SUPPORTING GUT FUNCTION THROUGH DIETARY INTERVENTIONS

Gemma González-Ortiz & Rob ten Doeschate

17th Turkey Science and Production Conference
Carden Park Hotel and Golf Resort, Chester, United Kingdom
20th March 2025

ABVista

The most important additive is intelligence

INTRODUCTION

TURKEY GENETIC EVOLUTION

)) Genetic improvements have been significant for turkey production.

)) Weight gain and FCR have significantly improved over the years

)) Liveability, however, has not improved (eg. reduced antibiotic use, heat stress, infectious diseases…)

	Hens ♀				Toms ♂		
	2003	**2020**	**2023**		**2003**	**2020**	**2023**
Age (days)	94	94	90		131	137	137
Average BW (kg)	6.68	7.52	7.56		14.45	18.63	21.17
ADG (g/bird/day)	71.1	80	84		110	136	155
FCR	2.22	2.27	2.10		2.57	2.57	2.29
Liveability (%)	93.3	91.2	92.5		87.8	87.1	85.5

(Adapted from Menges 2024, In Proceedings of the 16th Turkey Science and Production Conference)

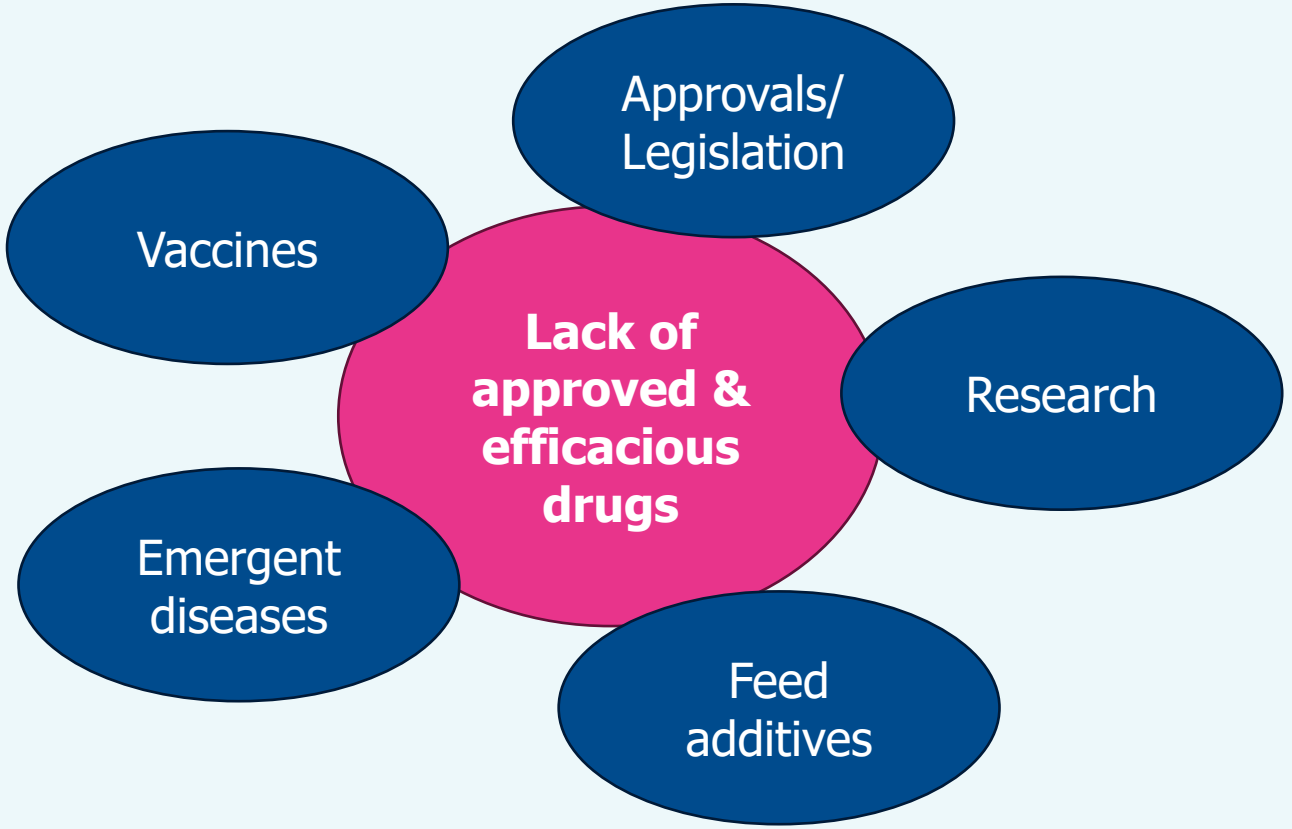
HEALTH ISSUES IN TURKEYS BY AGE

Early brooding period (0-14 days)	Later rearing period (2-6 weeks)	Growing period (6-20 weeks)
• Poor feed intake/starvation • Colibacillosis • Avian metapneumovirus • Rotavirus • Other enteric viruses • Aspergillosis	• Rotavirus • Colibacillosis • Coccidiosis • Haemorrhagic enteritis • Wet litter • Poult enteritis and mortality syndrome (PEMS)	• *Ornithobacterium rhinotracheale* • Pasteurellosis • Erysipelas • Histomoniasis (blackhead) • Mycoplasmosis • Necrotic enteritis • Intestinal parasites (worms) • Neoplasic disease (Marek's) • Leg problems • Septic arthritis • Aortic rupture and renal haemorrhage

Adapted from Jennison (2021)

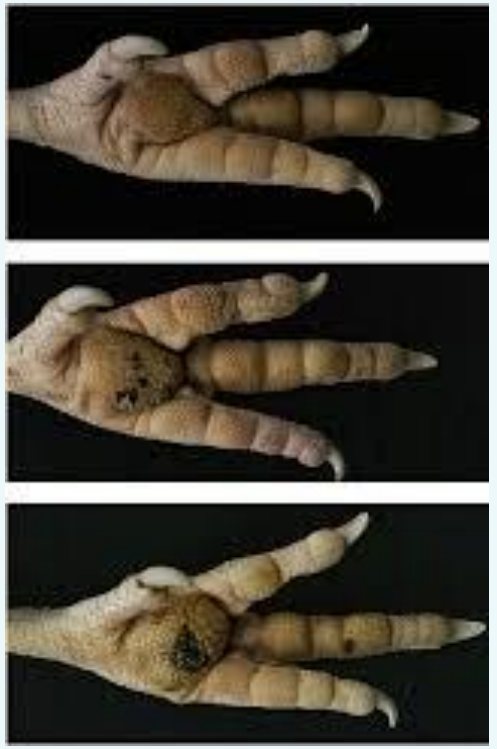
Underlined the gastrointestinal disorders

DEALING WITH SOLUTIONS IN TURKEYS



Clark and Chiaia (2024)

