Combined use of Feed Additives For Antibiotic reduction in swine

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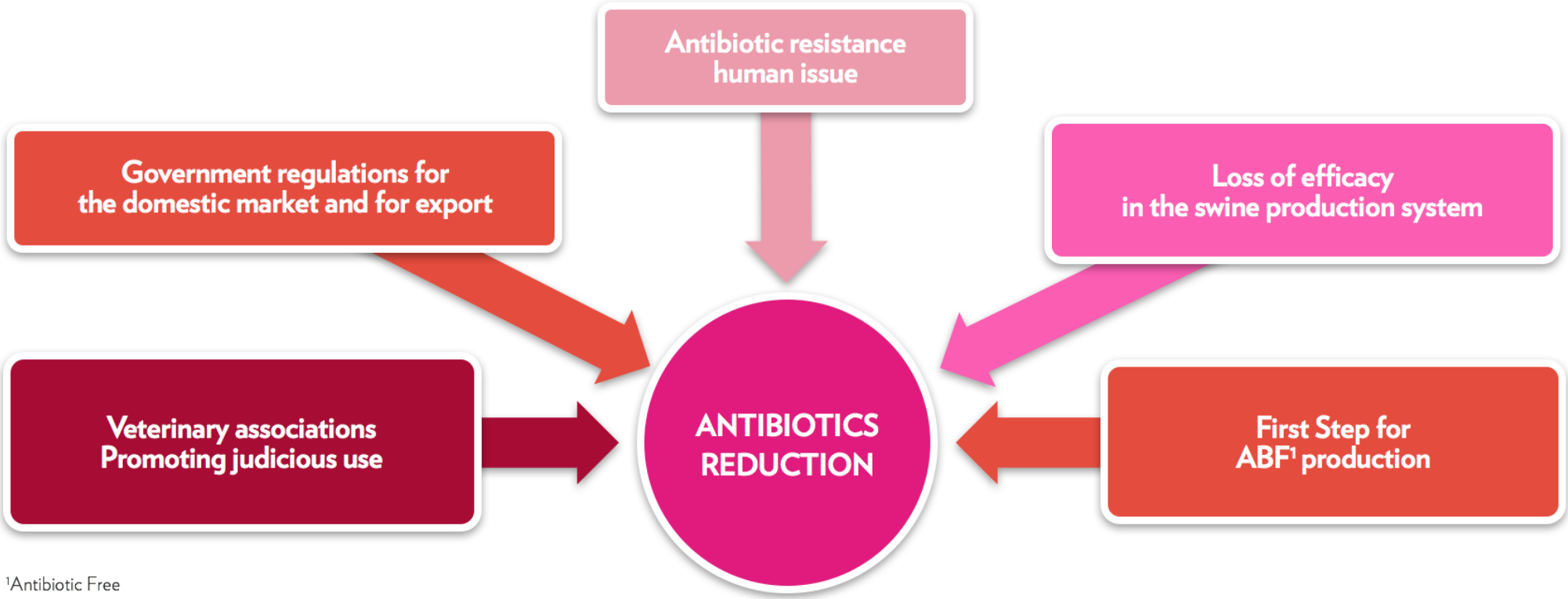
porkcalidad

overview

1. Key issues
2. Possible solutions
3. Combined solution
4. Take home message

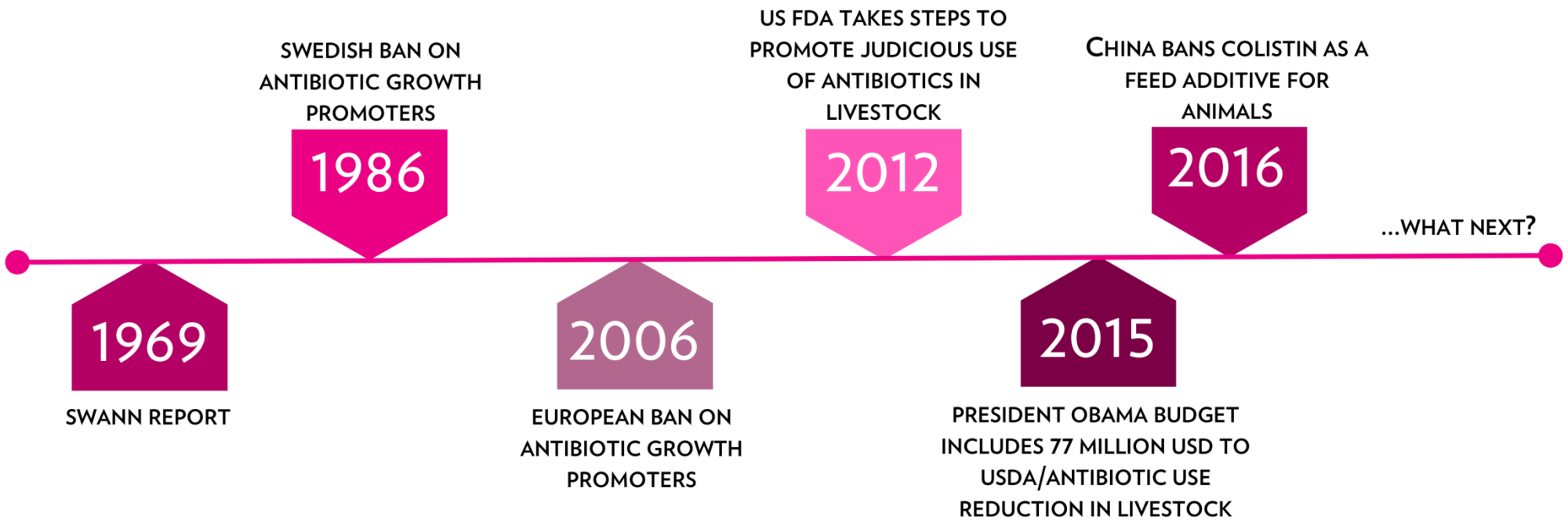
KEY ISSUES

Facts about the use of antibiotics



[1]Antibiotic Free

Facts about the use of antibiotics



> Overtime, social & political pressure lead to governmental regulations

A Major challenge

Post-weaning diarrhea in piglets

> Slow growth – low daily weight gain

> Decreased feed efficiency

> Increased veterinary costs and medicine

> Increased pig mortality

> Decreased efficiency of pen utilization and increased labour costs

> Less live weight sold from the farm and reduced profits

POSSIBLE SOLUTIONS

Strategies for successful antibiotic reduction

Management + biosecurity

> Cleaning & disinfecting

> Parity segregation

> All in – all out

> Weaning age (20 to 28 days)

> Space allocation

> Vaccines

Strategies for successful antibiotic reduction

Management + biosecurity

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> Weaning age (20 to 28 days)

> Space allocation

> Vaccines

Nutrition

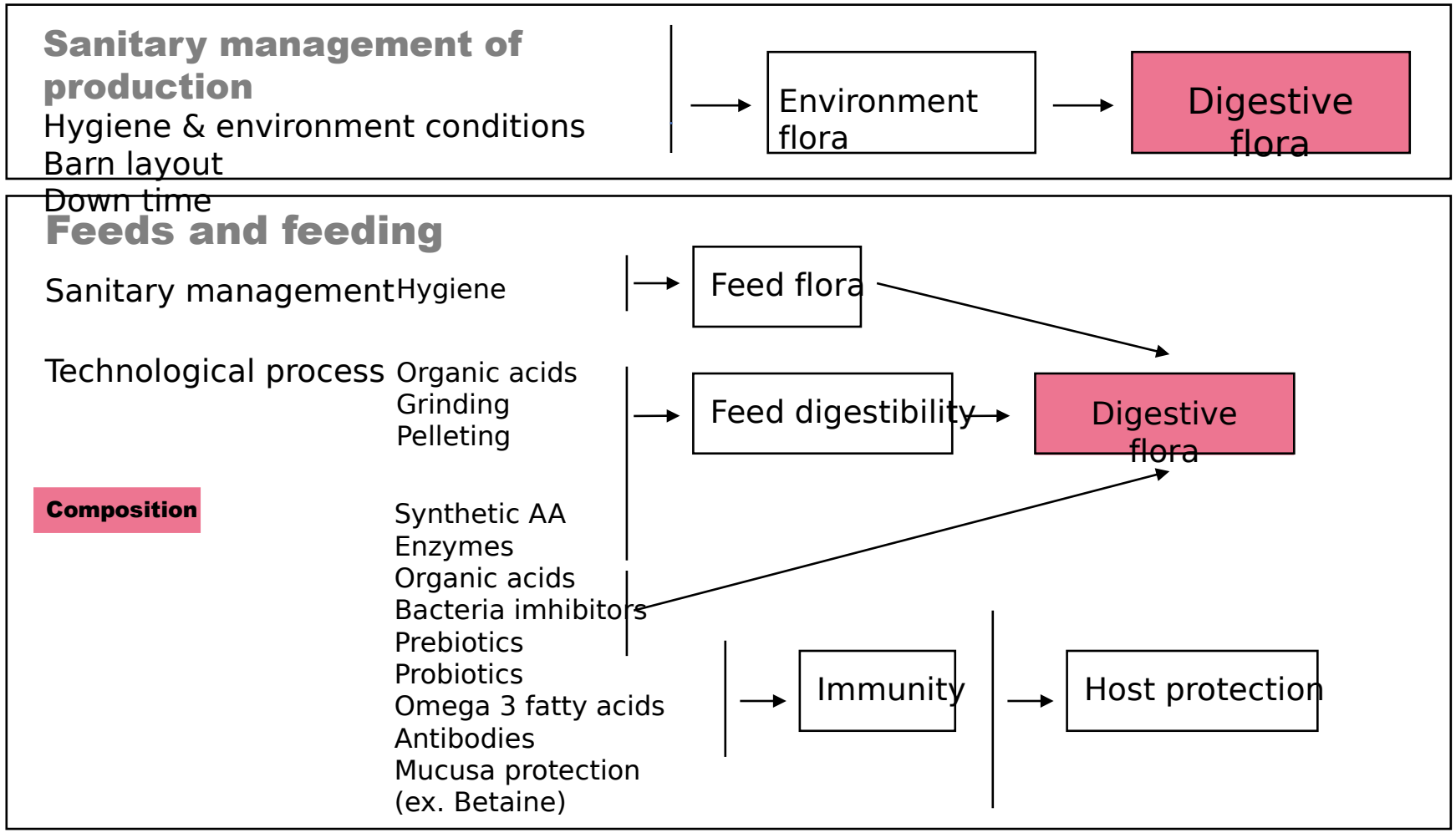
> Lower protein diet

> Buffering capacity

> Selected raw materials (high quality cereal grains)

> Supplementation of diets with alternative to antibiotics

Strategies for successful antibiotic reduction



(Adapted from Gabriel 2005)

Strategies for successful antibiotic reduction

Compound	Relative Effectiveness	Comments
Antibiotic growth promotants	+++++	The standard for comparison puposes.
Zinc oxide	+++++	Fed at 2000 to 3000 ppm for the first two weeks post weaning. Decrease in scours and improved performance.
Copper sulfate	+++	Improved performance at 200 to 250 ppm, similar (but independent) to antibiotics. largest effect in the nursery.
Plasma protein	+++	Increased feed intake and improved growth performance. Effects appear to be greater under unsanitary conditions.
Specific antibodies (egg yolk)	++	Limited data, but potentially promising. Result will likely depend on disease conditions.
Organic acids	+++	Likely most effective in newly weaned pigs. Inconsistent result.
Direct-fed microbials	++	Suggested to promote beneficial bacteria in the gut. Inconsistent results. May depend on strain selection.
Prebiotics	++	Suggested to promote beneficial bacteria in the gut. Research with oligosaccharides have shown beneficial results.
Enzymes	++	Potential benefit through improved digestibility of feed ingredients and subsequent improved gut health.
Bioactive peptides	++	Limited research. Some peptides have antibiotics properties and could have potential benefits.
Botanicals (herbs and spices)	+	More research is necessary. There are many potential products.
Essential oils	+	More research is necessary.

