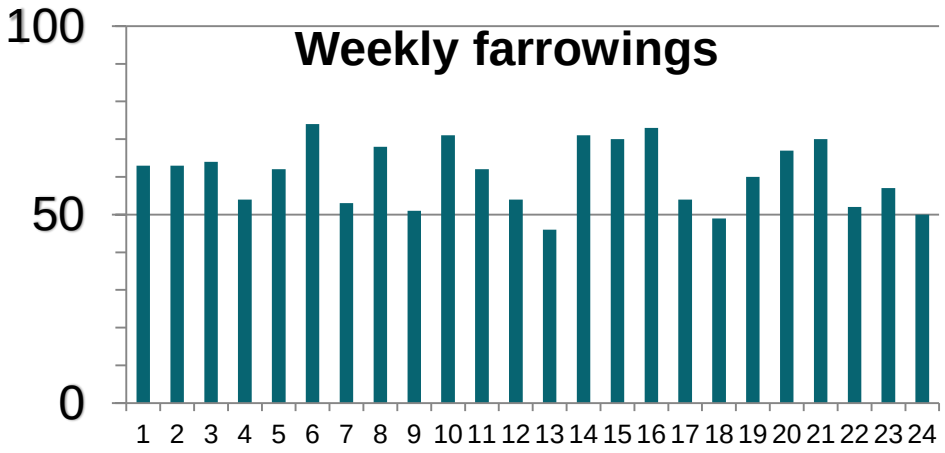
HOUSING CAPACITY

2002-2016
Increase in no. of weaned pigs pr. weekly batch by 36 %



5 % variation in no. of sows
+/- 57 pigs
10 % variation in no. of sows
+/- 81 pigs

THE FARROWING UNIT MATTERS

- **Variation in age**
  - 30% = younger than weaning batch (pigs from nurse sows)
  - 65% = weaning batch
  - 5% = older than weaning batch (buffer pigs)

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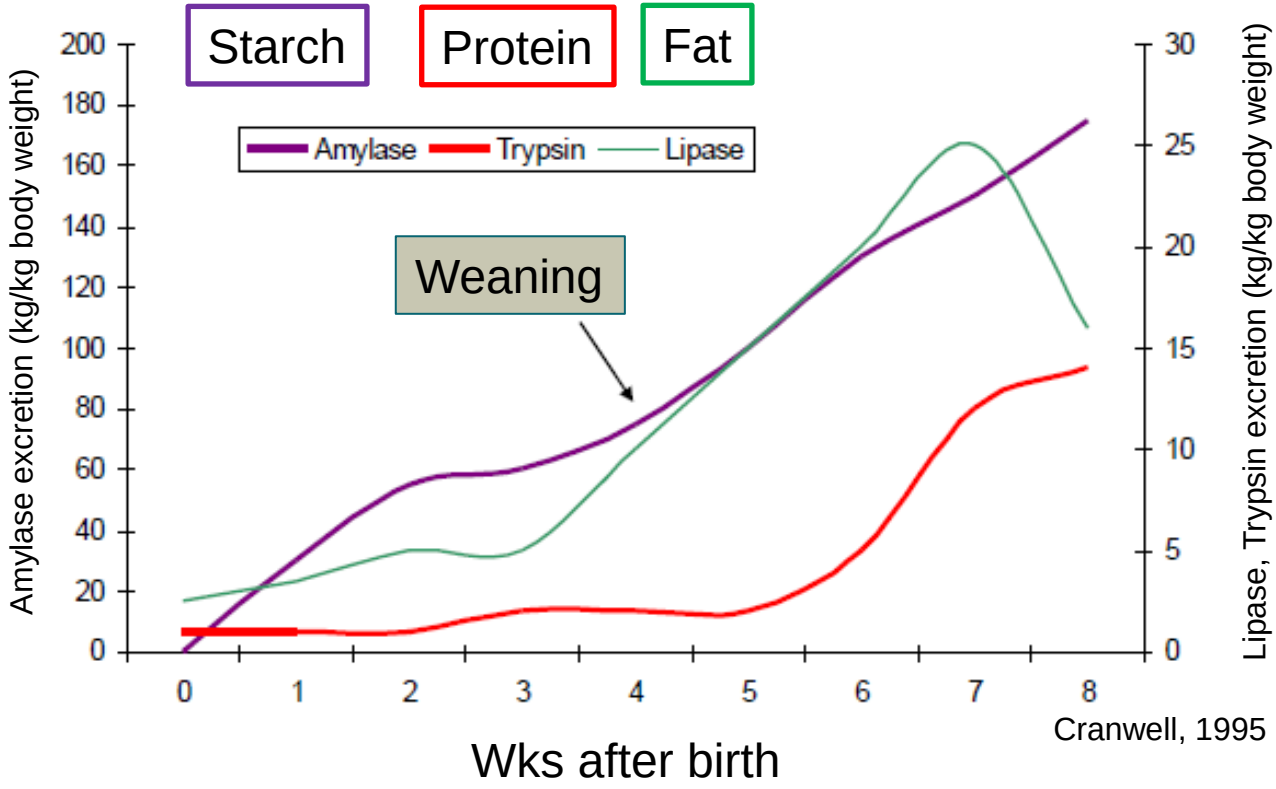
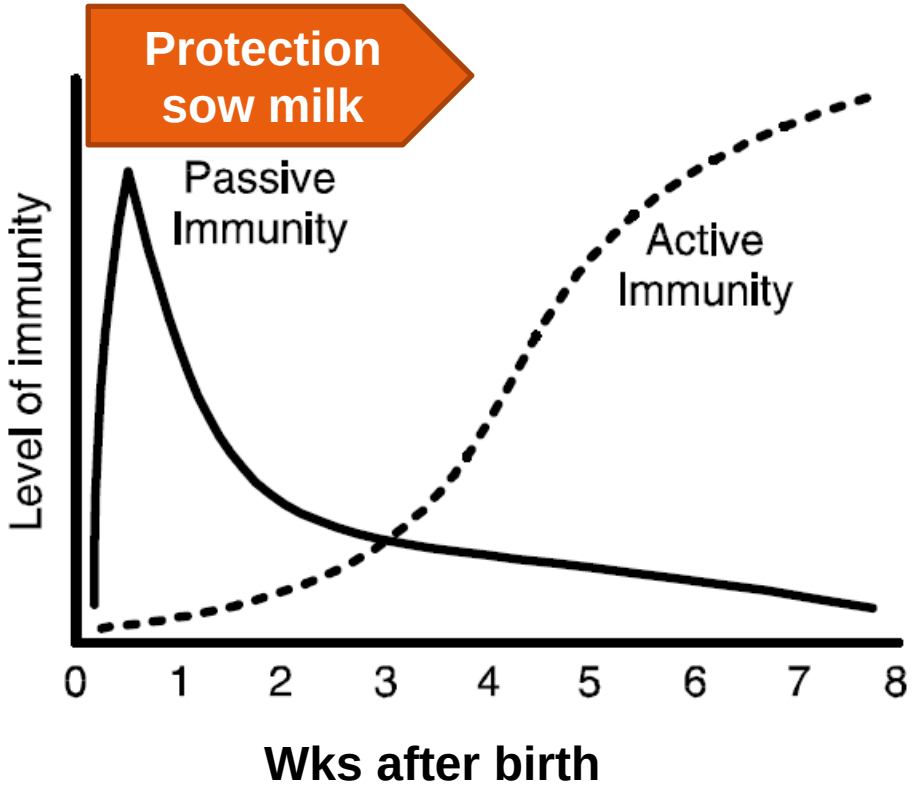
PHYSIOLOGICAL DEVELOPMENT