DIGESTIVE DISORDERS



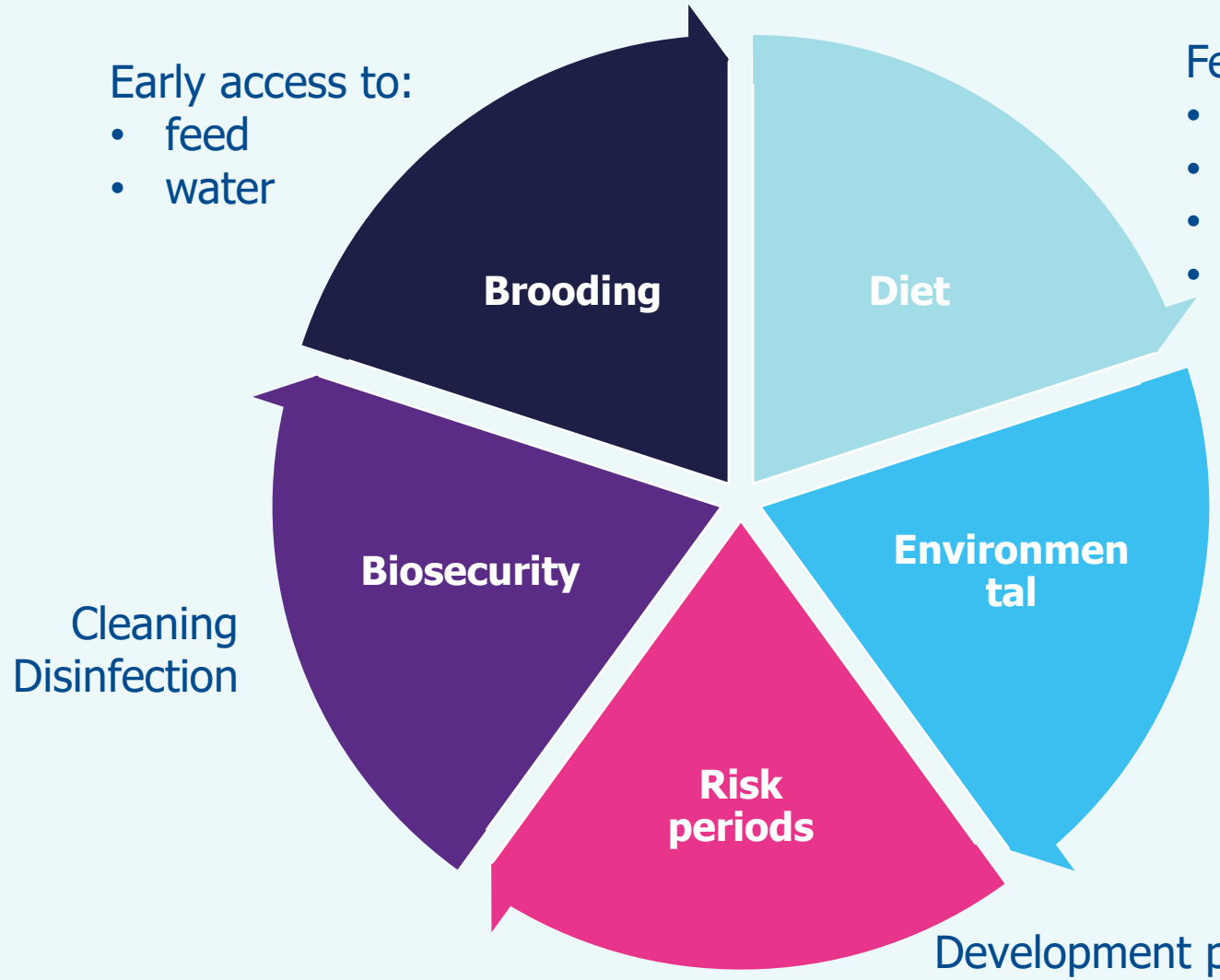
Infectious origin

DIGESTIVE DISORDERS

Wet litter

Poor nutrient digestibility

GOAL IS TO MAXIMIZE GUT HEALTH & FUNCTION



Early access to:
- feed
- water

Feed form
- Ingredient quality
- Mycotoxin
- Particle size
- Feeding phases

Temperature
Ventilation

Development phase
Likelihood of disease challenge
Vaccinations

Cleaning
Disinfection

GUT DEVELOPMENT STAGES

DEVELOPMENT

- Gut tissues
- Gut immunity
- Gut microbiota

Setting up the gut for the life of the bird

Bacterial colonisation & tissue development

TRANSITION

- Feed changes
- Vaccinations
- Environmental
- Handling

Prevent reduction in nutrient absorption and overgrowth of less favourable bacteria

Malabsorption & bacterial overgrowth risk

MAINTENANCE

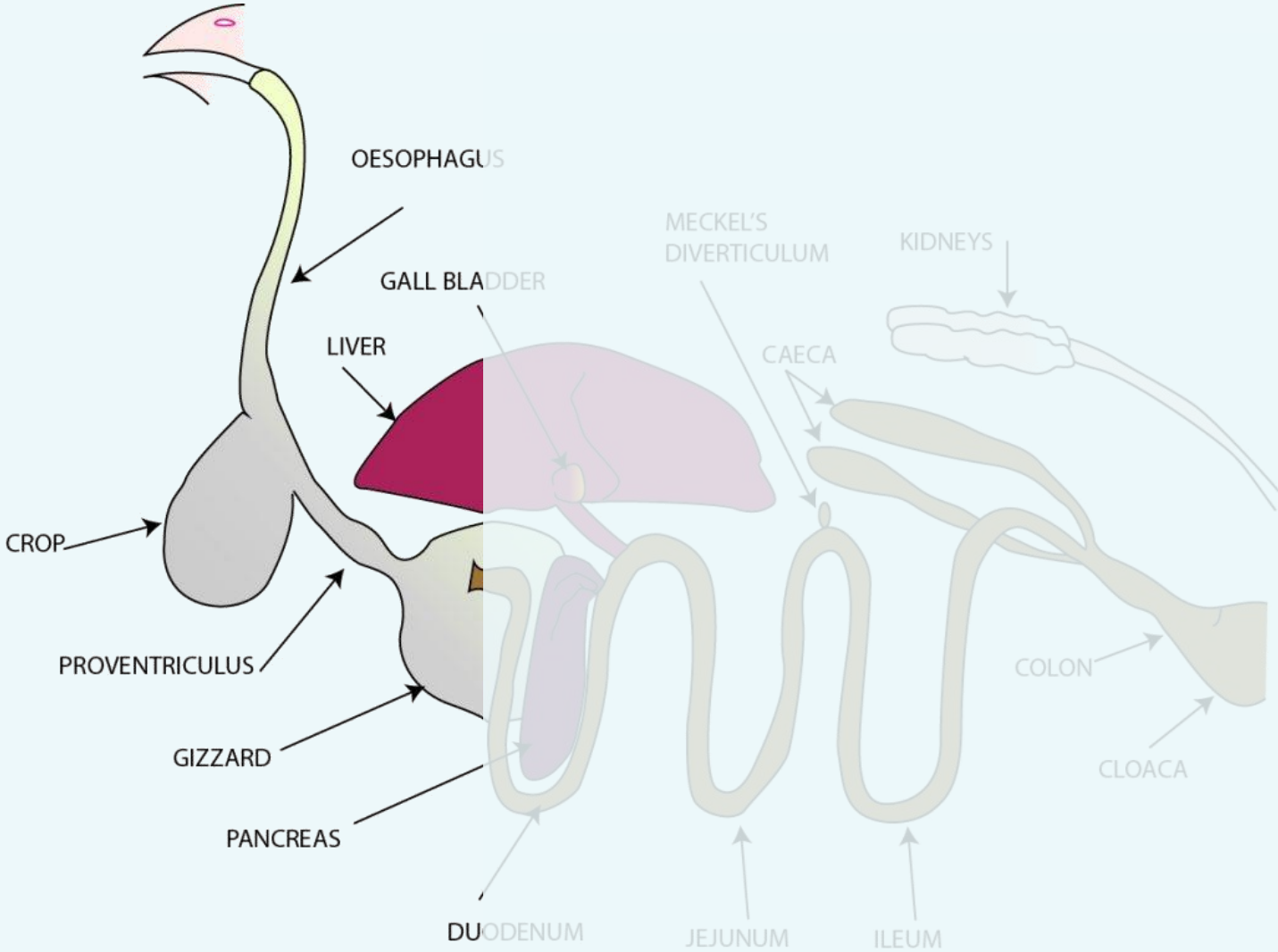
- Gut has developed
- Stable microbiota
- Promote integrity