NCSU 2005

COMBINED SOLUTION

Antibiotics reduction

A COMBINED USE OF DIFFERENT ALTERNATIVES HOLDS THE MOST PROMISING SOLUTION

TO PROMOTE INTESTINAL HEALTH

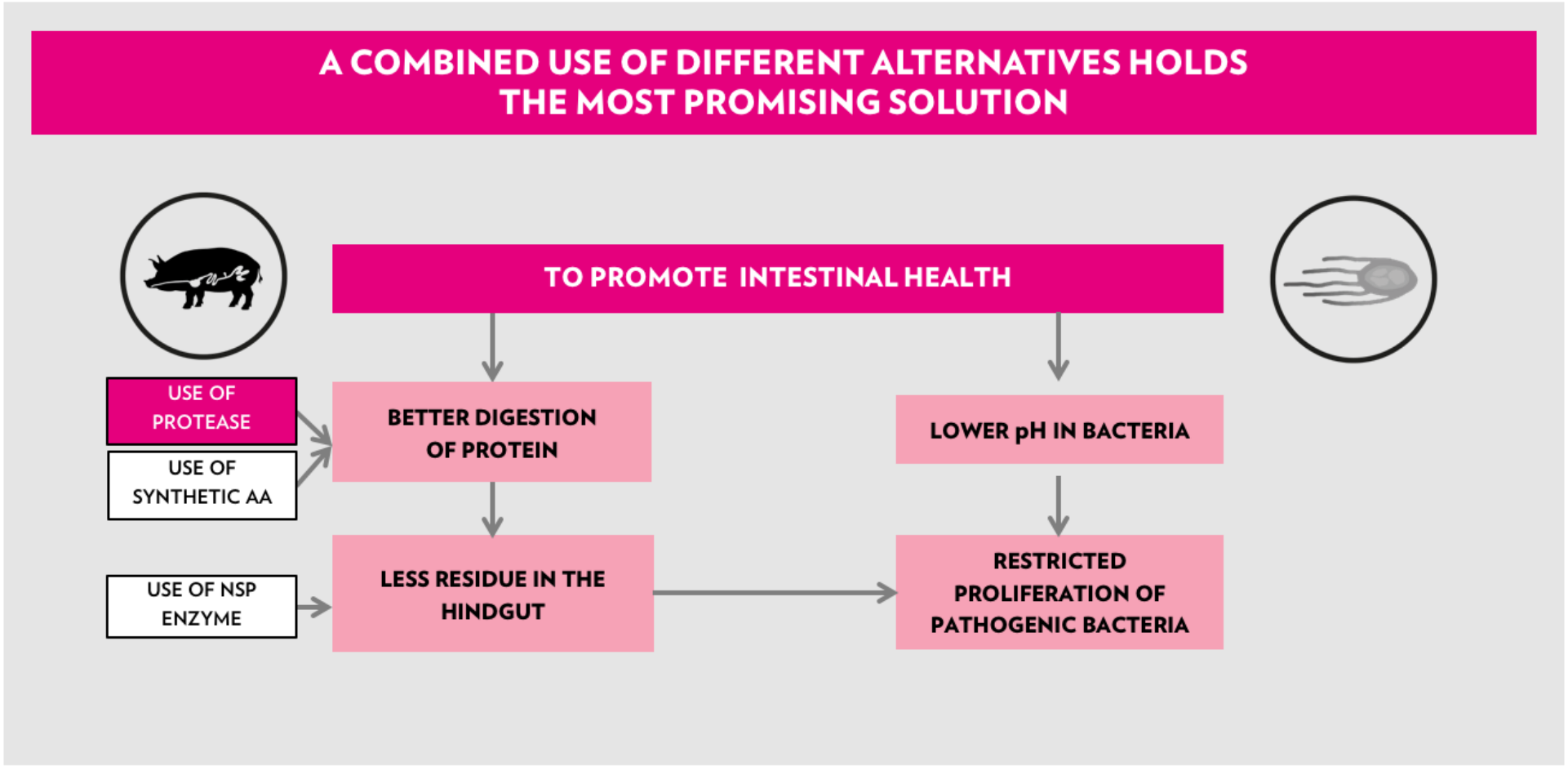
BETTER DIGESTION OF PROTEIN

LESS RESIDUE IN THE HINDGUT

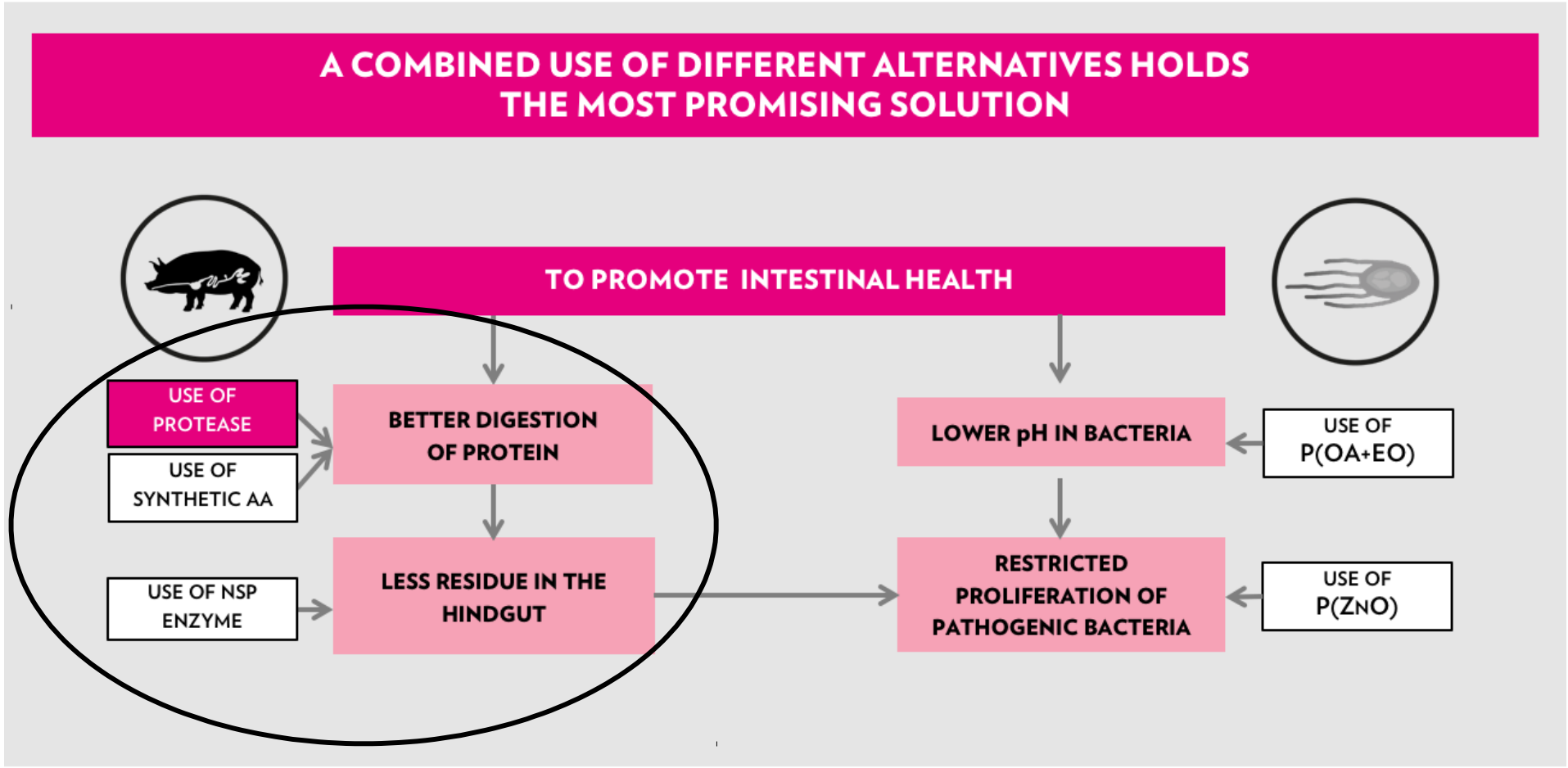
LOWER pH IN BACTERIA

RESTRICTED PROLIFERATION OF PATHOGENIC BACTERIA

Antibiotics reduction

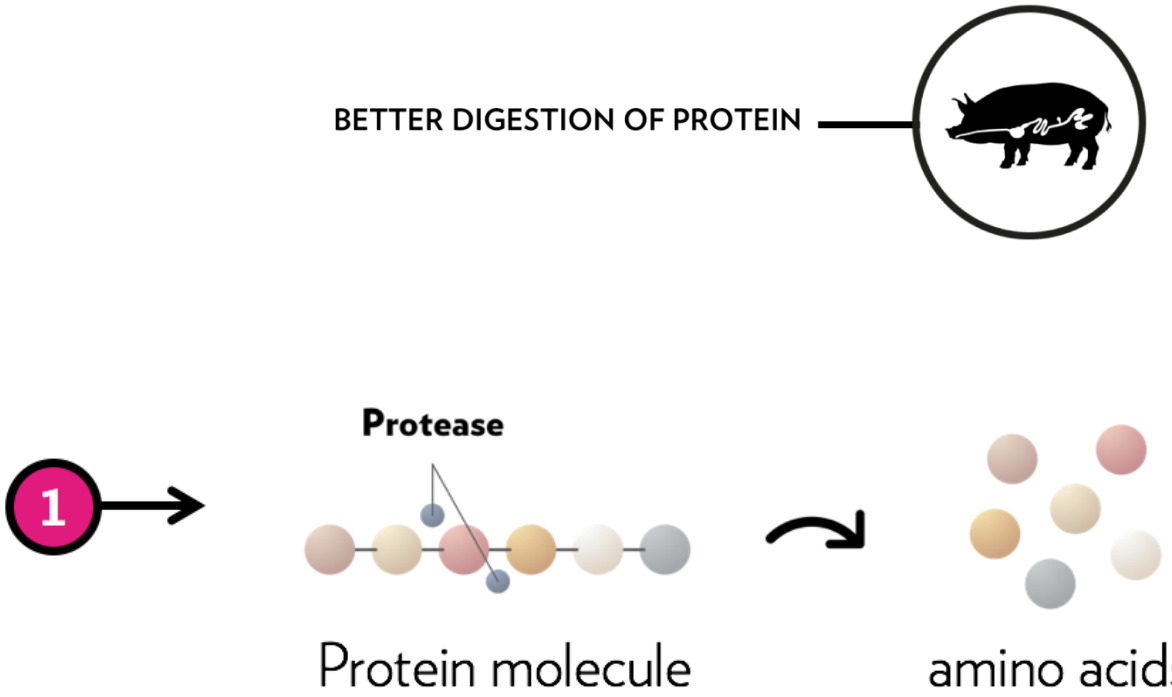


Antibiotics reduction



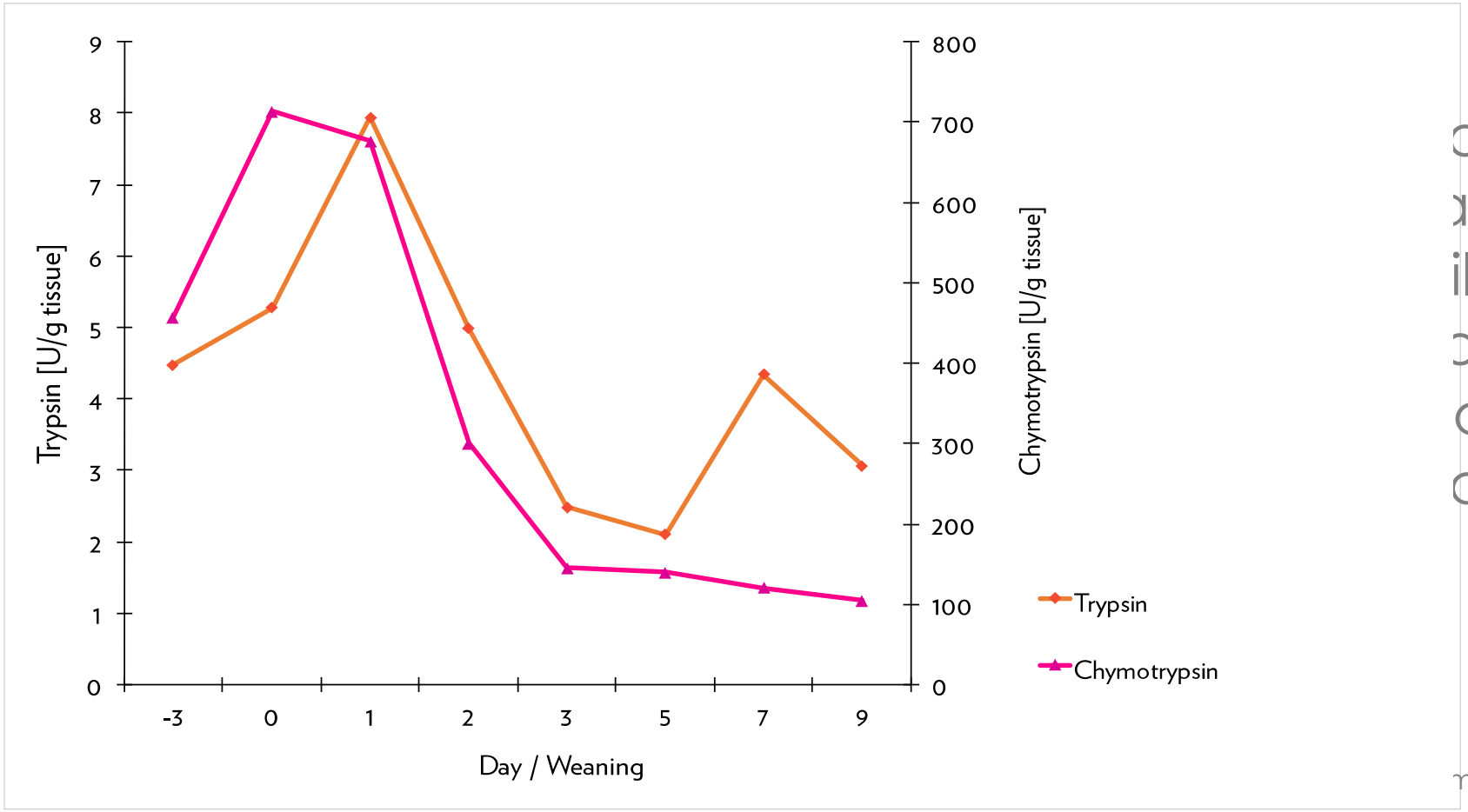
Protease

① Breaks down larger proteins into smaller fragments absorbed more easily in the small intestine



Protease
complements the action of endogenous proteases

BETTER DIGESTION OF PROTEIN



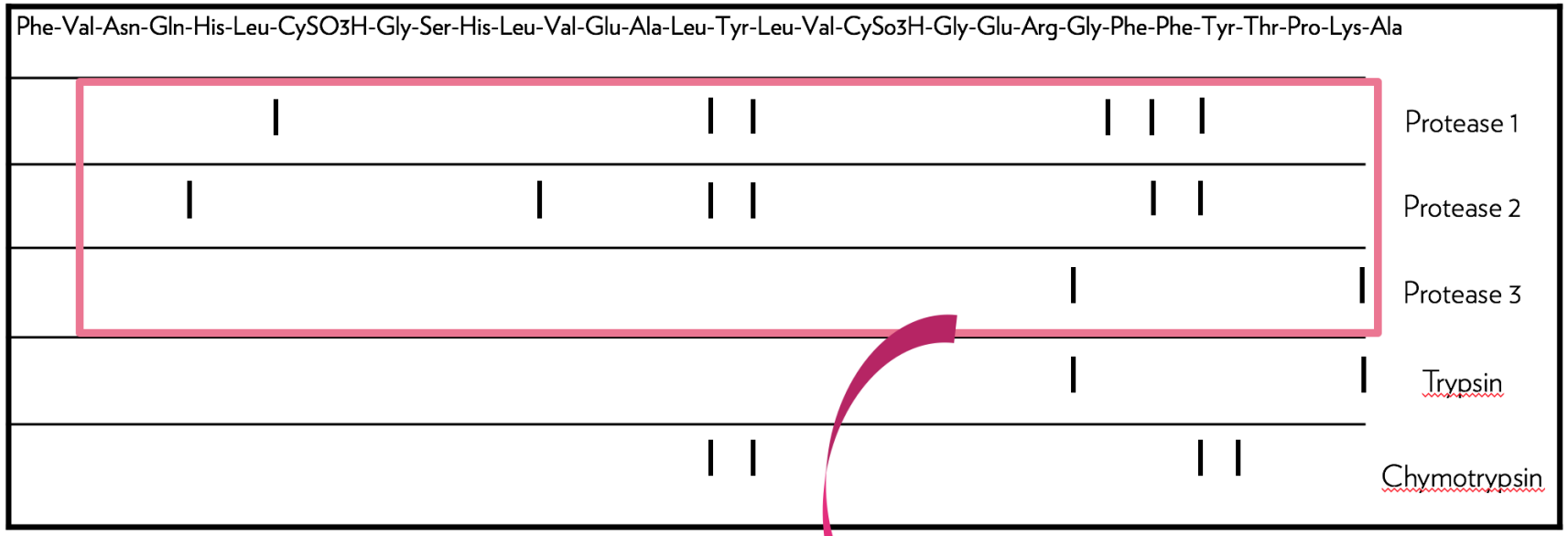
of enzymes in
atic tissue from
illed between 3
or to weaning at
of age and 9 days
aning

mann & Jensen (2004)

Protease
complements the action of endogenous proteases

BETTER DIGESTION OF PROTEIN

Action of Jefo protease (Hydrolyses the ß chain of an insulin molecule)



> A trypsin and chymotrypsin-like activity

14 cuts on insulin compared to 6 for trypsin and chymotrypsin

Jefo internal data

Protease
Improves digestibility

BETTER DIGESTION OF PROTEIN

Effect of Jefo protease on apparent ileal digestibility of crude protein, dry matter and amino acids of a complete feed for swine

	CONTROL (%)	JEFO PROTEASE (%)	DIFFERENCE	IMPROVEMENT (%)
CRUDE PROTEIN	74.9	78.4	3.5	+ 4.7
DRY MATTER	80.5	81.0	0.5	+ 0.6
AMINO ACIDS				
ARGININE	81.8	83.0	1.2	+ 1.5
HISTIDINE	82.2	85.7	3.5	+ 4.3
ISOLEUCINE	80.0	82.3	2.3	+ 2.9
LEUCINE	78.5	80.6	2.1	+ 2.7
LYSINE	80.6	84.2	3.6	+ 4.5
PHENYLALANINE	81.0	81.8	0.8	+ 1.0
THREONINE	68.0	70.7	2.7	+ 4.0
VALINE	76.4	80.1	3.7	+ 4.8
AVERAGE	**78.6**	**81.1**	**2.5**	**+ 3.2**

(University of Guelph, 2014)

Protease
Improves digestibility

BETTER DIGESTION OF PROTEIN

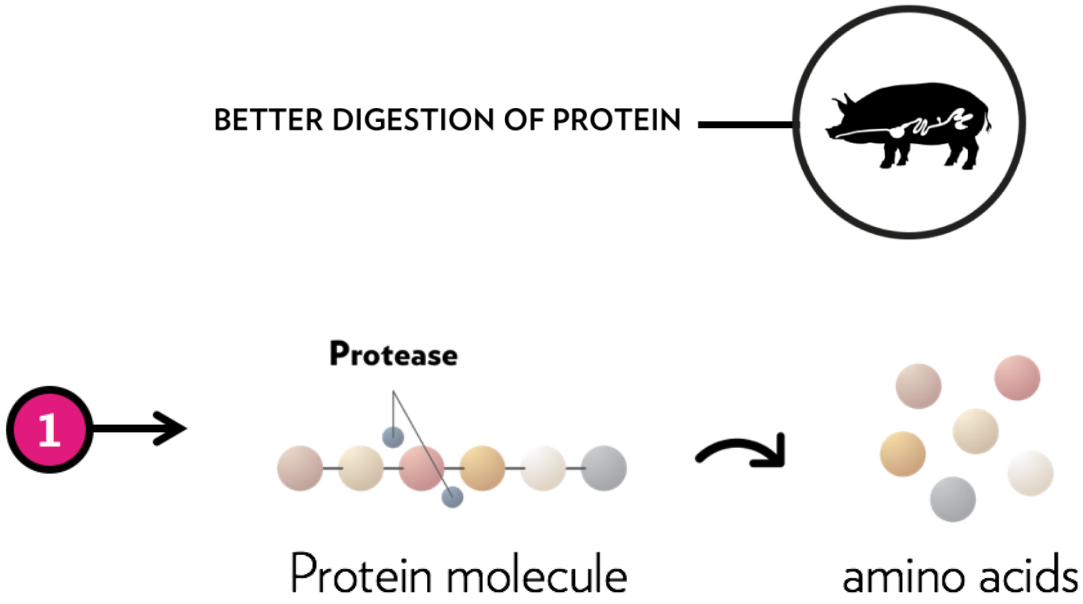
Get the most out of your raw materials

Don’t waste money, press your feedstuffs to their maximum !