Cranwell, 1995

IMMUNITY, DEVELOPMENT PIGS



Mod. *Coffey et. al*

FACTORS, POST-WEANING DIARRHOEA

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Necessary

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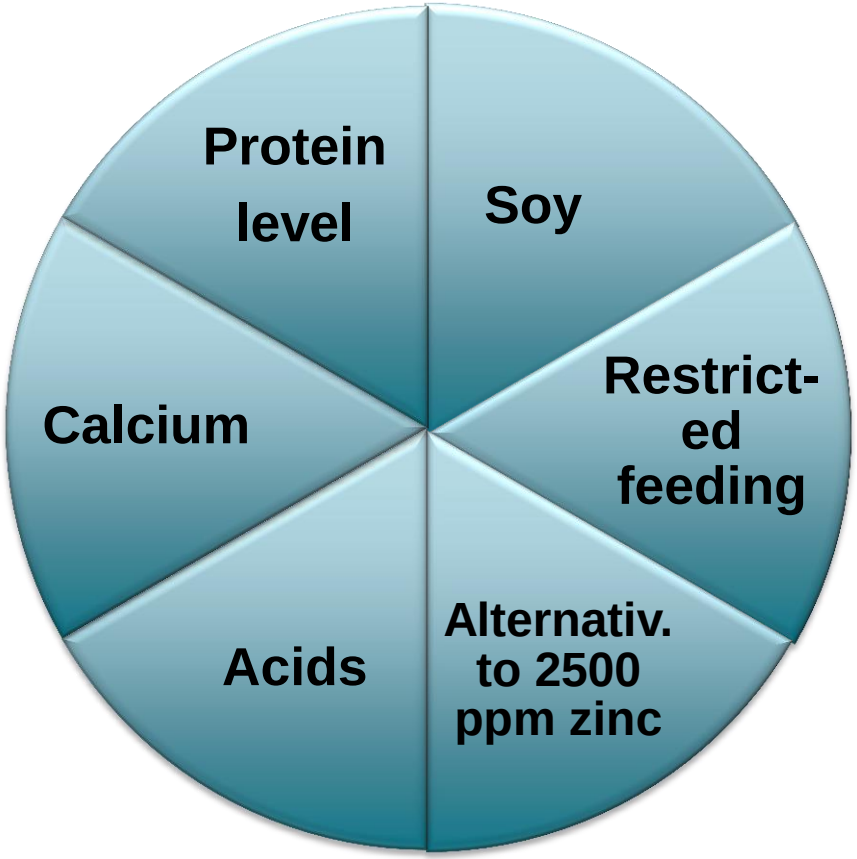
FEED INTERVENTIONS AGAINST DIARRHOEA



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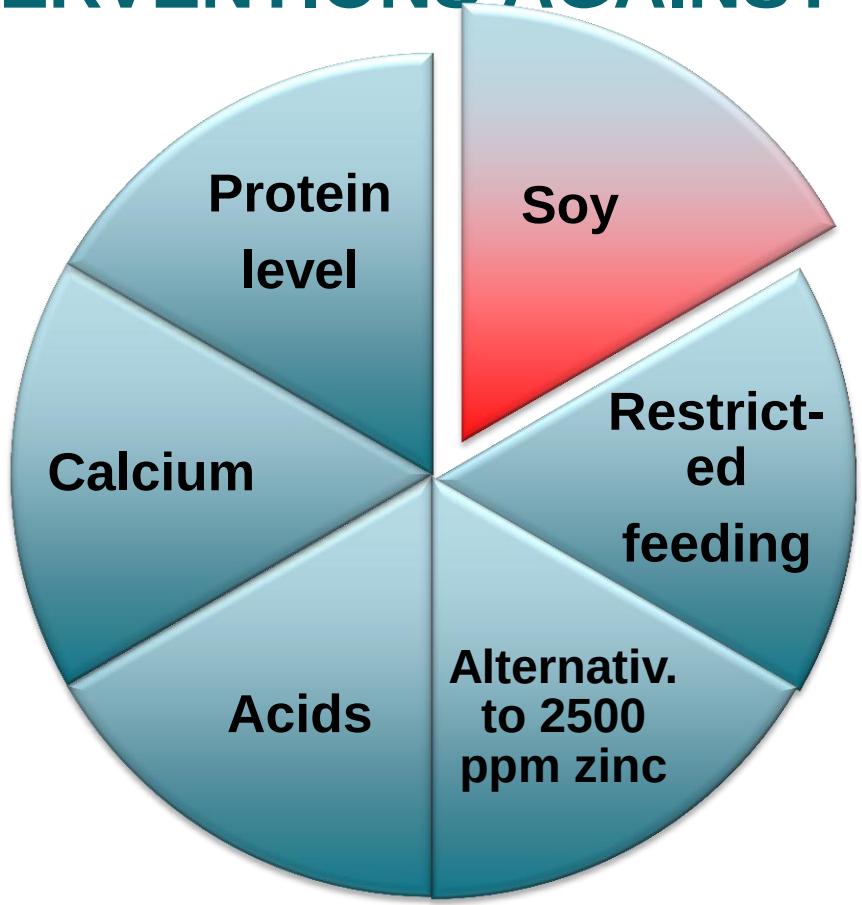
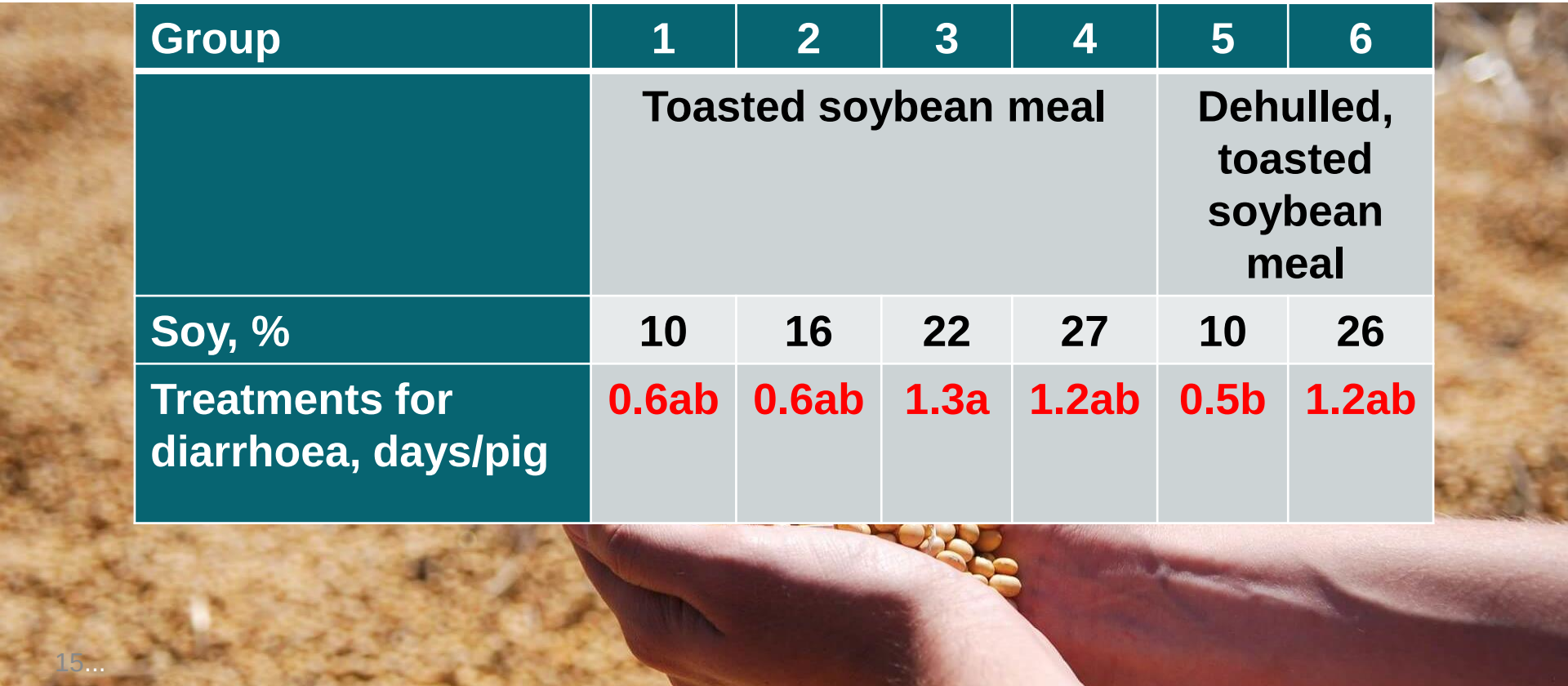


