

Milkiwean Vital Start Feeding Programme



Different levels of 'reducing antimicrobial resistance'

> define per customer status (examples)

1. Reducing AGP and antibiotics to legal levels, respecting withdrawal times

- Number, dosage

2. Without AGP

- Eg. EU since 2006, TNC Canada

3. Without antibiotics critically important for humans

- Eg. colistine

4. Without preventive (broad spectrum) antibiotics /high ZnO/ high Cu

- Eg. broad spectrum antibiotics, high Cu > trend and legislation EU

5. Without curative antibiotics

6. Without ionophores

Market evolution



Trouw Nutrition is committed to:

Empower our customers to reduce the need for antibiotics in poultry & swine production with at least equal, or improved, animal health, welfare and profitability.

Antibiotic reduction strategies require an integrated approach for total production chain optimization

Trouw Nutrition integrated feed-farm-health approach



The Milkiwean Programmes are key in Feed Management

Efficient Start

Cost conscious producer

Best Start

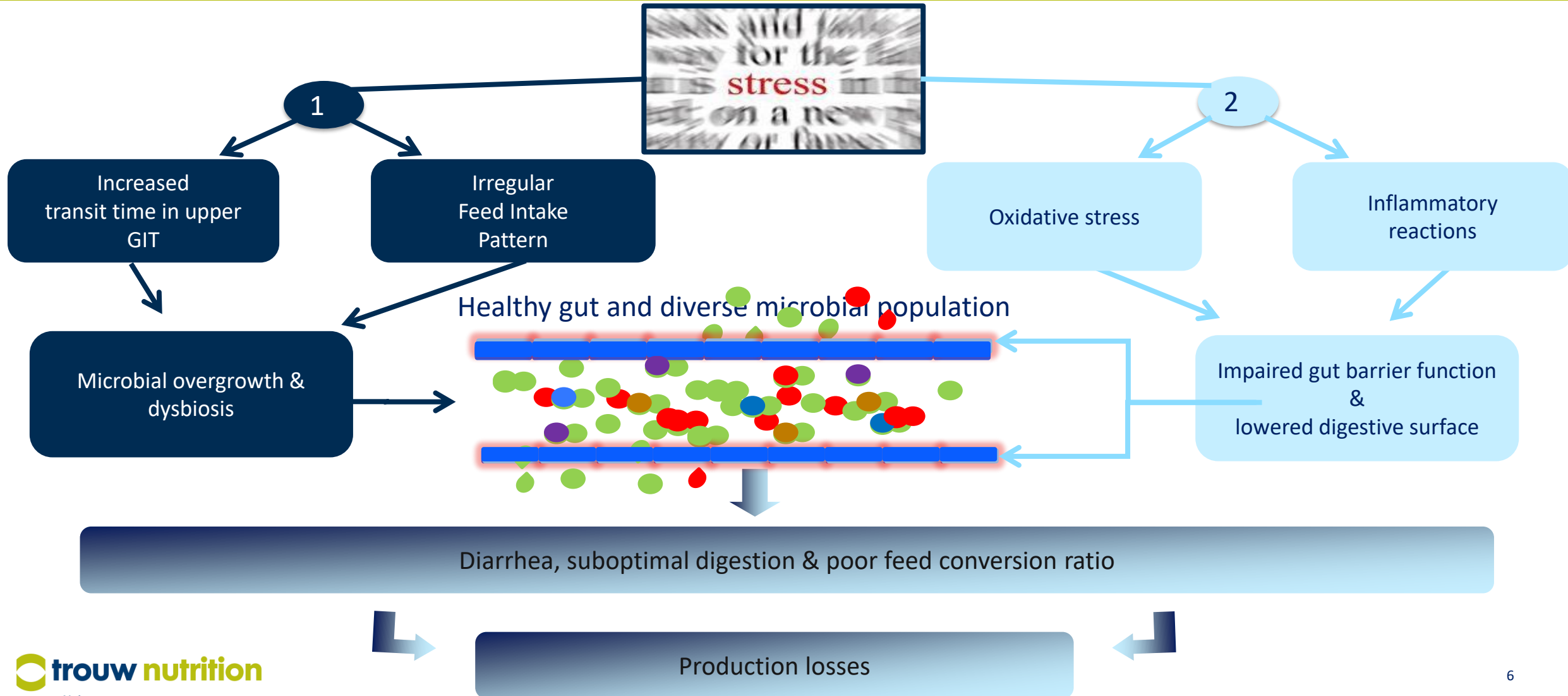
Performance driven producer

Vital Start

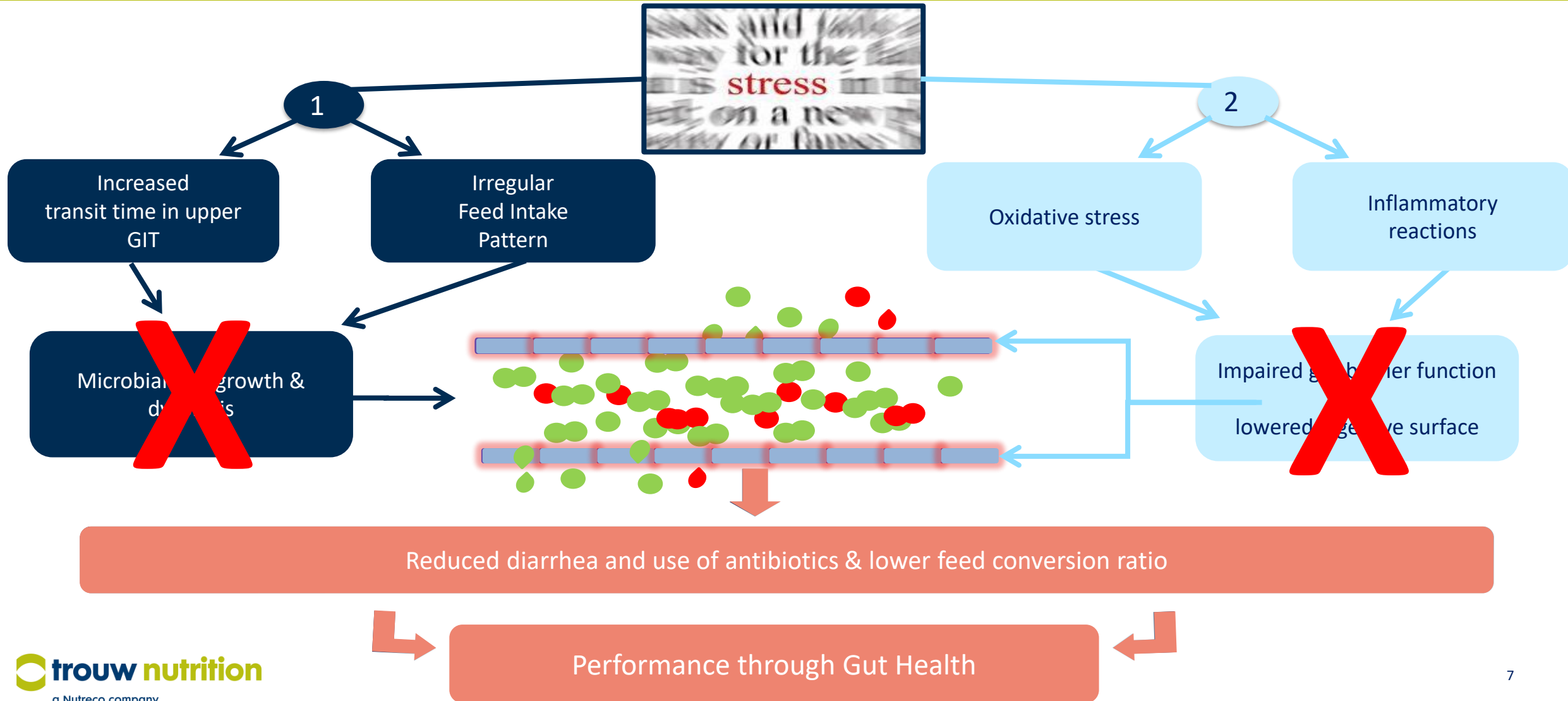
Health challenged producer



Milkiwean Vital Start: BACKGROUND



Milkiwean Vital Start: Background



Milkiwean Vital Start: Background

How to act within this pathogenesis?

- Keep piglets eating
- Adjust formulation to impaired gut function



KEY FEATURES OF THE MILKIWEAN VITAL START PROGRAMME

PALATABILITY

Crafted to support continuous feed intake around weaning

WATER

Carefully controlled to guarantee optimal development

FEED SAFETY

Designed to ensure complete feed protection

FIBRES

Formulated to boost gut development and microflora



PROTEIN SOURCES

Carefully selected to target optimal digestibility

AMINO ACID PROFILE

Specially designed to ensure normal immune system function

SPECIALTY INGREDIENTS

Combined to support the gut microflora and health

Trial results



What has been done?

More than 20 years R&D unravelling
nutritional physiology in non-medicated
environment

- In-house
- in cooperation with universities

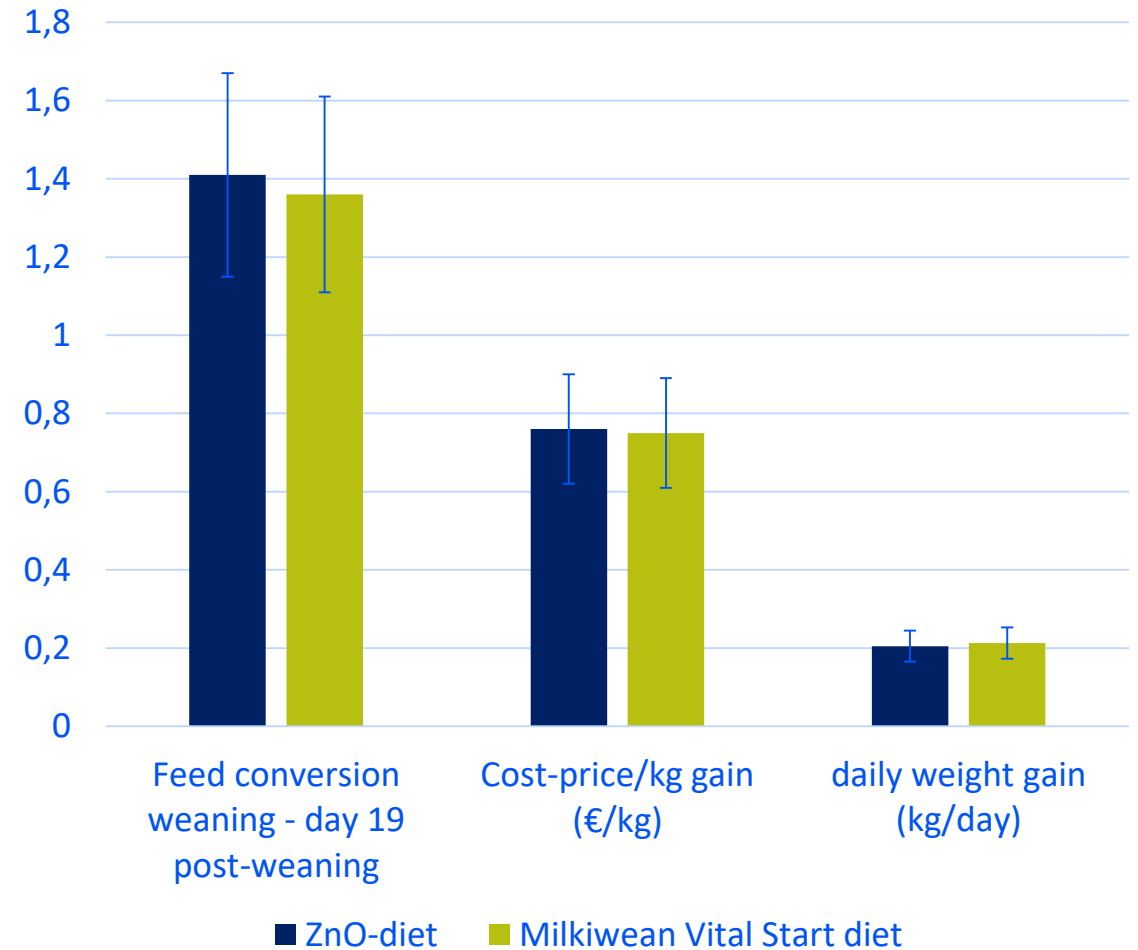
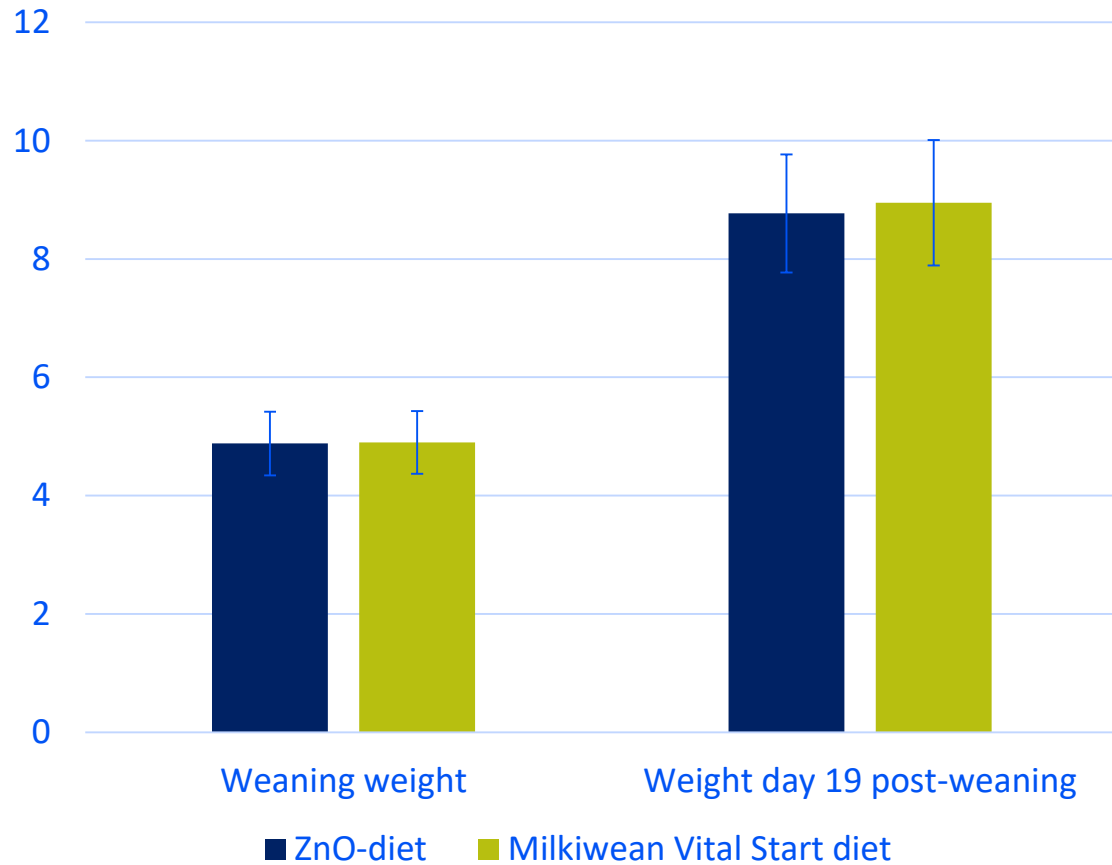


Development of MKW Vital Start

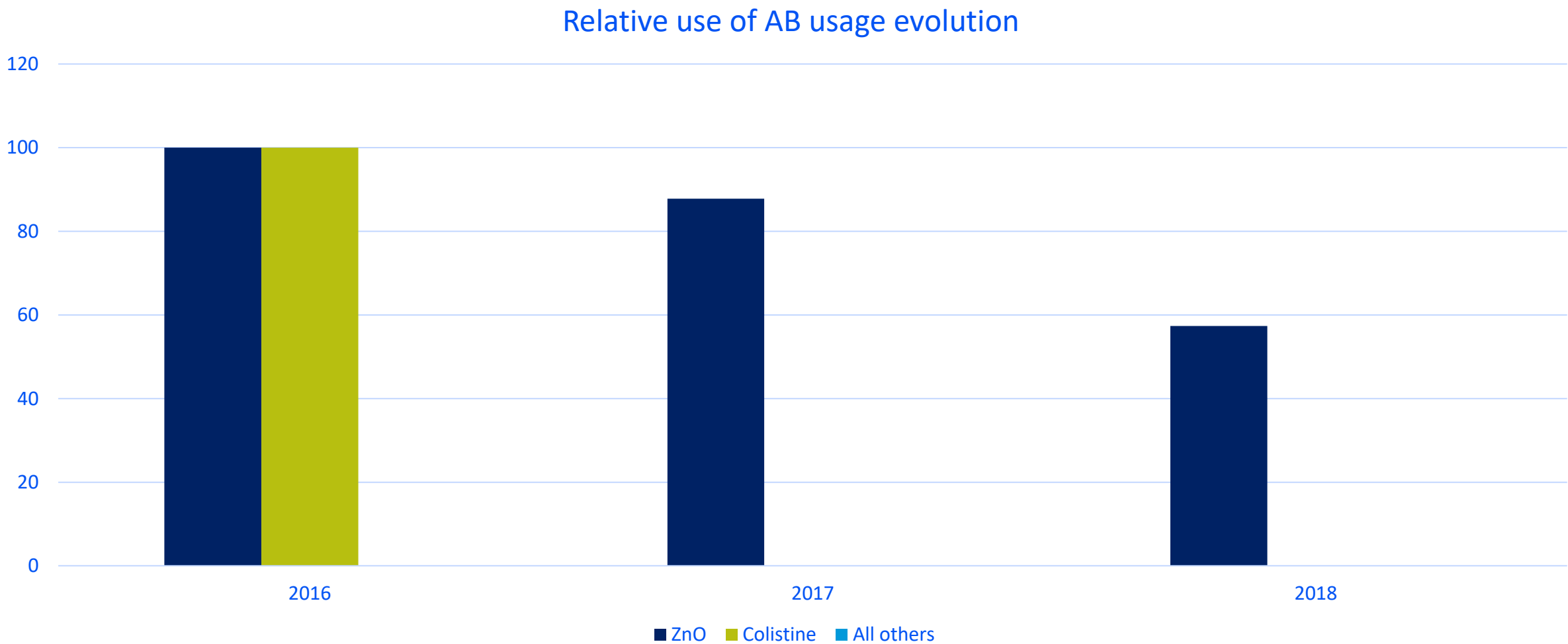
- Development research: TN
BeNeLux + TN Canada + TN
Spain + Nanta
- Field trials: Belgium,
Netherlands, Denmark, Italy,
Spain, Canada, Poland
- Starting: Thailand, Germany,
France, Slovakia, Czech
- Coming: Brasil, Mexico, China,
Ireland, UK