Enhance the digestibility of protein sources in feeds

Protease

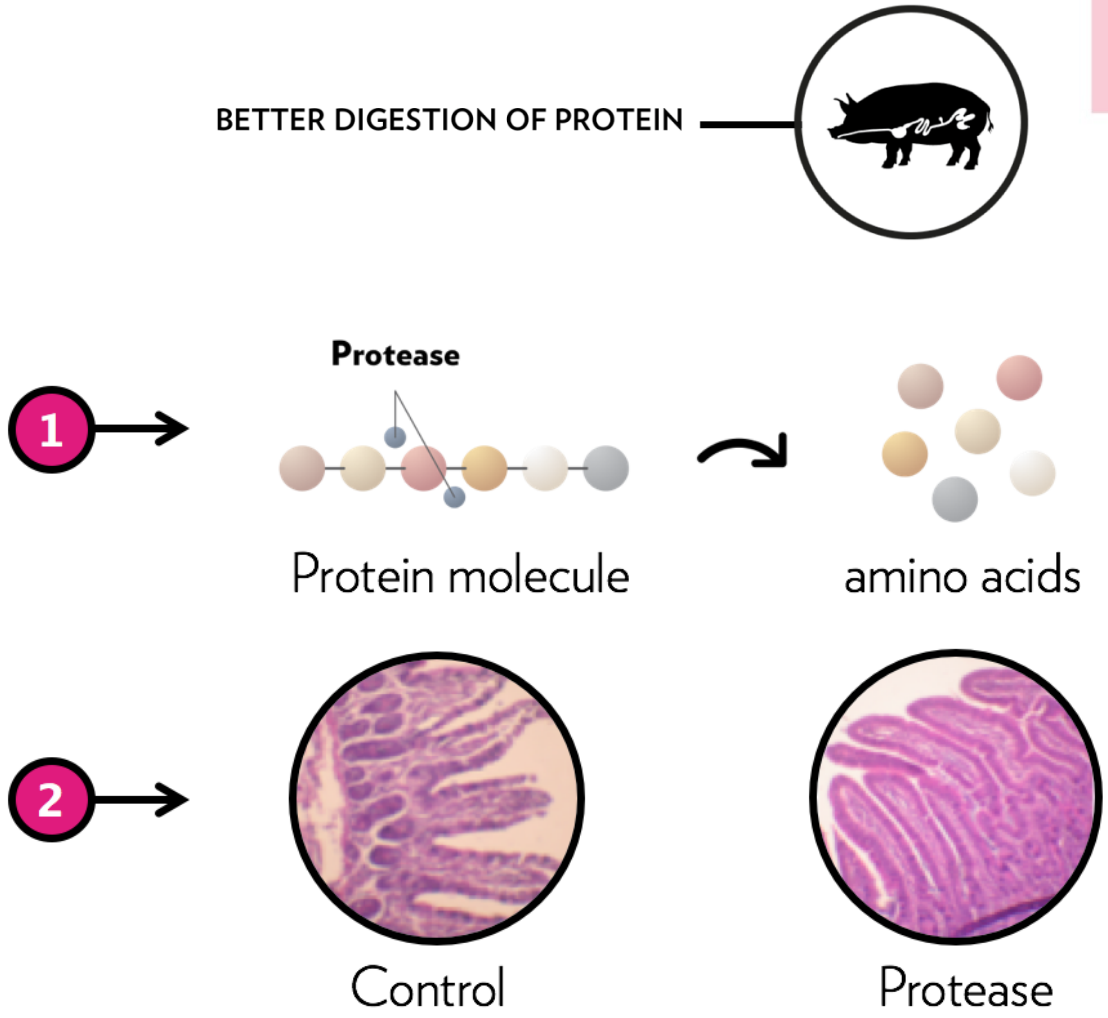
① Breaks down larger proteins into smaller fragments absorbed more easily in the small intestine



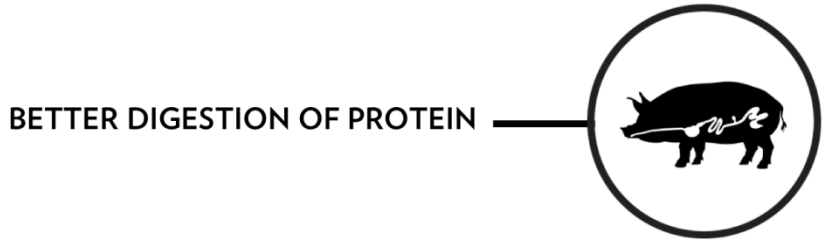
Protease

① Breaks down larger proteins into smaller fragments absorbed more easily in the small intestine

② Structural effect on the small intestine through an increase in villi size and number



Protease
Improves intestinal health



- Objective :

✓ To determine the effective dose of Protease in piglets nursery diets

✓ To determine Protease effect on top of feed formulated with cheaper (lower quality) raw materials

- Experimental Design :

  - 300 piglets (Pietrain x Duroc) x (Landrace x Yorkshire) weaned at 21d

  - 14 days trial (5 treatments x 6 reps of 10 piglets per pen)

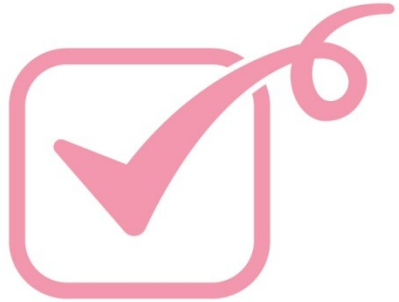
  - 5 treatments: basal diet

    basal diet (cheaper formula)

    basal diet + Jefo Protease (100, 200 and 300 ppm)

  - Pelleted feed (75°C)

(Zuo et al 2015)



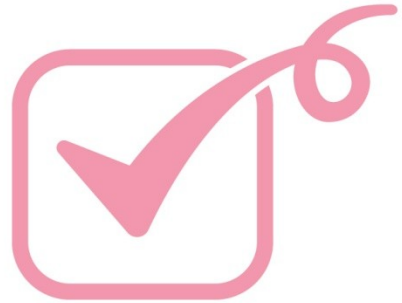
Protease
Improves intestinal health

BETTER DIGESTION OF PROTEIN

Ingredients	positive control	negative control
Corn (CP 8%)	415.10	412.10
Soybean	142.10	160.60
whey powder (CP 12%)	120.00	120.00
Soybean meal (CP 43%)	50.00	100.00
Flour	50.00	50.00
Concentrated whey protein (CP 34%)	50.00	0
Concentrated soybean protein (CP 64%)	30.00	40.00
Spray-dry plasma (CP 78%)	30.00	30.00
Fishmeal	30.00	0
Glucose	25.00	25.00
sucrose	20.00	20.00
Calcium hydrogen phosphate	7.00	11.50
soy oil	7.60	5.20
L-Lysine	3.10	4.00
Limestone	3.60	4.00
ZnO	2.50	2.50
L-Threonine	1.20	1.80
DL-Methionine	1.30	1.70
Choline	1.000	1.000
L-Tryptophan	0.500	0.600
premix	10.000	10.000
Total	1000.00	1000.00
price, RMB/t	6500.00	5900.00

Nutritional levels (calculated)	positive control	negative control
DE, MJ/kg	14.52	14.52
DE, kcal/kg	3470	3470
CP, %	21.00	21.00
Ca, %	0.60	0.60
P, %	0.45	0.45
NaCl, %	0.55	0.55
Lysine, %	1.53	1.54
Met+Cys, %	0.86	0.87
Threonine, %	1.06	1.05
Tryptophan, %	0.31	0.32
Arginine, %	0.65	0.64
Valine, %	1.08	1.09
Leucine, %	1.53	1.55
Isoleucine, %	0.86	0.87
Histidine, %	0.50	0.48
Phenylalanine, %	0.94	0.94

note: contents provided by premix (per kg feed): Fe 305 mg, Cu 250 mg, Mn 51 mg, Zn 1910 mg, I 0.5 mg, Se 0.5 mg, Co 0.5 mg, VA 19200IU, VD3 4800 IU, VE 60 IU, VK3 6 mg, VB1 6 mg, VB2 12 mg, VB6 7.2 mg, VB12 0.05 mg, Niacinamide 60 mg, Ca pantothenate 30 mg, Folic acid 3.6 mg, Biotin 0.6 mg



(Zuo et al 2015)

Protease
Improves intestinal health

BETTER DIGESTION OF PROTEIN

Effect of Protease supplementation on the morphology of small intestinal mucosa of weaned piglets

指标 Items	部位 Sites	正对照组 Postive control	负对照组 Negative control	负对照(NC)＋ 100g/T	负对照(NC)＋ 200g/T	负对照(NC)＋ 300g/T
绒毛高度（μm） Villus height	十二指肠 Duodenum	345.13±31.57^{a}	316.84±25.46^{b}	328.19±25.79^{ab}	350.20±19.28^{a}	343.46±24.01^{a}
	空肠 Jejunum	339.46±23.29^{a}	304.36±30.45^{b}	320.07±23.91^{ab}	342.52±26.03^{a}	346.87±21.85^{a}
	回肠 Ileum	331.55±16.82^{a}	320.62±25.41^{b}	330.41±19.66^{a}	333.86±20.59^{a}	329.15±18.06^{a}
隐窝深度（μm） Crypt depth	十二指肠 Duodenum	299.31±21.60^{ab}	305.34±24.08^{a}	292.92±17.95^{ab}	282.24±22.99^{b}	275.83±25.58^{b}
	空肠 Jejunum	289.04±18.58	295.50±20.00	288.35±19.95	283.07±20.26	288.89±21.52
	回肠 Ileum	285.15±20.20^{b}	306.89±19.15^{a}	284.96±19.90^{b}	284.36±20.03^{b}	278.92±17.24^{b}
VH/CD	十二指肠 Duodenum	1.15±0.10^{ab}	1.04±0.13^{b}	1.12±0.03^{ab}	1.24 ±0.02^{a}	1.25 ±..08^{a}
	空肠 Jejunum	1.17±0.05^{ab}	1.03±0.05^{b}	1.11±0.06^{b}	1.21±0.05^{a}	1.20 ±0.04^{a}
	回肠 Ileum	1.16±0.04^{a}	1.04±0.09^{b}	1.16±0.02^{a}	1.17 ±0.01^{a}	1.18 ±0.12^{a}

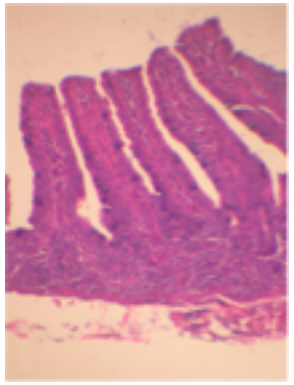
Values within a row with different superscripts differ significantly ($P<0.05$)

(Zuo et al 2015)

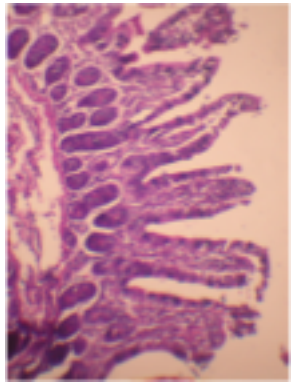
Protease
Improves intestinal health

BETTER DIGESTION OF PROTEIN

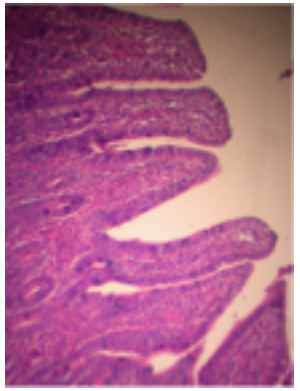
Effect of Protease supplementation on the morphology of small intestinal mucosa of weaned piglets



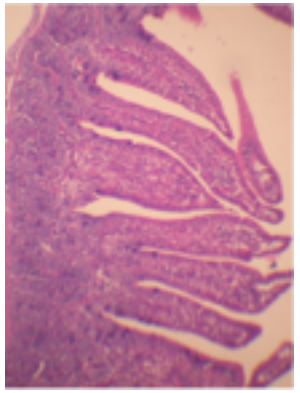
Control



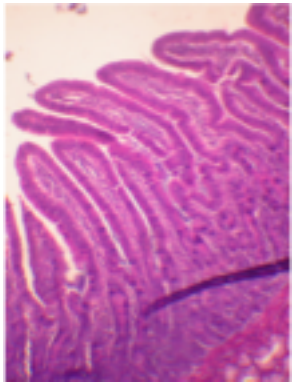
Negative control



Negative control +100 ppm Protease



Negative control +200 ppm Protease



Negative control +300 ppm Protease

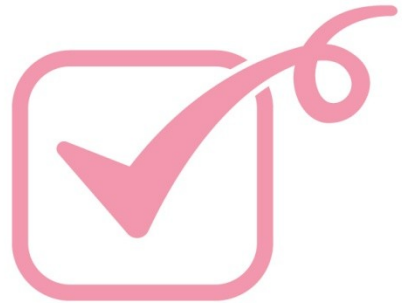
(Zuo et al 2015)

Protease
Improves intestinal health

BETTER DIGESTION OF PROTEIN

Effect of Protease supplementation on the growth performance and diarrhoea incidence of weaned piglets

Items	Positive control	Negative control	Negative control +100mg/kg	Negative control +200mg/kg	Negative control +300 mg/kg
Initial weight, kg	6.27±0.00	6.27±0.00	6.27±0.00	6.27±0.00	6.27±0.00
Final weight, kg	10.21±0.37	9.89±0.48	10.12±0.39	10.39±0.47	10.37±0.44
Average daily gain, g	281.12±26.46	258.19±34.30	274.69±27.56	293.95±33.52	292.64±29.70
Average feed intake, g	329.36±26.83	312.32±27.76	327.00±26.14	343.44±30.48	344.80±33.33
Feed/gain	1.17±0.03	1.21±0.04	1.19±0.04	1.17±0.03	1.18±0.02
Diarrhea index, %	1.79±0.81^{b}	3.37±0.76^{a}	2.34±0.95^{b}	1.84±0.69^{b}	1.91±0.83^{b}



(Zuo et al 2015)

Protease
2 ways to make profits

BETTER DIGESTION OF PROTEIN

Effect of Protease supplementation on the growth performance and diarrhoea incidence of weaned piglets

① « on top » of feed formula (low density diets)

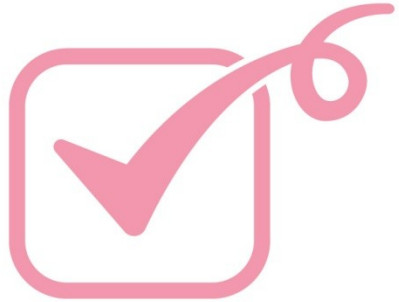
> Improve production performance (ADG, Feed conversion, etc.)

> Reduce raw material qualitiy variations

② With its matrix uplift for maximisation of protein digestibility

> Allows feed cost savings

Improved protein digestibility requires less protein raw material in feed formula

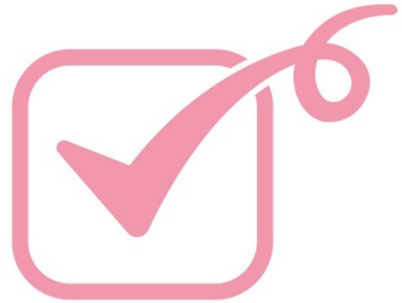


Protease
with matrix uplift

BETTER DIGESTION OF PROTEIN

Savings* CAD $10.21 per metric ton

Ingredients	-Jefo Protease Amount	$/MT	+Jefo Protease Amount
Corn	453.650	220.00	474.575
Lactoseum powder	200.000	1,450.00	200.000
Soybean meal	188.000	660.00	172.000
Plasma AP-920	50.000	5,450.00	50.000
AP-301 G	25.000	2,350.00	25.000
Corn DDGS	-	325.00	-
Animal fat	45.000	810.00	40.000
Calcium carbonate	14.000	70.00	14.000
Salt	-	150.00	-
Dicalcium phosphate	8.000	790.00	8.000
Lysine HCl	1.700	1,850.00	1.700
Threonine	1.250	2,500.00	1.250
DL-Methionine	1.350	4,000.00	1.300
Tryptophane	0.300	22,000.00	0.300
Micro-premix	10.000	3,350.00	10.000
Zinco Plus	0.750	-	0.750
Porcinat +	1.000	-	1.000
Jefo Protease	-	-	0.125
Total	1000.00		1000.00
Formula cost (CAD $)	957.65		947.45



Protease
improves performance

BETTER DIGESTION OF PROTEIN

Effect of Protease supplementation on top and with matrix uplift on the growth performance of weaned piglets

THE TRIAL

The objective of this trial was to compare performance and economic advantage of nursery pigs fed protease supplemented diet with and without optimization by matrix value to original diet fed as control.

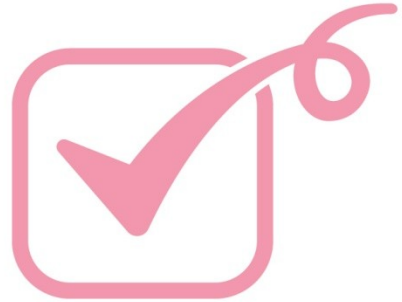
360 PIC mixed sex piglets allocated in 32 pens
(10 piglets per pen balanced per weight and gender, 12 pens per treatment).

3 treatments:

- T1: Control
- T2: Control + Jefo Protease on top
- T3: Control + Jefo Protease with matrix valorization (with half energy matrix)

Piglets were fed per phase and weighed weekly at days 0, 7, 21 and 42 and feed consumption calculated accordingly.

Non medicated corn-soybean meal based diets were delivered in pellet form and *ad libitum* to the pigs.