EFFECT OF SOY ON DIARRHOEA 9-30 KG

Trial report 796 (2007)

Group	1	2	3	4	5	6
	Toasted soybean meal				Dehulled, toasted soybean meal	
Soy, %	10	16	22	27	10	26
Treatments for diarrhoea, days/pig	0.6ab	0.6ab	1.3a	1.2ab	0.5b	1.2ab



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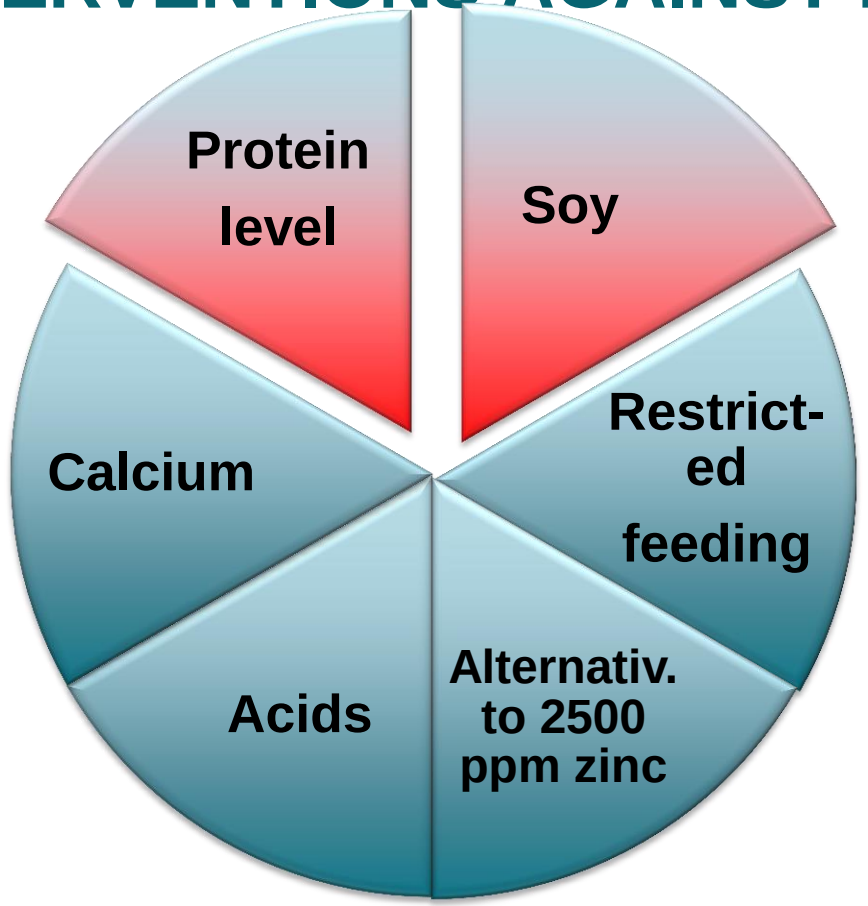
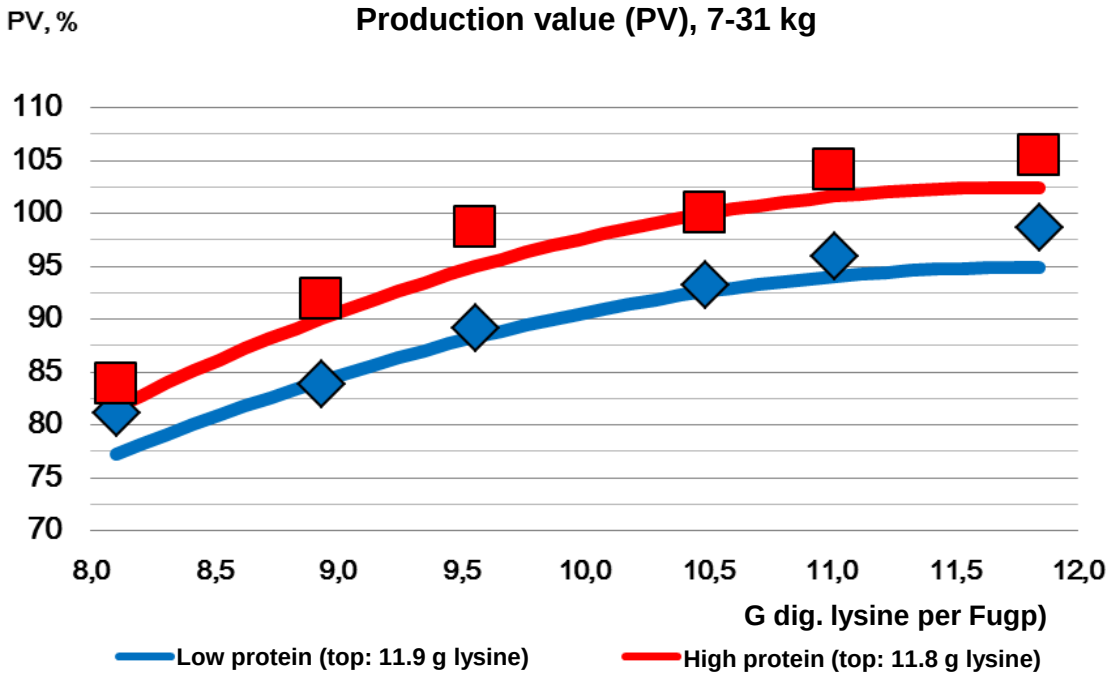