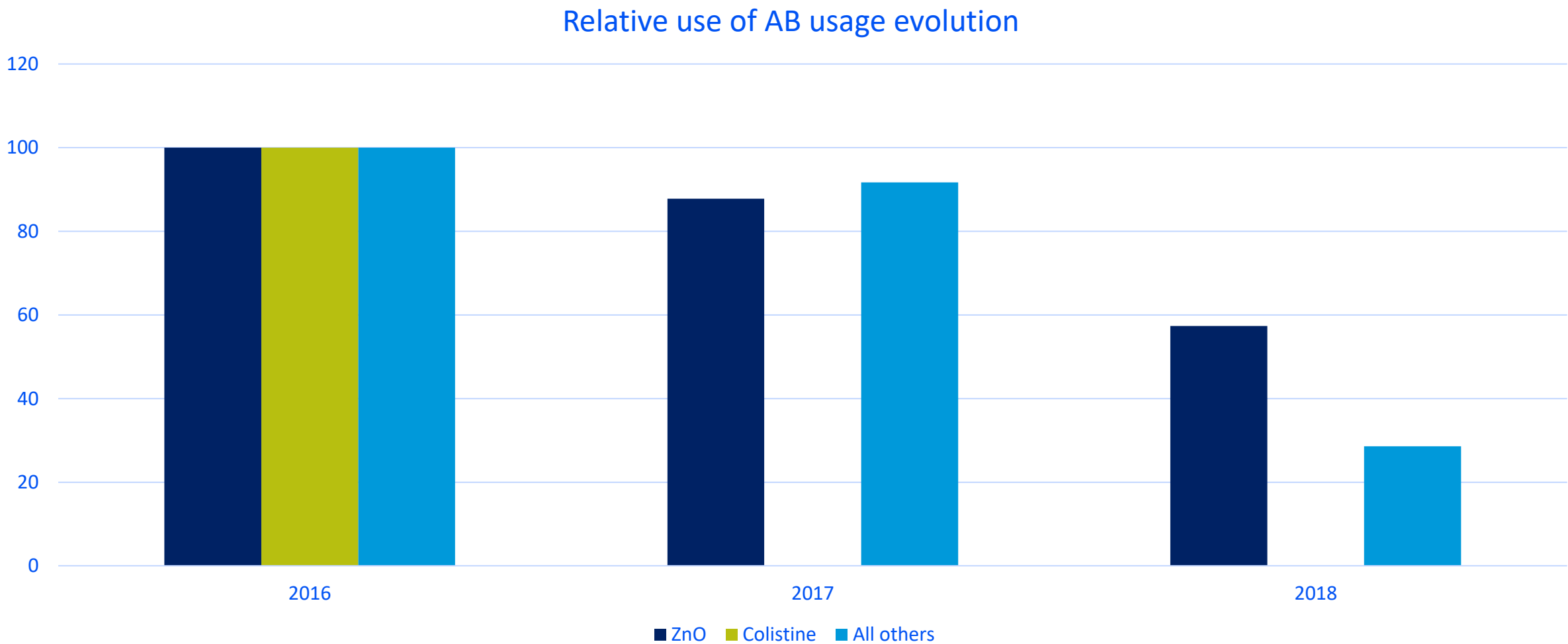
Milkiwean Vital Start: results BNL



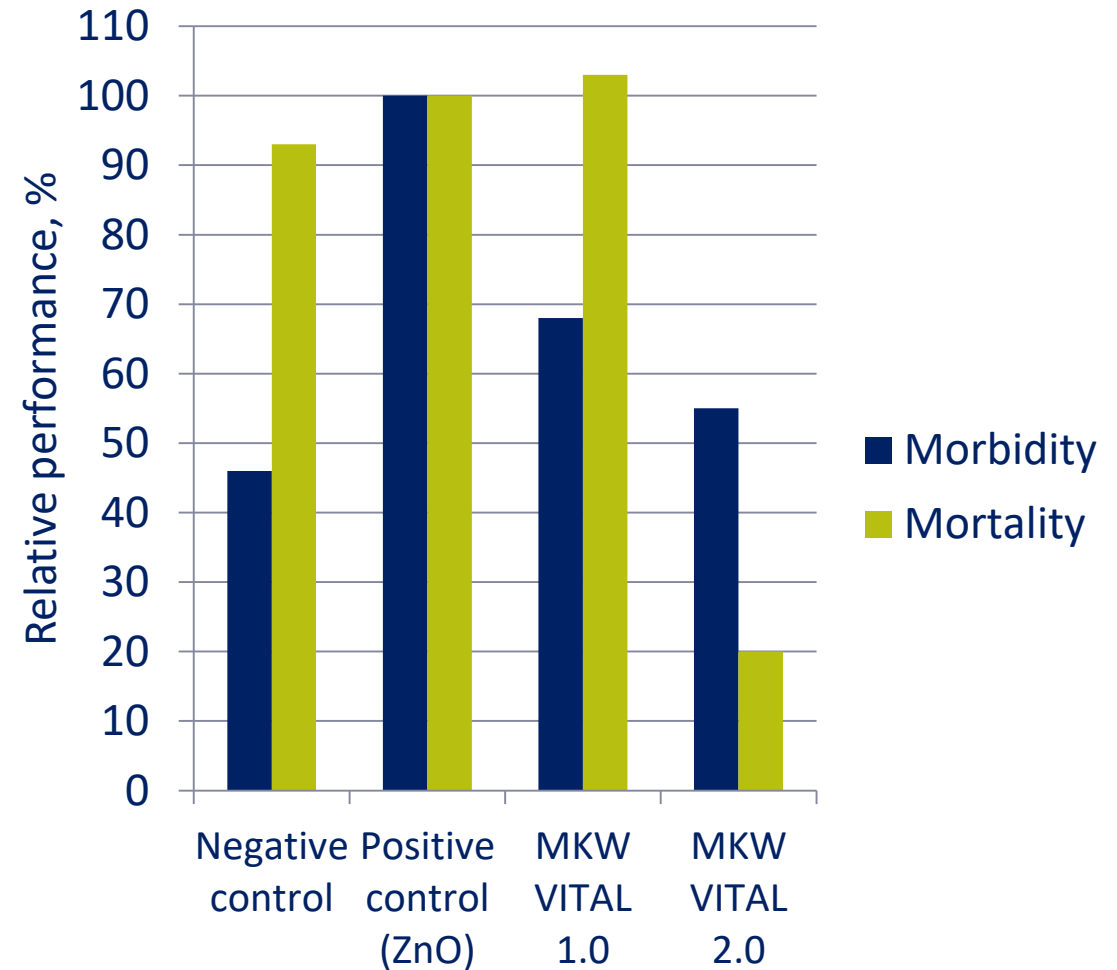
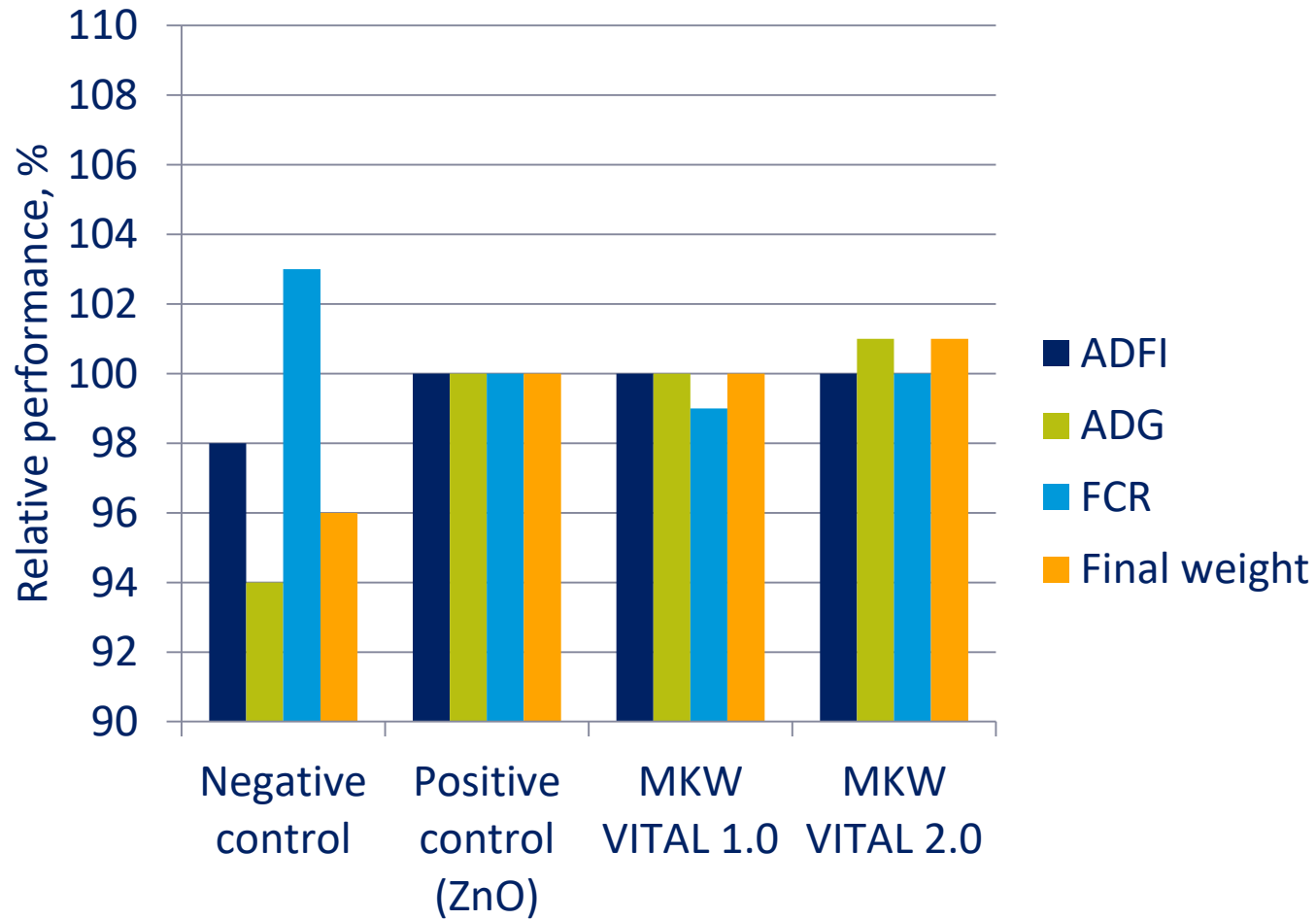
Milkiwean Vital Start: results Spain



Milkiwean Vital Start: results Spain



Milkiwean Vital Start: results Spain



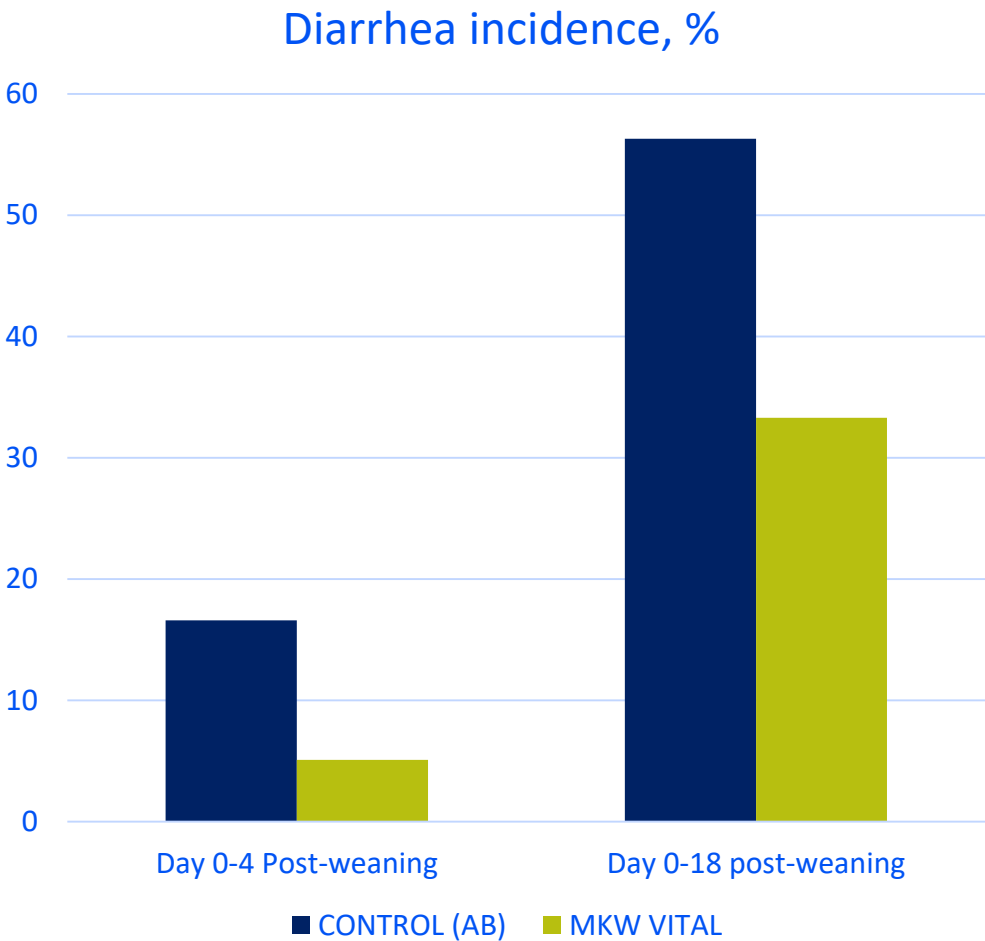
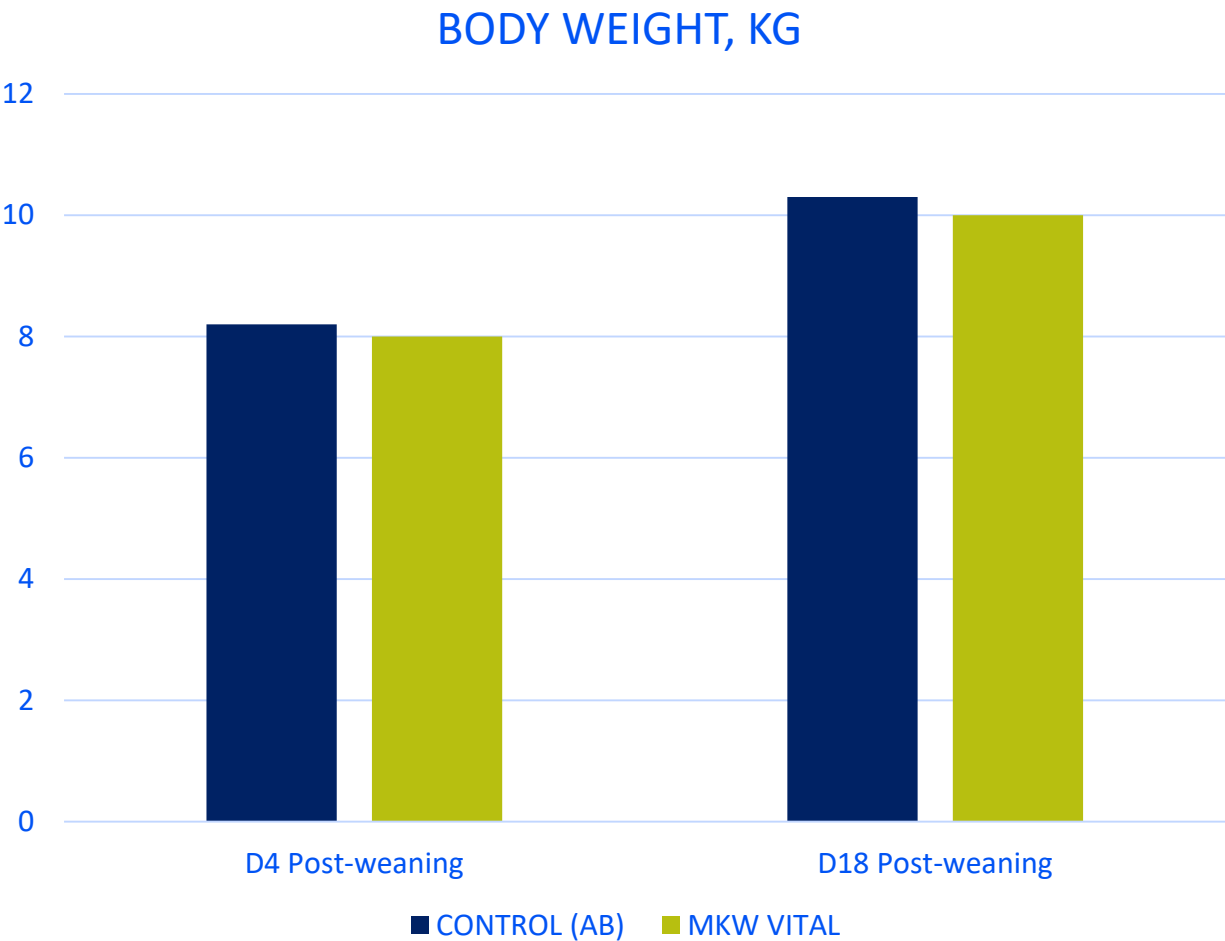
Milkiwean Vital Start: results Spain

Cost factor/piglet, €	Negative control	Positive control	MKW VITAL	BENCH
Feed and water	10,32	10,79	11,1	11,07
Treatments	0,02	0,02	0,02	0,02
Mortality	1,72	1,85	0,38	1,89
OVERALL COST/PIGLET	12,06	12,66	<u>11,5</u>	12,98