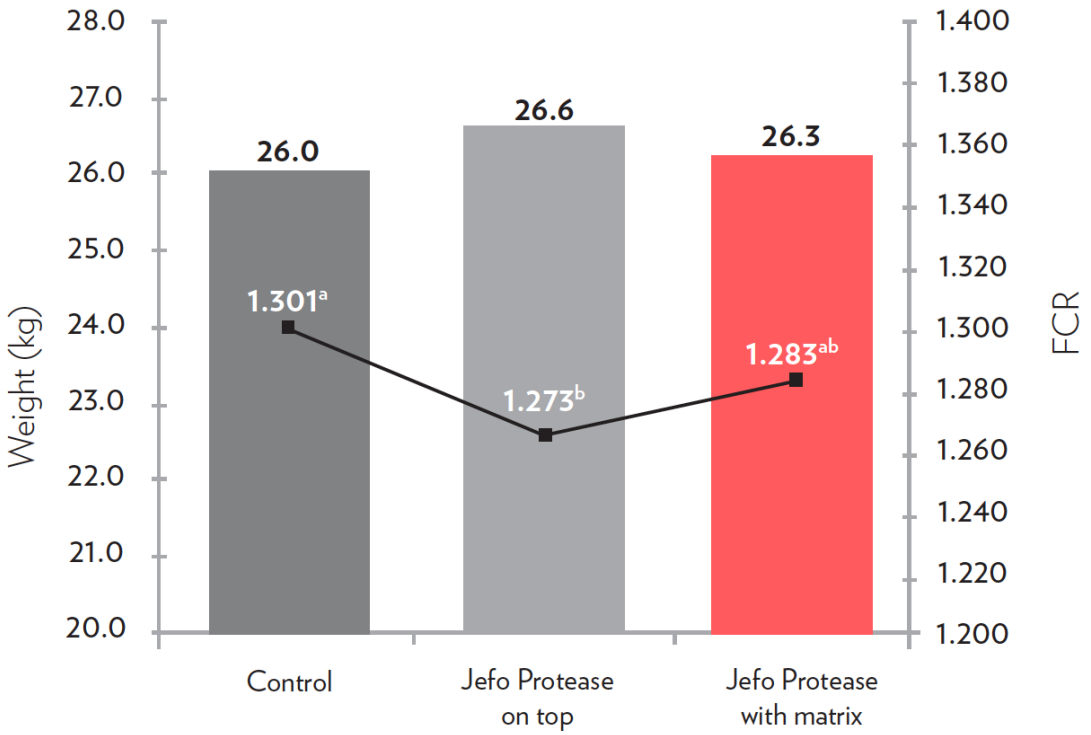
(Jefo internal data 2017)

Protease
improves performance

BETTER DIGESTION OF PROTEIN

Effect of Protease supplementation on top and with matrix uplift on the growth performance of weaned piglets

Figure 1. Body weight at day 42 and Feed Conversion Ratio (FCR) 0-42d



(Jefo internal data 2017)

Protease
improves performance

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Effect of Protease supplementation on top and with matrix uplift on the growth performance of weaned piglets

Table 2. Overall economic comparison (USD)[1]

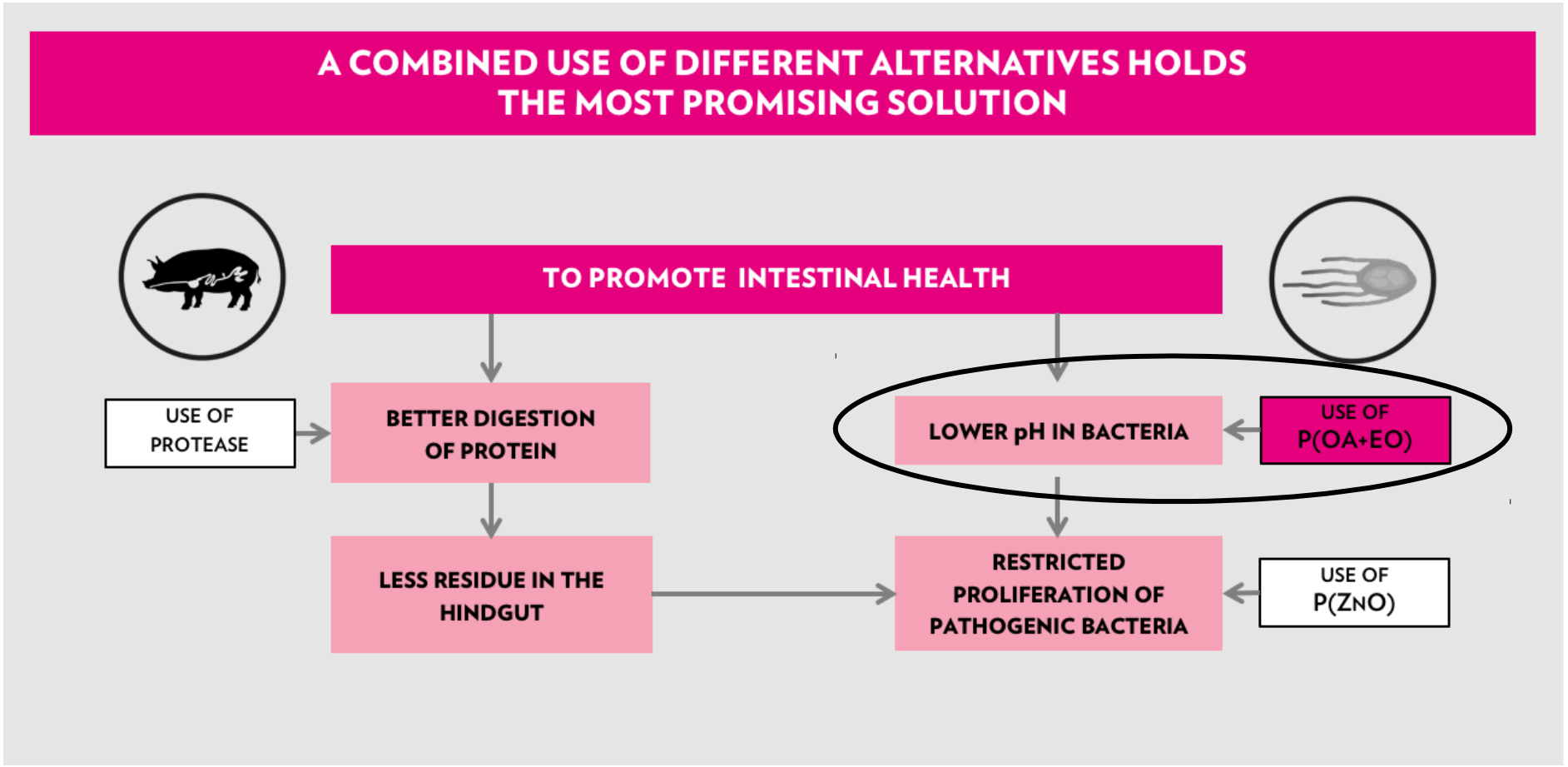
	Control	Jefo Protease on top	Jefo Protease with matrix
OVERALL (d 0-42)			
Feed cost/ pig, $	12.27	12.33	12.13
IOFC[2], $	33.14	33.54	33.48

[1] A price of $50/head for each pig was calculated for total revenue with 0.77 cents bonus for additional kg over 25.5kg

[2] Income over feed cost = value of pig- feed costs during trial period – facility cost ($5.00/pig)

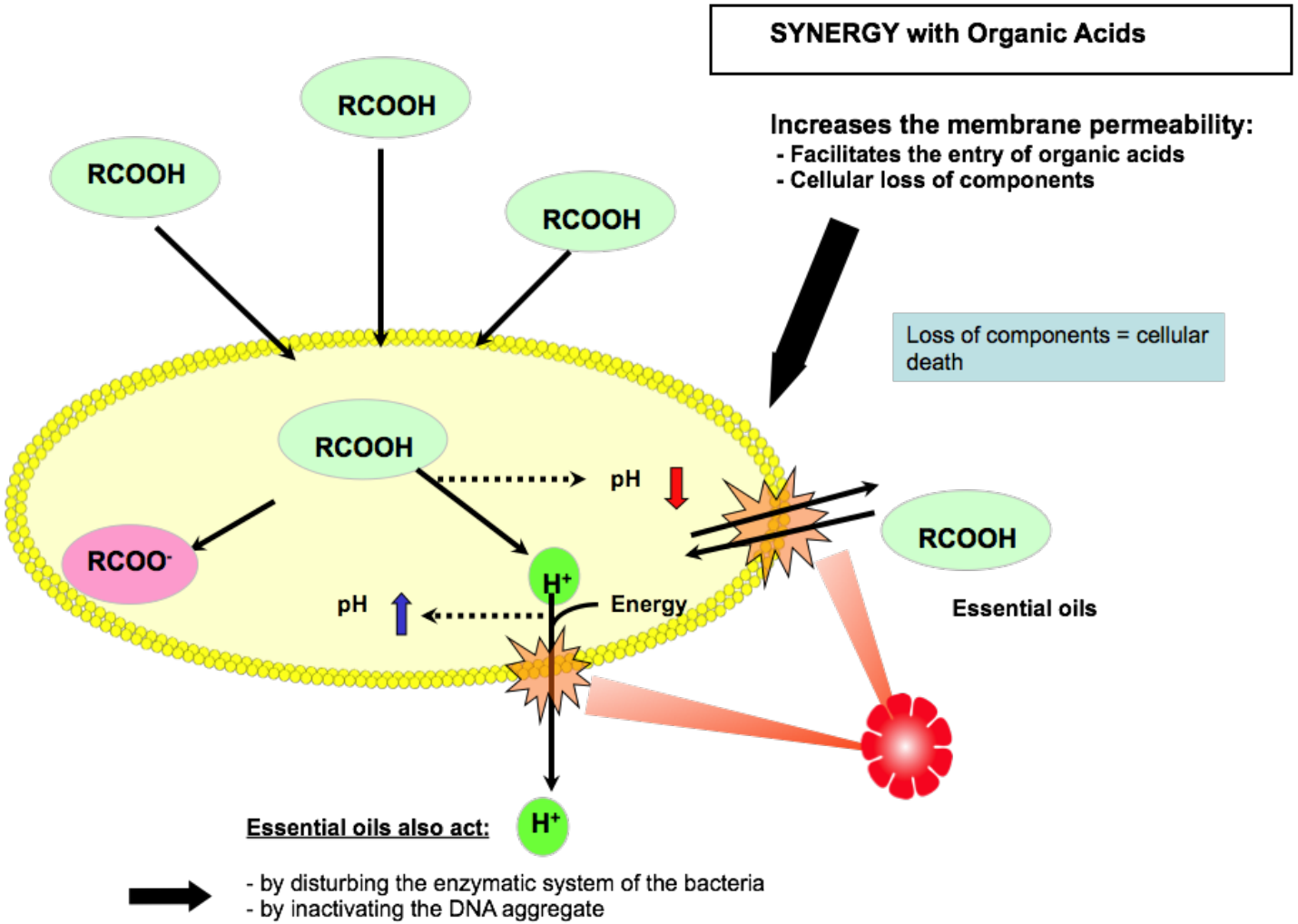
(Jefo internal data 2017)

Antibiotics reduction



Targeting the bacteria

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



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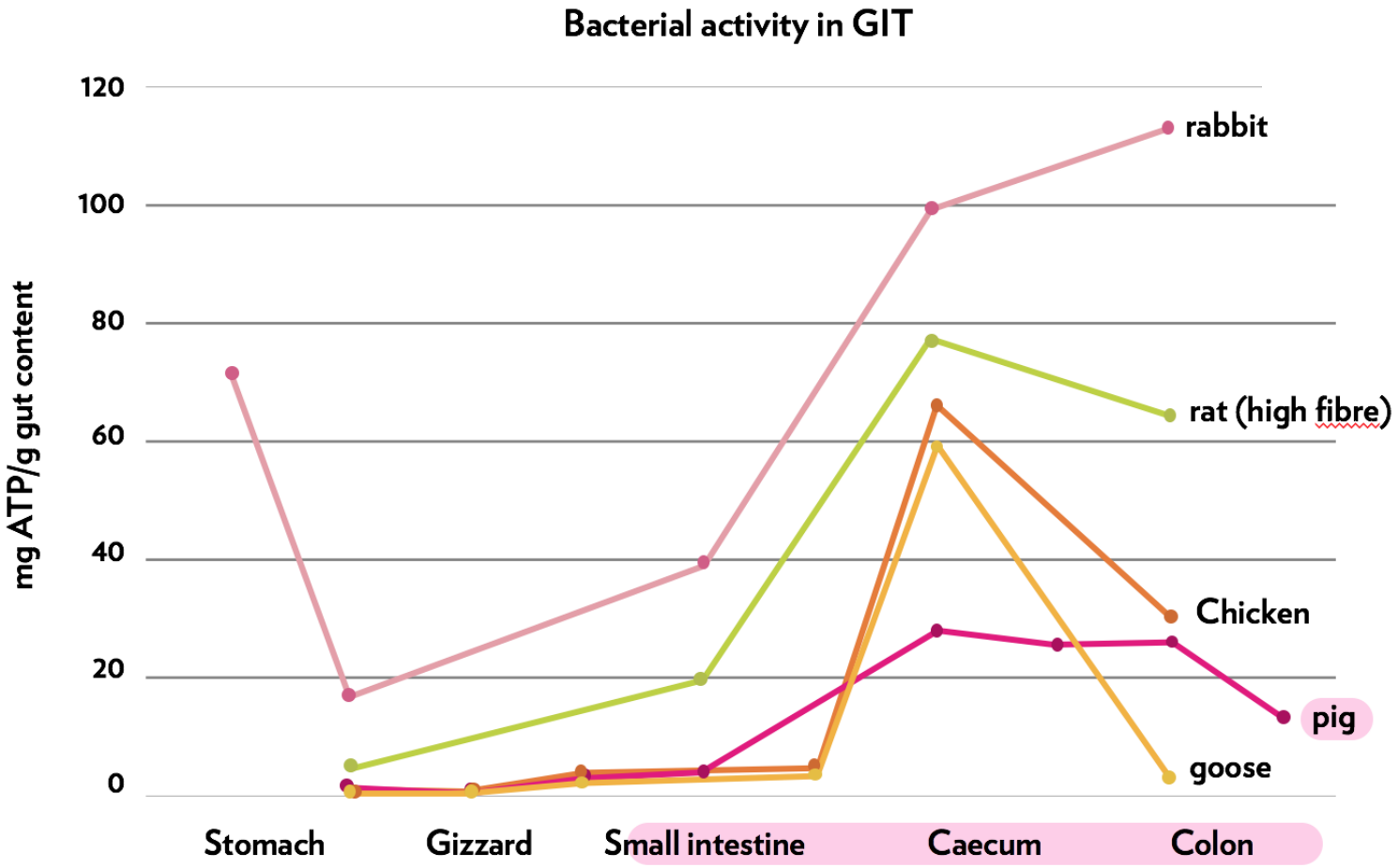
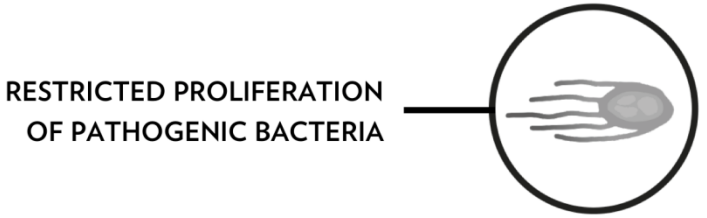
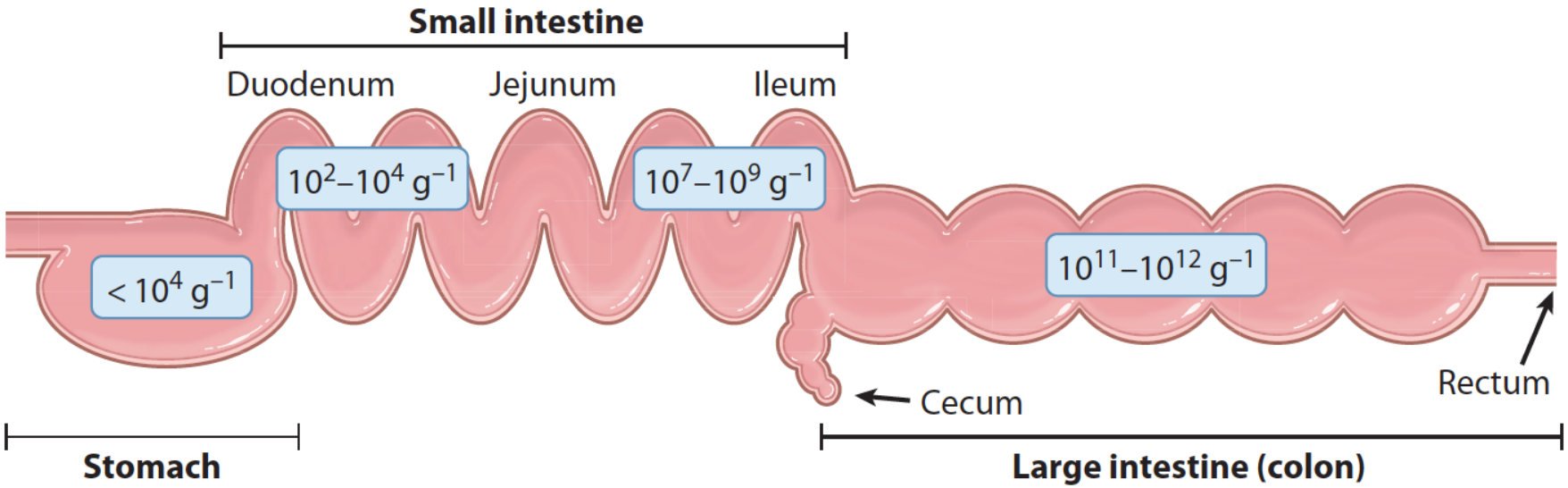