LOW PROTEIN CONTENT REDUCES DIARRHOEA

7-16 kg		
Protein, %	18	21
Treatments, days, %	2.0a	6.4b



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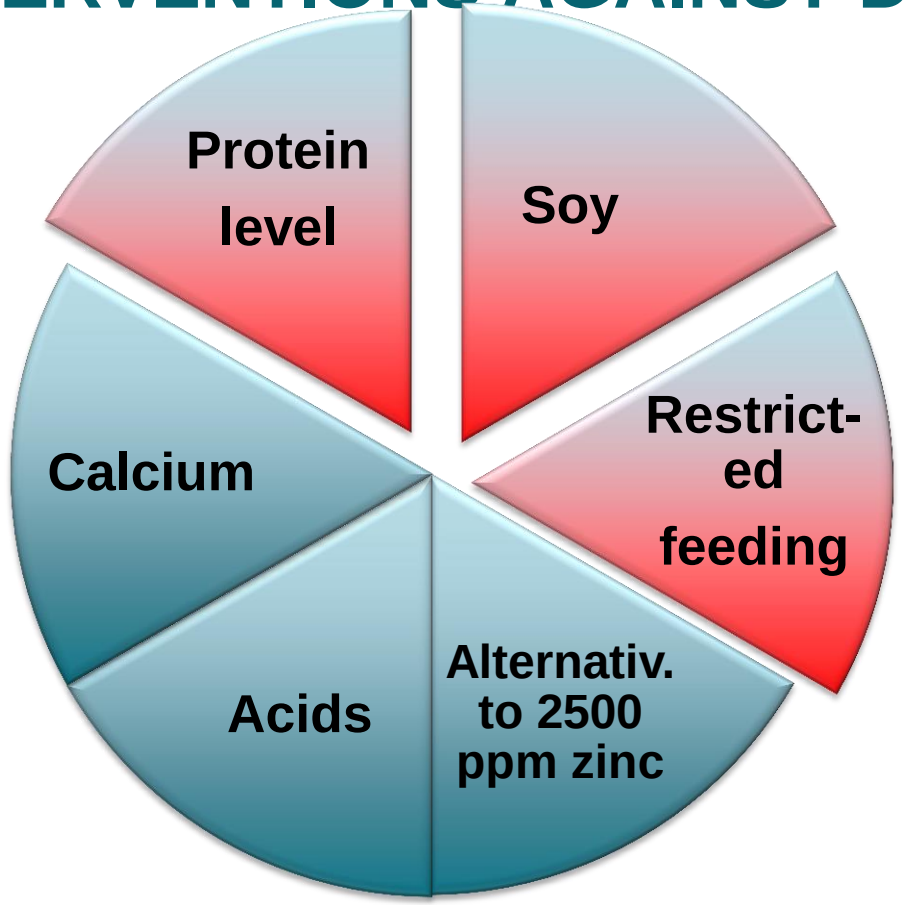

RESTRICTED FEEDING

Restricted feeding the first 14 days post-weaning may reduce the frequency of treatments for diarrhoea without adversely affecting the production economy Trial report 460 (2000)

Why: Undigested protein in colon

↪ Proliferation of *E. coli*

↪ Diarrhoea

Heo *et. al,* 2012

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RESTRICTED FEEDING

How?

- Pigs must eat up within 15 minutes
- Feed pigs min. 4 times a day
- Min. 10 cm feeding space per pig
- Use portable troughs or floor feeding
- Provide gruel feed the first 14 days

Brief 9952 (1999)

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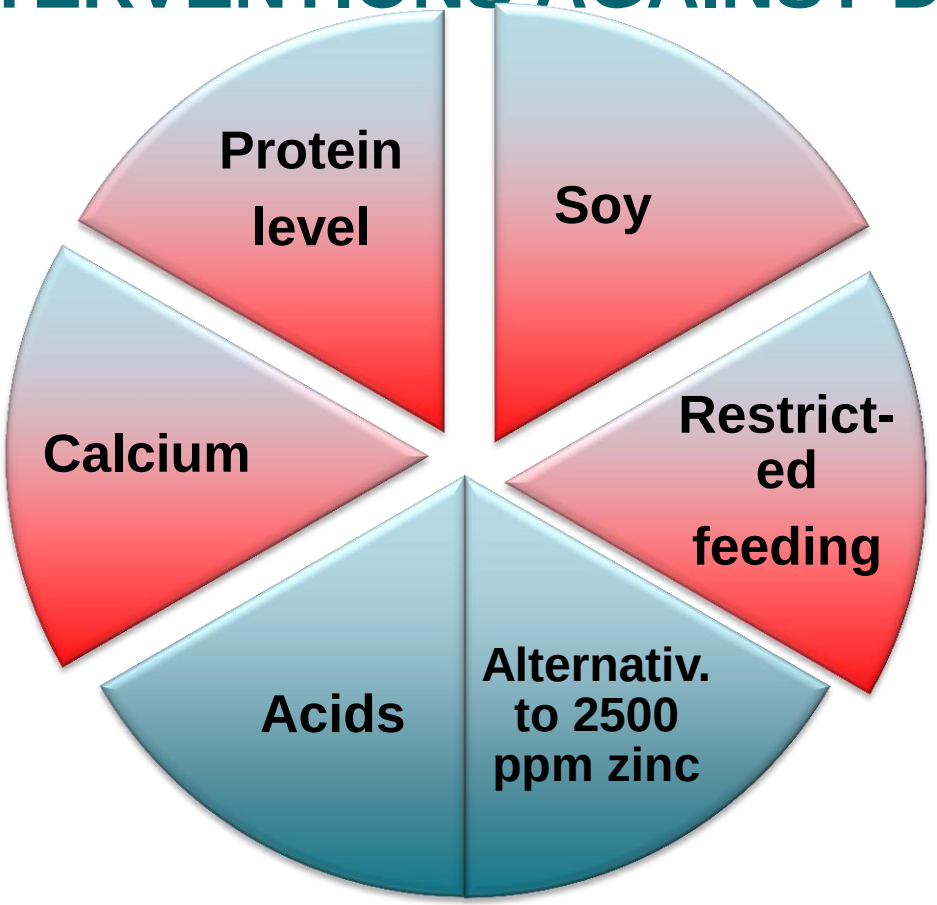
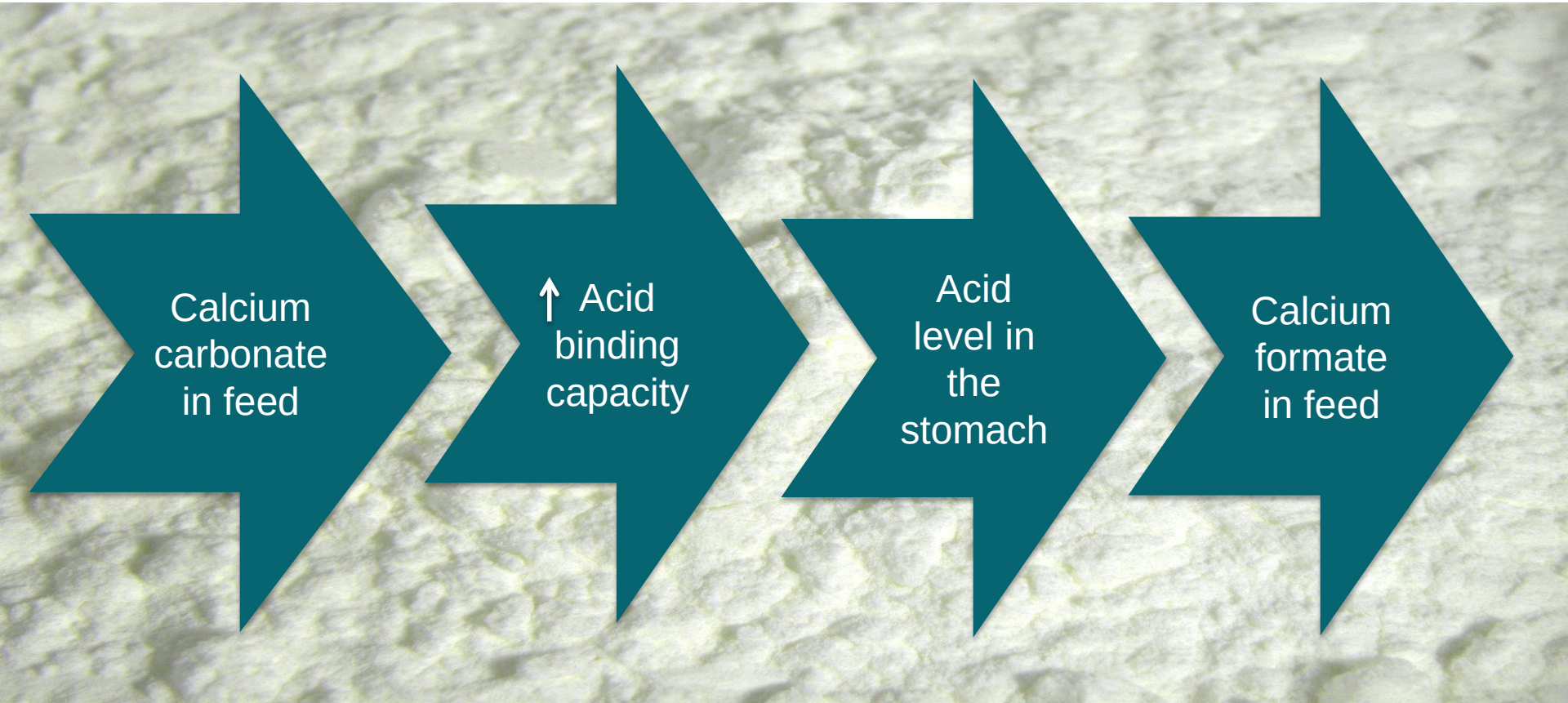
FEED INTERVENTIONS AGAINST DIARRHOEA