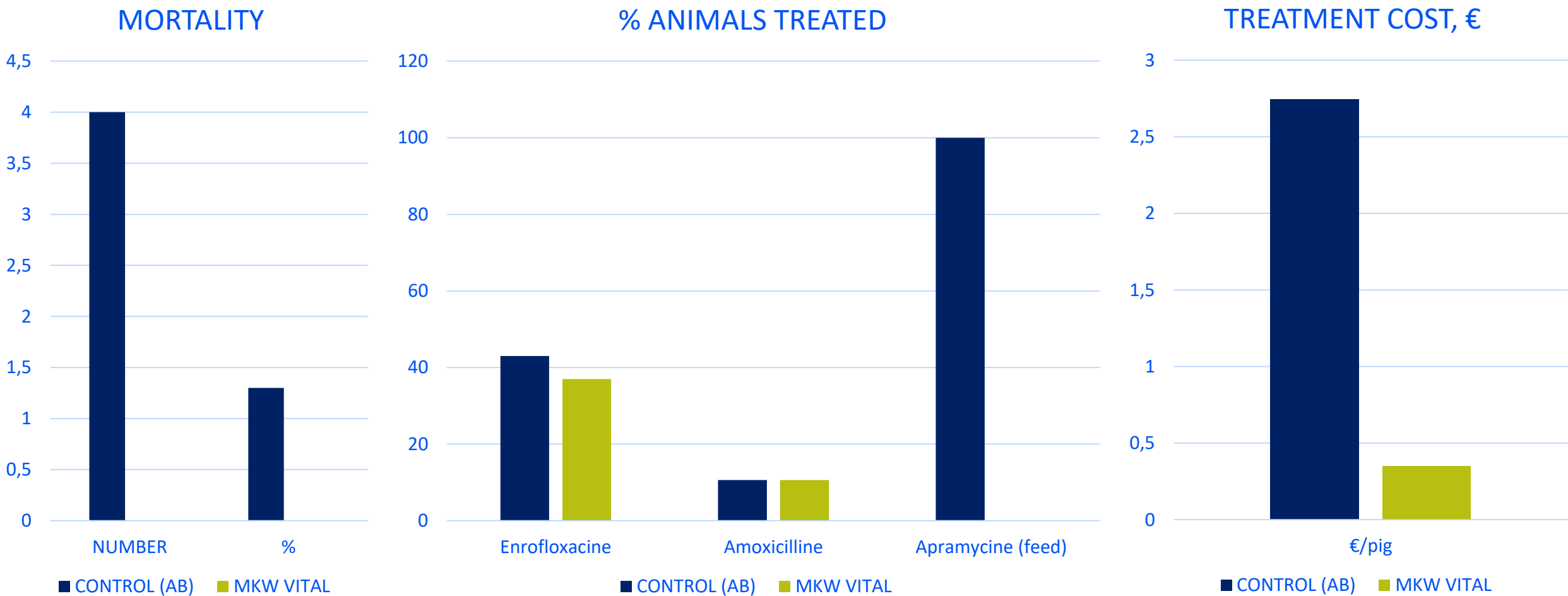
Trial IRTA-facilities, 2018, Spain

Calculated with piglet value of 25€

Milkiwean Vital Start: results Italy

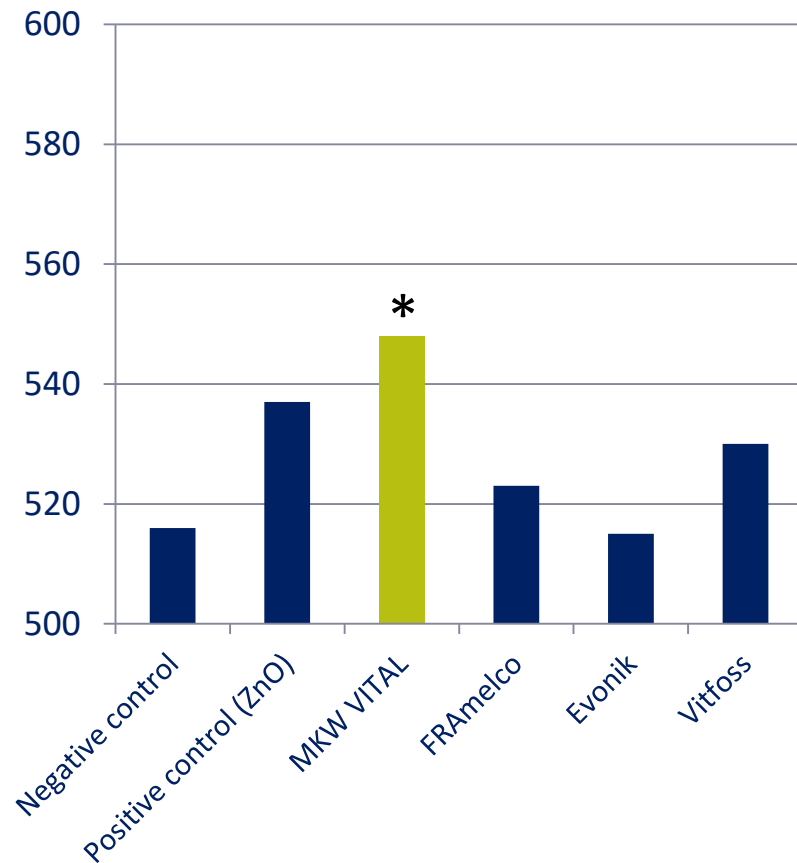


Milkiwean Vital Start: results Italy

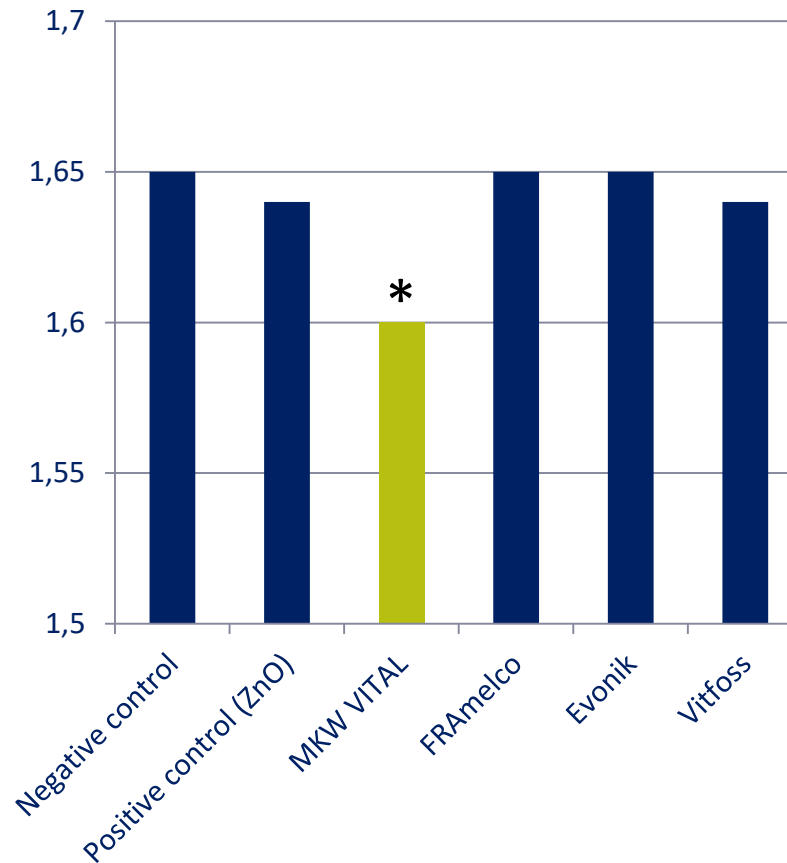


Milkiwean Vital Start: results Denmark

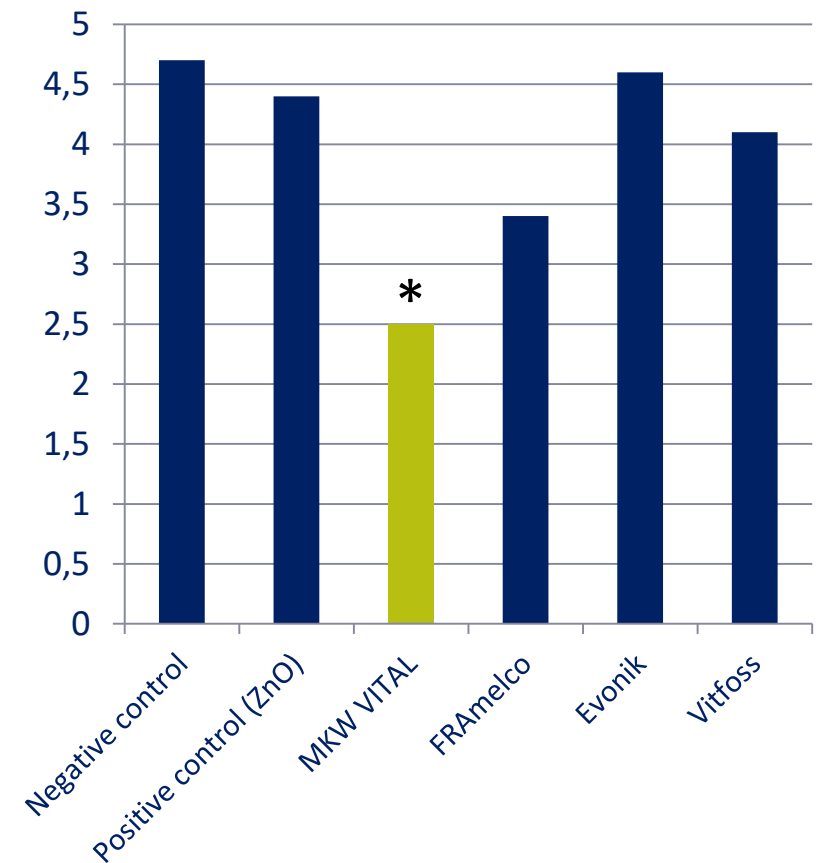
Daily weight gain overall



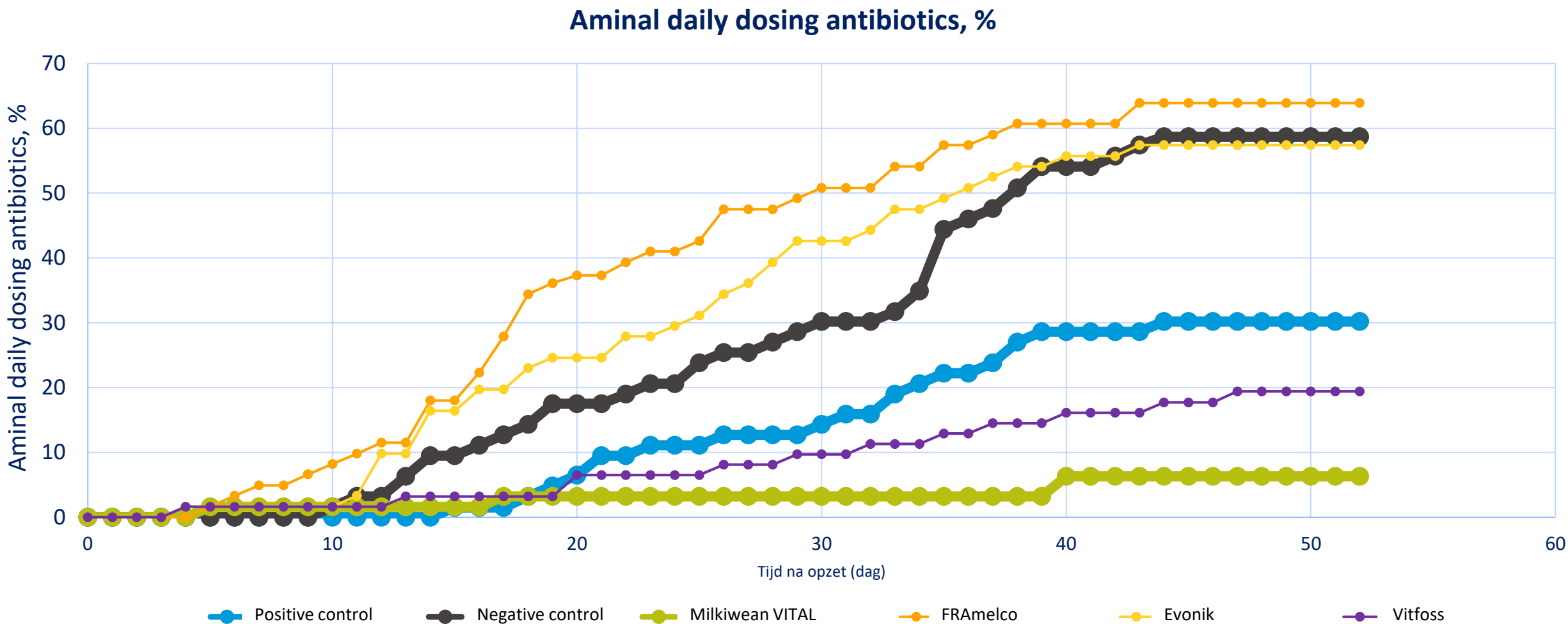
Feed conversion rate overall



Mortality overall



Milkiwean Vital Start: results Denmark



Milkiwean Vital Start: results Denmark

Cost factor/piglet	Negative control	Positive control	MKW VITAL	BENCH 1	BENCH 2	BENCH 3
Feed and water	10,06	10,5	10,47	10,21	10,16	10,26
Treatments	0,21	0,1	0,02	0,25	0,2	0,06
Mortality	1,18	1,1	0,63	0,85	1,15	1,03
OVERALL COST/PIGLET	11,45	11,7	<u>11,12</u>	11,31	11,51	11,35

Trial IRTA-facilities, 2018, Spain

Calculated with piglet value of 25€

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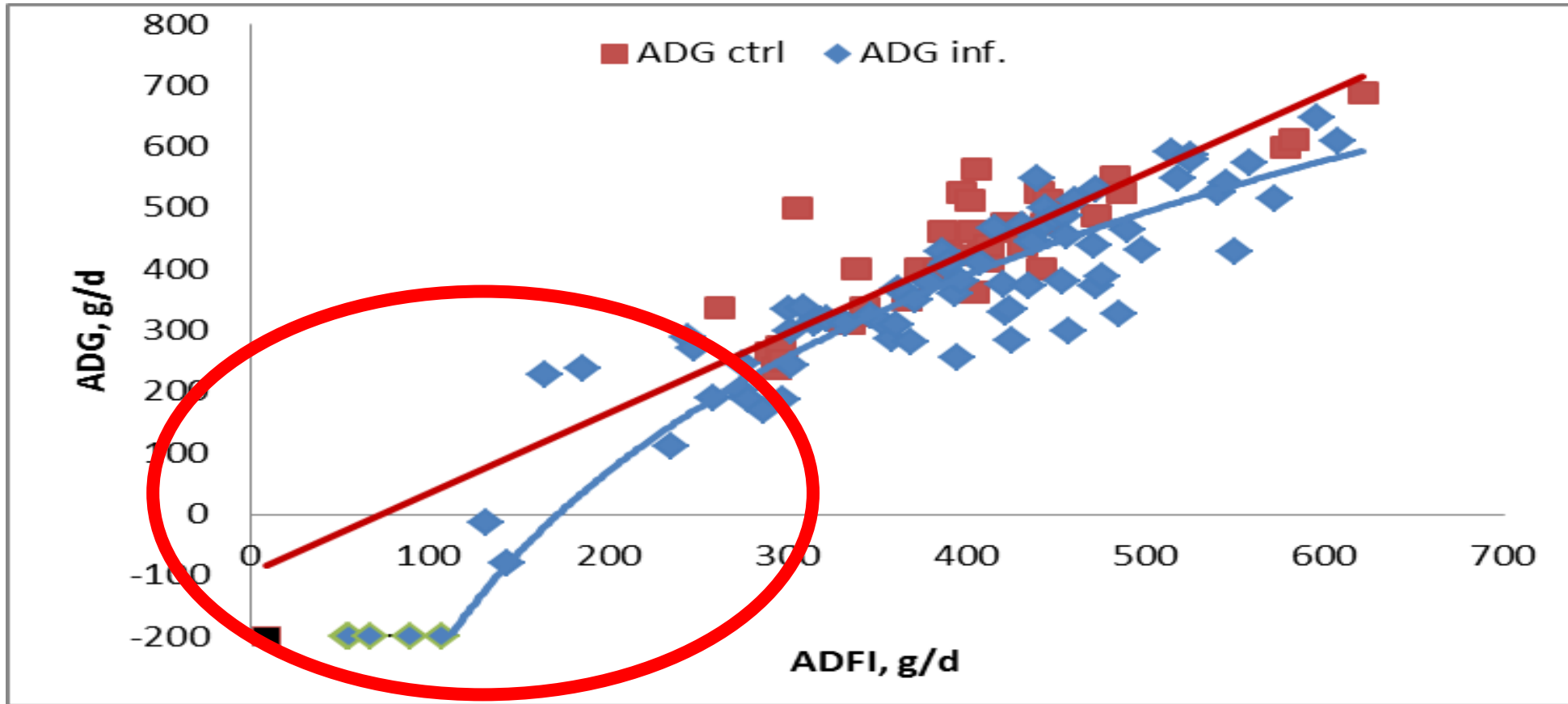
SPECIALTY INGREDIENTS

Combined to support the gut microflora and health

Palatability



Keep piglets eating



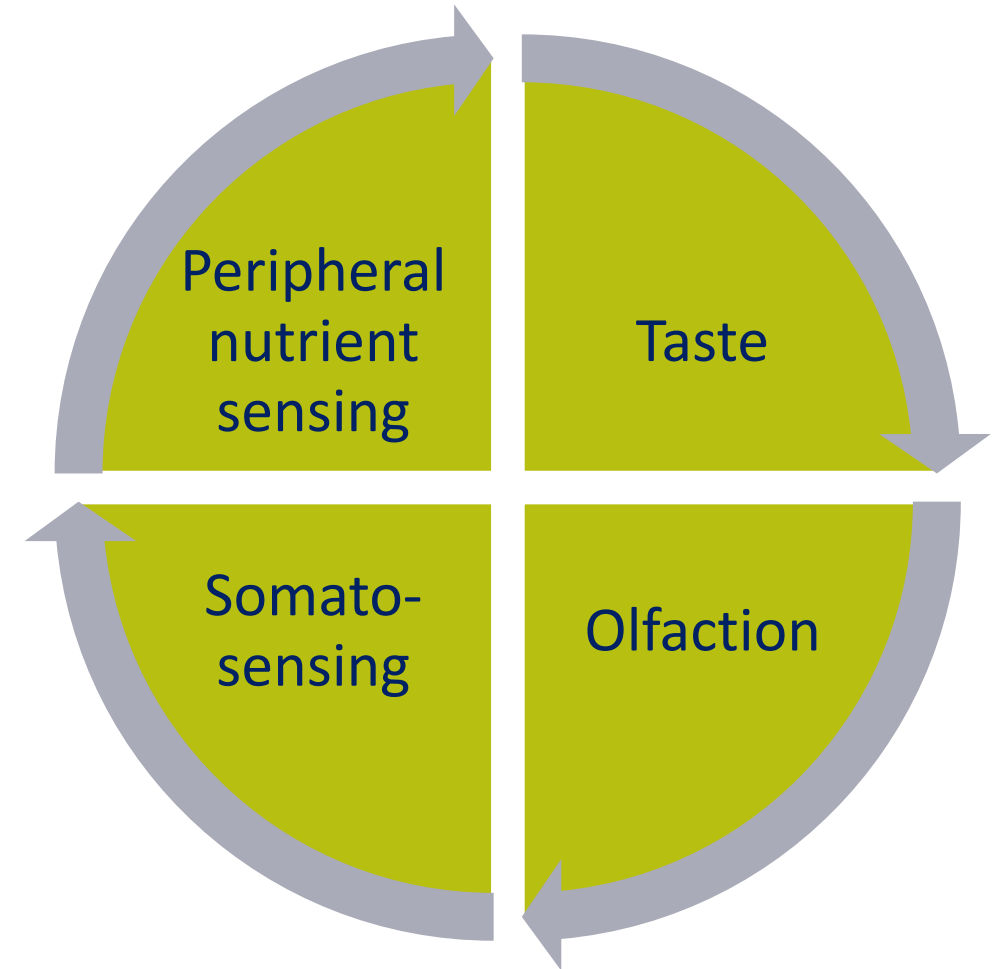
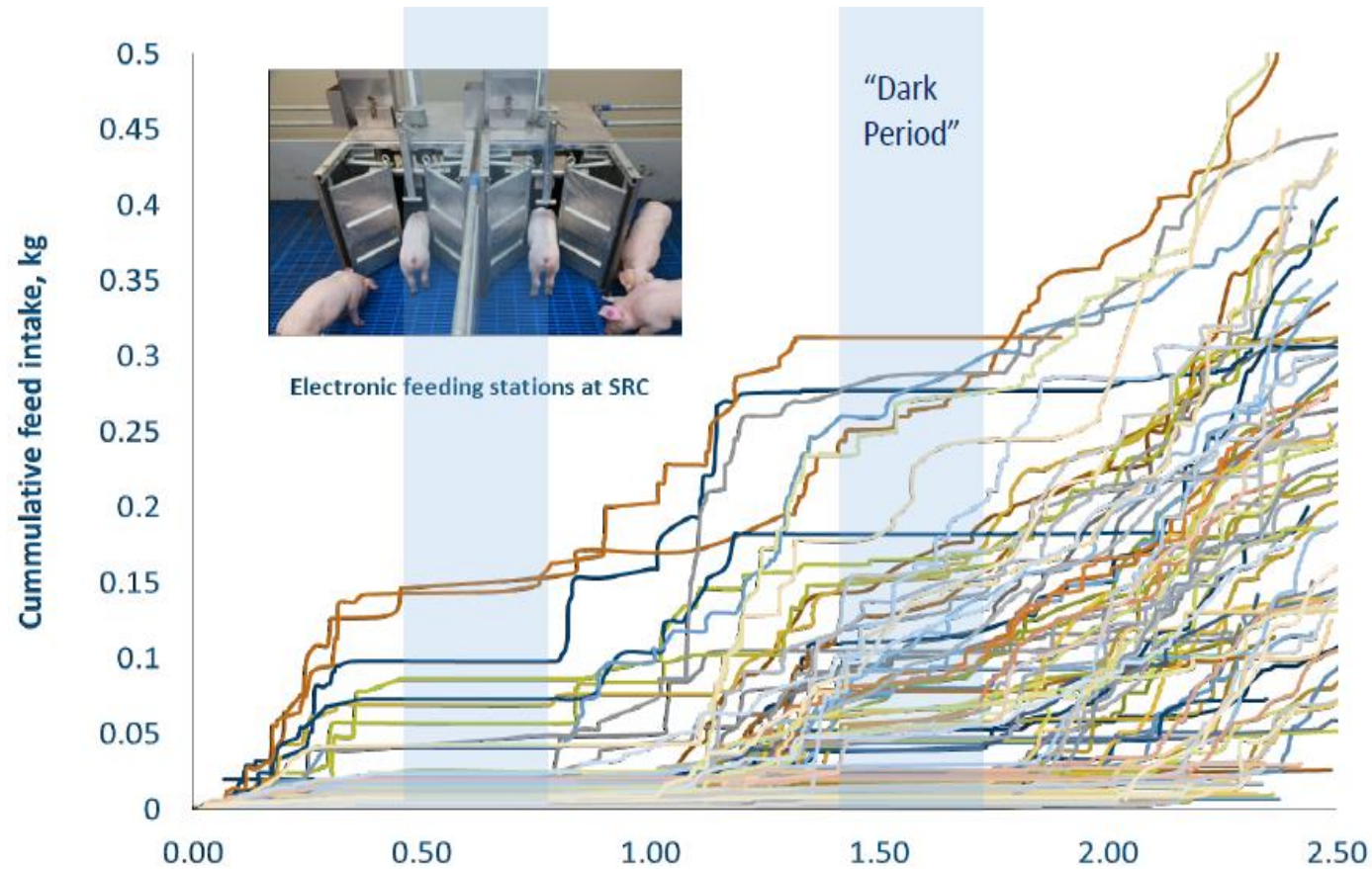
How to act within this pathogenesis?