(Jensen, 1993 cited by Mul et al. 1994)

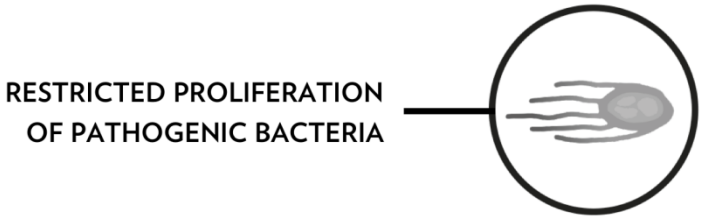
Targeting the bacteria





(From Kleerebezem et al. 2009)

Targeting the bacteria



Organic acids and pH in GIT

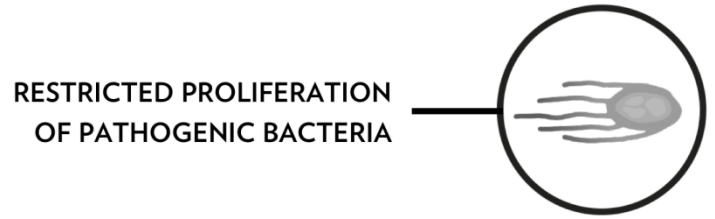
Acid pH

Stomach

Basic pH

Intestines

Targeting the bacteria



Organic acids and pH in GIT

Acid pH

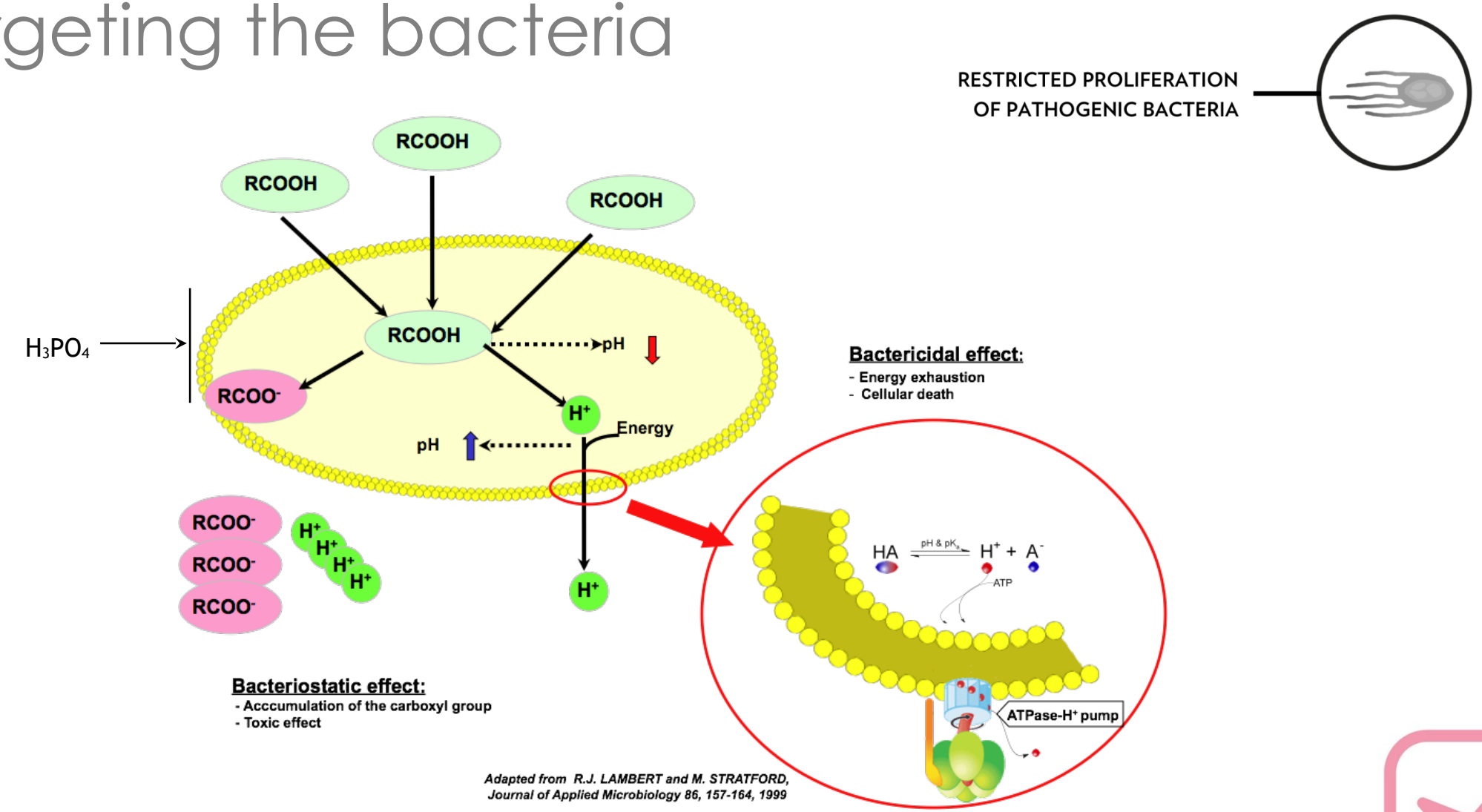
Stomach

Basic pH

Intestines

Targeting the bacteria

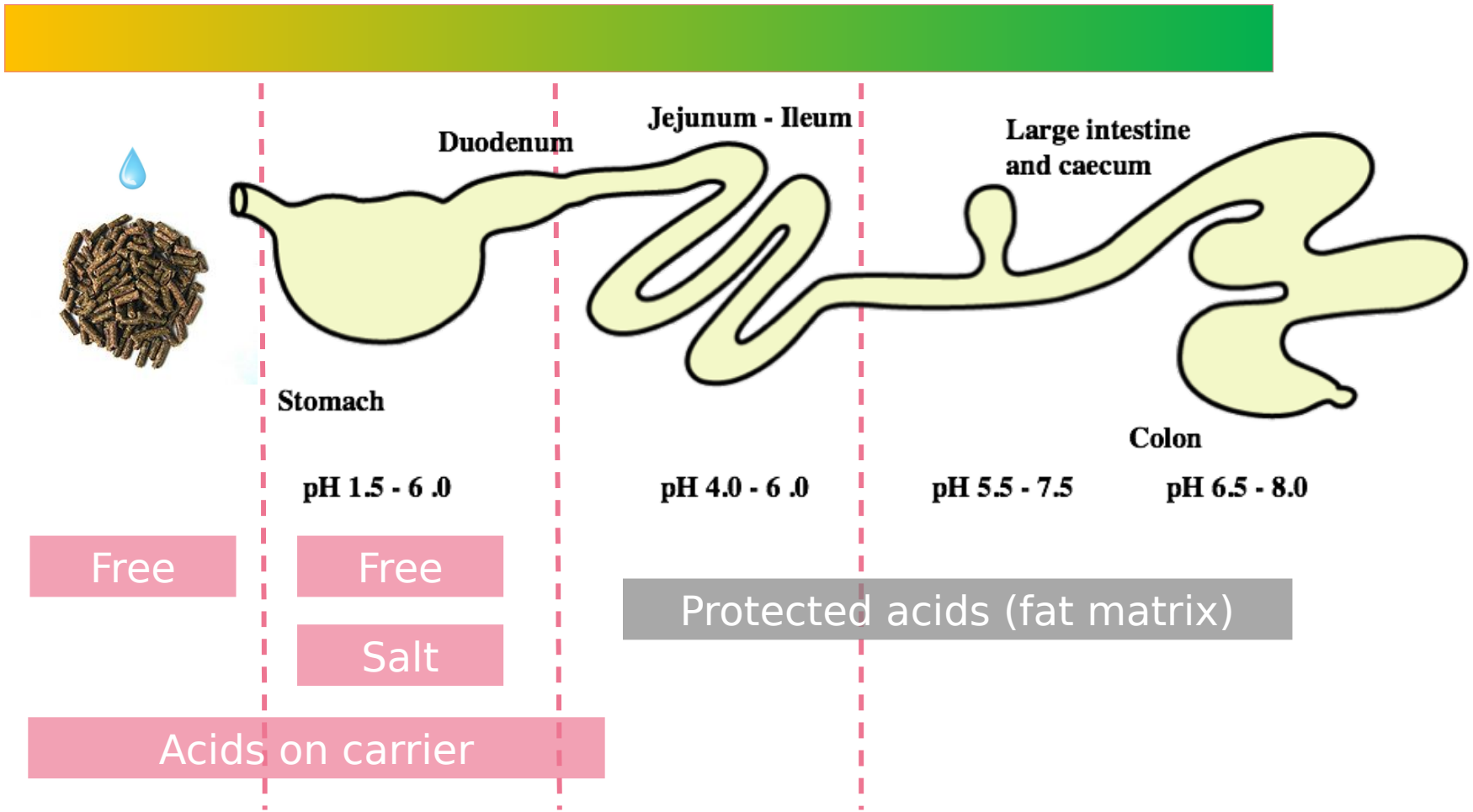
RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



Adapted from R.J. LAMBERT and M. STRATFORD, Journal of Applied Microbiology 86, 157-164, 1999

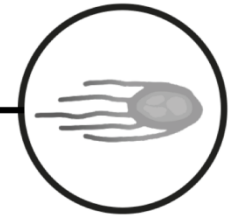
Targeting the bacteria

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



Matrix Technology

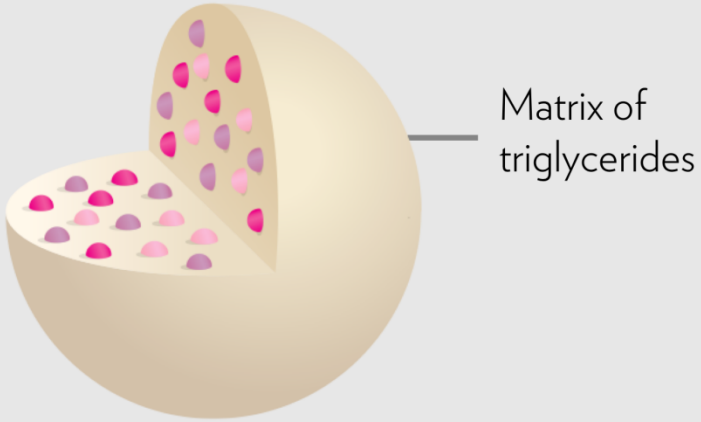
RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

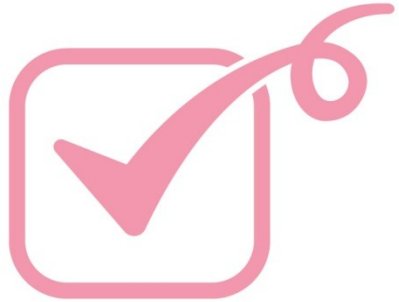


SELECTION OF ORGANIC ACIDS AND ESSENTIAL OILS

Essential Oils Organic Acids

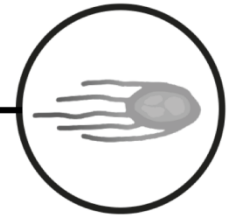
JEFO MATRIX TECHNOLOGY





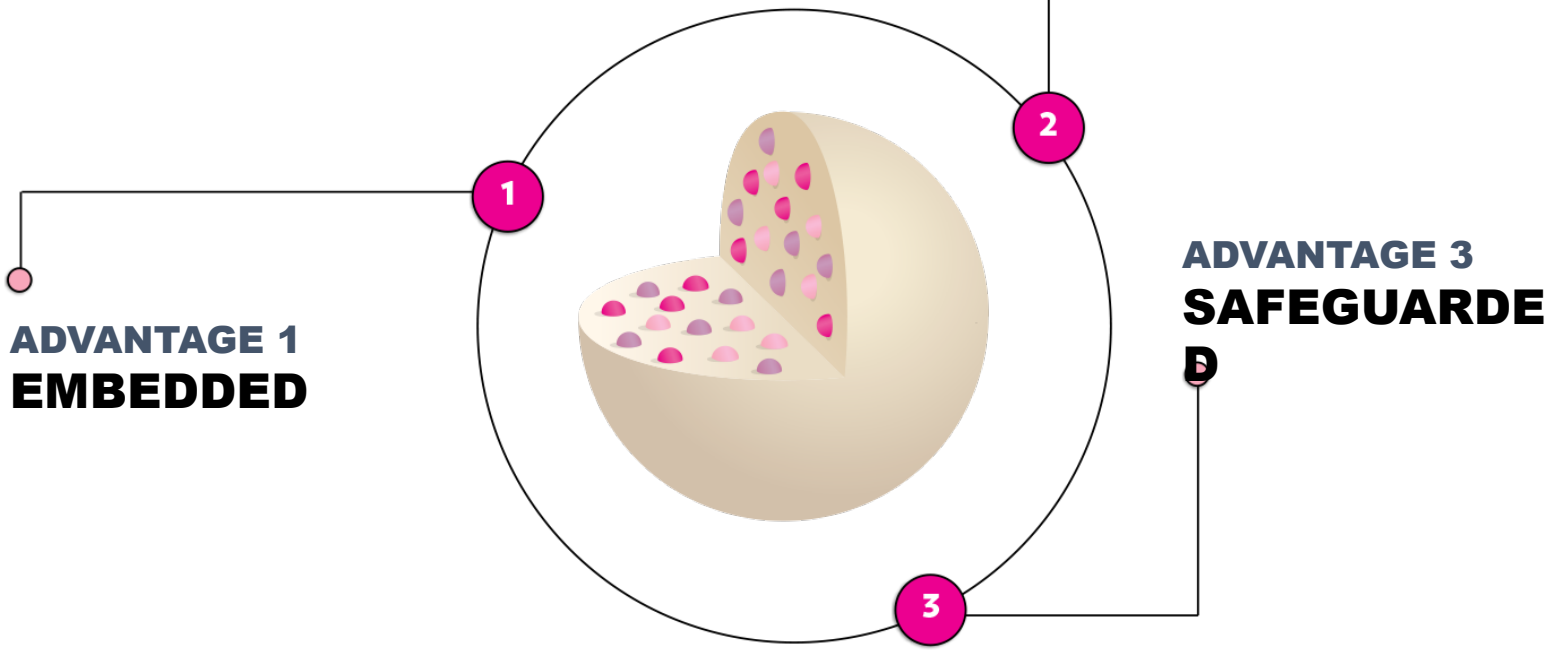
Matrix Technology

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



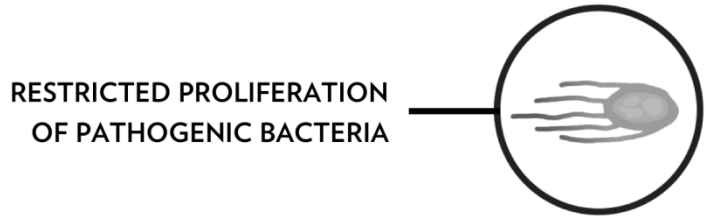
ADVANTAGE 2
TARGETED

ADVANTAGE 1
EMBEDDED



ADVANTAGE 3
SAFEGUARDE
D

Matrix Technology



ADVANTAGE 1

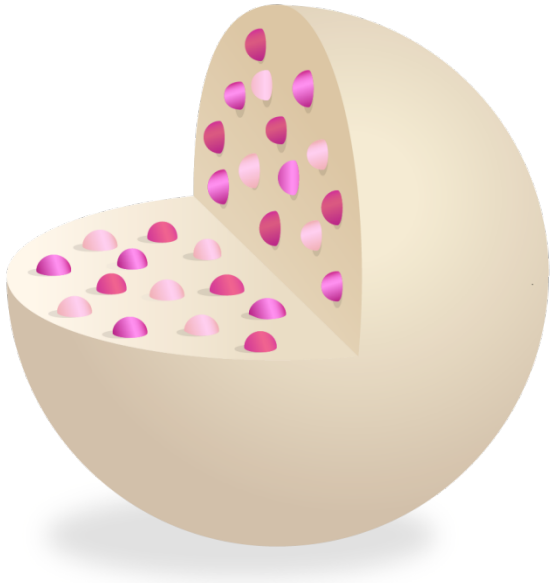
Embedded

> Embeds ingredients in a matrix of triglycerides

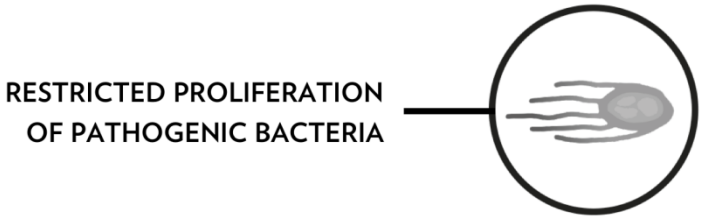
> Avoids chemical reactions between compounds before release

> Protects active compounds until release (from light, moisture, gastric acidity, oxidation, etc.)