CALCIUM AND DIARRHOEA



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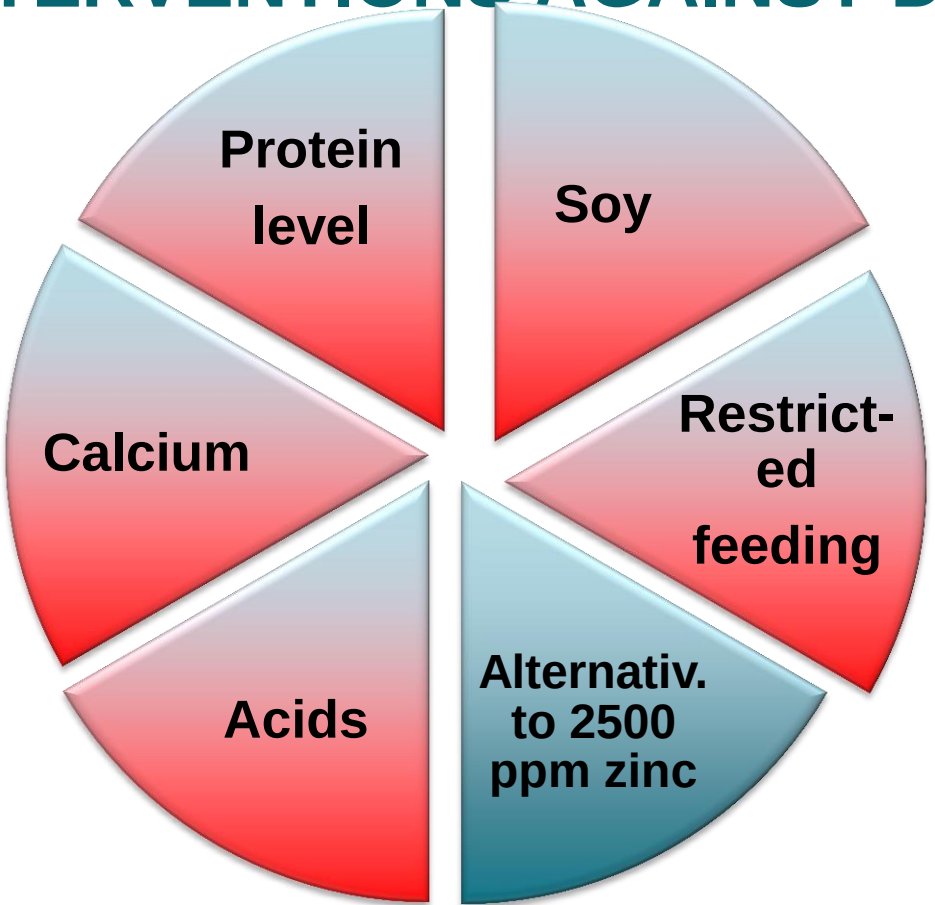

EFFECT OF ACIDS AND ZINC

	Control	Acids	Acids & zinc
		1% lactic acid 1 % formic acid 0.5 % benzoic acid	1% lactic acid 1% formic acid 0.5 % benzoic acid + 2.500 ppm Zn (d 1-14)
Treatm. diarrhoea, day/pig	8.7a	6.9b	0.9c

Trial report 778 (2007)

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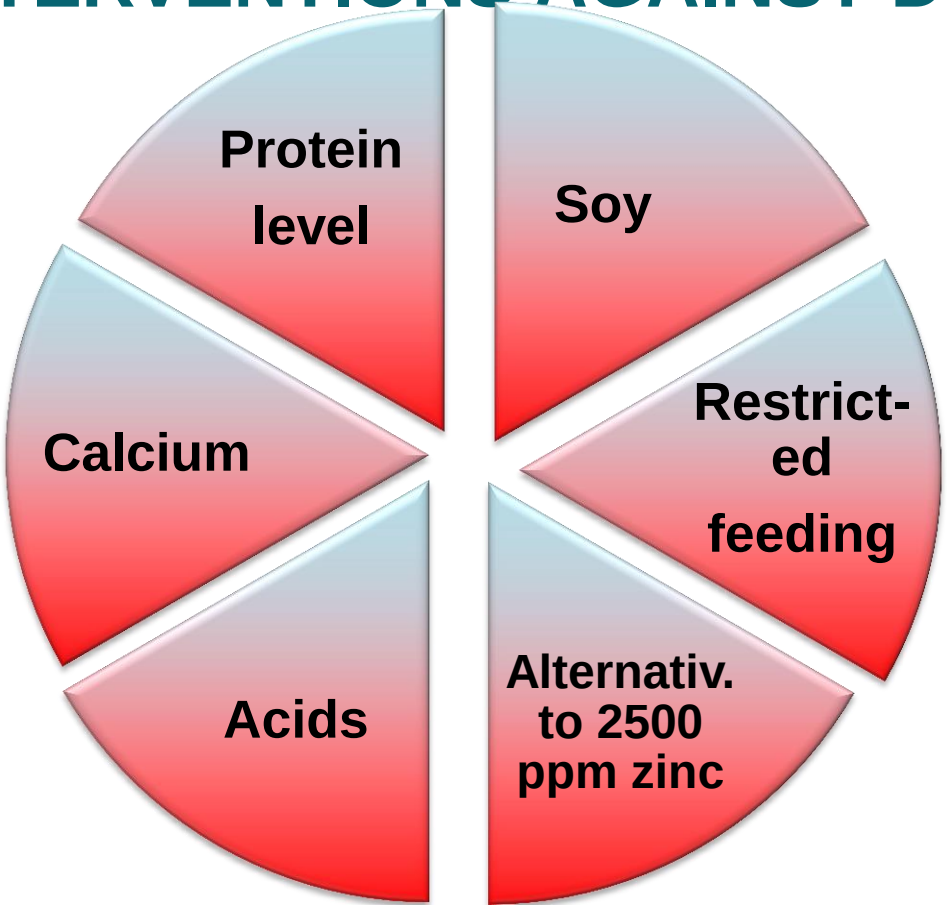
FEED INTERVENTIONS AGAINST DIARRHOEA