- Pre- and post weaning feed management
- Diets respecting inherent palatability preference

Milkiwean Vital Start: feed solutions

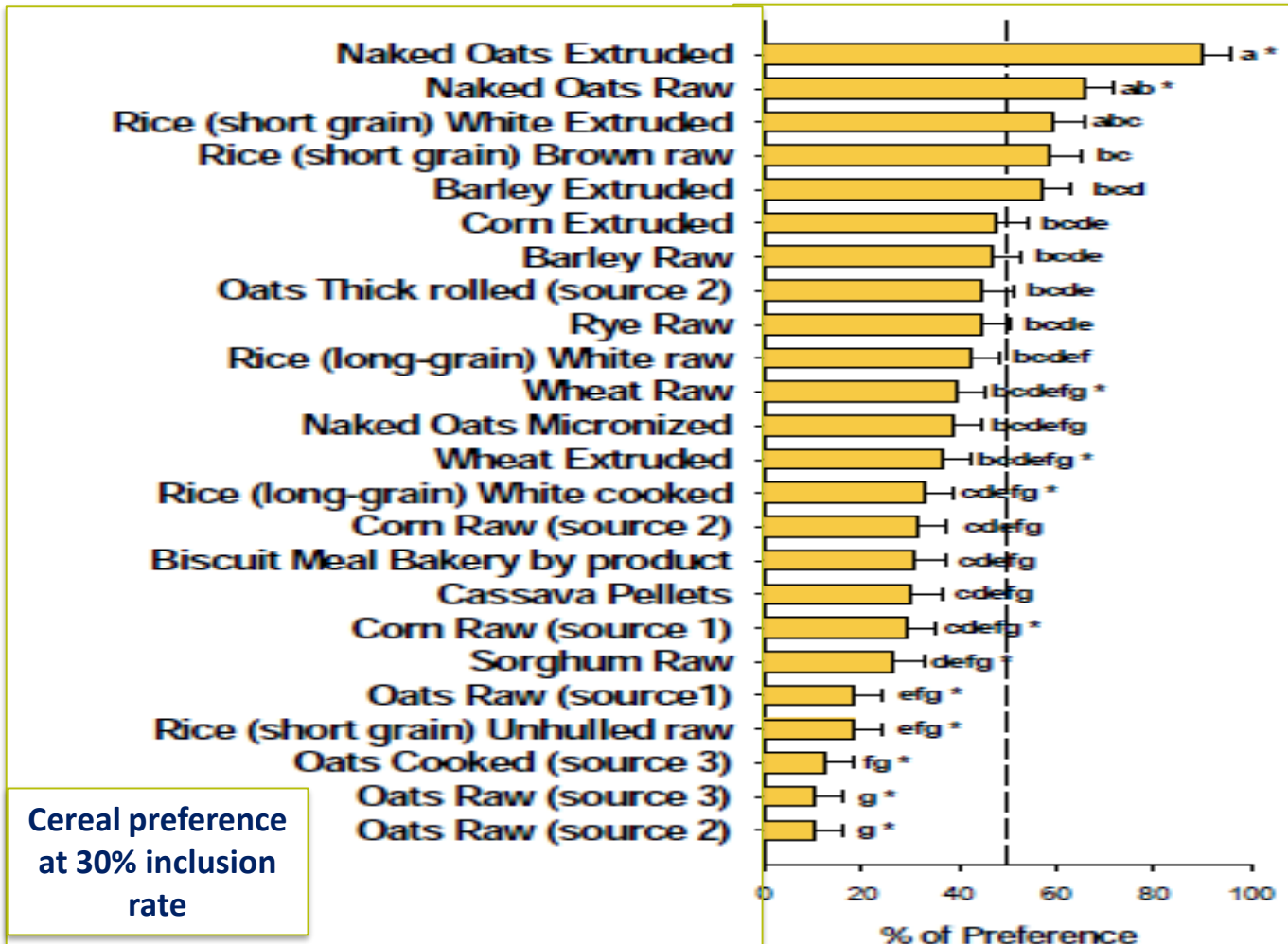
Palatability

KEEP PIGLETS EATING



Milkiwean Vital Start: feed solutions

Palatability



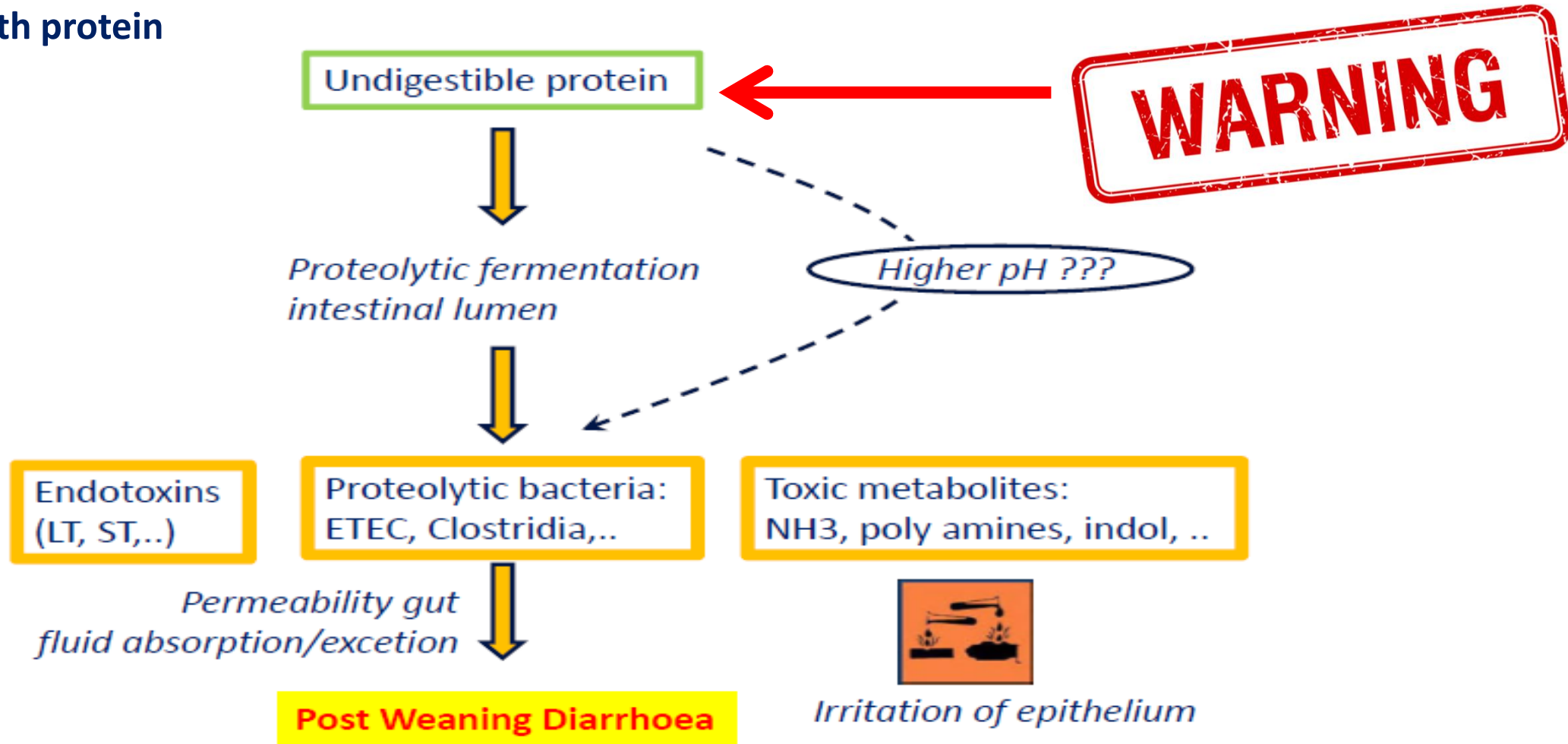
Protein sources



Milkiwean Vital Start: feed solutions

Protein

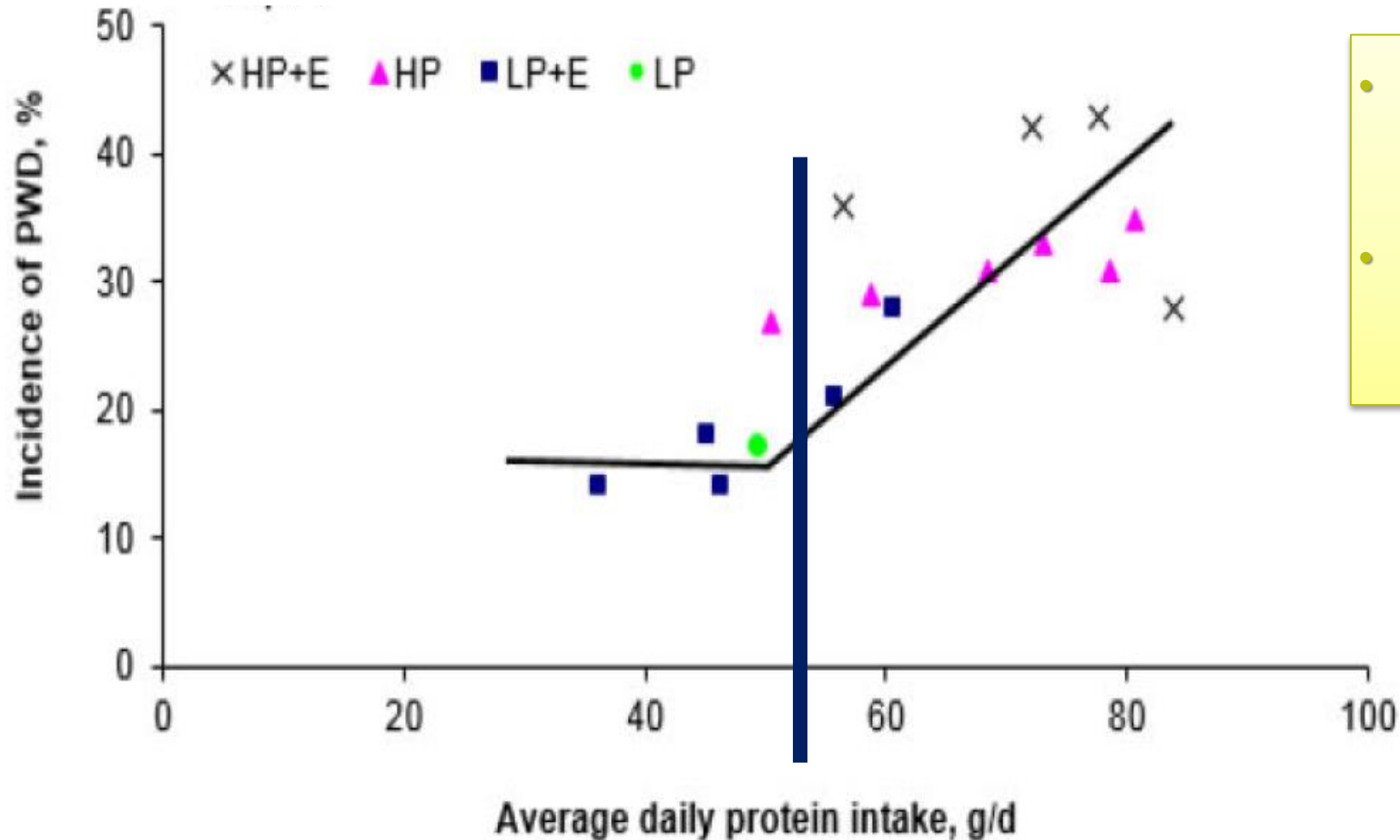
Be carefull with protein



Trouw Nutrition R&D (2015)

Milkiwean Vital Start: feed solutions

Protein



- Average daily protein intake after E. Coli infection and risk for PWD
- Too high protein intake – risk for diarrhea

Heo, et al, 2014

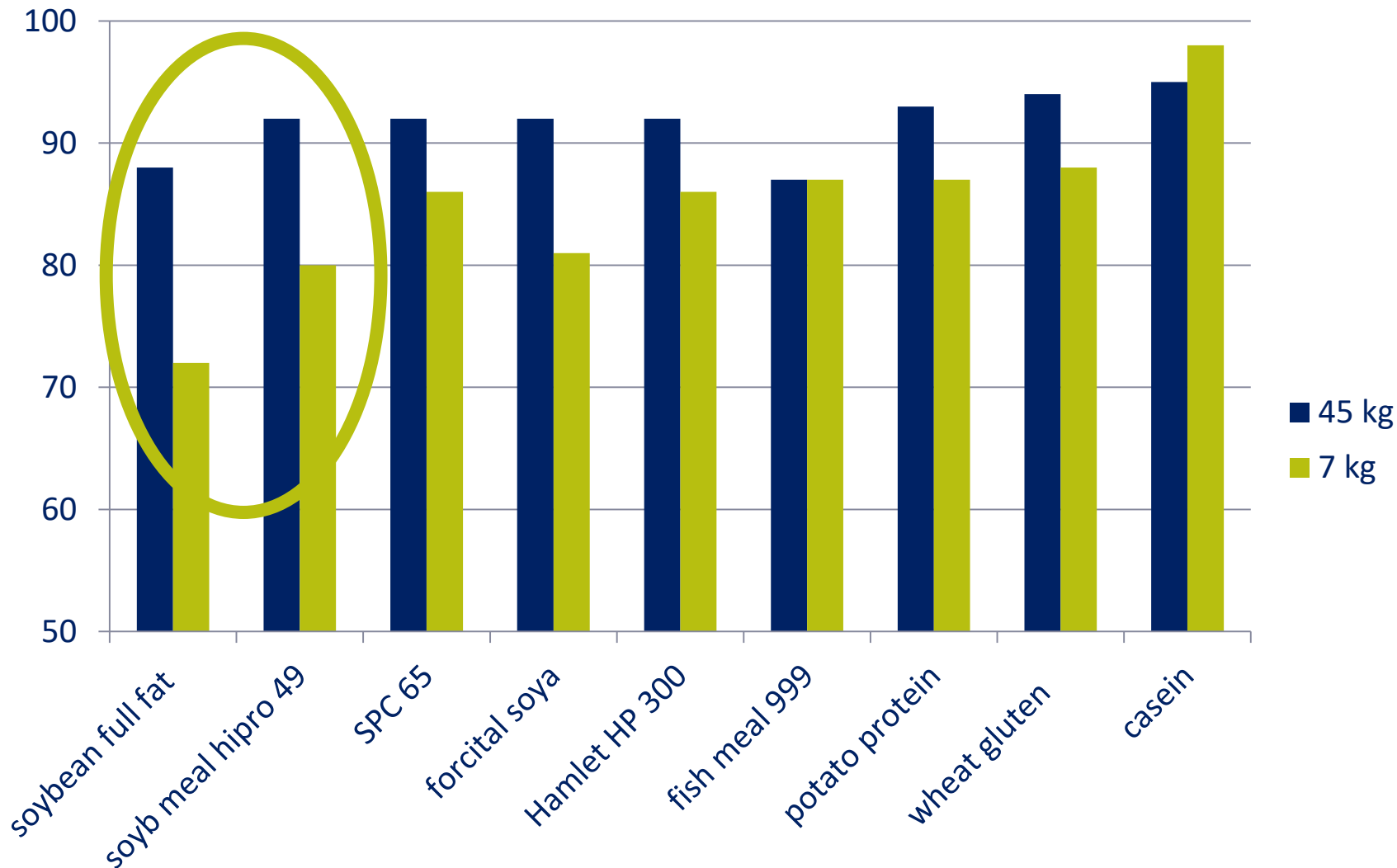
Daily feed intake (g/day)	Crude protein levels in feed (kg)										
	150	155	160	165	170	175	180	185	190	195	200
150	22,5	23,25	24	24,75	25,5	26,25	27	27,75	28,5	29,25	30
175	26,25	27,125	28	28,75	29,5	30,25	31	31,75	32,5	33,25	34
200	30	31	32	32,5	33	33,5	34	34,5	35	35,5	36
225	33,75	34,875	36	36,75	37,5	38,25	39	39,75	40,5	41,25	42
250	37,5	38,75	40	40,75	41,5	42,25	43	43,75	44,5	45,25	46
275	41,25	42,625	44	44,75	45,5	46,25	47	47,75	48,5	49,25	50
300	45	46,5	48	48,75	49,5	50,25	51	51,75	52,5	53,25	54
325	48,75	50,375	52	52,5	53,25	54	54,75	55,5	56,25	57	57,5
350	52,5	54,25	56	56,75	57,5	58,25	59	59,75	60,5	61,25	62
375	56,25	58,125	60	60,75	61,5	62,25	63	63,75	64,5	65,25	66
400	60	62	64	64,75	65,5	66,25	67	67,75	68,5	69,25	70

Digestibility
 Amino acid (ratios)
 Taste effects
 Ingredient choices
 Anti-nutritional factors
 Interacting ingredients
 Disease pressure
 ...

Too high protein intake risk for disease development? →

There is more than meets the eye

Protein digestibility in weaners



Source	Ileal digestibility	Std
SBM 1	77.0	6.8
SBM 2	77.7	0.5
SBM 3	79.3	4.0
SBM 4	81.7	4.4
SBM 5	82.1	3.5
SBM 6	83.2	3.7
Average	80.2	3.8

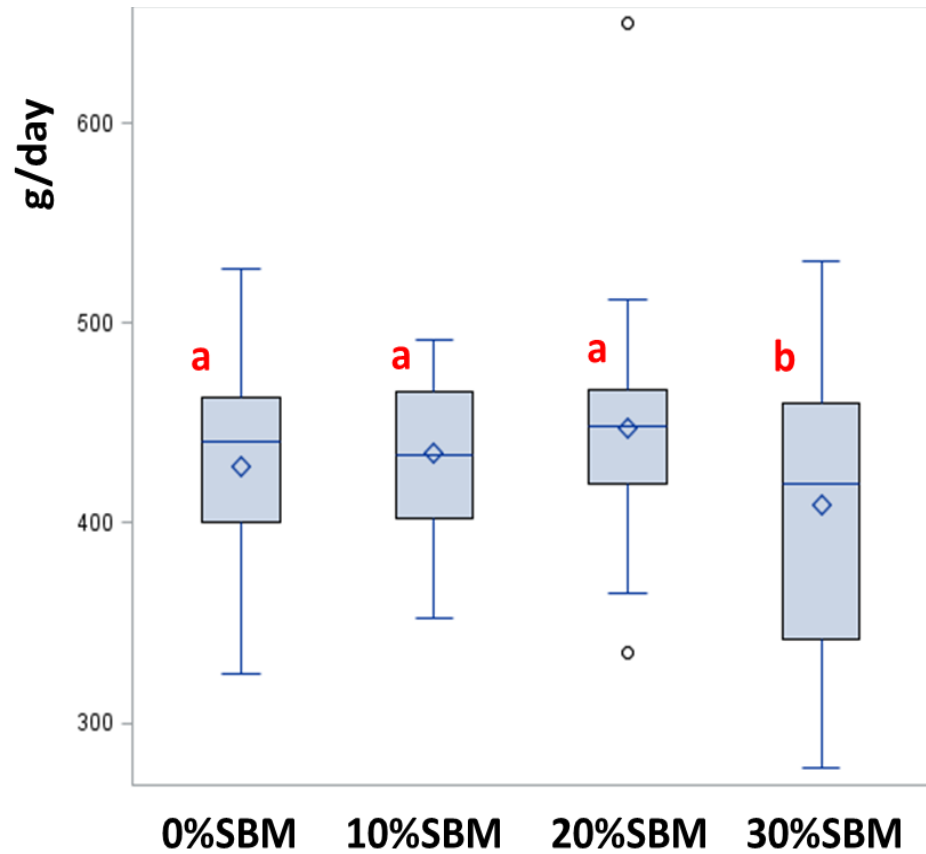
Analyze and monitor
your sources!!

nutri@pt

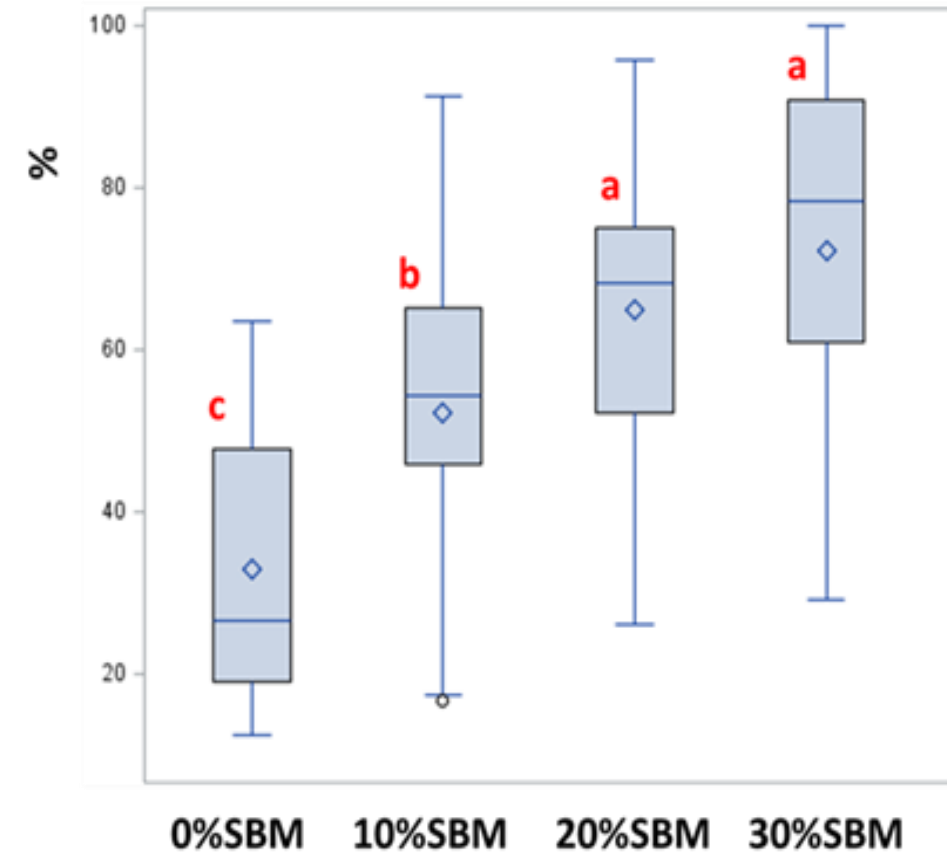
masterlab

How much soybean meal can we use?