Ensure gut is supported to conserve homeostasis

Stability

Adapted from Bailey V5 from Aviagen Turkeys

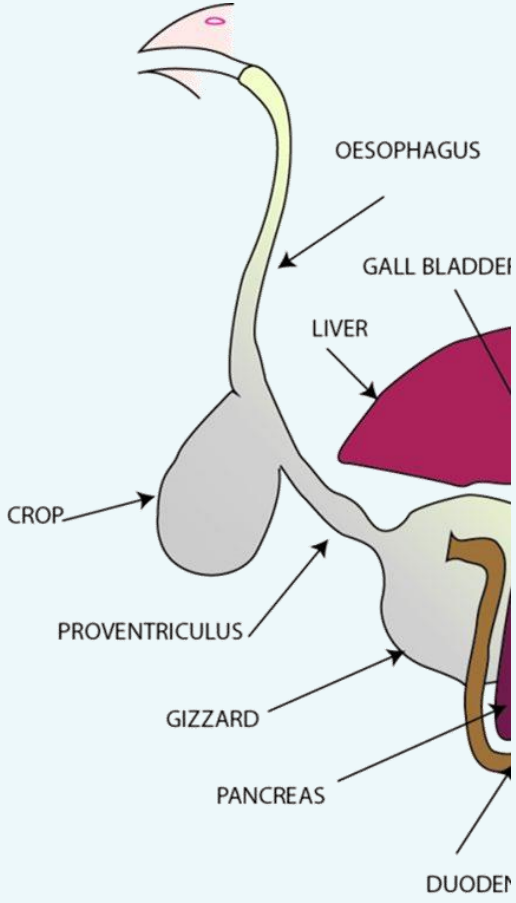
FUNCTION & SUPPORT



ABVista

The most important additive is intelligence

UPPER GUT



Crop

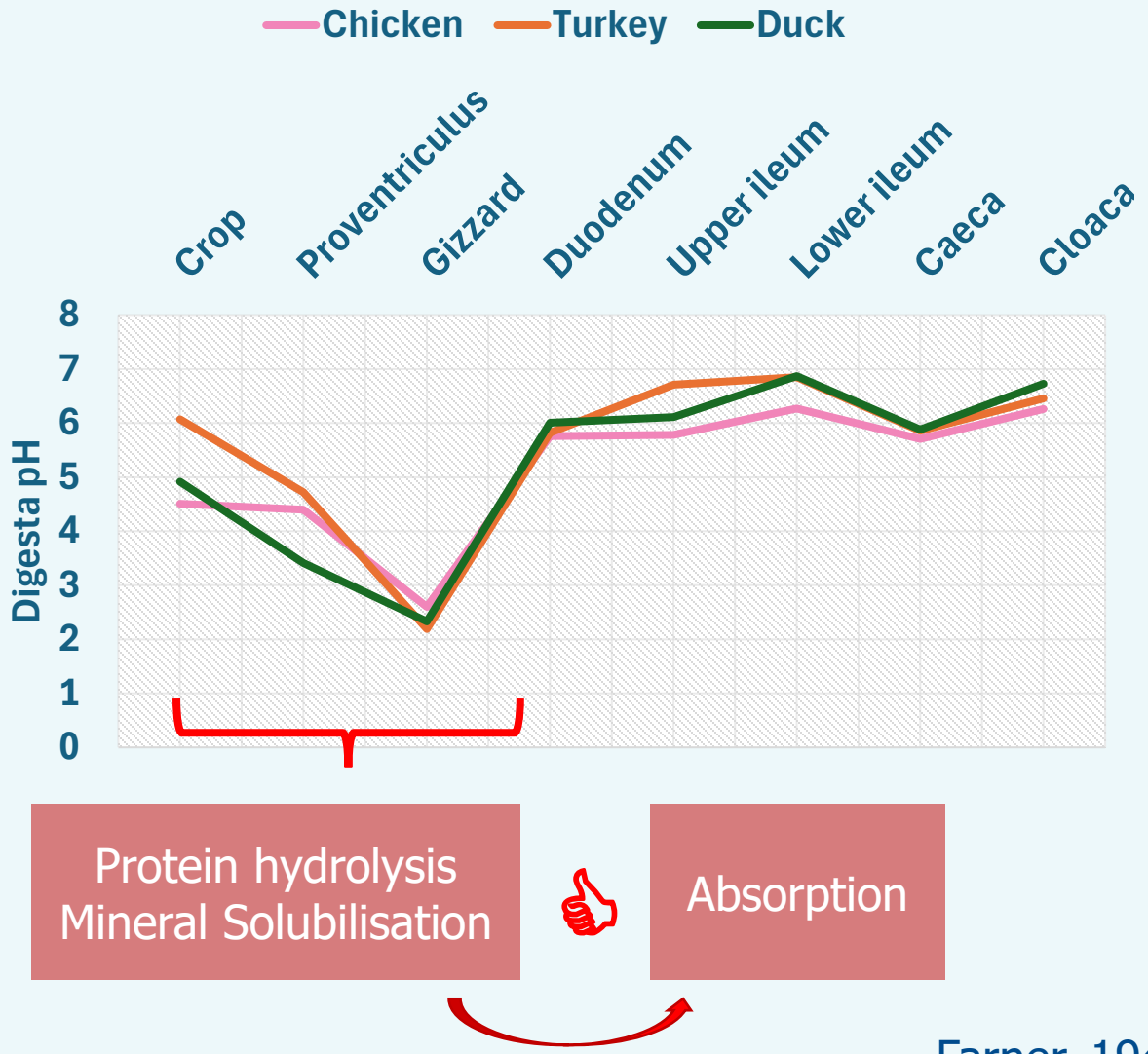
- Feed storage
- *Lactobacillus* species
- Partially fermentation CHO