ALTERNATIVES TO ZINC

60 pens = 750 pigs per group

Group	1	2	3	4	5	6
Name	Positive control		Negative control	Seaweed	Probiotic	Yeast+probiotic
Diet 1 (7-9 kg)	2500 Zn*	1500 Zn*	0 Zn*	1.5% OceanFeed Swine	2 kg/tonne Miya-Gold	0.5 kg/tonne GærPlus
Diet 2 (9-15 kg)	0 Zn*	0 Zn*	0 Zn*	1.5% OceanFeed Swine	1 kg/tonne Miya-Gold	0.5 kg/tonne GærPlus
Diet 3 (15-30 kg)	0 Zn*	0 Zn*	0 Zn*	1.5% OceanFeed Swine	0,5 kg/tonne Miya-Gold	0.25 kg/tonne GærPlus

*Zn = level of zinc oxide added

Trial report 1101 (2017)

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PRODUCTION RESULTS, 7-30 KG

ENTIRE PERIOD

No difference between 2500 Zn and 1500 Zn

Increased productivity in pigs given zinc compared with the four other groups

Trial report 1101 (2017)

SEGES Svineproduktion

EFFECT ON DIARRHOEA TREATMENTS

TREATMENT, DAYS PER PIG

Group	2500 Zn	1500 Zn	0 Zn	Ocean Feed	Miya Gold	GærPlus
7-30 kg	4.47	4.62	7.42	7.73	7.29	7.08
% increase	-	3	66	73	63	58

Red = significantly different from 2500 Zn

No effect of alternative products compared with 0 Zn

Trial report 1101 (2017)

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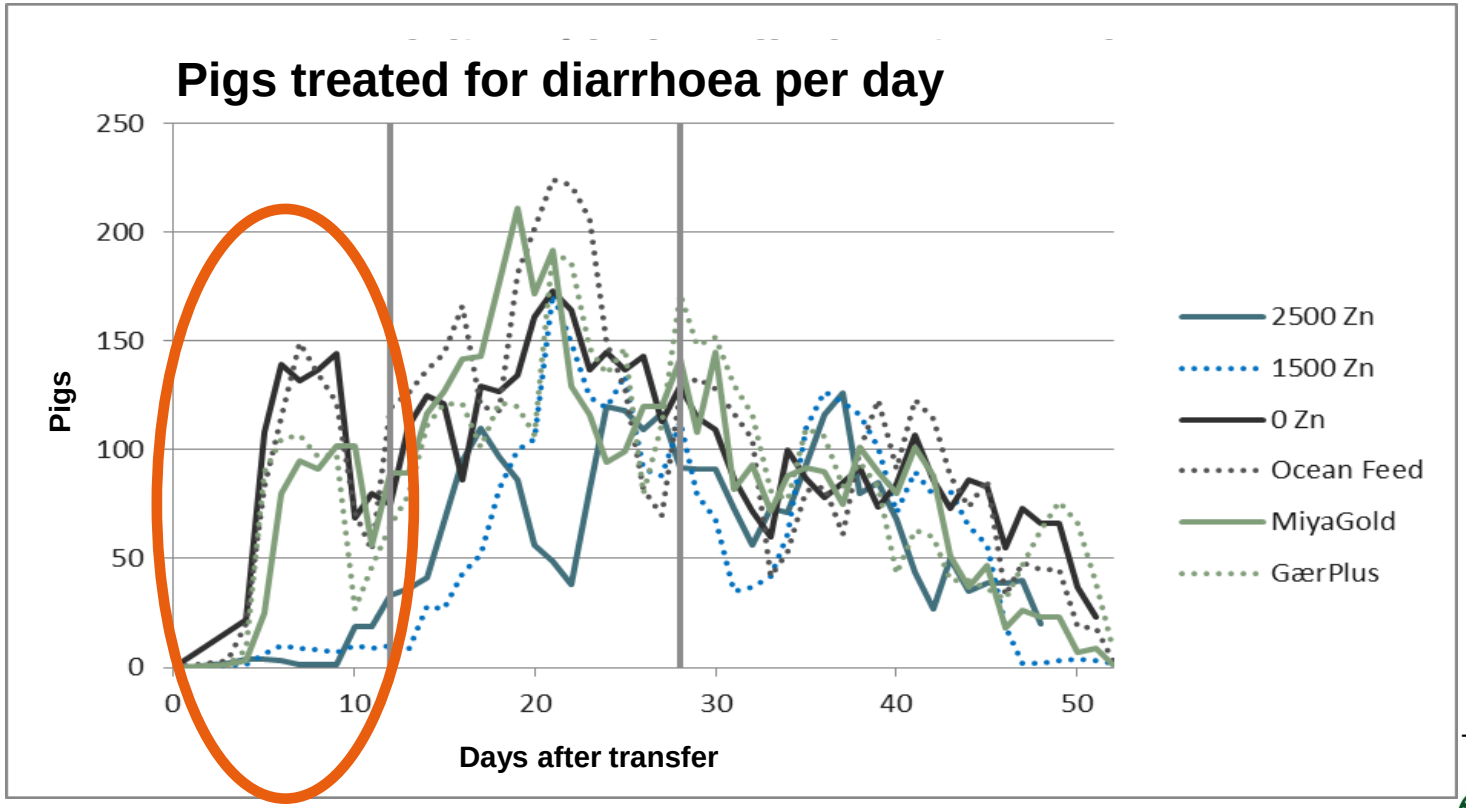
TOTAL NUMBER OF PIGS TREATED PER DAY



Trial report 1101 (2017)