> Does not affect palatability



Matrix Technology



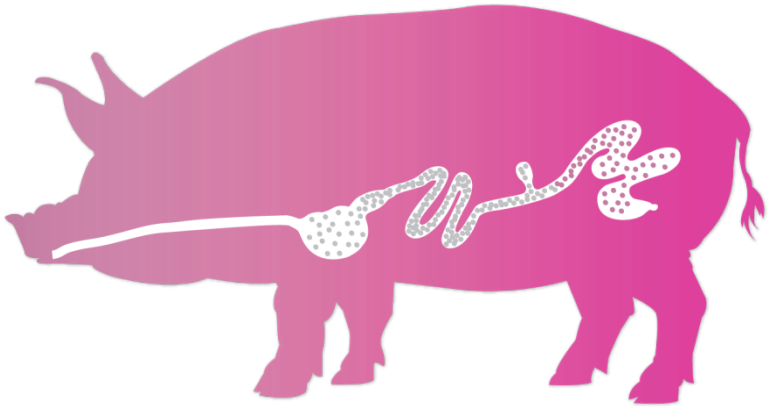
ADVANTAGE 2

TARGETED

> Precise formula of active compounds for each species

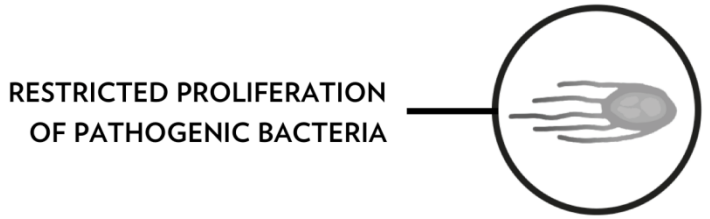
> Targets a progressive release of active compounds precisely into the intestine

> Matrix dimensions adapted to the digestive characteristics of the species



30-38 HOURS TRANSIT

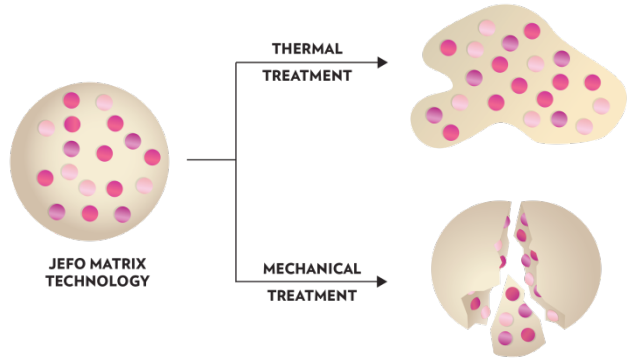
Matrix Technology

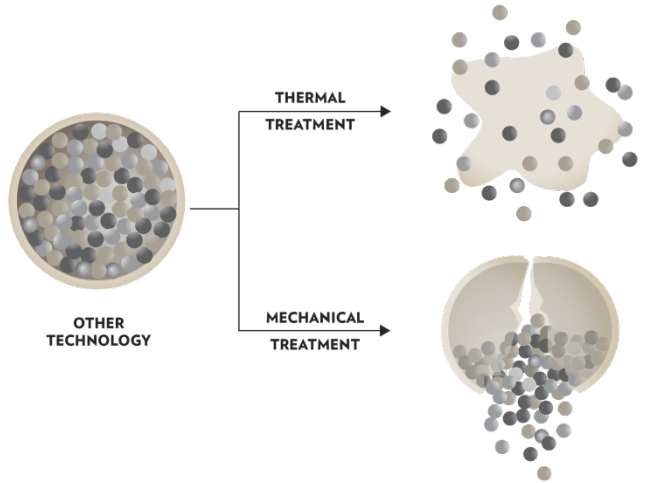


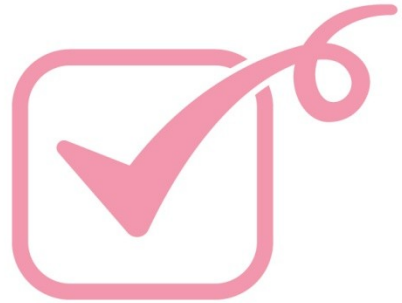
ADVANTAGE 3

SAFEGUARDED

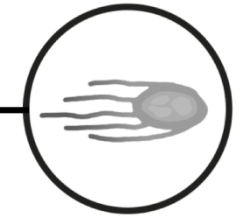
- > Resistant to mechanical or thermal constraints (feed manufacture, storage, etc.)
- > Safe for equipment (no corrosivness)
- > Safe for employee manipulation







P(OA+EO)
effect of P(OA+EO) – piglet trial



Results

- Identical growth performance with P(OA+EO) at 2.5 kg/t compared to those obtained with colistine at 120 g/t.
- No difference between both treatments in terms of diarrhea and mortality.

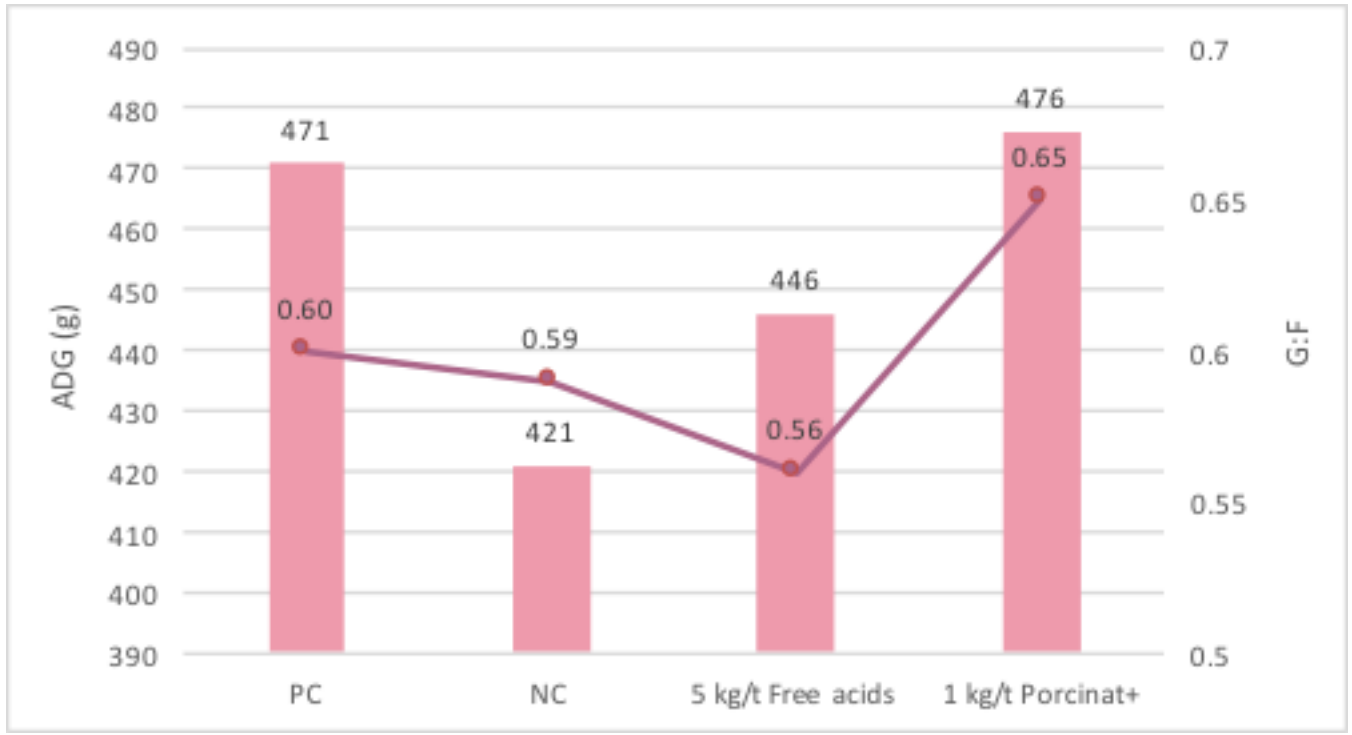
	COLISTINE	P(OA+EO)
Weight at 28 days (kg)	**7.15**	**6.90**
Weight at 42 days (kg)	**12.96**	**12.61**
ADG 28-42 (g/d)	**431.4**	**425.2**
Mortality	**1.09%**	**0.72%**

Source: Referenced Breeding, Feed Miller, France 2009.

P(OA+EO)
effect of P(OA+EO) – piglet trial

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

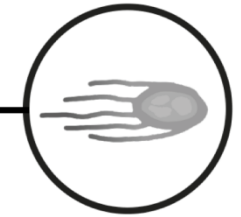
Effect of P(OA+EO) on piglets peformance challenged with e. Coli



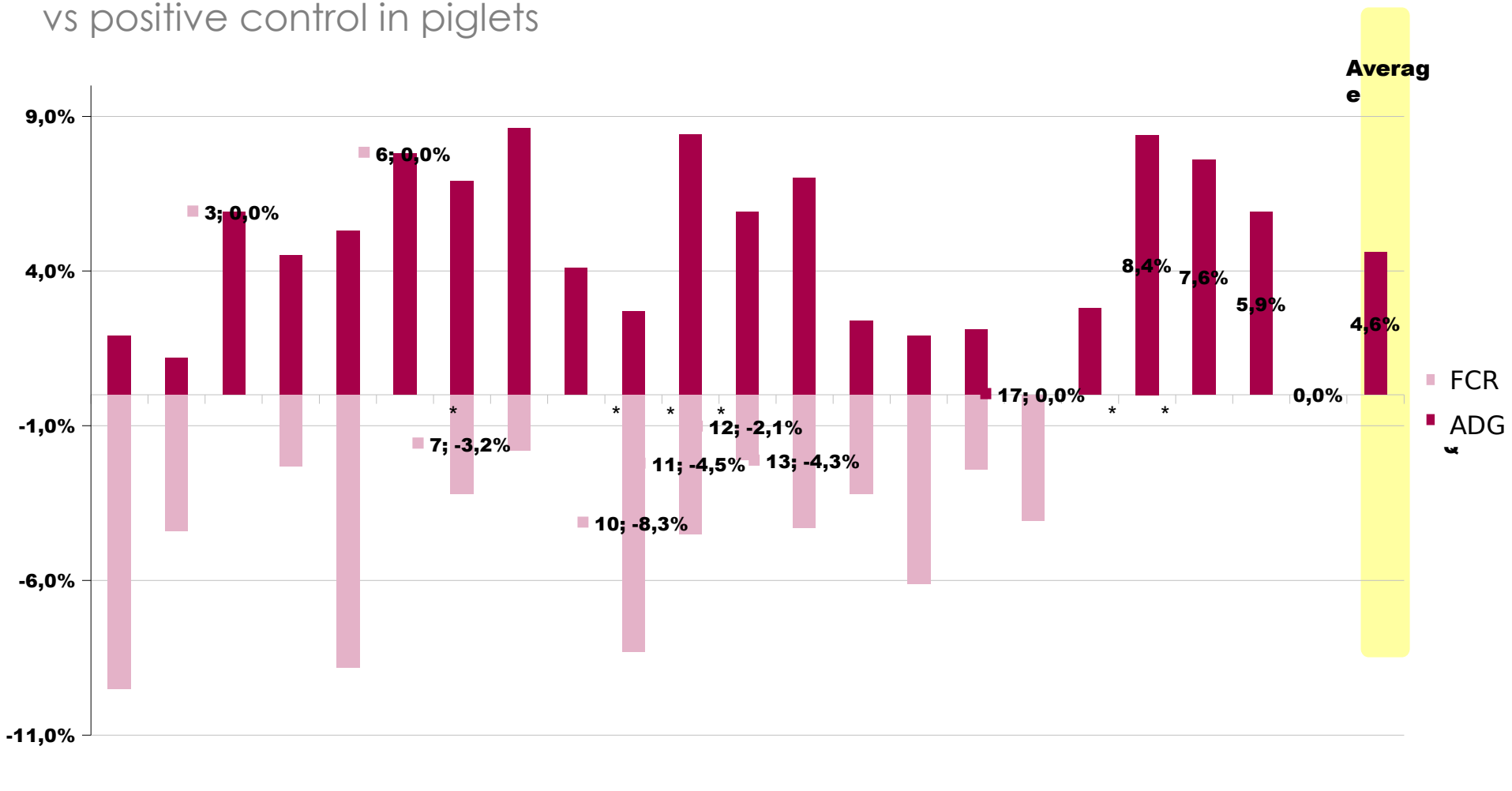
(University of Beijing, 2017)

Matrix Technology

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

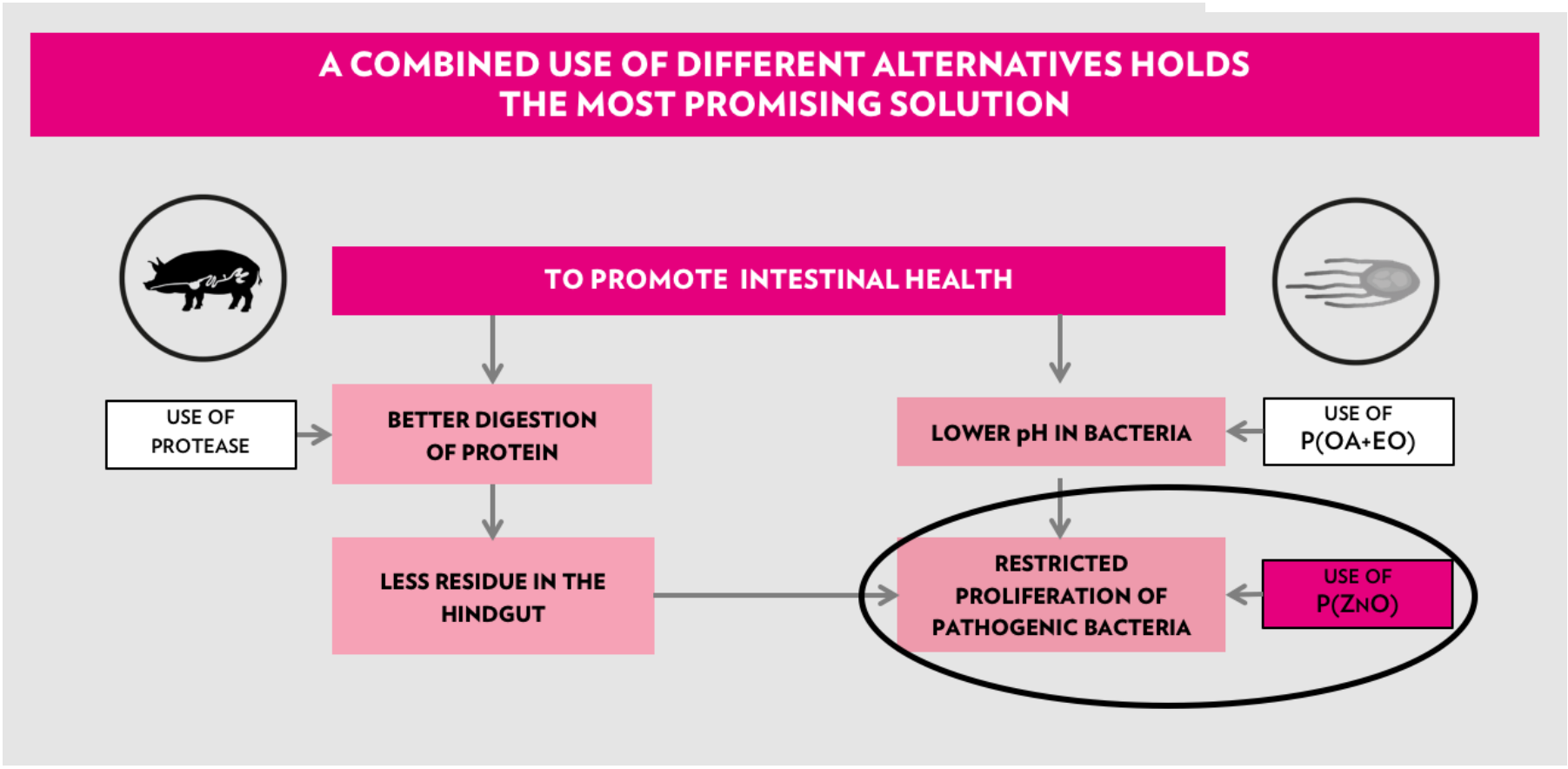


Synthesis of trials with Matrix Technology vs positive control in piglets

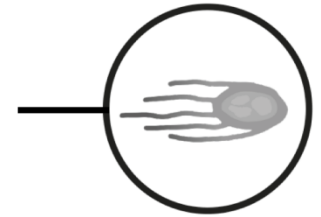


Antibiotics reduction

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



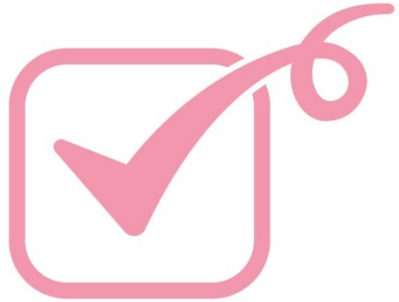
Optimal free zinc levels are limited by regulations