Proventriculus

- Acid
- Pepsin

Gizzard

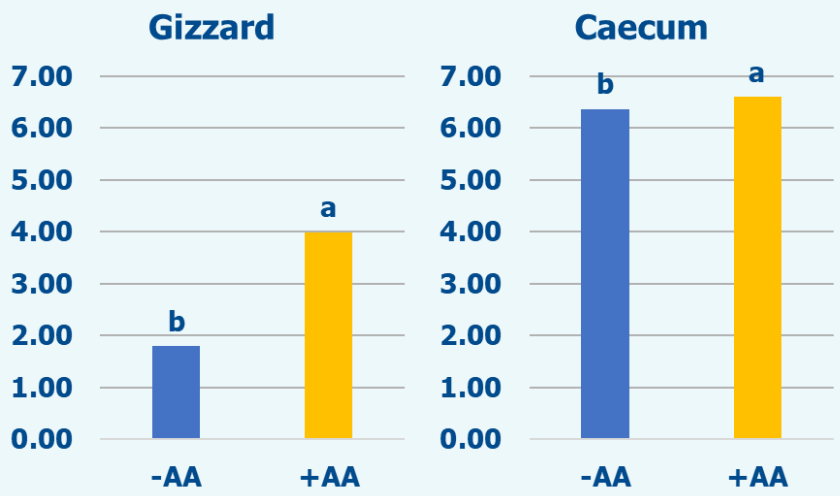
- Mechanical grinder



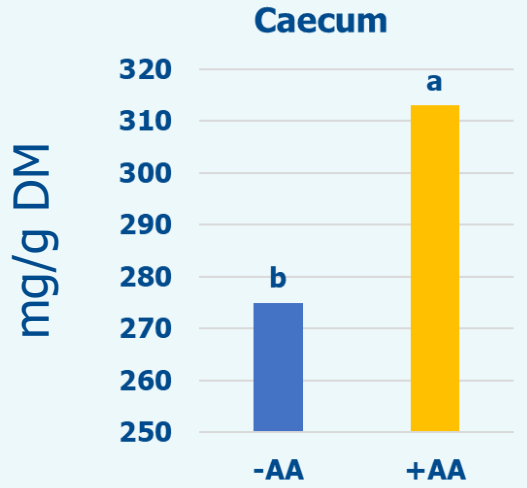
Farner, 1942

UPPER GUT

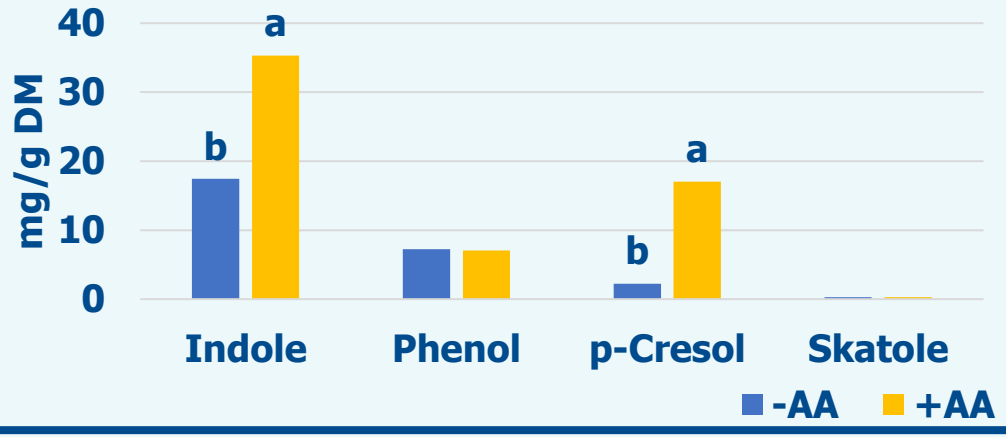
Digesta pH



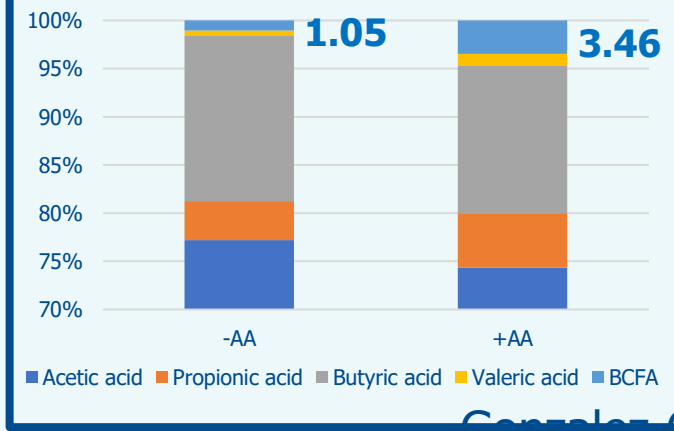
Protein content



Putrefaction end products

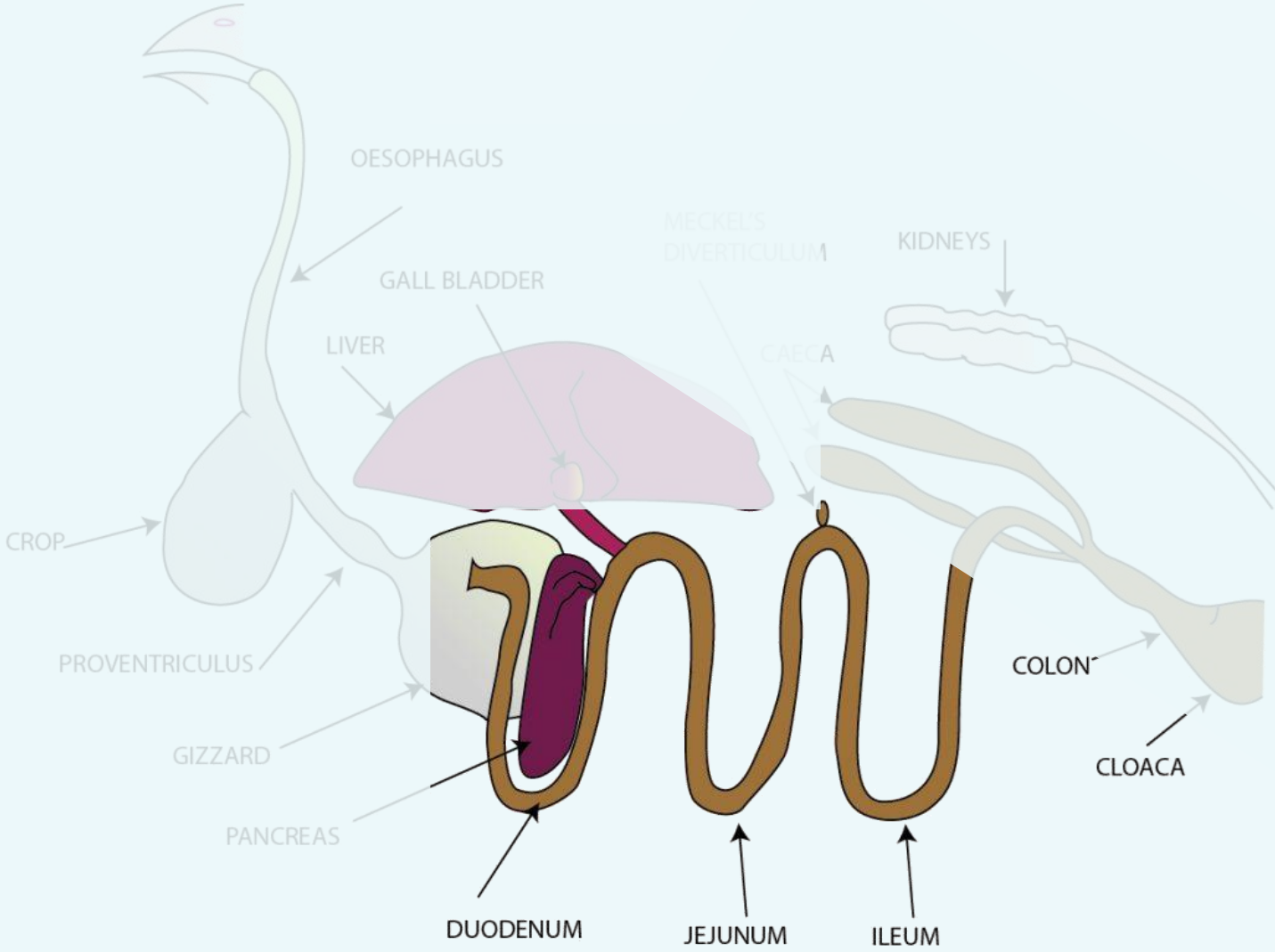


Caecum VFA %



González-Ortiz et al., 2022

FUNCTION & SUPPORT



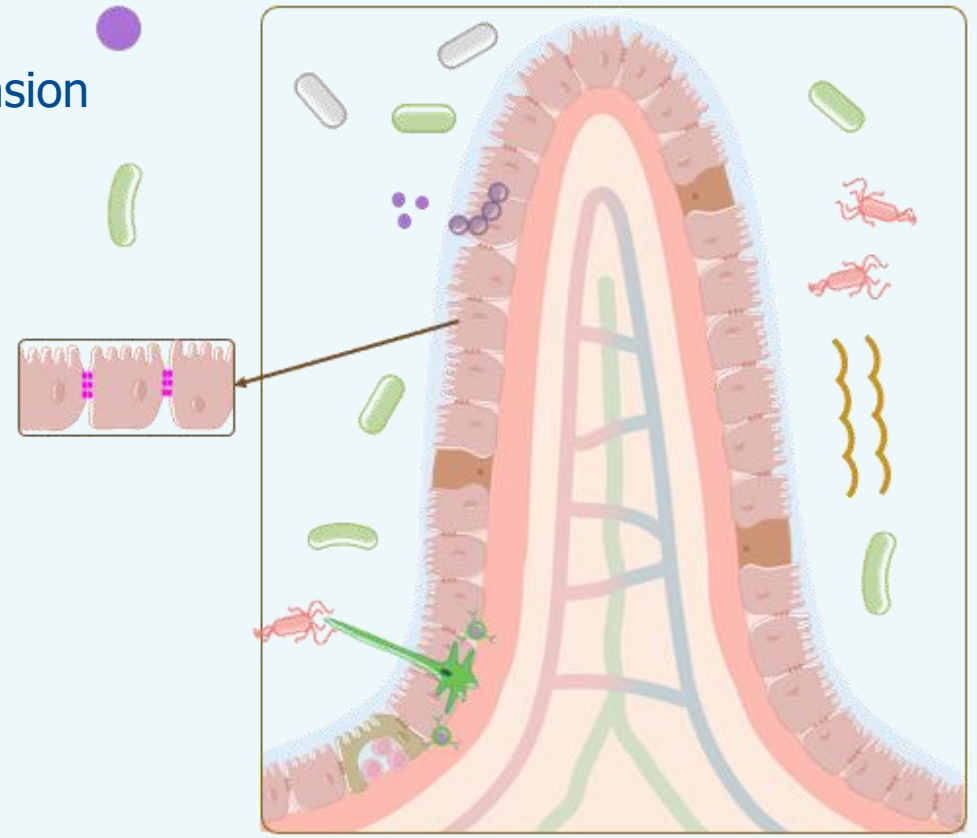
ABVista

The most important additive is intelligence

SMALL INTESTINE

- Absorption of nutrients
- Gut barrier function
  - Commensal microbiota
    - Block pathogen invasion
    - VFA production
    - Cell differentiation
  - Mucus
  - Tight junctions
  - Immunological functions
  - Endocrine functions
- Host-microbiota interaction