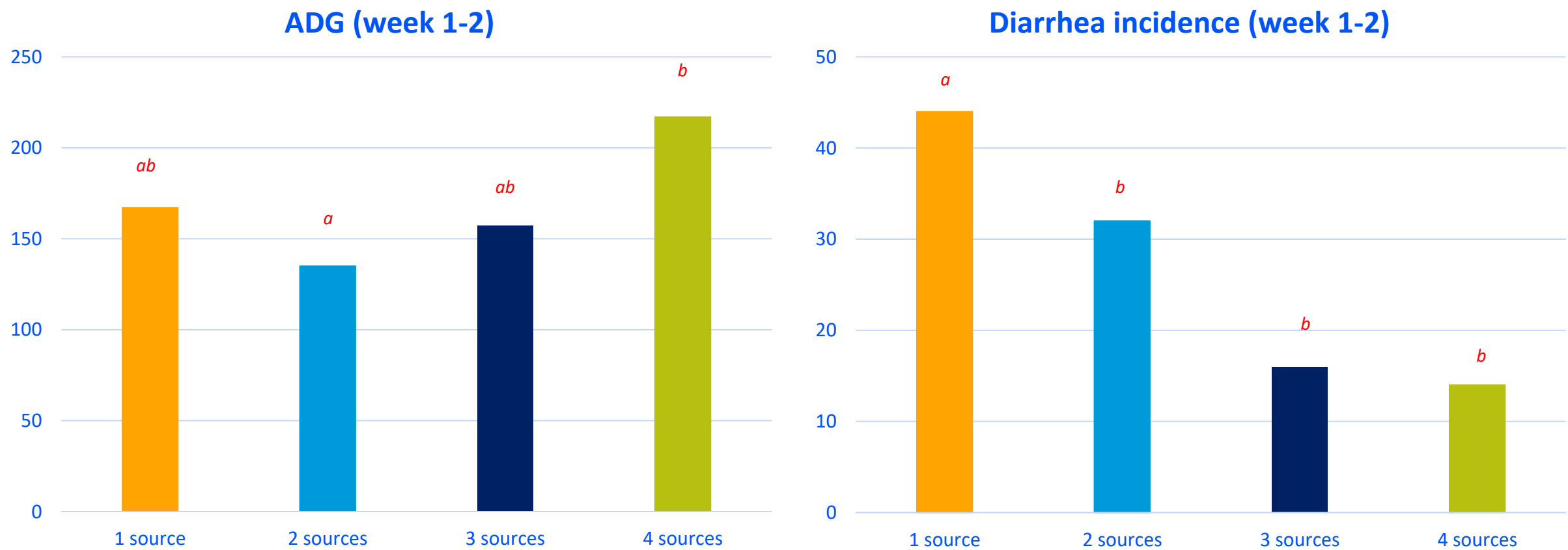
Daily weight gain D0-34 post-weaning



Incidence suboptimal faecal scoring

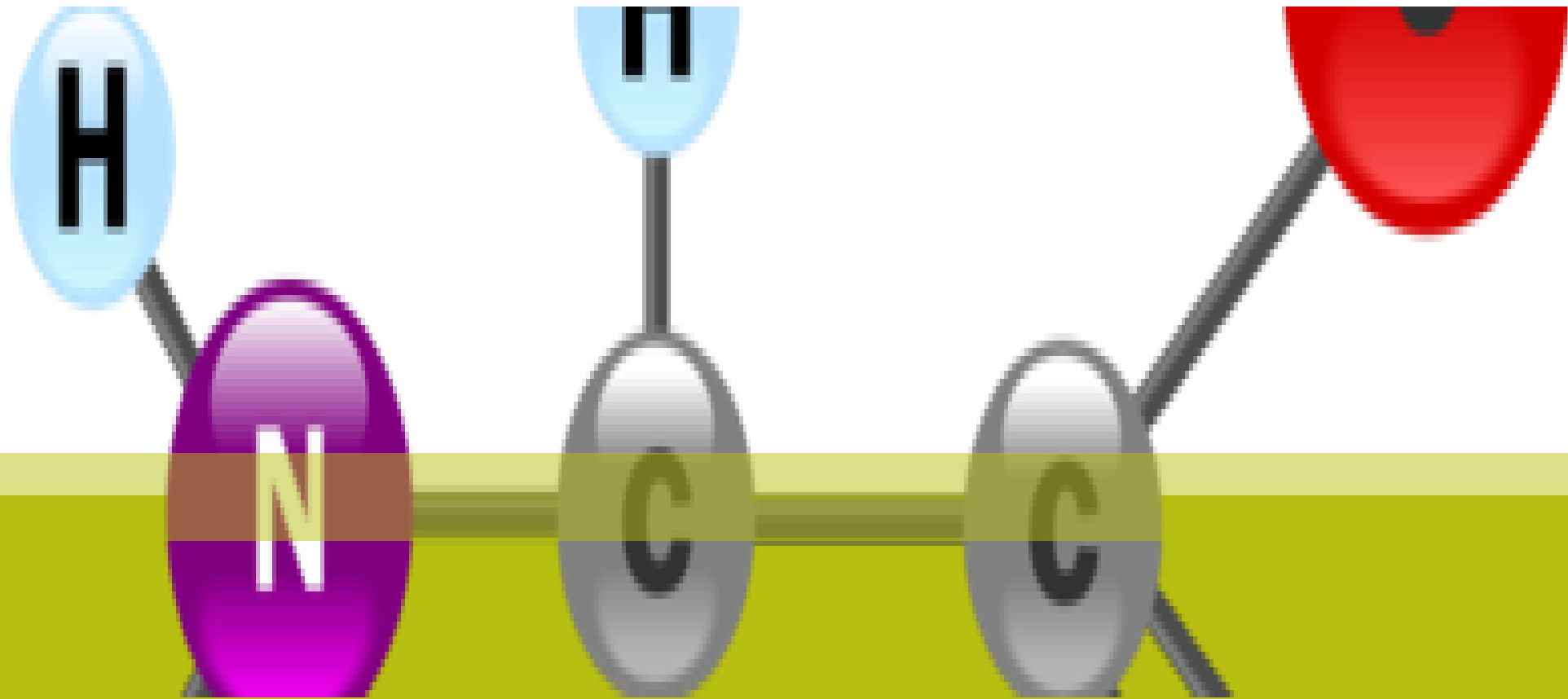


Smartly combining protein sources - better growth and less diarrhea incidents



Due to higher intakes and better feed efficiencies

Amino acids



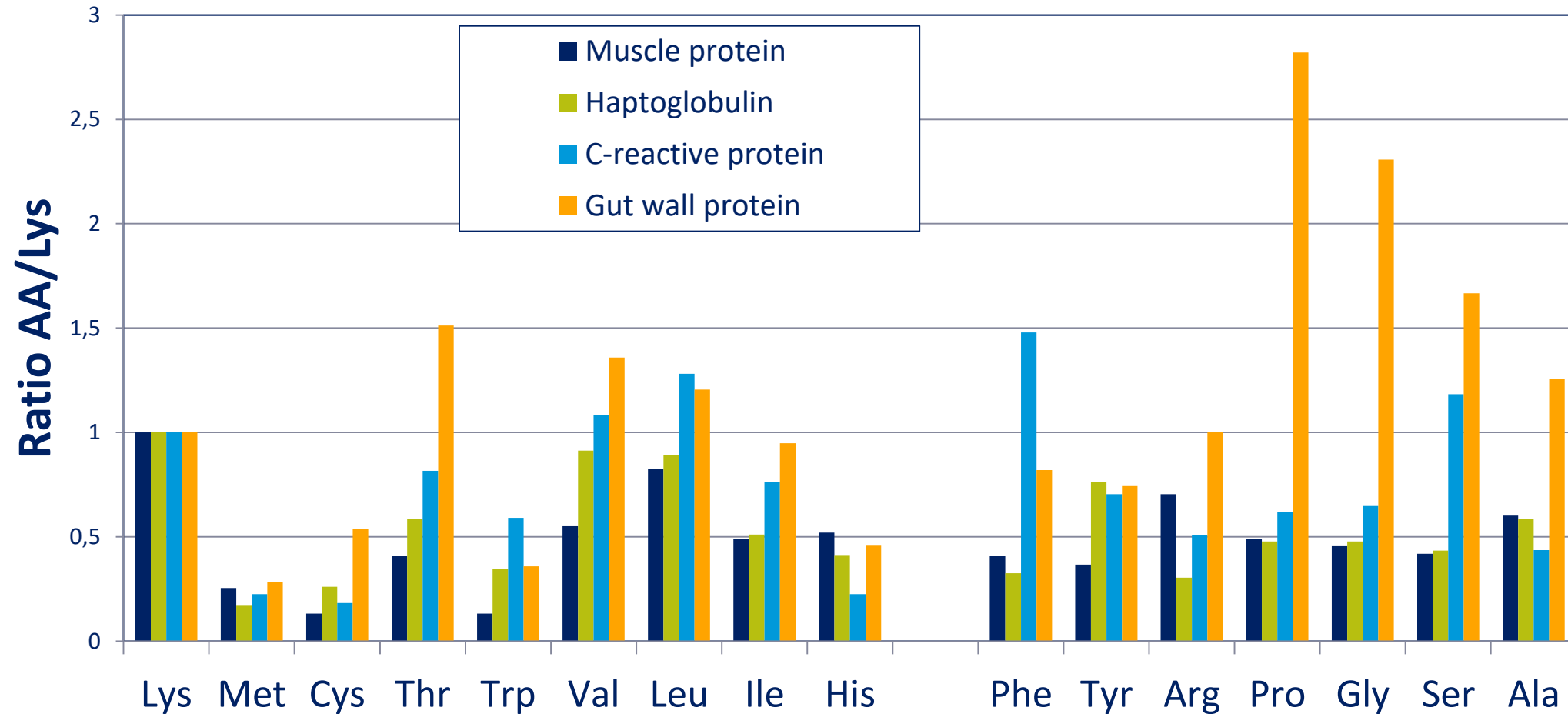
Milkiwean Vital Start: feed solutions

Amino acids ratios

AA:Lys, DIS	Sève (1994)	NRC (1998)	BSAS (2003)	NRC (2012)	INRA ⁽¹⁾
Lys:Lys	100	100	100	100	100
Thr:Lys	65	62	65	59	65
Met:Lys	30	27	30	29	30
(Met + Cys):Lys	60	57	59	55	60
Trp:Lys	18	18	19	16	22
Val:Lys	70	68	70	63	70
Ile:Lys	60	54	58	51	52-60 ⁽²⁾
Leu:Lys	100	101	100	100	101
Phe:Lys	50	61	57	58	54 ⁽³⁾
(Phe + Tyr):Lys	95	94	100	93	-
Tyr:Lys	-	-	-	-	40
His:Lys	32	32	34	34	31

Milkiwean Vital Start: feed solutions

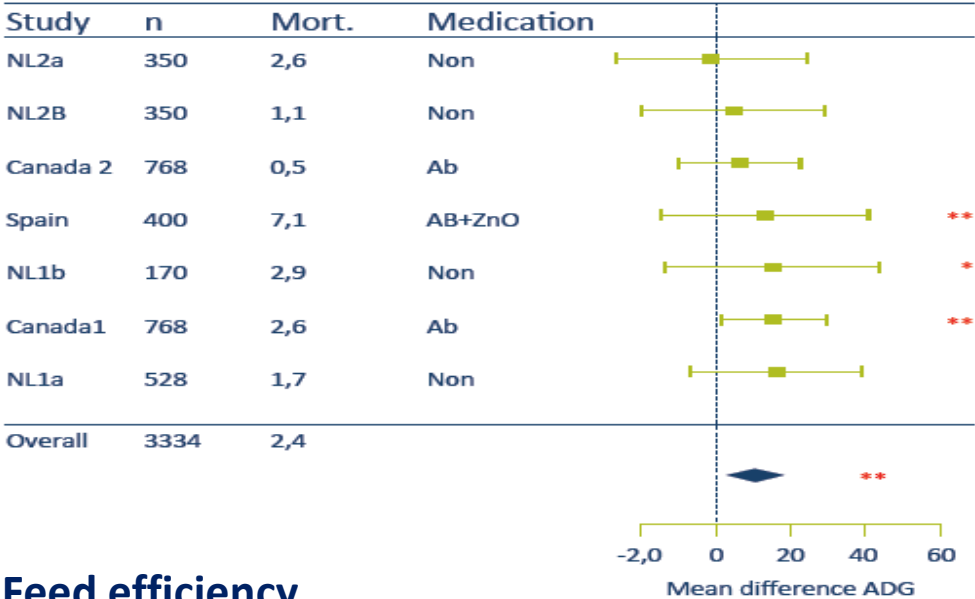
Amino acid ratios



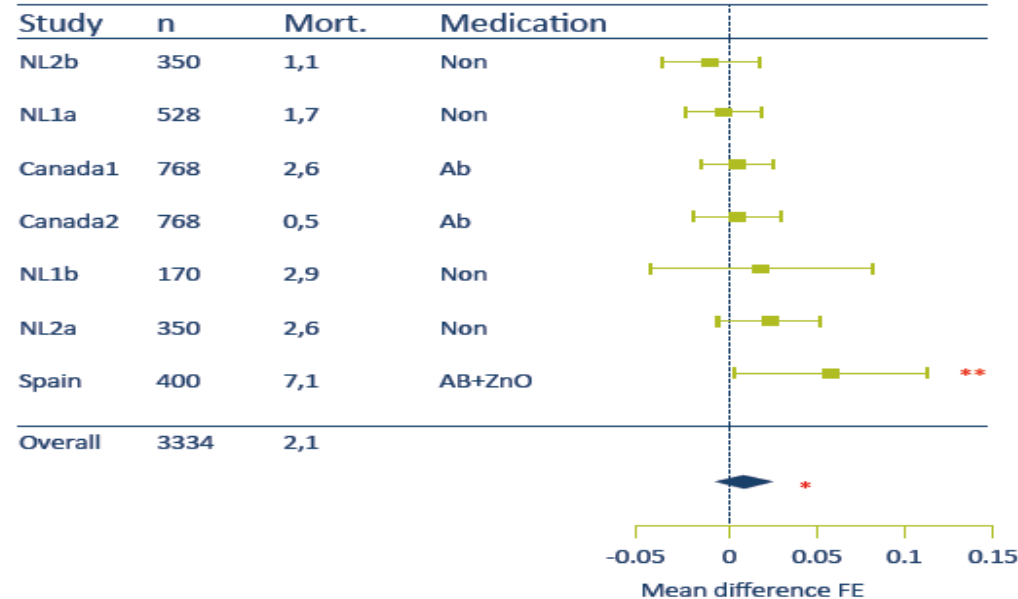
AA-profile differs between tissues

Summary of results field trials (AMINOPT)