Maximum authorized dosage of ZnO used in pig feeds

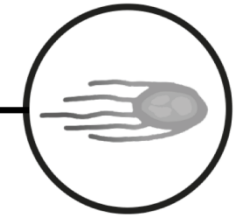
COUNTRY	CREEP FEED	STARTER FEED	GROWING-FINISHING FEED
Canada	500 ppm	500 ppm	500 ppm
USA	500 ppm	500 ppm	500 ppm
France	150 ppm	150 ppm	150 ppm
China	2250 ppm (1 to 14d after weaning)	120 ppm	120 ppm

- High dosage of free ZnO (2250 ppm and more) is known to reduce incidence of diarrhea in piglets
- Nevertheless, legislation may prevent its use as it is (free form and high dosage)



P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

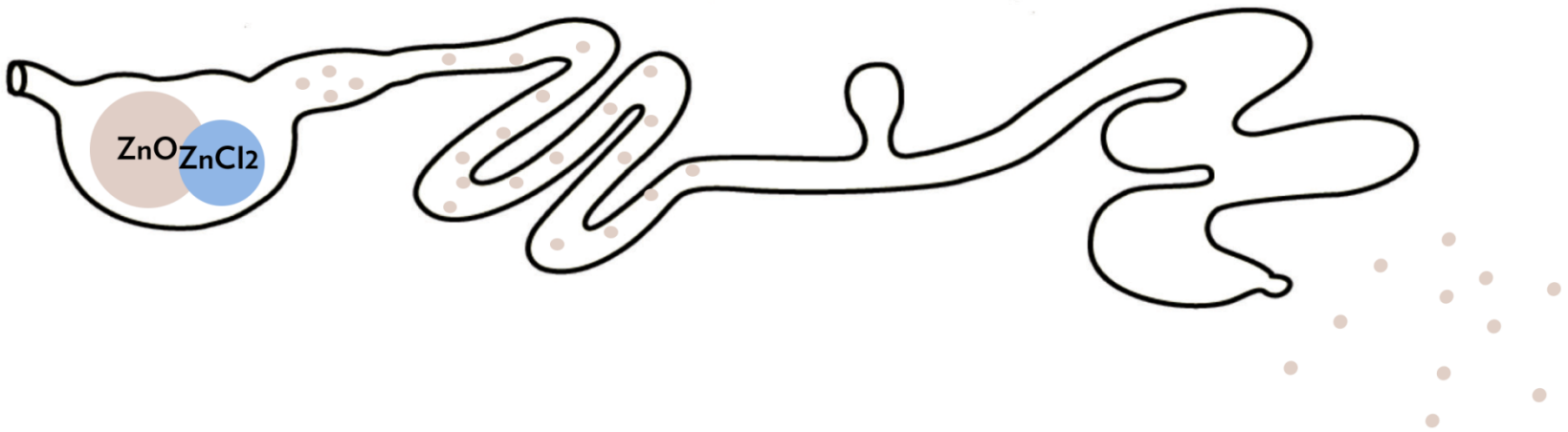


Unprotected Zinc Oxide

STOMACH
pH 1.5 - 6 .0

SMALL INTESTINE
pH 6 .0 - 7.0

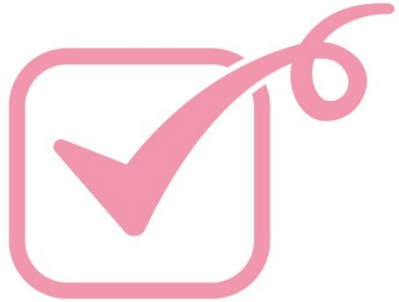
LARGE INTESTINE
pH > 7.0



In the stomach,
ZnO reacts with HCl → $ZnCl_2$.

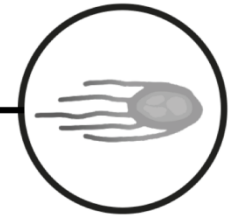
in order to get ZnO reaching the intestines, massive dose of ZnO is required.

Drawback is a massive excretion of zinc via urine and feces.



P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

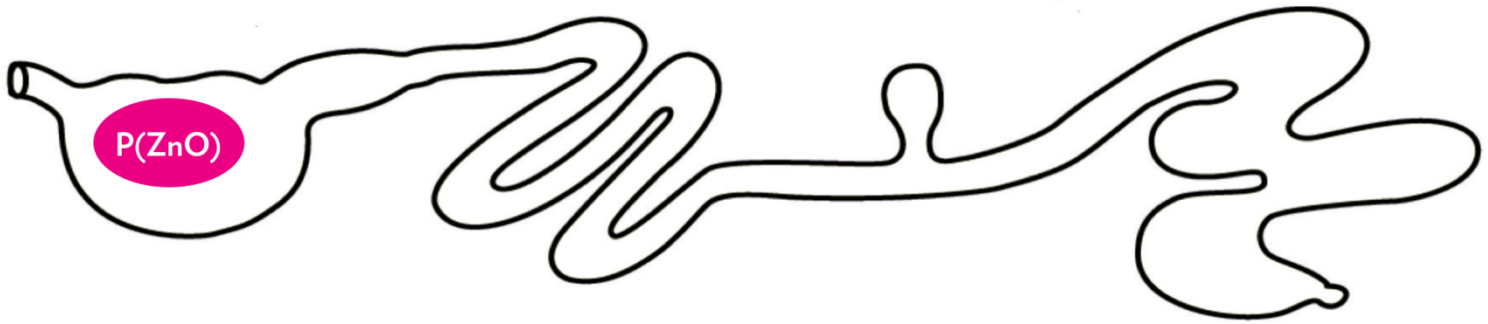


Unprotected Zinc Oxide

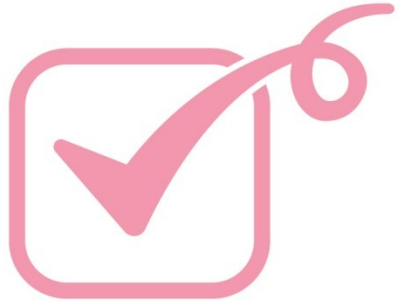
STOMACH
pH 1.5 - 6 .0

SMALL INTESTINE
pH 6 .0 - 7.0

LARGE INTESTINE
pH > 7.0

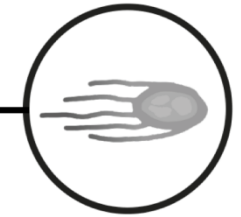


In the stomach, Protected ZnO shows little reaction with HCl → little transformation by dissociation of the zinc oxide in stomach.



P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

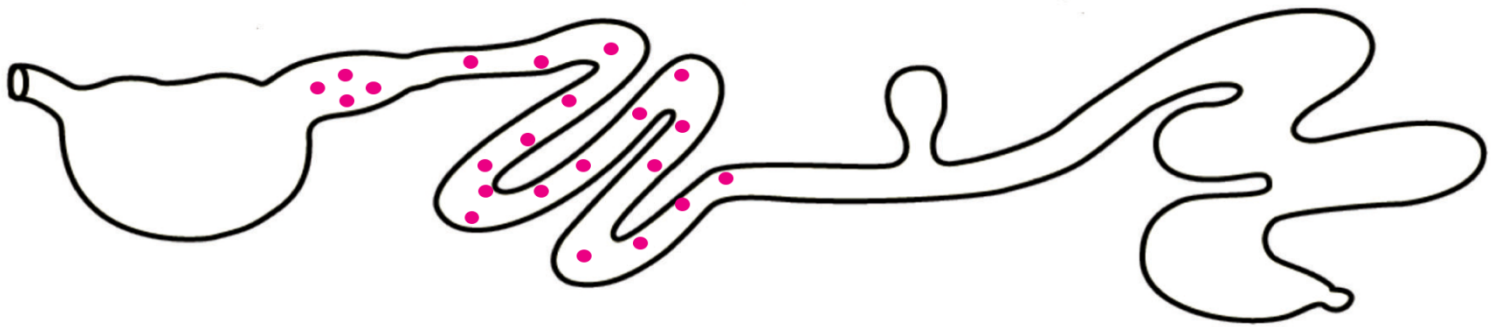


Protected Zinc Oxide

STOMACH
pH 1.5 - 6 .0

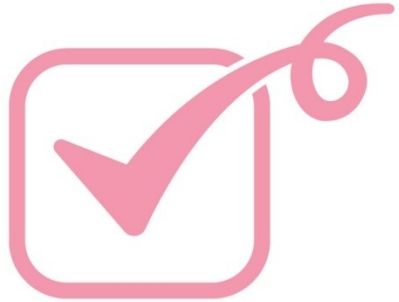
SMALL INTESTINE
pH 6 .0 - 7.0

LARGE INTESTINE
pH > 7.0



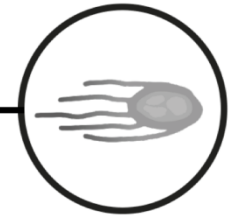
In the stomach, Protected ZnO shows little reaction with HCl → little transformation by dissociation of the zinc oxide in stomach.

Most of the protected ZnO reaches the intestine without being dissociated.



P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

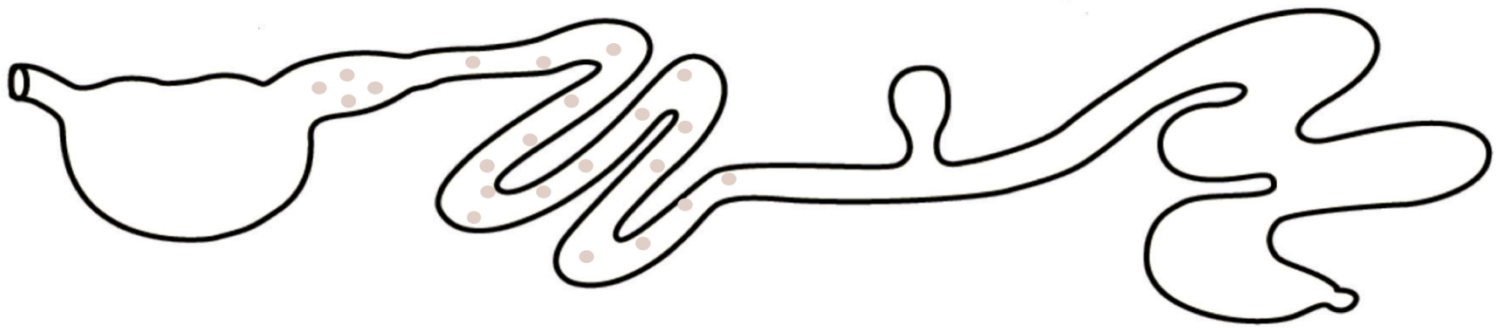


Protected Zinc Oxide

STOMACH
pH 1.5 - 6 .0

SMALL INTESTINE
pH 6 .0 - 7.0

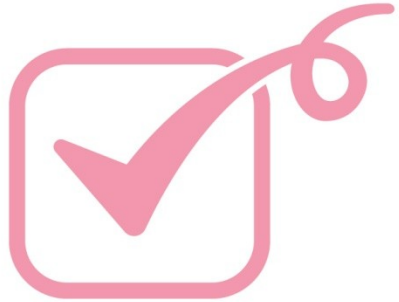
LARGE INTESTINE
pH > 7.0



In the stomach, Protected ZnO shows little reaction with HCl → little transformation by dissociation of the zinc oxide in stomach.

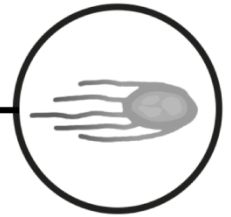
Most of the protected ZnO reaches the intestine without being dissociated.

Lipase slowly degrades the triglyceride protection, allowing a controlled release of ZnO in the intestine.



P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

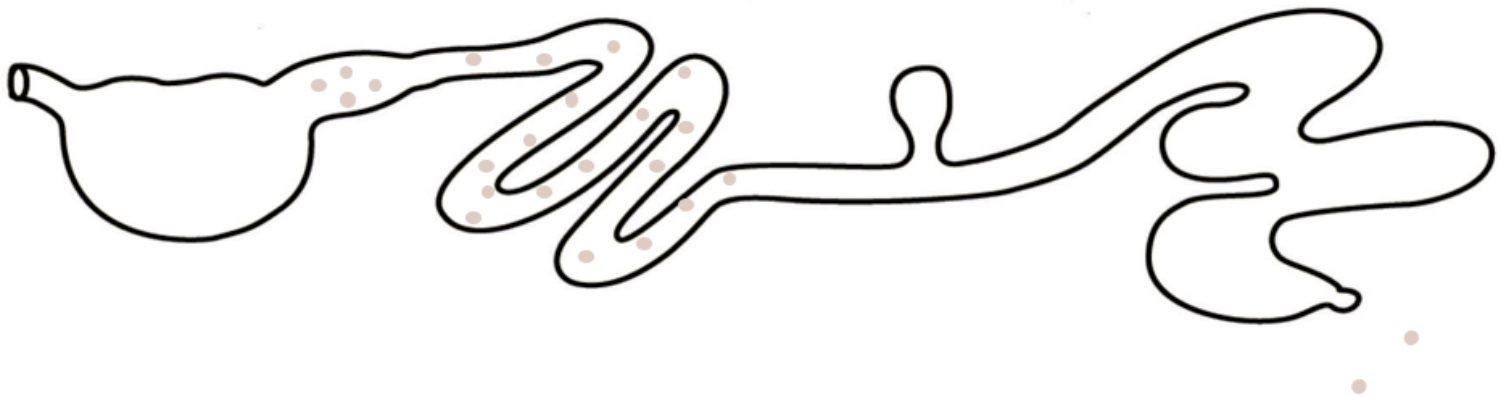


Protected Zinc Oxide

STOMACH
pH 1.5 - 6 .0

SMALL INTESTINE
pH 6 .0 - 7.0

LARGE INTESTINE
pH > 7.0



In the stomach, Protected ZnO shows little reaction with HCl → little transformation by dissociation of the zinc oxide in stomach.

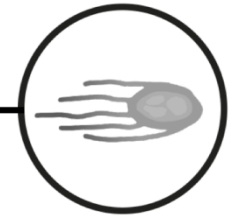
Most of the protected ZnO reaches the intestine without being dissociated.

Lipase slowly degrades the triglyceride protection, allowing a controlled release of ZnO in the intestine.

A limited amount of zinc is then excreted via urine and feces.