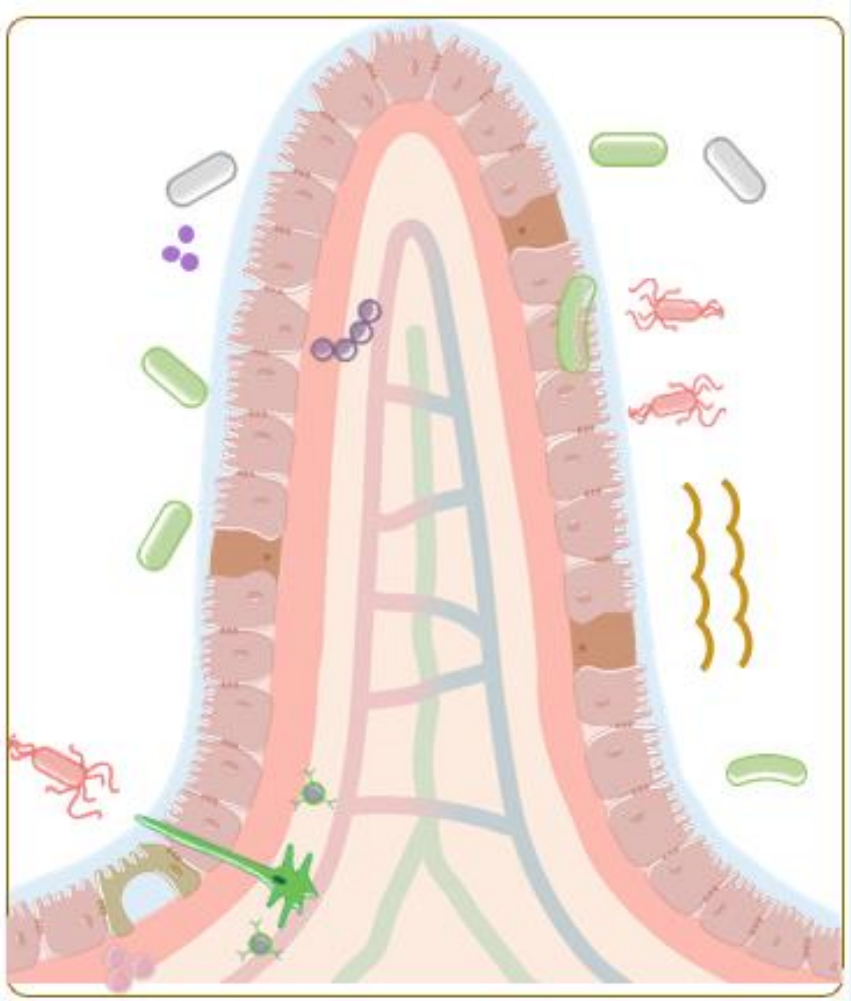
Intestinal epithelium



SMALL INTESTINE

Intestinal epithelium is constantly challenged

- Pathogenic bacteria
- Dysbiosis
- Coccidiosis
- Toxins
- Heat stress

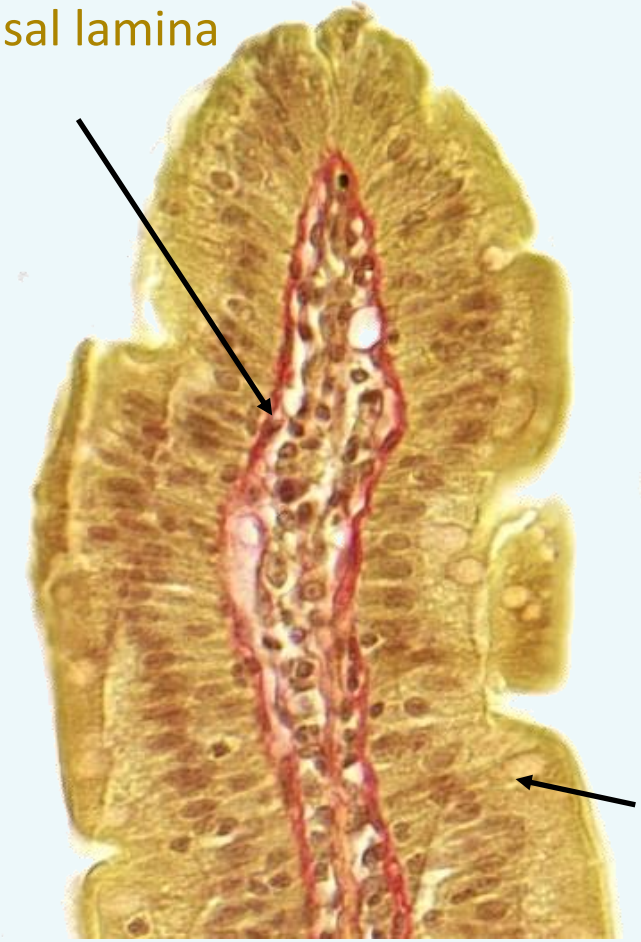


- Weakened gut barrier
- Inflammatory processes
- Leaky gut syndrome

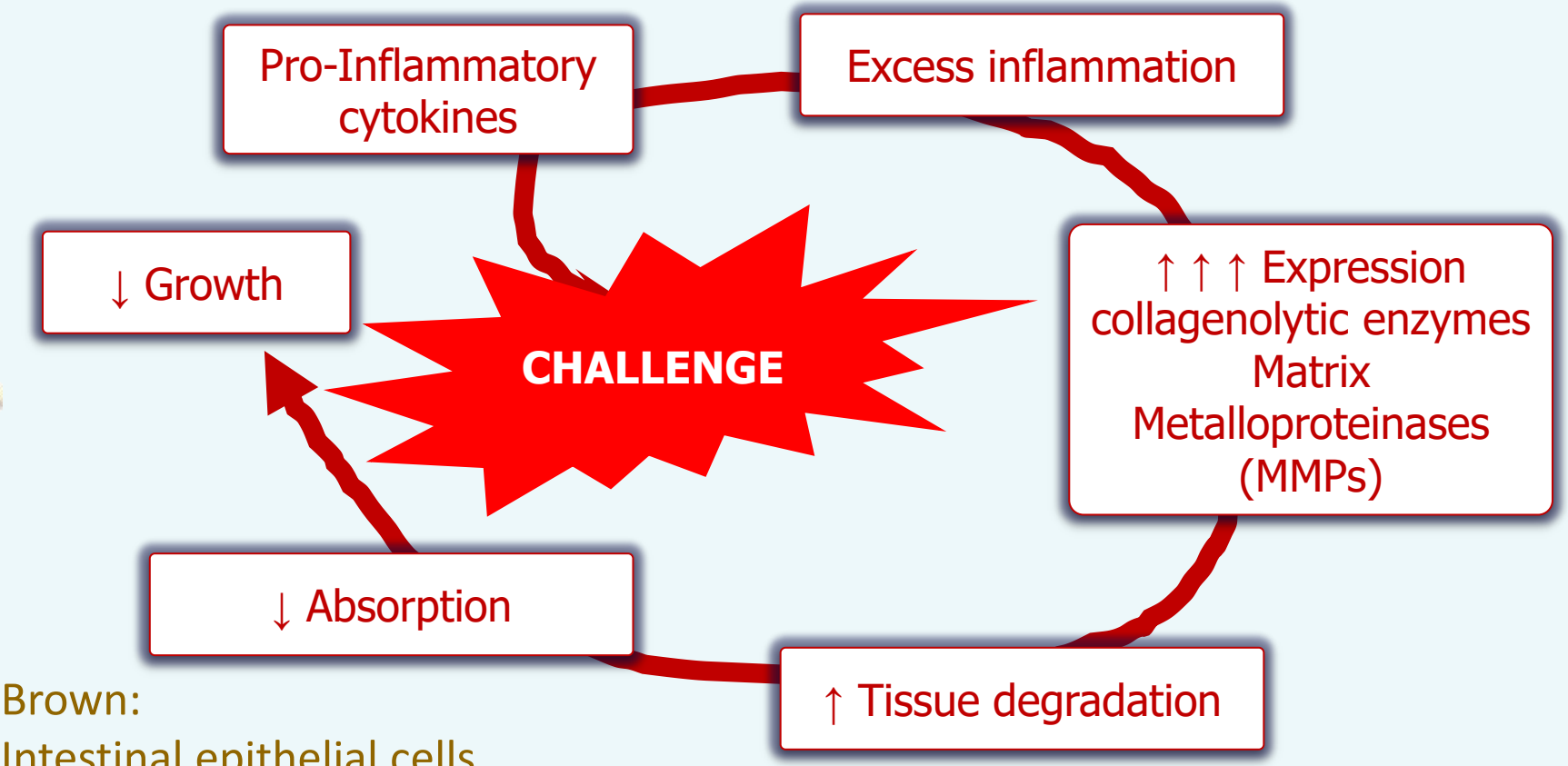
SMALL INTESTINE

Collagen & Metalloproteinases (MMPs) & Epithelial Integrity

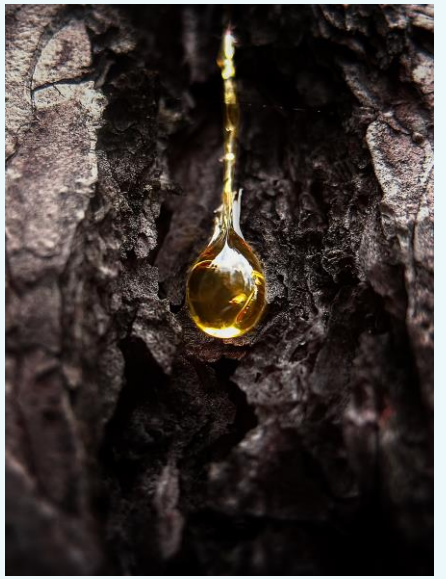
Red: collagen in connective tissue in basal lamina



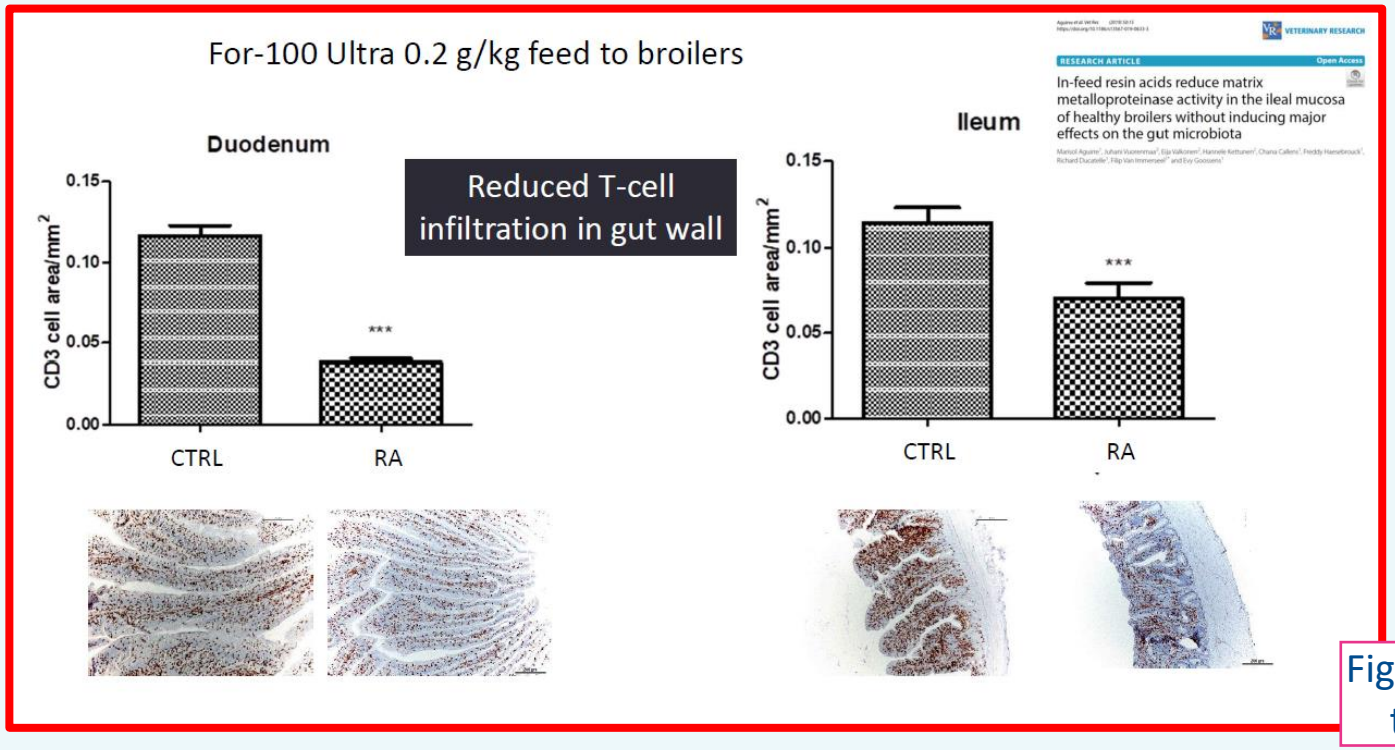
Brown:
Intestinal epithelial cells



SMALL INTESTINE



- **Resin** from coniferous trees and processed by thermal distillation
  - Blend of fatty acids, resin acid & antioxidants → **RESIN ACID**
- Interesting properties supporting the small intestine gut function