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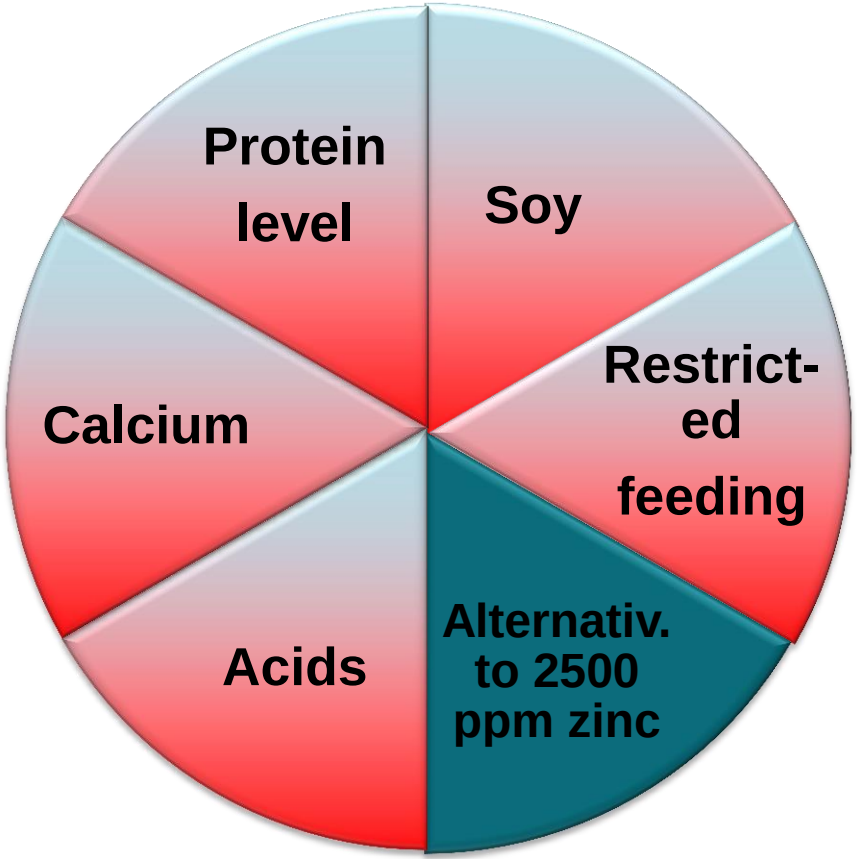

TEST OF COMMERCIAL DIETS – WEANED PIGS
7- 9 KG

Group	Control incl. zinc	Trial no zinc
Feed intake, FUgp /day	0.25a	0.24a
Daily gain, g/day	194a	147b
FCR, FUgp/kg gain	1.31a	1.68b

No significant difference between groups in the period 7-30 kg

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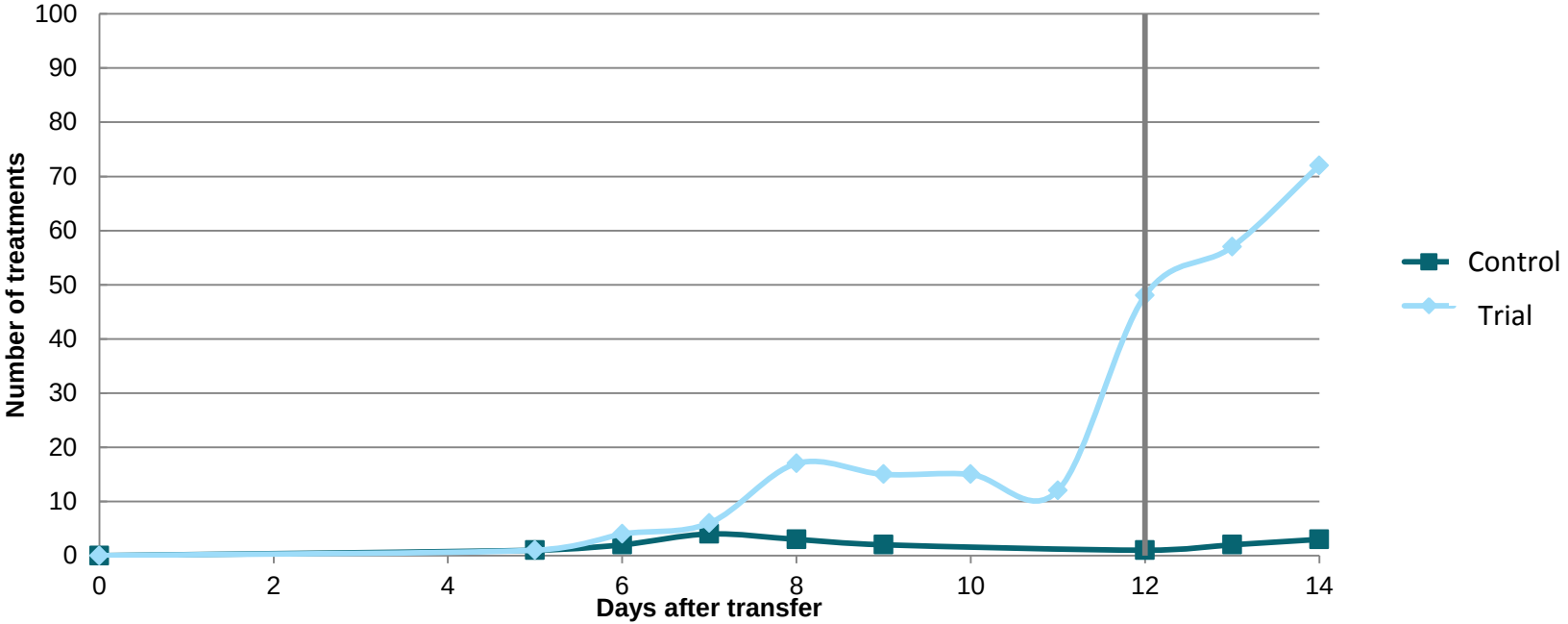
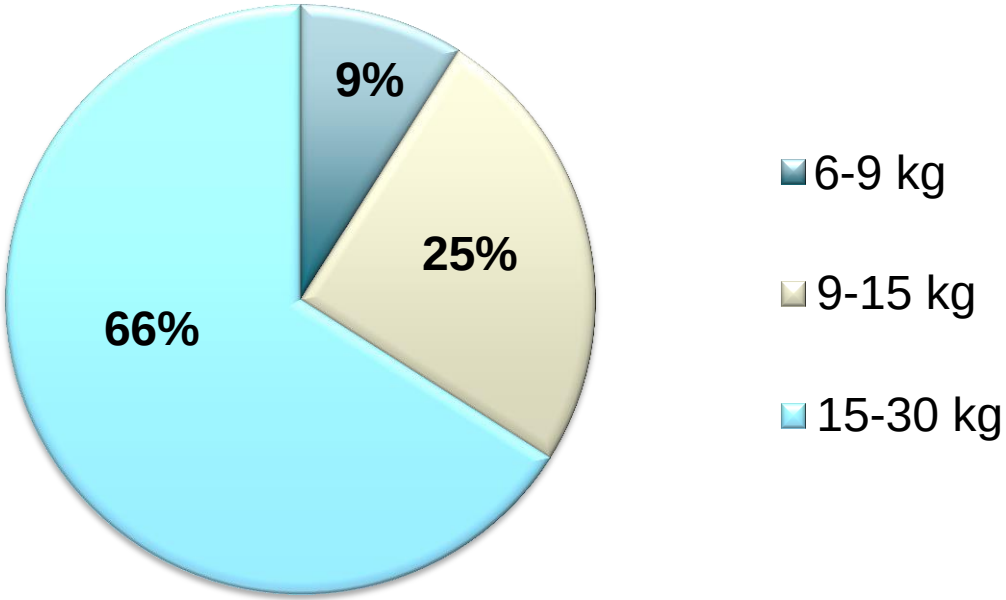
TREATMENTS FOR DIARRHOEA IN THE WEANING PERIOD



% OF DIETS FROM WEANING TO 30 KG



WEANING FEED WITHOUT ZINC – EXAMPLES

	Lysine, g/FUgp			DKK / pig	GM / pig	GM index	Diarrhoea index
	6-9 kg	9-15 kg	15-30 kg				
Protective diet	10.0 (137)	10.0 (137)	10.5 (144)				