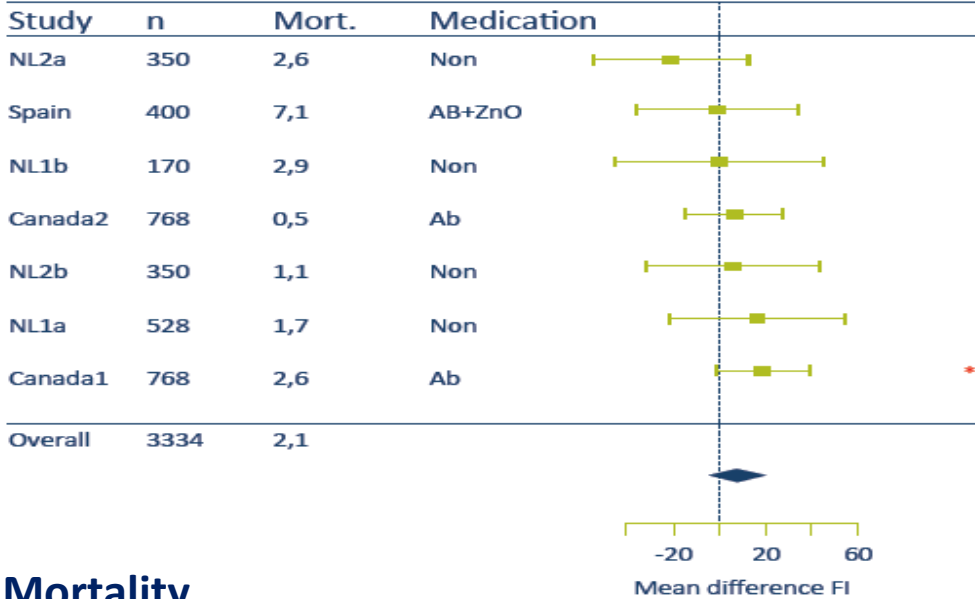
Growth



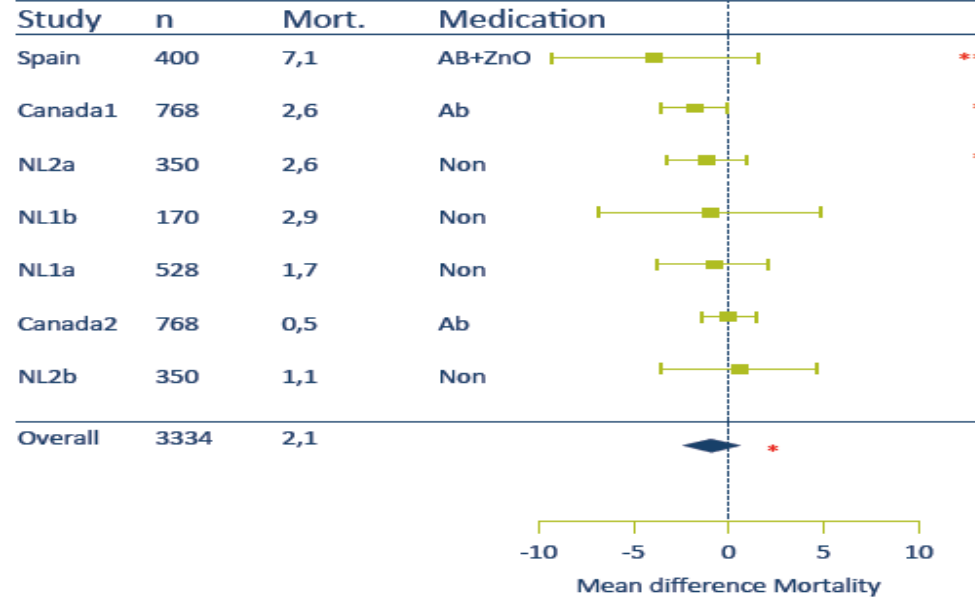
Feed efficiency



Feed intake



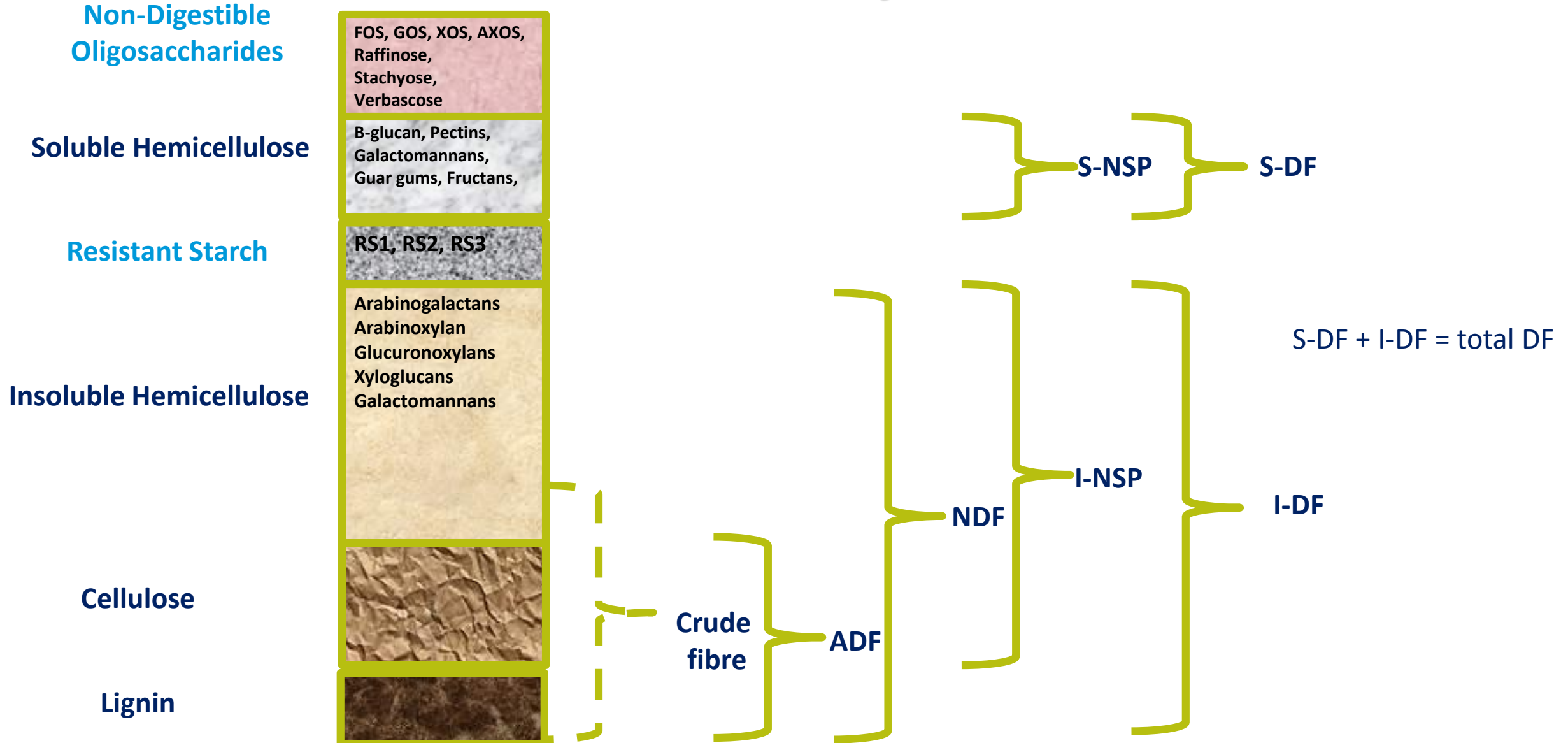
Mortality



Fibres



Fibres analysis



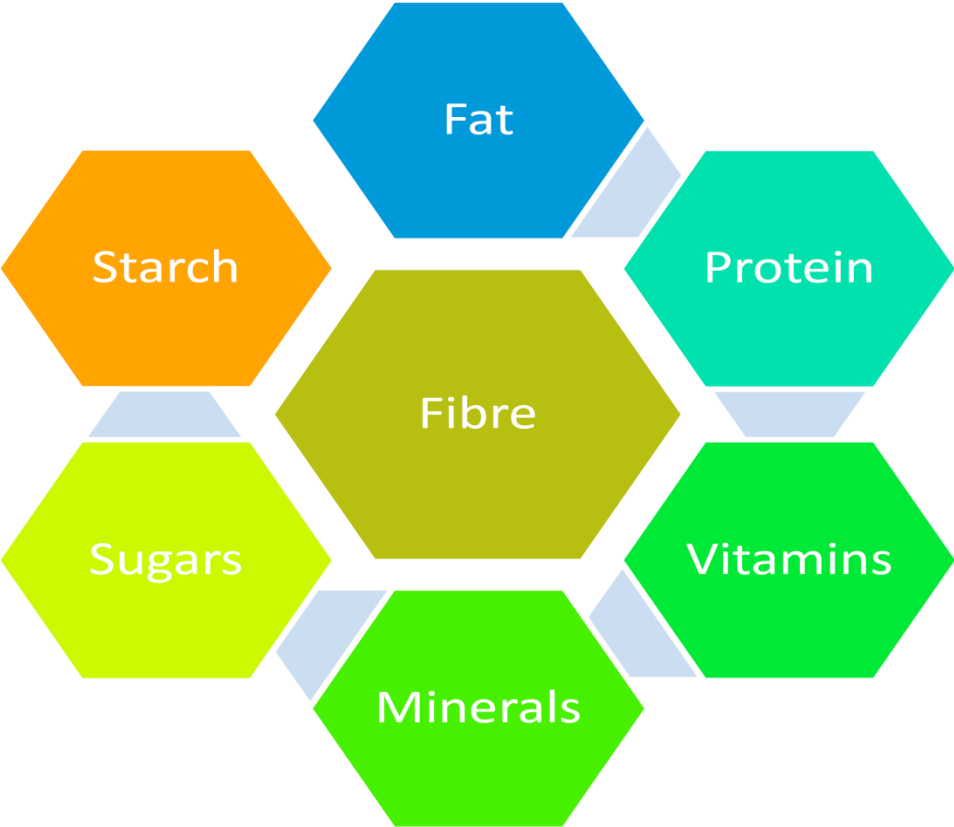
Milkiwean Vital Start: feed solutions

Fibre

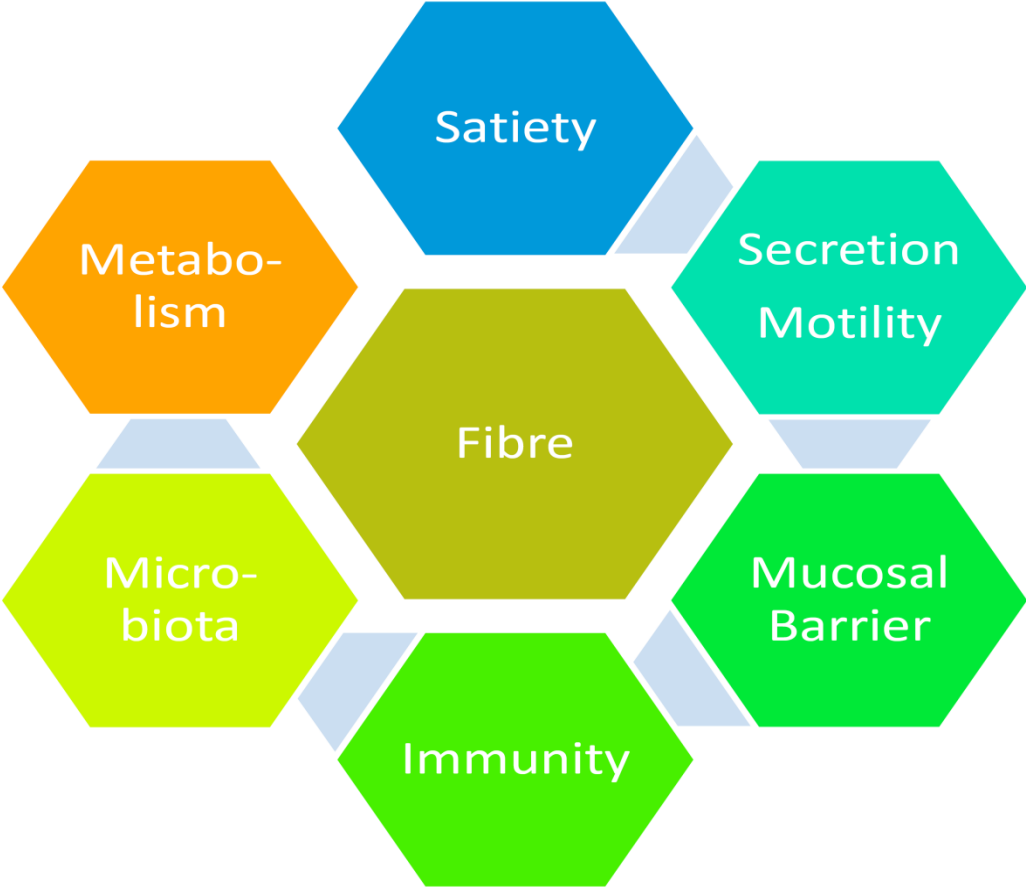
Effect	sol. fibres	insol. fibres	-
Fibre source	Pectin Guar gum	Wheat bran Cellulose	Inulin / oligofructose
Fermentation	++	0/+	++
pH chyme	↓	0	↓
Stomach emptying	↓	↓?	?
Rate of passage	↓	↑	?
Weight mucosa	↑	?	↑
Binding of bile salts	+	0	?
Weight faeces	0	↑	↑
Glucose absorption	More gradual	0	More gradual

Milkiwean Vital Start: feed solutions

Fibre

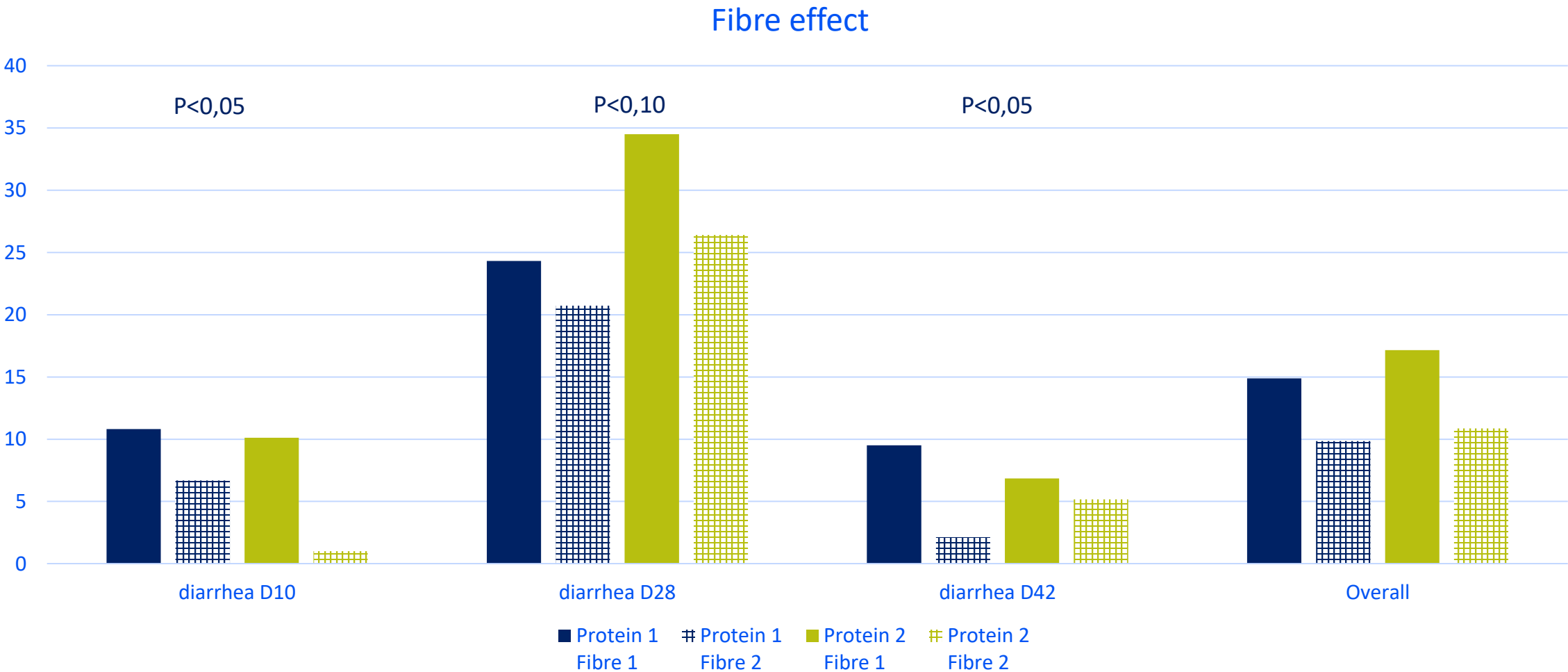


Interaction with other nutrients



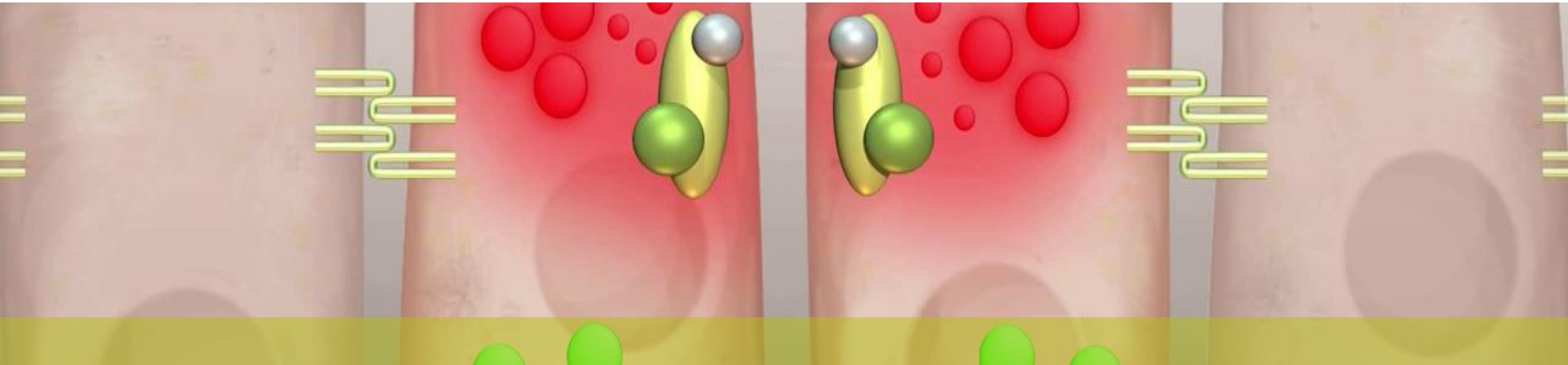
Physiological effects

Fibres and their effect on scouring



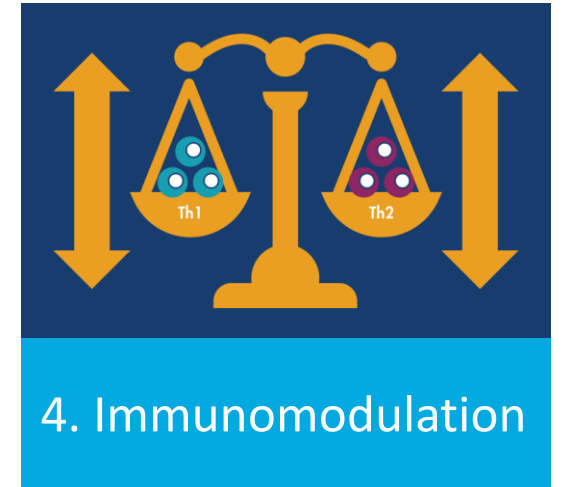
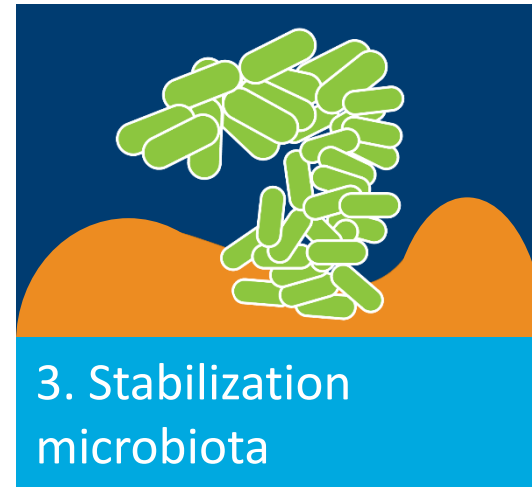
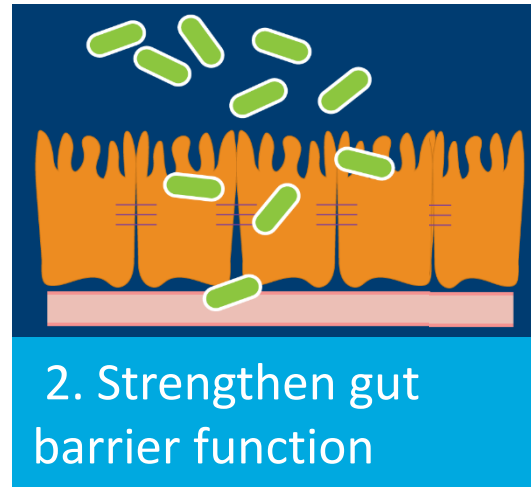
Combination with correct fibre dropped diarrhea >30%

Specialty ingredients



Our Swine Health strategy

different mechanism for achieving gut health



Acidifiers

Gut health modifier

Block attachment & mucosal immune support

Our Swine Health strategy

different mechanism for achieving gut health



Acidifiers

Gut health modifier

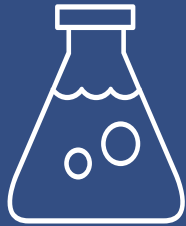
Block attachment & mucosal immune support

Reduce buffer capacity of feed

Acidifiers

Synergistic blends of SCFA's with focus on

- pH reduction in stomach
- Gram- approach

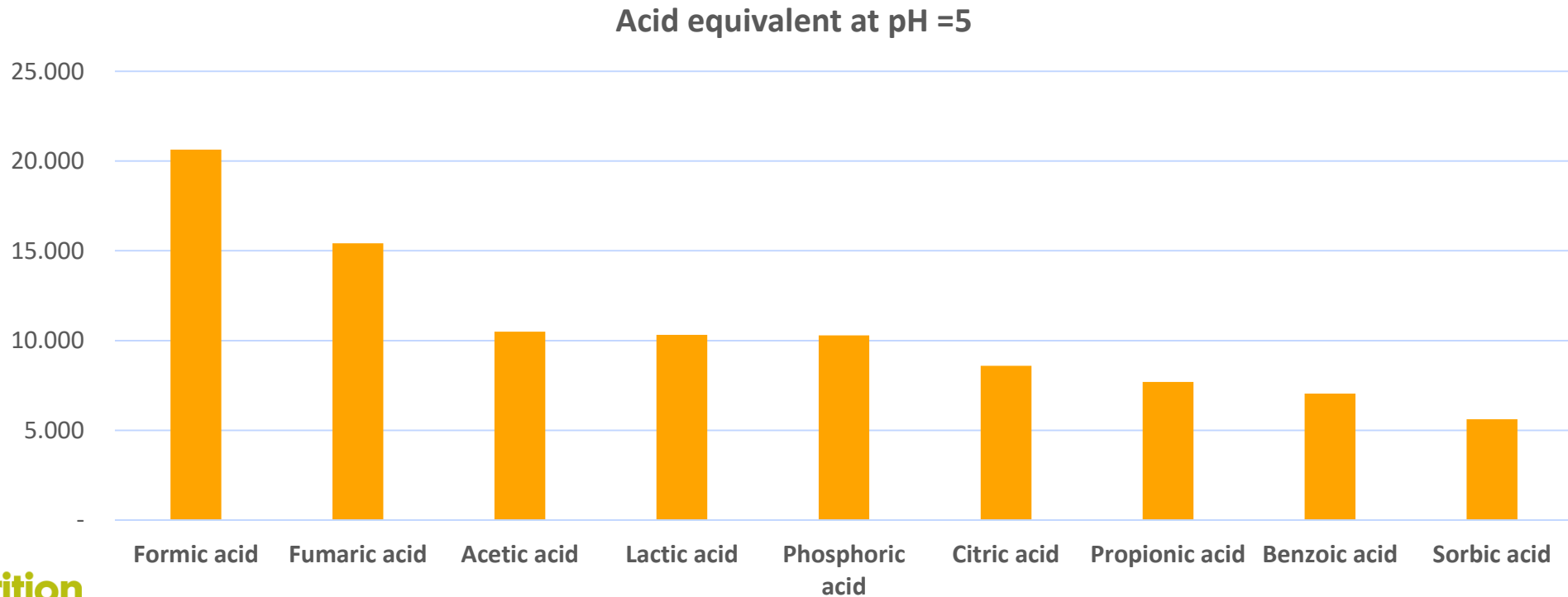


Replace calcium sources

By Ca-salts to reduce the buffer capacity of the feed

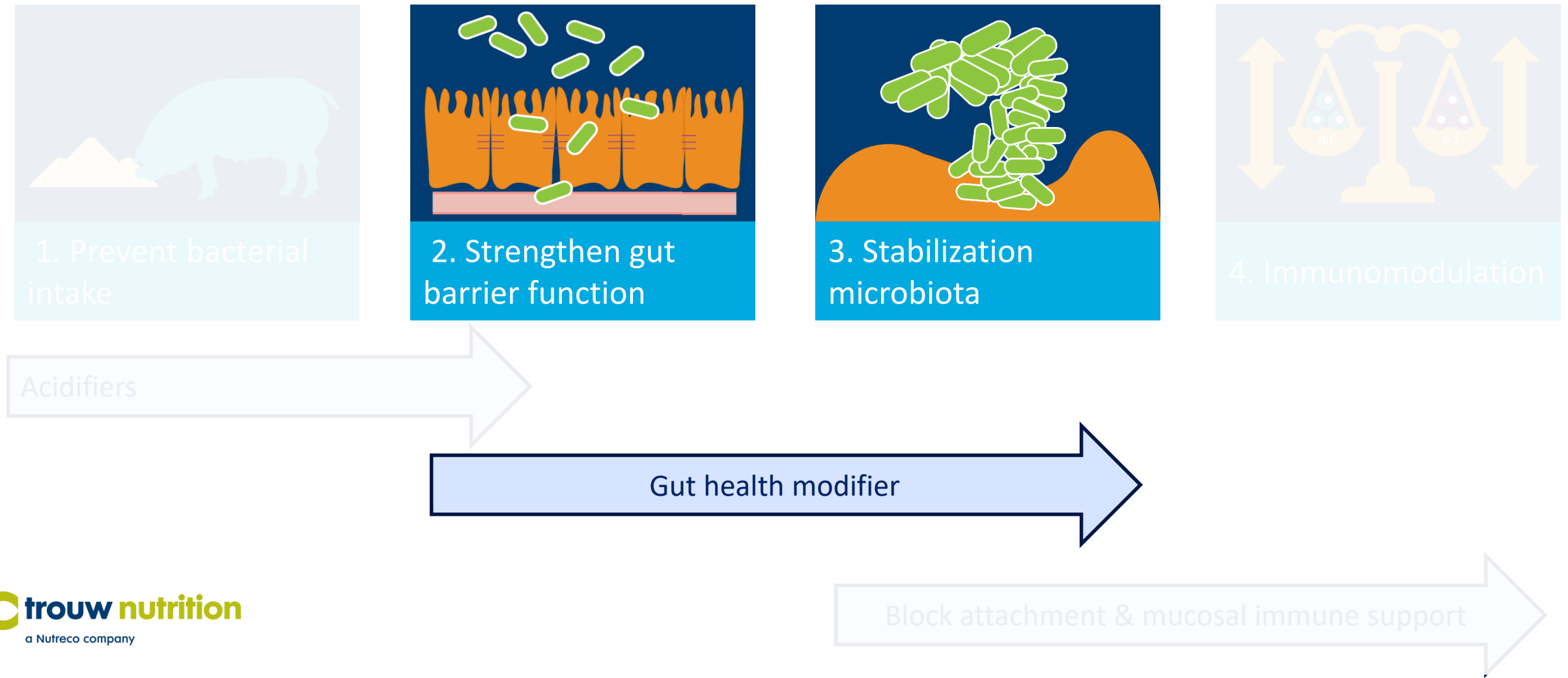
Strong acidifiers

- **Formic acid and Fumaric acid strongest acidifiers**
- - Formic acid 34% higher acid equivalent
- - Formic acid 60% cheaper compared to Fumaric acid