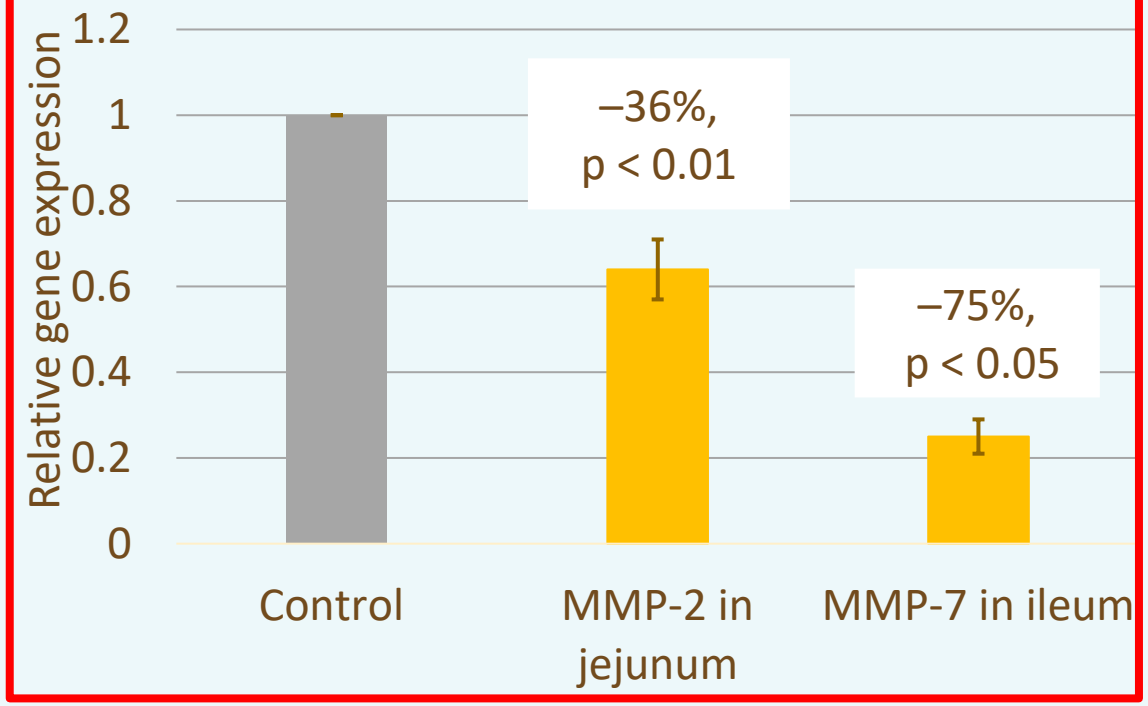
Resin acids reduce the density of inflammation-associated CD3+ T-lymphocytes (immune cells) in the small intestinal tissue of broiler chickens

Figures from Prof. Van Immerseel's presentation at the virtual Progres seminar, October 16, 2020

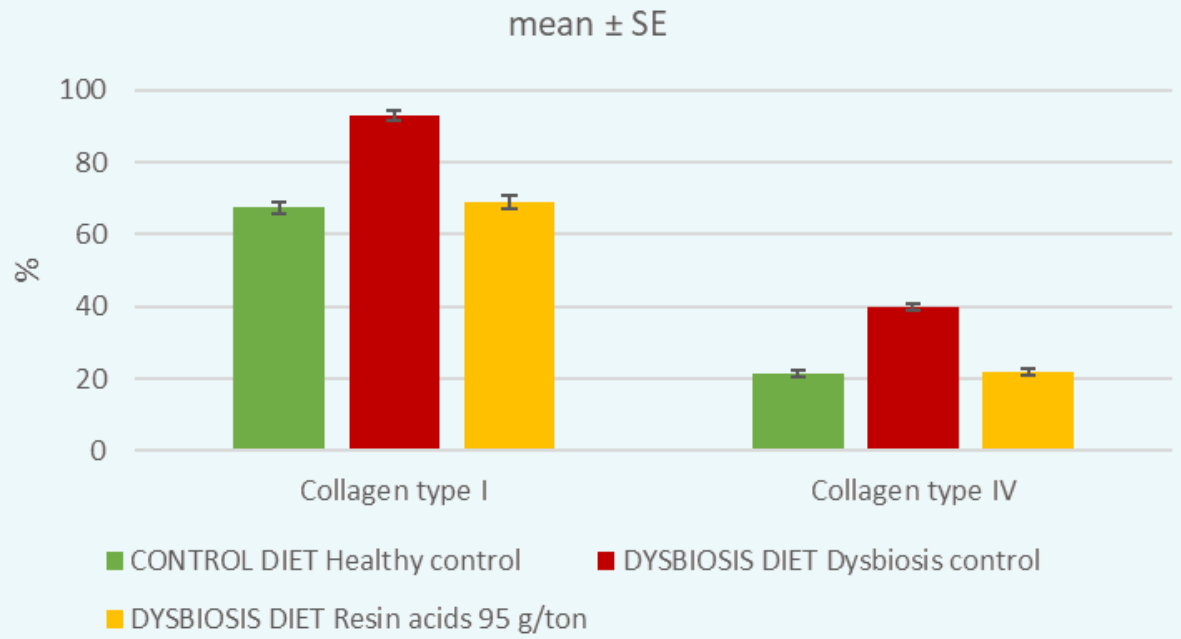
SMALL INTESTINE

RESIN ACID SUPPORTS EPITHELIAL CELL LINE

Both MMPs were reduced by RESIN ACID supplementation



Relative breakdown of col lagen types I and IV



Kettunen *et al.*, 2019, IHSIG Conference, Italy

Poulpharm 2019

SMALL INTESTINE

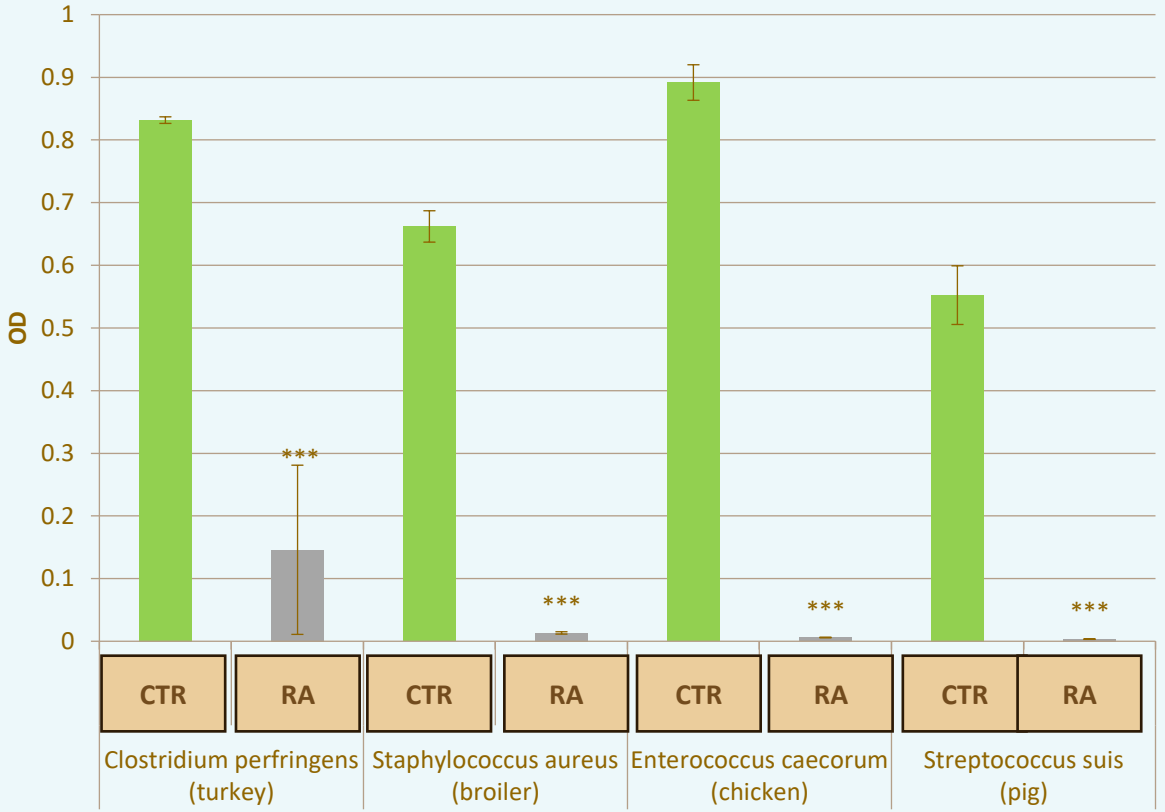
RESIN ACID INLUENCES BACTERIAL COMPOSITION OF ILEAL DIGESTA OF BROILER CHICKENS

Relaitve abundance (%)			
	Taxa	**Resin Acid**	**Control**
Ileum	*Lactobacillus*	76.45	66.04
	Corynebacterium	7.89	12.82
	Brachybacterium	1.98	4.45
	Staphylococcus	1.61	3.56
	Enterococcaceae	0.74	2.88
	Weissella	0.12	0.02
	Ruminococcaceae	0.09	0.03

The most abundant bacteria that were statistically different between the treatments