P(ZnO)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



- Dust-free product and better working conditions
- Fewer environmental concerns due to excreted zinc
- Complies with regulations (supplemented equal to or less than 500 ppm)
- Limits possible interference with other minerals as antagonist
- Reduces buffering capacity of feeds

FREE PRODUCT

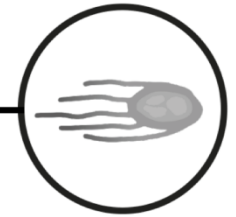
NO DUST

WITH OUR MICRO-MATRIX TECHNOLOGY

1 mm

P(ZnO)
Research partners: Americas results

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

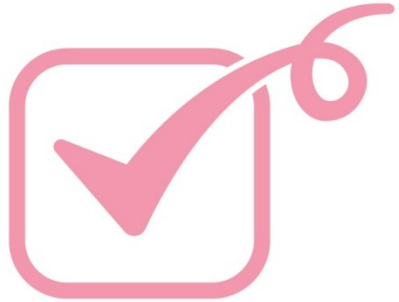


Effect of P(ZnO) – piglet trial

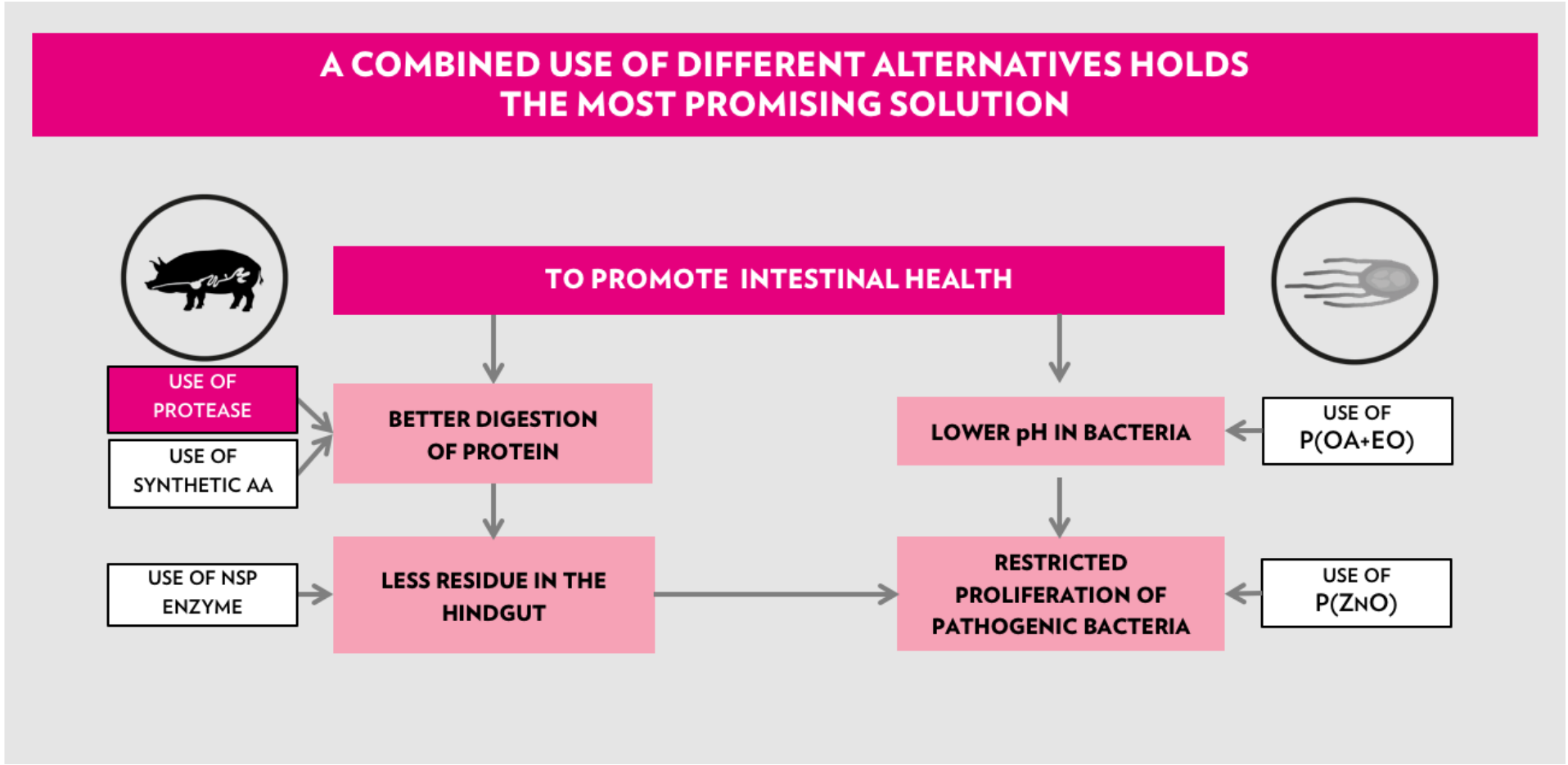
	FREE ZnO I & II – 3000 PPM Zn III – 150 PPM Zn	P(ZnO) 360 PPM Zn SUPPLIED BY 900 PPM P(ZnO)
Weaning age (d)	**19**	**19**
Weight in (kg)	**6.03**	**6.03**
Weight out (kg)	**33.57[a]**	**34.20[b]**
Number of days	**51**	**51**
FI (kg)	**41.57**	**41.57**
FCR	**1.51**	**1.48**
ADG (kg/d)	**0.540[a]**	**0.552[b]**
Mortality	**0.7**	**0.7**

[a, b] $P<0.001$

Source: Field Trial in a Large Integrator #1 – Canada, 2012.

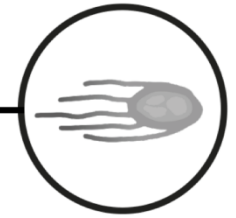


Antibiotics reduction



Combination #1

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA



Effect of combination – piglet trial (54 days trial)

TRIAL

. 480 piglets of 3 subsequent batches weaned at 19 days of age
. 4 pens per batch per treatment; 20 piglets/pen
. 2 treatments

Table 1. Trial description

	PRE-STARTER 0-21 d	STARTER 21-54 d
Control	Prestarter diet (ZnO) + Antibiotics	Starter diet (ZnO)
JEFO ABF Program	Prestarter diet + JEFO ABF program 1	Starter diet + Jefo ABF program 2

Antibiotic strategy currently used in the farm (Control feeds) :

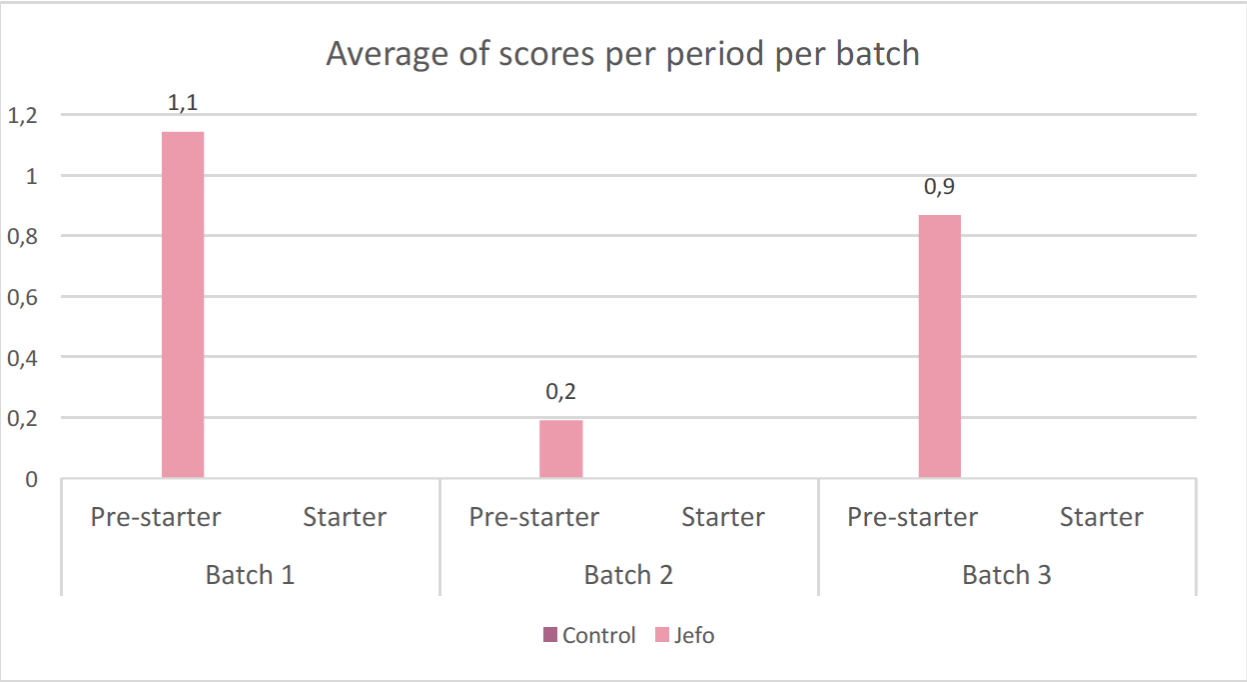
- Prestarter: 120 mg/kg Colistin + 300 mg/kg Amoxicillin + 2400 mg/kg ZnO
- Starter: 1600 mg/kg ZnO.

Source: Jefo data – Hungary, 2017

Combination #1

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

Effect of combination – piglet trial (54 days trial)



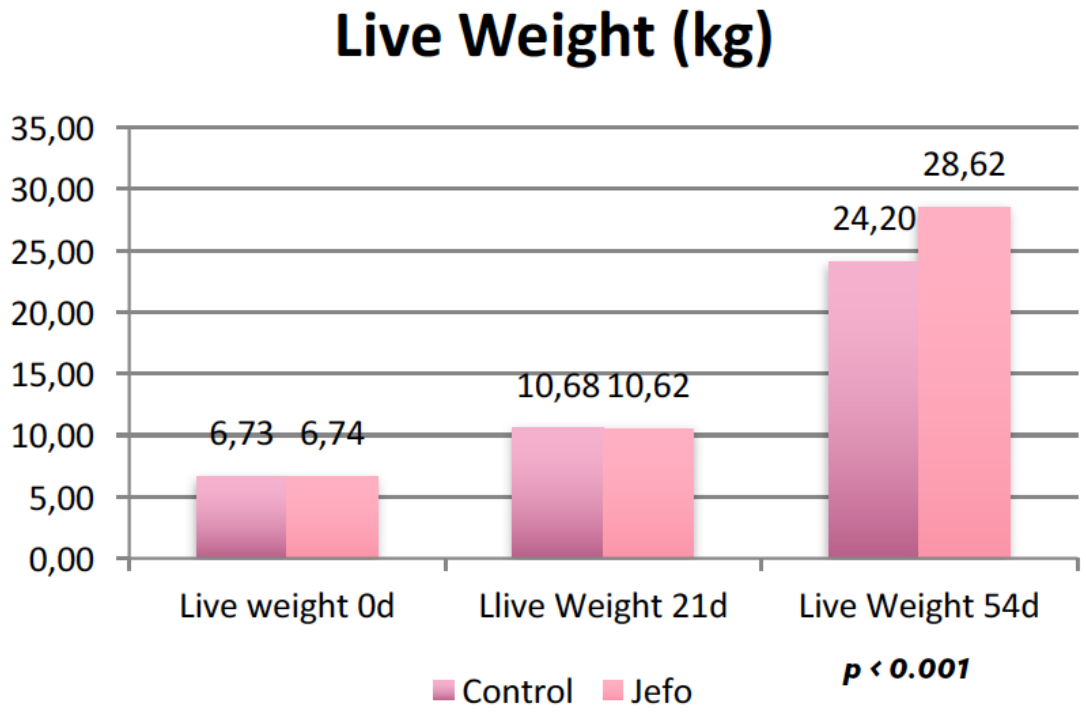
0: Diarrhoea absence: normal faeces
1: Soft diarrhoea: characteristic by some piglets (1-5 pigs)
2: Diarrhoea: characteristic by less than 50% (6-10 pigs)
3: Strong diarrhoea: more than 50% of whole pen (11-20 pigs)

Source: Jefo data – Hungary, 2017

Combination #1

Effect of combination – piglet trial (54 days trial)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

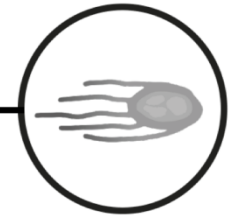


Source: Jefo data – Hungary, 2017

Combination #1

Effect of combination – piglet trial (54 days trial)

RESTRICTED PROLIFERATION
OF PATHOGENIC BACTERIA

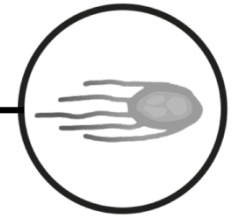


	POST-WEANING		
	CONTROL	JEFO	p-value
INITIAL WEIGHT (kg)	6.73	6.74	N.S.
FINAL WEIGHT (kg)	24.22	28.61	< .001
ADG Post-Weaning (g/d)	323.4	405.1	< .001
FCR	2.15	1.84	0.001

Source: Jefo data – Hungary, 2017

Combination #2

RESTRICTED PROLIFERATION OF PATHOGENIC BACTERIA



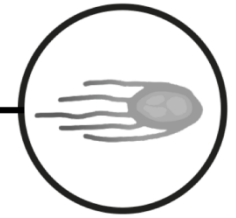
Effect of combination – piglet trial (41 days trial)

	CTRL	COLISTINE	ZNO	JEFO COMBINATION
Initial weight (kg)	7.0	7.1	7.1	7.1
Final weight (kg)	26.4	27.0	26.9	26.9
Daily Feed Intake (g)	624	632	630	617
Daily weight gain (g)	472	487	485	483
Feed conversion	1.325	1.301	1.298	1.280
Feed consommed (kg)	25.6	25.9	25.9	25.3
Kg produced	19.3	20.0	19.9	19.8
Feed expense per kg live weight produced (CAD $)	0.861	0.866	0.871	0.859
Income per piglets (CAD $)	67.07	67.72	67.65	67.57
Income over feed per sold piglets (CAD $)	50.42	50.43	50.33	50.57

Source: Jefo data – Canada, 2016

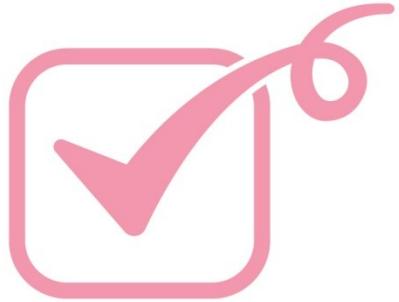
Combination #3

RESTRICTED PROLIFERATION OF PATHOGENIC BACTERIA



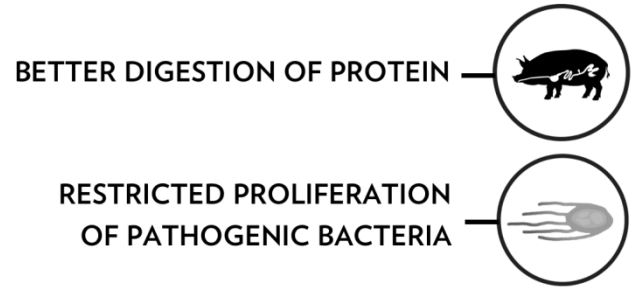
Effect of combination – Growing pigs trial (111 days trial)

	SALINOMYCINE	JEFO COMBINATION
Initial weight (kg)	27.0	27.2
Average final weight at shipment (kg) at d111	129.3	129.3
Initial pig amount	104	104
Final pig amount	96	97
Survival rate (%)	92.3	93.3
Cost for consommed feed (CAD $)	7 208.64	7 026.54
Total live weight shipped	12 430	12 542
Income over feed per sold pigs (CAD $)	12 848.84	13 212.49
Benefit over Salinomycine (CAD $)		363.65
Benefit per pig over Salinomycine (CAD $)		3.75



Source: Jefo data – Canada, 2016

Research Partners
A pratical Canadian example



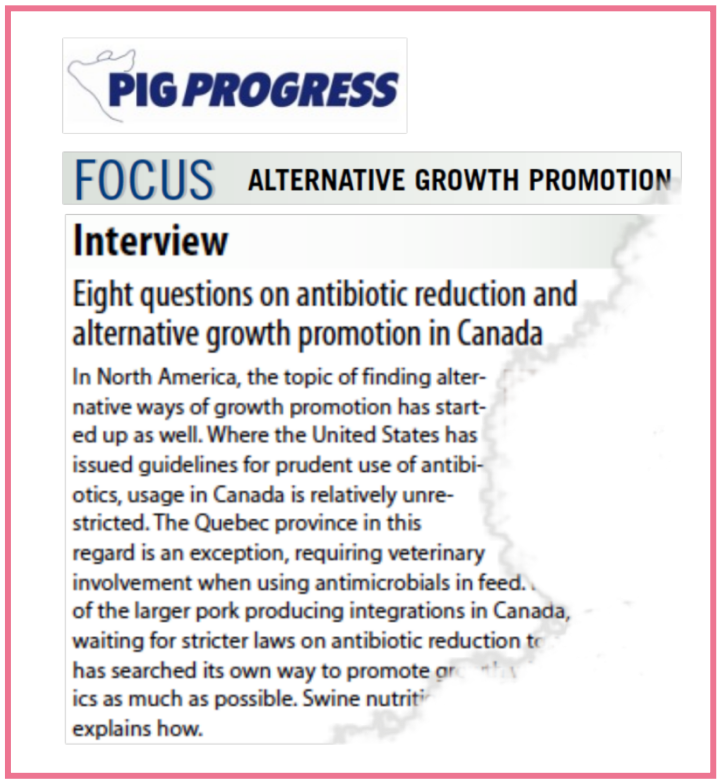
What they changed

> Stopped mixing litters from different barns
> Implemented use of vaccines
(for Lawsonia and E. coli)

> Gave more space to piglets

> Supplemented additives in feed:

- Protected P(OA+EO)
- Protected P(ZnO)
(Zn reduced from 3000 to 500 ppm)
- Enzymes (Xylanase and Protease).


PIG PROGRESS

FOCUS ALTERNATIVE GROWTH PROMOTION

Interview

Eight questions on antibiotic reduction and alternative growth promotion in Canada

In North America, the topic of finding alternative ways of growth promotion has started up as well. Where the United States has issued guidelines for prudent use of antibiotics, usage in Canada is relatively unrestricted. The Quebec province in this regard is an exception, requiring veterinary involvement when using antimicrobials in feed. ... of the larger pork producing integrations in Canada, ... waiting for stricter laws on antibiotic reduction t... has searched its own way to promote g... ics as much as possible. Swine nutriti... explains how.

TAKE HOME MESSAGE

Combined use of Feed additives for ANTIBIOTICS REDUCTION

	PRODUCT BENEFITS
P(OA+EO)	> Reduction of diarrhea > Control of mortality > Improvement of growth performance
Protease	> Improves digestibility and gut integrity + costs savings
P(ZnO)	> Protection of intestinal mucosa (↘ fixation of pathogenic bacteria) (↗ integrity of mucosa)

MUCHAS GRACIAS

porkcalidad