Our Swine Health strategy

different mechanism for achieving gut health



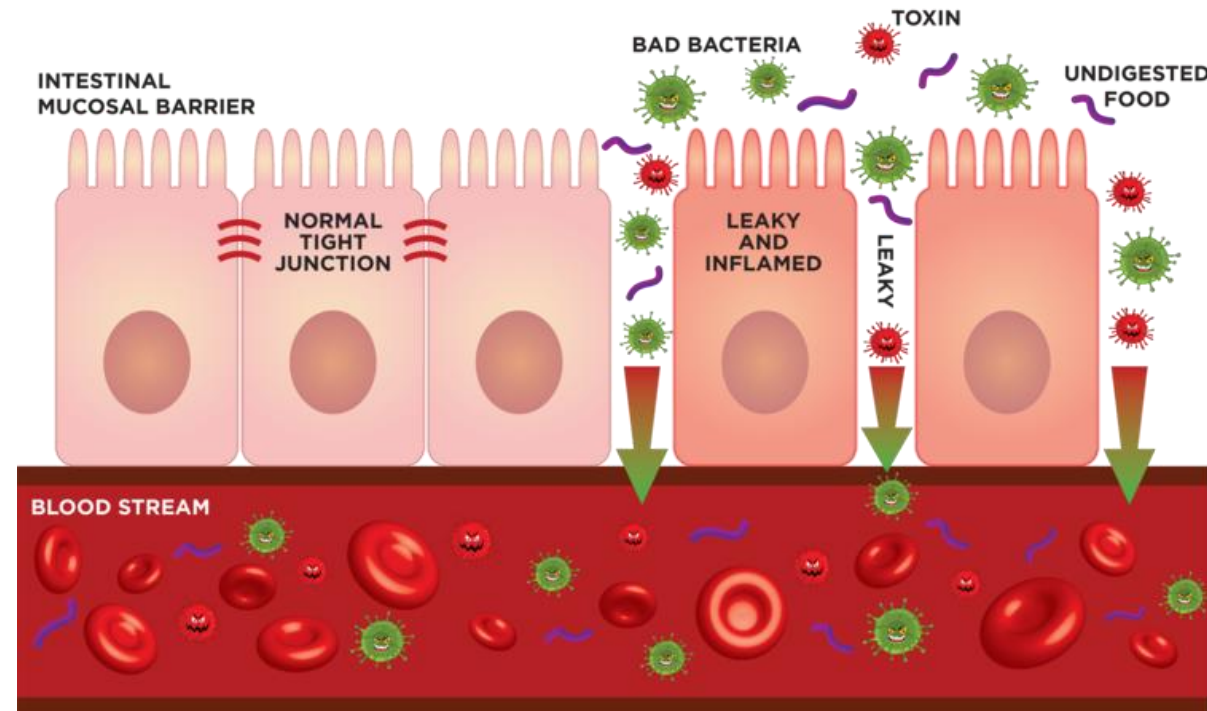
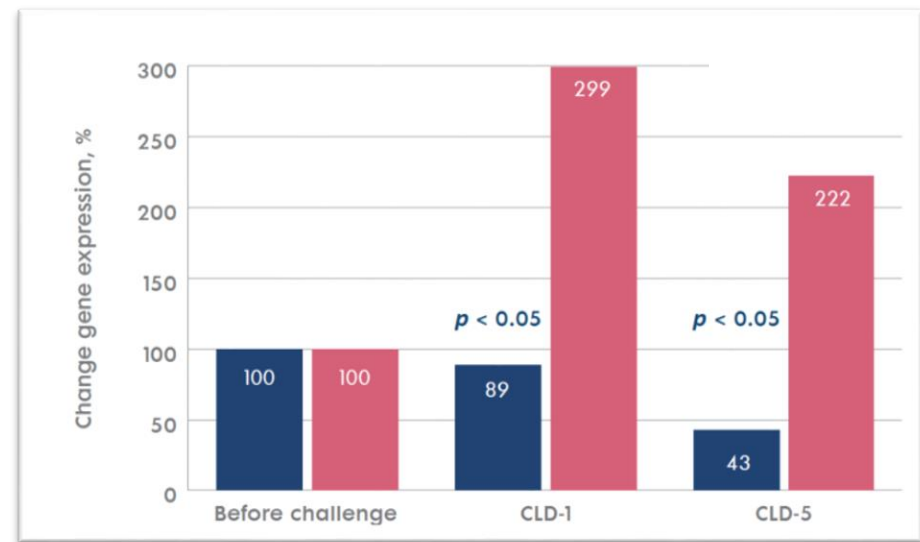
Phenolic Compounds positively influencing tight junction

Tight junctions bind cells together

- thereby forming a barrier that prevents molecules from getting through
- helps to maintain the polarity of cells.

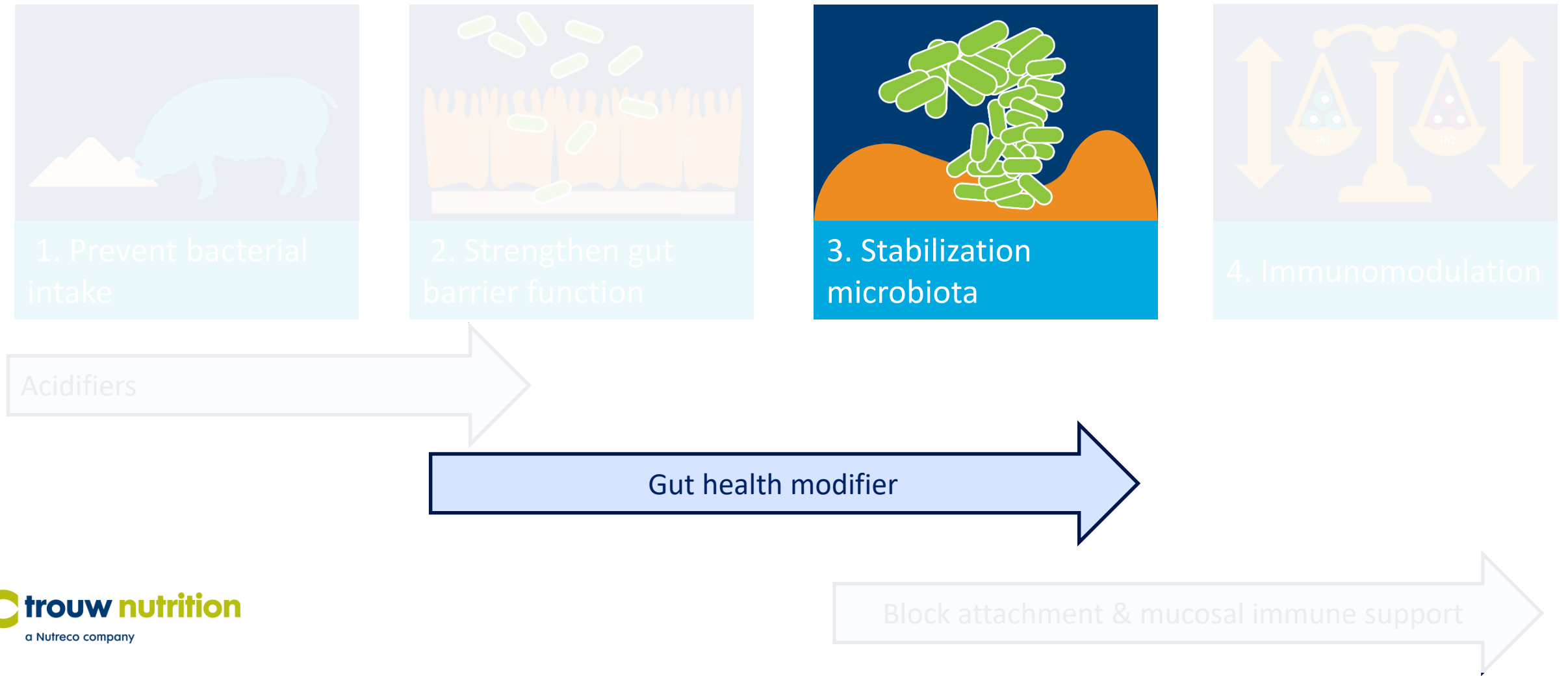
The phenolic compound supports the intestinal barrier integrity, shown by an upregulated expression of tight junction proteins

- CLD-1 & CLD-5



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different mechanism for achieving gut health



Antibacterial effect of organic acids

Selko laboratory Tilburg and Trouw Nutrition Masterlab Boxmeer – based on *in vitro* (MIC) studies from 2010 to 2019

	Gram- bacteria	Gram+ bacteria
Formic acid	+++	+
Citric acid	++	-
Sorbic acid	++++	+++
Benzoic acid	++++	++
Lactic acid	+++	-
Propionic acid	++	+
Acetic acid	+	+
Fumaric acid	++	+
C8	+++++	+++
C10	+++++	+++
C8, C10 mix	+++++	++++
C12	-	+++++
C8, C10, C12 mix	++++	+++++

Synergistic antibacterial effect of blends

In vitro lab testing

- Single ingredients
- Blends or acids

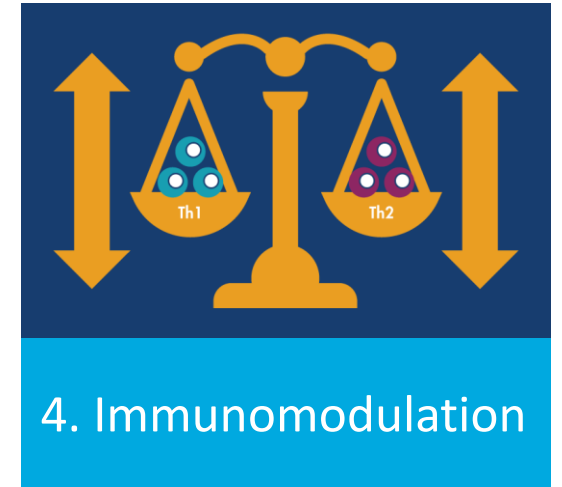
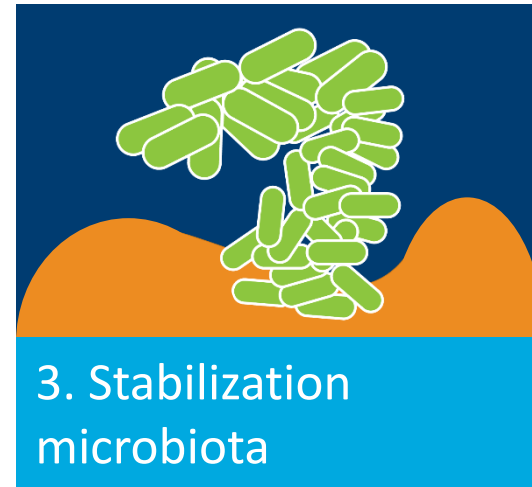
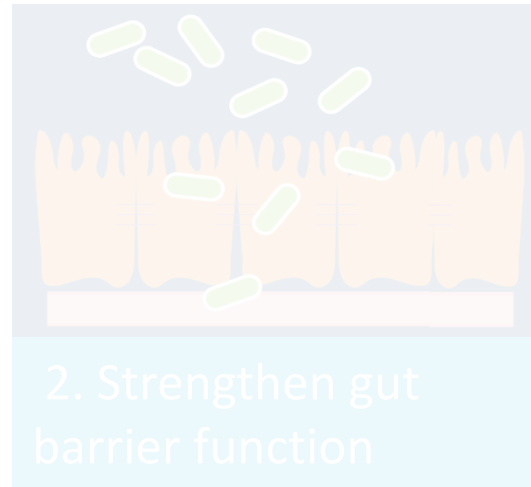
--> Compare measured result with calculated result