Internal data, 2017

RESIN ACID INHIBITS GROWTH OF GRAM + BACTERIA IN PURE CULTURES



Internal data, 2014

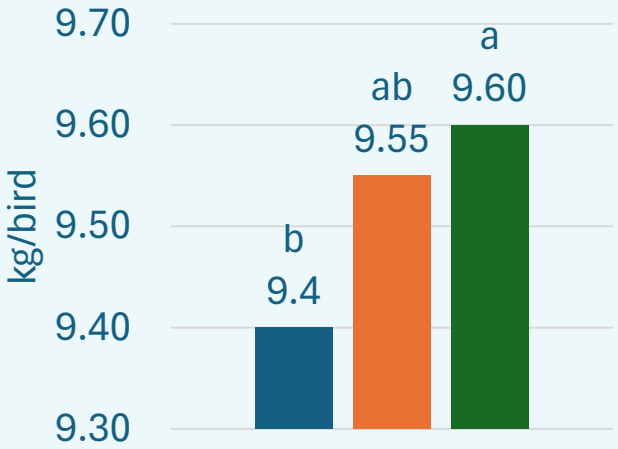
SMALL INTESTINE

➢ BENEFITS OF RESIN ACID IN TURKEYS

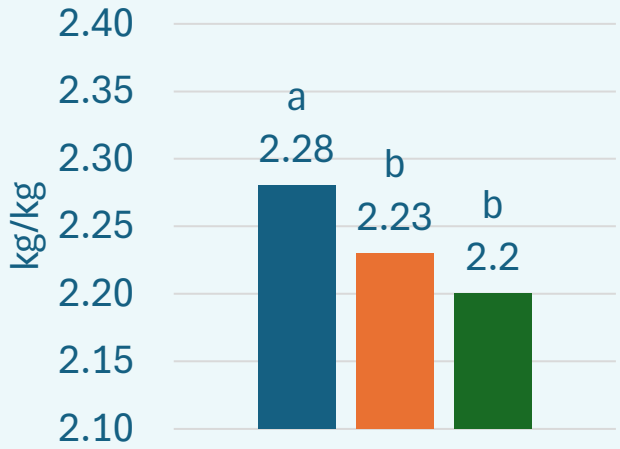
600 BIG 6 ♀
3 treatments (10 reps x 20 birds)
- CONTROL
- Low RA (0.5 kg/t)
- High RA (1.0 kg/t)

Trial duration 105 days (15 weeks)