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INGREDIENTS (STANDARD) WEANING FEED 6-9 KG

Barley
Wheat, heat-treated
Soya bean meal
Soy protein concentrate
Potato protein concentrate
Dried whey
Fishmeal
Benzoic acid
Calcium formate

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SEGES Svineproduktion

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Protective diet	10.0 (137)	10.0 (137)	10.5 (144)	77.00	58.8	100	100
Reverse phase feeding	9.5 (130)	10.0 (137)	11.0 (150)				

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WEANING FEED WITHOUT ZINC – OUR PICKS

	Lysine, g/FUgp			DKK / pig	GM / pig	GM index	Diarrhoea index
	6-9 kg	9-15 kg	15-30 kg				
Protective diet	10.0 (137)	10.0 (137)	10.5 (144)	77.00	58.8	100	100
Reverse phase feeding	9.5 (130)	10.0 (137)	11.0 (150)	77.20	58.2	99	~70

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STANDARD	11.0 (148)	10.5 (144)	10.5 (144)	78.70	59.8	102	139

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STANDARD	11.0 (148)	10.5 (144)	10.5 (144)	78.70	59.8	102	139
Super(expen-sive) feed	10.0 (130)	10.0 (137)	11.0 (150)				

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INGREDIENTS (SUPER(EXPENSIVE) FEED)
WEANING FEED 6-9 KG

Wheat, heat-treated
Oatmeal, heat-treated
Cake mix
Soy protein concentrate
Potato protein concentrate, Protastar
Dried whey
Blood plasma
Fishmeal
Benzoic acid
Calcium formate

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FEED AS TREATMENT FOR DIARRHOEA

Trial with weaned pigs in the period 9-15 kg in one herd

Group	Tetracycline	Colistin 1	Colistin 2	Super feed
Number of pigs	540	540	539	540
Normal body condition, end of trial, %	97.0	95.2	97.4	98.2
Dead and culled, %	3.15	6.11	4.64	3.52
Av. daily gain, g	596 [a]	533 [b]	539 [b]	590 [a]
Total flock treatments	39	39	54	25
Total antibiotic use, %	-	+8.5%	+42.9%	-29.1%

(Not published C. Hansen *et al*, 2017)

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WEANING FEED WITHOUT ZINC – EXAMPLES

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STANDARD	11.0 (148)	10.5 (144)	10.5 (144)	78.70	59.8	102	139
Super(expen-sive) feed	10.0 (130)	10.0 (137)	11.0 (150)	86.80	50.1 ?	85 ?	< 100 ?

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WEANING FEED WITHOUT ZINC – EXAMPLES
ACCORDING TO EFFECT ON DIARRHOEA

	Lysine, g/FUgp			DKK / pig	GM / pig	GM index	Diarrhoea index
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Super(expen-sive) feed	10.0 (130)	10.0 (137)	11.0 (150)	86.80	50.1 ?	85 ?	< 100 ?
STANDARD	11.0 (148)	10.5 (144)	10.5 (144)	78.70	59.8	102	139

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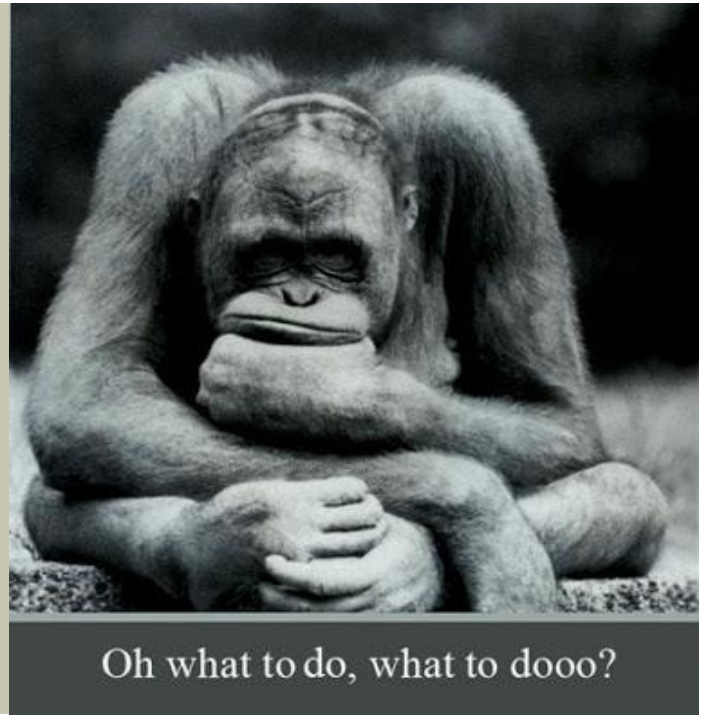
WHAT CAN YOU DO TODAY?

- 1500 ppm zinc?
- Try different feed interventions
  - Prepare a treatment strategy
- **REMEMBER:**
- Do you wean robust pigs?
  - Focus on variations in weaning age
- Is the facility ready for no zinc?
- Restricted feeding?



MEANWHILE SEGES:

- Strategy plan
- Analysis of experiences
- Feed trials
- OUA project
- Communication with the industry

A HUGE CHALLENGE

- 5 years to come up with the least painful solutions
- Joint responsibility for the entire industry

The aim is no zinc in 2022 without an increase in antibiotic use

INGREDIENTS
WEANING FEED 6 - 9 KG

	Protective	Standard	Reverse phase	Super expensive
Calcium formate	1.09	1.09	1.02	1.09
Barley, spring 16, +x	25	25	25	-
Wheat, 16, heat-treated	43.33	39.17	45.86	-
Wheat, 16, Spec-v	-	-	-	56
Cake mix (hved, fe)	-	-	-	3
Oatmeal, heat-treated	-	-	-	5
Soybean meal, a	8.3	12.15	5.77	-
HP 300 Soy protein	4	4	4	8.2
Potato protein conc	4	4	4	-
Potato protein conc Protastar	-	-	-	1.7
Dried whey, sø	6	6	6	10
Blood plasma, Dak	-	-	-	4
Fishmeal	2	2	2	2
Benzoic acid (1 %)	0.5	0.5	0.5	0.5

INGREDIENTS
9 - 15 KG

	Protective	Standard	Reverse phase	Super expensive
Calcium formate	1.29	1.21	1.29	1.26
Barley, spring 16, +x	25	25	25	-
Barley, spring 16, Spec.	-	-	-	20.19
Wheat, 16, heat-treated	48.41	45.80	48.41	-
Wheat, 16, Spec-v	-	-	-	45
Cake mix (hved, fe)	-	-	-	3
Oatmeal, heat-treated	-	-	-	5
Soybean meal, a	11.84	12	11.84	8
HP 300 Soy protein	2	2	2	4.79
Potato protein conc	3	3	3	3
Dried whey, sø	3	3	3	5
Fishmeal	1	1	1	1
Benzois acid (1 %)	0.5	0.5	0.5	0.5

INGREDIENTS
15 - 30 KG

	Protective	Standard	Reverse phase	Super expensive
Barley, spring 16, +x	25	25	25	25
Wheat, 16, heat-treated	47.61	47.61	45.39	45.39
Soybean meal, a	19.15	19.15	21.23	21.23
Potato protein conc	2	2	2	2
Veg. oil, palm	1.81	1.81	1.95	1.95
Benzoic acid (1 %)	0.5	0.5	0.5	0.5