Lab results show a synergistic antibacterial effect of blends of organic acids

		MIC (T=24h)		MIC (T=48h)		MIC (T=72h)		MIC (T=96h)		MIC (T=120h)		MIC (T=144h)		MIC (T=168h)		MIC (T=192h)		MIC (T=216h)		MIC (T=240h)		MIC (T=264h)		MIC (T=288h)		MIC (T=312h)		MIC (T=336h)		MIC (T=360h)		MIC (T=384h)		MIC (T=408h)		MIC (T=432h)		MIC (T=456h)		MIC (T=480h)		MIC (T=504h)		MIC (T=528h)		MIC (T=552h)		MIC (T=576h)		MIC (T=600h)		MIC (T=624h)		MIC (T=648h)		MIC (T=672h)		MIC (T=696h)		MIC (T=720h)		MIC (T=744h)		MIC (T=768h)		MIC (T=792h)		MIC (T=816h)		MIC (T=840h)		MIC (T=864h)		MIC (T=888h)		MIC (T=912h)		MIC (T=936h)		MIC (T=960h)		MIC (T=984h)		MIC (T=1008h)		MIC (T=1032h)		MIC (T=1056h)		MIC (T=1080h)		MIC (T=1104h)		MIC (T=1128h)		MIC (T=1152h)		MIC (T=1176h)		MIC (T=1200h)		MIC (T=1224h)		MIC (T=1248h)		MIC (T=1272h)		MIC (T=1296h)		MIC (T=1320h)		MIC (T=1344h)		MIC (T=1368h)		MIC (T=1392h)		MIC (T=1416h)		MIC (T=1440h)		MIC (T=1464h)		MIC (T=1488h)		MIC (T=1512h)		MIC (T=1536h)		MIC (T=1560h)		MIC (T=1584h)		MIC (T=1608h)		MIC (T=1632h)		MIC (T=1656h)		MIC (T=1680h)		MIC (T=1704h)		MIC (T=1728h)		MIC (T=1752h)		MIC (T=1776h)		MIC (T=1800h)		MIC (T=1824h)		MIC (T=1848h)		MIC (T=1872h)		MIC (T=1896h)		MIC (T=1920h)		MIC (T=1944h)		MIC (T=1968h)		MIC (T=1992h)		MIC (T=2016h)		MIC (T=2040h)		MIC (T=2064h)		MIC (T=2088h)		MIC (T=2112h)		MIC (T=2136h)		MIC (T=2160h)		MIC (T=2184h)		MIC (T=2208h)		MIC (T=2232h)		MIC (T=2256h)		MIC (T=2280h)		MIC (T=2304h)		MIC (T=2328h)		MIC (T=2352h)		MIC (T=2376h)		MIC (T=2400h)		MIC (T=2424h)		MIC (T=2448h)		MIC (T=2472h)		MIC (T=2496h)		MIC (T=2520h)		MIC (T=2544h)		MIC (T=2568h)		MIC (T=2592h)		MIC (T=2616h)		MIC (T=2640h)		MIC (T=2664h)		MIC (T=2688h)		MIC (T=2712h)		MIC (T=2736h)		MIC (T=2760h)		MIC (T=2784h)		MIC (T=2808h)		MIC (T=2832h)		MIC (T=2856h)		MIC (T=2880h)		MIC (T=2904h)		MIC (T=2928h)		MIC (T=2952h)		MIC (T=2976h)		MIC (T=3000h)		MIC (T=3024h)		MIC (T=3048h)		MIC (T=3072h)		MIC (T=3096h)		MIC (T=3120h)		MIC (T=3144h)		MIC (T=3168h)		MIC (T=3192h)		MIC (T=3216h)		MIC (T=3240h)		MIC (T=3264h)		MIC (T=3288h)		MIC (T=3312h)		MIC (T=3336h)		MIC (T=3360h)		MIC (T=3384h)		MIC (T=3408h)		MIC (T=3432h)		MIC (T=3456h)		MIC (T=3480h)		MIC (T=3504h)		MIC (T=3528h)		MIC (T=3552h)		MIC (T=3576h)		MIC (T=3600h)		MIC (T=3624h)		MIC (T=3648h)		MIC (T=3672h)		MIC (T=3696h)		MIC (T=3720h)		MIC (T=3744h)		MIC (T=3768h)		MIC (T=3792h)		MIC (T=3816h)		MIC (T=3840h)		MIC (T=3864h)		MIC (T=3888h)		MIC (T=3912h)		MIC (T=3936h)		MIC (T=3960h)		MIC (T=3984h)		MIC (T=4008h)		MIC (T=4032h)		MIC (T=4056h)		MIC (T=4080h)		MIC (T=4104h)		MIC (T=4128h)		MIC (T=4152h)		MIC (T=4176h)		MIC (T=4200h)		MIC (T=4224h)		MIC (T=4248h)		MIC (T=4272h)		MIC (T=4296h)		MIC (T=4320h)		MIC (T=4344h)		MIC (T=4368h)		MIC (T=4392h)		MIC (T=4416h)		MIC (T=4440h)		MIC (T=4464h)		MIC (T=4488h)		MIC (T=4512h)		MIC (T=4536h)		MIC (T=4560h)		MIC (T=4584h)		MIC (T=4608h)		MIC (T=4632h)		MIC (T=4656h)		MIC (T=4680h)		MIC (T=4704h)		MIC (T=4728h)		MIC (T=4752h)		MIC (T=4776h)		MIC (T=4800h)		MIC (T=4824h)		MIC (T=4848h)		MIC (T=4872h)		MIC (T=4896h)		MIC (T=4920h)		MIC (T=4944h)		MIC (T=4968h)		MIC (T=4992h)		MIC (T=5016h)		MIC (T=5040h)		MIC (T=5064h)		MIC (T=5088h)		MIC (T=5112h)		MIC (T=5136h)		MIC (T=5160h)		MIC (T=5184h)		MIC (T=5208h)		MIC (T=5232h)		MIC (T=5256h)		MIC (T=5280h)		MIC (T=5304h)		MIC (T=5328h)		MIC (T=5352h)		MIC (T=5376h)		MIC (T=5400h)		MIC (T=5424h)		MIC (T=5448h)		MIC (T=5472h)		MIC (T=5496h)		MIC (T=5520h)		MIC (T=5544h)		MIC (T=5568h)		MIC (T=5592h)		MIC (T=5616h)		MIC (T=5640h)		MIC (T=5664h)		MIC (T=5688h)		MIC (T=5712h)		MIC (T=5736h)		MIC (T=5760h)		MIC (T=5784h)		MIC (T=5808h)		MIC (T=5832h)		MIC (T=5856h)		MIC (T=5880h)		MIC (T=5904h)		MIC (T=5928h)		MIC (T=5952h)		MIC (T=5976h)		MIC (T=6000h)		MIC (T=6024h)		MIC (T=6048h)		MIC (T=6072h)		MIC (T=6096h)		MIC (T=6120h)		MIC (T=6144h)		MIC (T=6168h)		MIC (T=6192h)		MIC (T=6216h)		MIC (T=6240h)		MIC (T=6264h)		MIC (T=6288h)		MIC (T=6312h)		MIC (T=6336h)		MIC (T=6360h)		MIC (T=6384h)		MIC (T=6408h)		MIC (T=6432h)		MIC (T=6456h)		MIC (T=6480h)		MIC (T=6504h)		MIC (T=6528h)		MIC (T=6552h)		MIC (T=6576h)		MIC (T=6600h)		MIC (T=6624h)		MIC (T=6648h)		MIC (T=6672h)		MIC (T=6696h)		MIC (T=6720h)		MIC (T=6744h)		MIC (T=6768h)		MIC (T=6792h)		MIC (T=6816h)		MIC (T=6840h)		MIC (T=6864h)		MIC (T=6888h)		MIC (T=6912h)		MIC (T=6936h)		MIC (T=6960h)		MIC (T=6984h)		MIC (T=7008h)		MIC (T=7032h)		MIC (T=7056h)		MIC (T=7080h)		MIC (T=7104h)		MIC (T=7128h)		MIC (T=7152h)		MIC (T=7176h)		MIC (T=7200h)		MIC (T=7224h)		MIC (T=7248h)		MIC (T=7272h)		MIC (T=7296h)		MIC (T=7320h)		MIC (T=7344h)		MIC (T=7368h)		MIC (T=7392h)		MIC (T=7416h)		MIC (T=7440h)		MIC (T=7464h)		MIC (T=7488h)		MIC (T=7512h)		MIC (T=7536h)		MIC (T=7560h)		MIC (T=7584h)		MIC (T=7608h)		MIC (T=7632h)		MIC (T=7656h)		MIC (T=7680h)		MIC (T=7704h)		MIC (T=7728h)		MIC (T=7752h)		MIC (T=7776h)		MIC (T=7800h)		MIC (T=7824h)		MIC (T=7848h)		MIC (T=7872h)		MIC (T=7896h)		MIC (T=7920h)		MIC (T=7944h)		MIC (T=7968h)		MIC (T=7992h)		MIC (T=8016h)		MIC (T=8040h)		MIC (T=8064h)		MIC (T=8088h)		MIC (T=8112h)		MIC (T=8136h)		MIC (T=8160h)		MIC (T=8184h)		MIC (T=8208h)		MIC (T=8232h)		MIC (T=8256h)		MIC (T=8280h)		MIC (T=8304h)		MIC (T=8328h)		MIC (T=8352h)		MIC (T=8376h)		MIC (T=8400h)		MIC (T=8424h)		MIC (T=8448h)		MIC (T=8472h)		MIC (T=8496h)		MIC (T=8520h)		MIC (T=8544h)		MIC (T=8568h)		MIC (T=8592h)		MIC (T=8616h)		MIC (T=8640h)		MIC (T=8664h)		MIC (T=8688h)		MIC (T=8712h)		MIC (T=8736h)		MIC (T=8760h)		MIC (T=8784h)		MIC (T=8808h)		MIC (T=8832h)		MIC (T=8856h)		MIC (T=8880h)		MIC (T=8904h)		MIC (T=8928h)		MIC (T=8952h)		MIC (T=8976h)		MIC (T=9000h)		MIC (T=9024h)		MIC (T=9048h)		MIC (T=9072h)		MIC (T=9096h)		MIC (T=9120h)		MIC (T=9144h)		MIC (T=9168h)		MIC (T=9192h)		MIC (T=9216h)		MIC (T=9240h)		MIC (T=9264h)		MIC (T=9288h)		MIC (T=9312h)		MIC (T=9336h)		MIC (T=9360h)		MIC (T=9384h)		MIC (T=9408h)		MIC (T=9432h)		MIC (T=9456h)		MIC (T=9480h)		MIC (T=9504h)		MIC (T=9528h)		MIC (T=9552h)		MIC (T=9576h)		MIC (T=9600h)		MIC (T=9624h)		MIC (T=9648h)		MIC (T=9672h)		MIC (T=9696h)		MIC (T=9720h)		MIC (T=9744h)		MIC (T=9768h)		MIC (T=9792h)		MIC (T=9816h)		MIC (T=9840h)		MIC (T=9864h)		MIC (T=9888h)		MIC (T=9912h)		MIC (T=9936h)		MIC (T=9960h)		MIC (T=9984h)		MIC (T=10008h)		MIC (T=10032h)		MIC (T=10056h)		MIC (T=10080h)		MIC (T=10104h)		MIC (T=10128h)		MIC (T=10152h)		MIC (T=10176h)		MIC (T=10200h)		MIC (T=10224h)		MIC (T=10248h)		MIC (T=10272h)		MIC (T=10296h)		MIC (T=10320h)		MIC (T=10344h)		MIC (T=10368h)		MIC (T=10392h)		MIC (T=10416h)		MIC (T=10440h)		MIC (T=10464h)		MIC (T=10488h)		MIC (T=10512h)		MIC (T=10536h)		MIC (T=10560h)		MIC (T=10584h)		MIC (T=10608h)		MIC (T=10632h)		MIC (T=10656h)		MIC (T=10680h)		MIC (T=10704h)		MIC (T=10728h)		MIC (T=10752h)		MIC (T=10776h)		MIC (T=10800h)		MIC (T=10824h)		MIC (T=10848h)		MIC (T=10872h)		MIC (T=10896h)		MIC (T=10920h)		MIC (T=10944h)		MIC (T=10968h)		MIC (T=10992h)		MIC (T=11016h)		MIC (T=11040h)		MIC (T=11064h)		MIC (T=11088h)		MIC (T=11112h)		MIC (T=11136h)		MIC (T=11160h)		MIC (T=11184h)		MIC (T=11208h)		MIC (T=11232h)		MIC (T=11256h)		MIC (T=11280h)		MIC (T=11304h)		MIC (T=11328h)		MIC (T=11352h)		MIC (T=11376h)		MIC (T=11400h)		MIC (T=11424h)		MIC (T=11448h)		MIC (T=11472h)		MIC (T=11496h)		MIC (T=11520h)		MIC (T=11544h)		MIC (T=11568h)		MIC (T=11592h)		MIC (T=11616h)		MIC (T=11640h)		MIC (T=11664h)		MIC (T=11688h)		MIC (T=11712h)		MIC (T=11736h)		MIC (T=11760h)		MIC (T=11784h)		MIC (T=11808h)		MIC (T=11832h)		MIC (T=11856h)		MIC (T=11880h)		MIC (T=11904h)		MIC (T=11928h)		MIC (T=11952h)		MIC (T=11976h)		MIC (T=12000h)		MIC (T=12024h)		MIC (T=12048h)		MIC (T=12072h)		MIC (T=12096h)		MIC (T=12120h)		MIC (T=12144h)		MIC (T=12168h)		MIC (T=12192h)		MIC (T=12216h)		MIC (T=12240h)		MIC (T=12264h)		MIC (T=12288h)		MIC (T=12312h)		MIC (T=12336h)		MIC (T=12360h)		MIC (T=12384h)		MIC (T=12408h)		MIC (T=12432h)		MIC (T=12456h)		MIC (T=12480h)		MIC (T=12504h)		MIC (T=12528h)		MIC (T=12552h)		MIC (T=12576h)		MIC (T=12600h)		MIC (T=12624h)		MIC (T=12648h)		MIC (T=12672h)		MIC (T=12696h)		MIC (T=12720h)		MIC (T=12744h)		MIC (T=12768h)		MIC (T=12792h)		MIC (T=12816h)		MIC (T=12840h)		MIC (T=12864h)		MIC (T=12888h)		MIC (T=12912h)		MIC (T=12936h)		MIC (T=12960h)		MIC (T=12984h)		MIC (T=13008h)		MIC (T=13032h)		MIC (T=13056h)		MIC (T=13080h)		MIC (T=13104h)		MIC (T=13128h)		MIC (T=13152h)		MIC (T=13176h)		MIC (T=13200h)		MIC (T=13224h)		MIC (T=13248h)		MIC (T=13272h)		MIC (T=13296h)		MIC (T=13320h)		MIC (T=13344h)		MIC (T=13368h)		MIC (T=13392h)		MIC (T=13416h)		MIC (T=13440h)		MIC (T=13464h)		MIC (T=13488h)		MIC (T=13512h)		MIC (T=13536h)		MIC (T=13560h)		MIC (T=13584h)		MIC (T=13608h)		MIC (T=13632h)		MIC (T=13656h)		MIC (T=13680h)		MIC (T=13704h)		MIC (T=13728h)		MIC (T=13752h)		MIC (T=13776h)		MIC (T=13800h)		MIC (T=13824h)		MIC (T=13848h)		MIC (T=13872h)		MIC (T=13896h)		MIC (T=13920h)		MIC (T=13944h)		MIC (T=13968h)		MIC (T=13992h)		MIC (T=14016h)		MIC (T=14040h)		MIC (T=14064h)		MIC (T=14088h)		MIC (T=14112h)		MIC (T=14136h)		MIC (T=14160h)		MIC (T=14184h)		MIC (T=14208h)		MIC (T=14232h)		MIC (T=14256h)		MIC (T=14280h)		MIC (T=14304h)		MIC (T=14328h)		MIC (T=14352h)		MIC (T=14376h)		MIC (T=14400h)		MIC (T=14424h)		MIC (T=14448h)		MIC (T=14472h)		MIC (T=14496h)		MIC (T=14520h)		MIC (T=14544h)		MIC (T=14568h)		MIC (T=14592h)		MIC (T=14616h)		MIC (T=14640h)		MIC (T=14664h)		MIC (T=14688h)		MIC (T=14712h)		MIC (T=14736h)		MIC (T=14760h)		MIC (T=14784h)		MIC (T=14808h)		MIC (T=14832h)		MIC (T=14856h)		MIC (T=14880h)		MIC (T=14904h)		MIC (T=14928h)		MIC (T=14952h)		MIC (T=14976h)		MIC (T=15000h)		MIC (T=15024h)		MIC (T=15048h)		MIC (T=15072h)		MIC (T=15096h)		MIC (T=15120h)		MIC (T=15144h)		MIC (T=15168h)		MIC (T=15192h)		MIC (T=15216h)		MIC (T=15240h)		MIC (T=15264h)		MIC (T=15288h)		MIC (T=15312h)		MIC (T=15336h)		MIC (T=15360h)		MIC (T=15384h)		MIC (T=15408h)		MIC (T=15432h)		MIC (T=15456h)		MIC (T=15480h)		MIC (T=15504h)		MIC (T=15528h)		MIC (T=15552h)		MIC (T=15576h)		MIC (T=15600h)		MIC (T=15624h)		MIC (T=15648h)		MIC (T=15672h)		MIC (T=15696h)		MIC (T=15720h)		MIC (T=15744h)		MIC (T=15768h)		MIC (T=15792h)		MIC (T=15816h)		MIC (T=15840h)		MIC (T=15864h)		MIC (T=15888h)		MIC (T=15912h)		MIC (T=15936h)		MIC (T=15960h)		MIC (T=15984h)		MIC (T=16008h)		MIC (T=16032h)		MIC (T=16056h)		MIC (T=16080h)		MIC (T=16104h)		MIC (T=16128h)		MIC (T=16152h)		MIC (T=16176h)		MIC (T=16200h)		MIC (T=16224h)		MIC (T=16248h)		MIC (T=16272h)		MIC (T=16296h)		MIC (T=16320h)		MIC (T=16344h)		MIC (T=16368h)		MIC (T=16392h)		MIC (T=16416h)		MIC (T=16440h)		MIC (T=16464h)		MIC (T=16488h)		MIC (T=16512h)		MIC (T=16536h)		MIC (T=16560h)		MIC (T=16584h)		MIC (T=16608h)		MIC (T=16632h)		MIC (T=16656h)		MIC (T=16680h)		MIC (T=16704h)		MIC (T=16728h)		MIC (T=16752h)		MIC (T=16776h)		MIC (T=16800h)		MIC (T=16824h)		MIC (T=16848h)		MIC (T=16872h)		MIC (T=16896h)		MIC (T=16920h)		MIC (T=16944h)		MIC (T=16968h)		MIC (T=16992h)		MIC (T=17016h)		MIC (T=17040h)		MIC (T=17064h)		MIC (T=17088h)		MIC (T=17112h)	
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Our Swine Health strategy

different mechanism for achieving gut health



Acidifiers

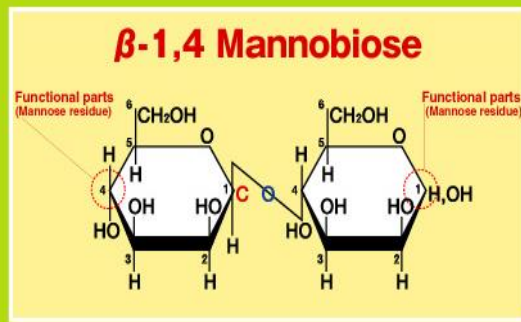
Gut health modifier

Block attachment & mucosal immune support

Hydrolyzed copra meal (MCM)

Contains Mannobiose

- Indigestible Disaccharide of Mannose
- *In vitro* binding affinity to Salmonella
- Supports a functional immune system

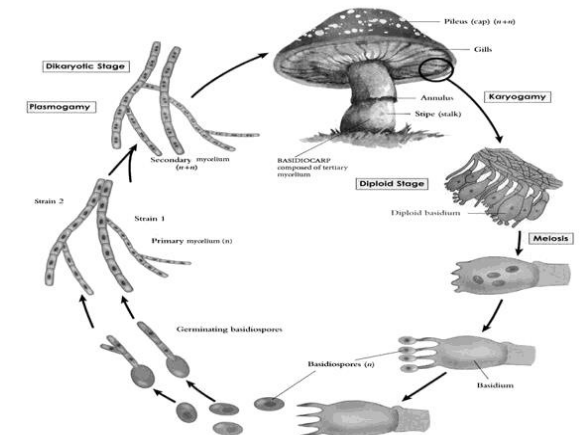


Fermented Rye (FR)

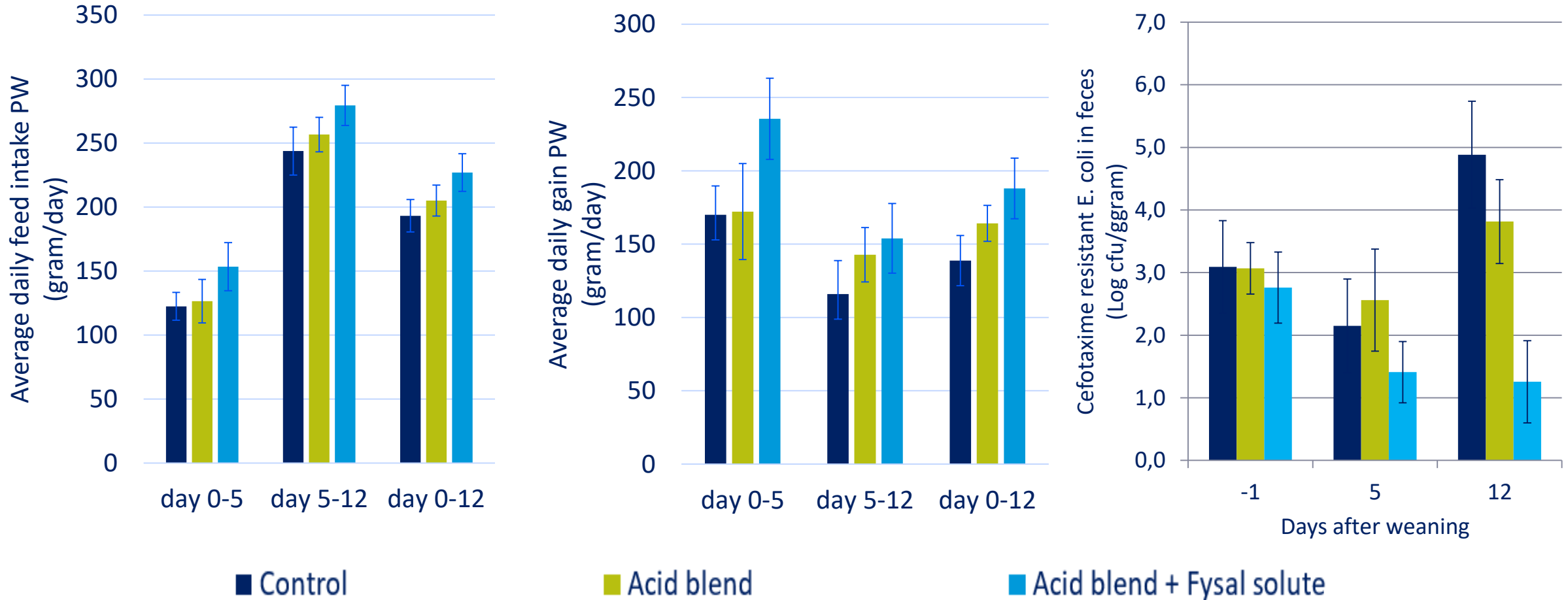
Rye overgrown with mycelium of Agaricus subrufescens

Contains: beta glucans, glycoproteins, bioactive peptides, prebiotics, phenolic compounds

- *In vitro* binding affinity to Salmonella and *E.coli*
- Supports a functional immune system
- Supports the growth beneficial bacteria



A better performance during *E.coli* challenged conditions



- **Conclusion:** The acid blend + fysal Solute numerically increase feed intake and growth under *E. coli* challenged conditions.

Selection, monitoring and treatment of raw materials



Feed safety overview

Raw material processors (Soya / MBM)

Microbial risk management

Transporting and
processing raw material

Feed millers (Commercial / Integrated)

Microbial risk management

Process moisture management

Mycotoxin risk management

Feed production

Farm

Mixer

Pelletiser
Extruder
Cooker

Cooler

Water



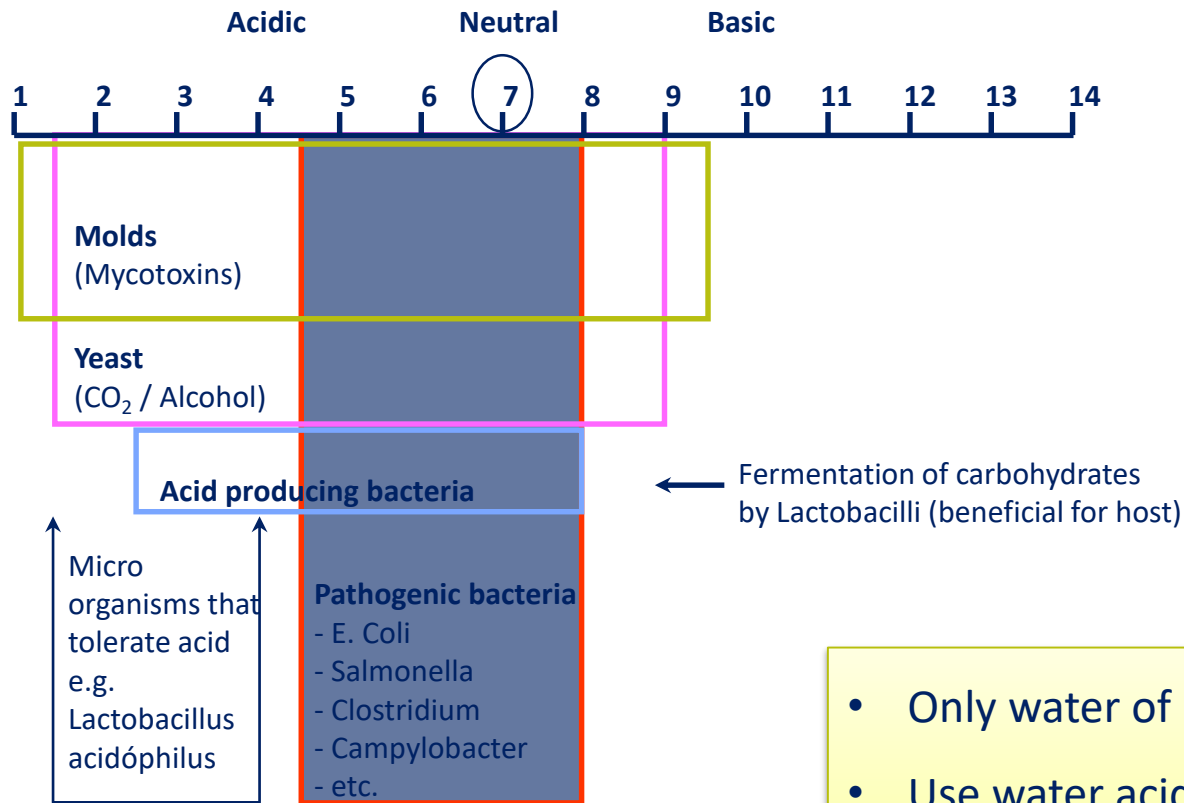
Milkiwean Vital Start: feed solutions

Water



Milkiwean Vital Start: feed solutions

Water



Gram negative bacteria
(*Salmonella*, *E.coli*) struggle to
survive at a pH below 4.

- Only water of drinking quality
- Use water acidification to support the weaned piglet stomach

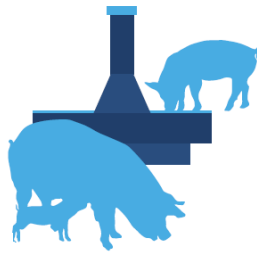
MKW Vital Start in practice





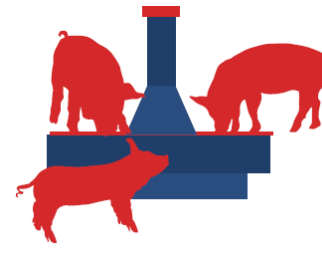
Phase 0

Less than 14 days
1 g – 2 g/piglet



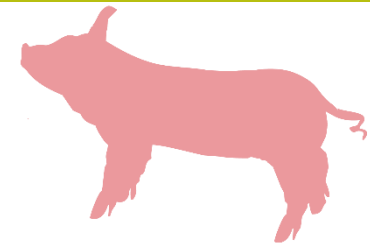
Phase 1

Less than 24 days
200 g – 1 kg/piglet



Phase 2

14-23 days
Less than 5 kg/piglet



Phase 3

32-70 days
Less than 20 kg/pig

Milk replacer

Creep Feed

Weaner Diet

**LINK/Grower
Diet**

Concentrates

Vario Taste

Vario Protein

Vario Fiber

Vario Health

Thank you