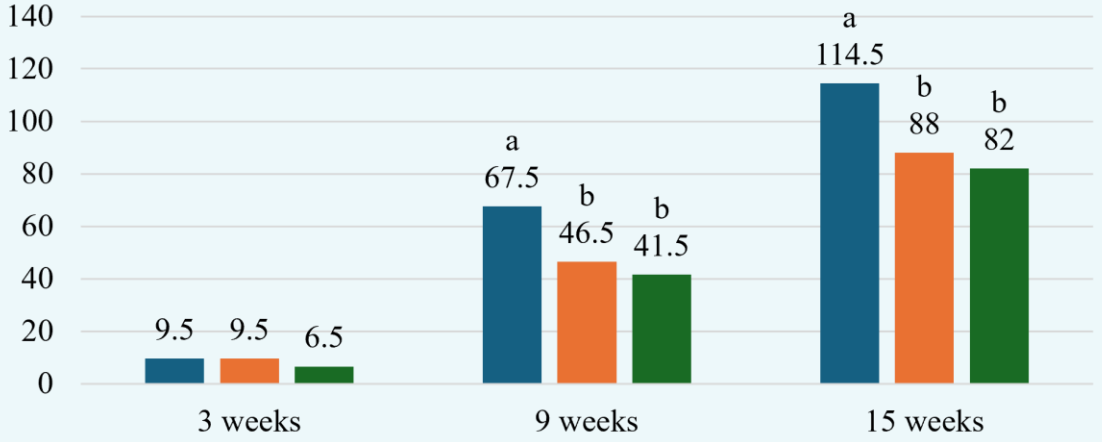
Final body weight



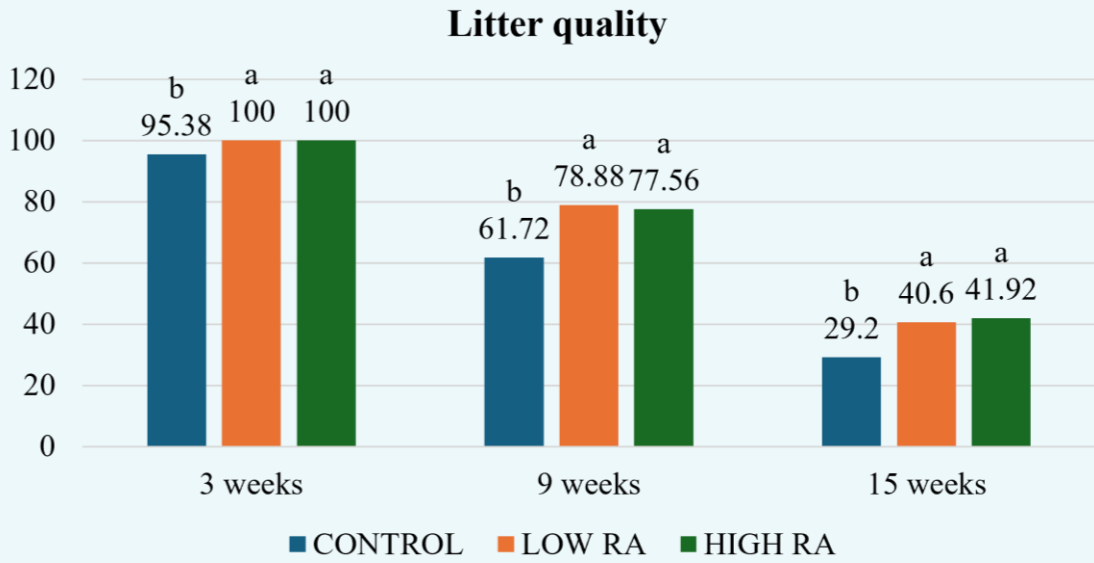
FCR



Footpad dermatitis



Litter quality



adapted from Lipiński et al., 2020

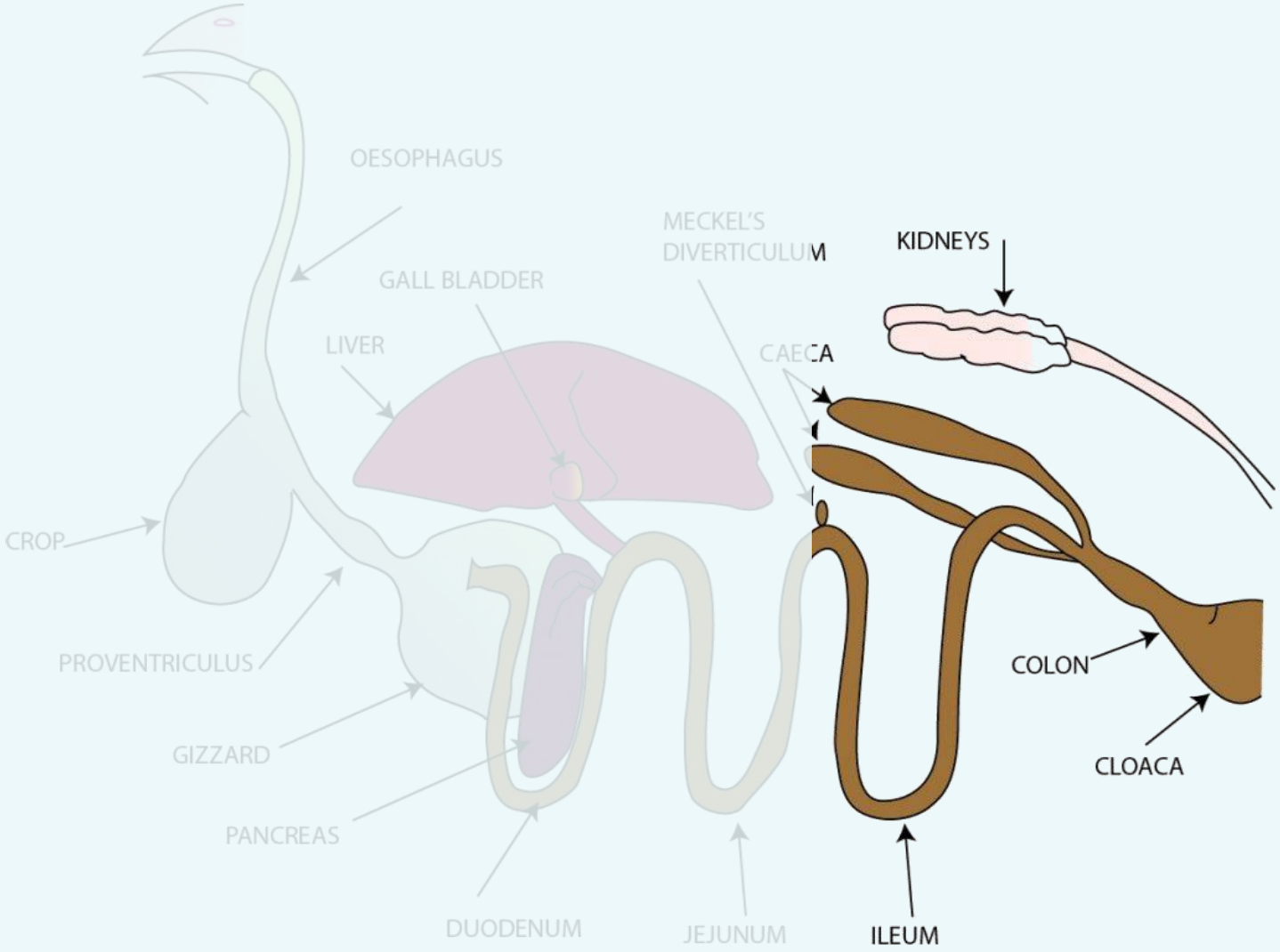
SMALL INTESTINE

Gizzard lesions	CONTROL	RESIN ACID
Lesions	27	0
No lesions	26	50
Total	53	50

$P < 0.0001$

Internal data, 2014

FUNCTION & SUPPORT

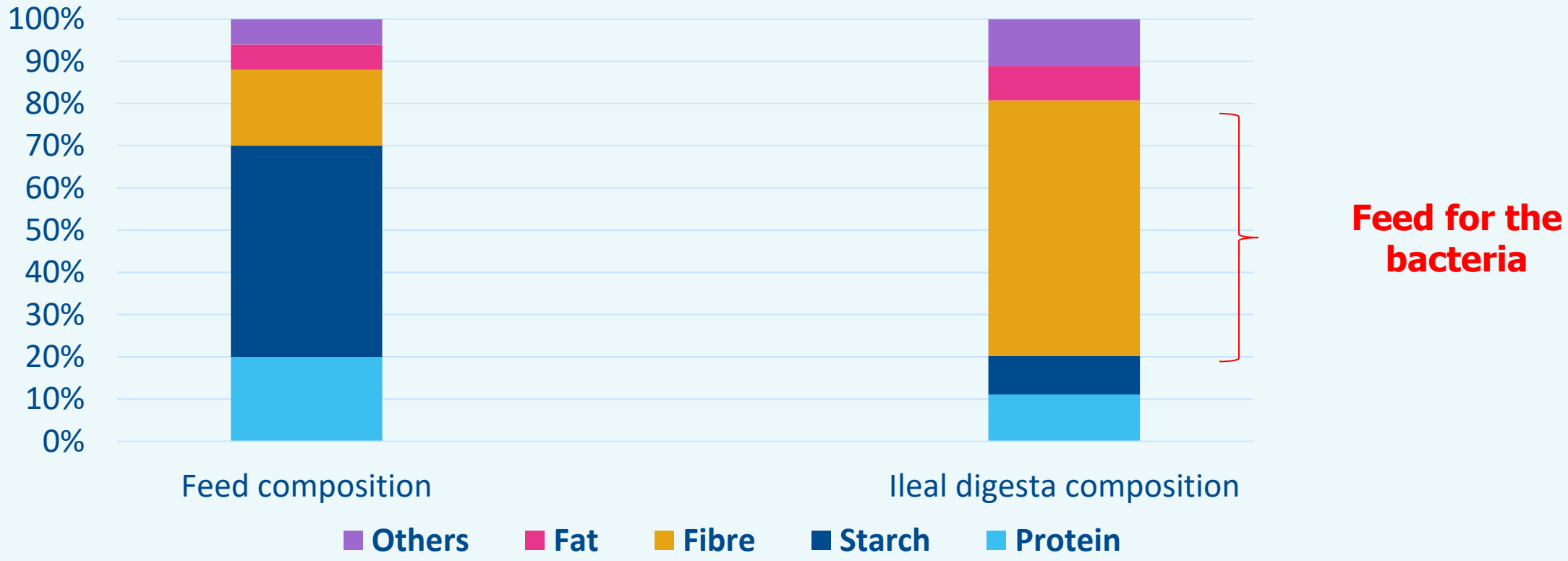


ABVista

The most important additive is intelligence

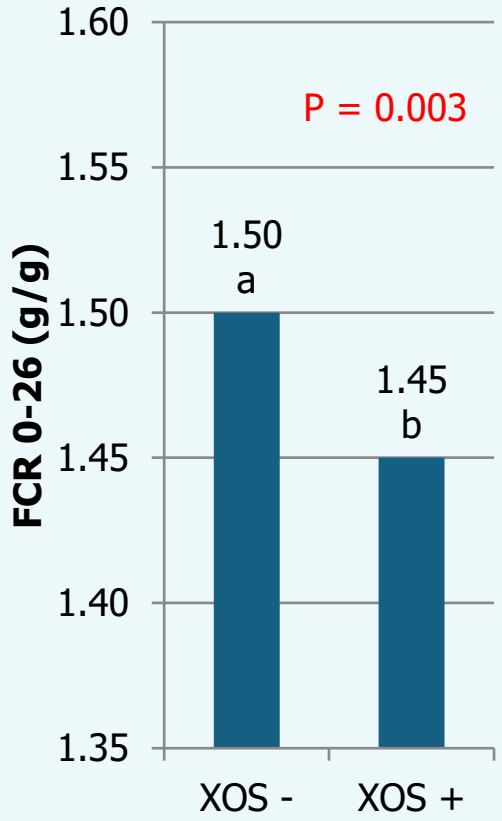
HINDGUT

- All nutrients not digested and absorbed in the small intestine will reach the caeca



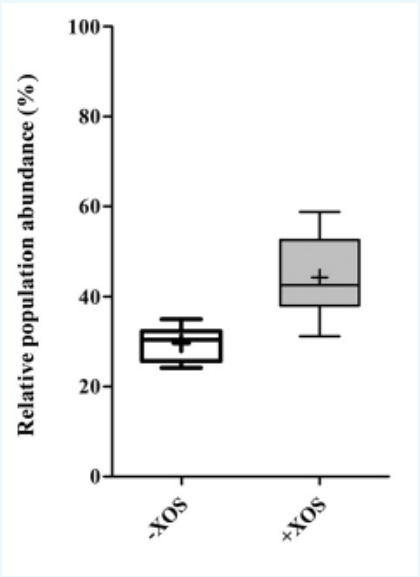
HINDGUT

- Hindgut microbiota training

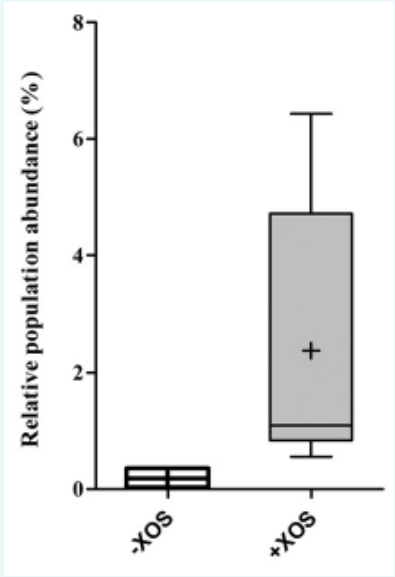


Cross-feeding interactions

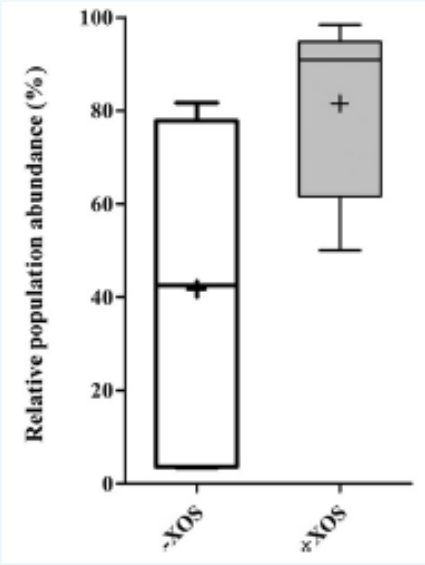
Clostridium cluster XIVa



Anaerostipes butyraticus



Lactobacillaceae

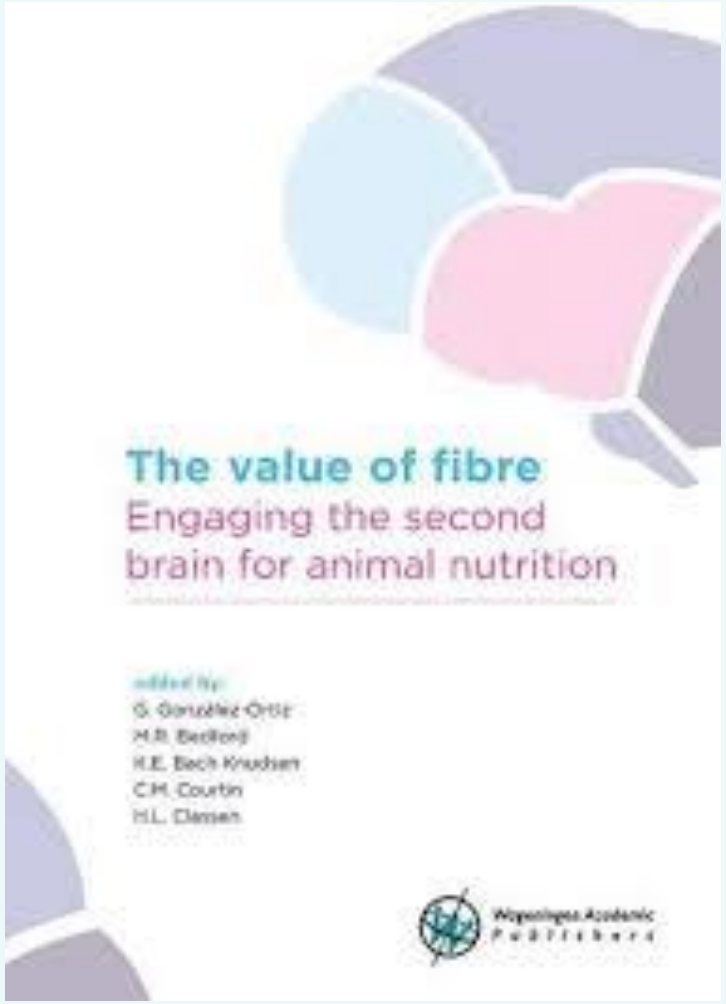


Total bacteria
Butyryl-CoA:acetate-CoA transferase
Longer villous height ileum

De Maesschalck et al., 2015

HINDGUT

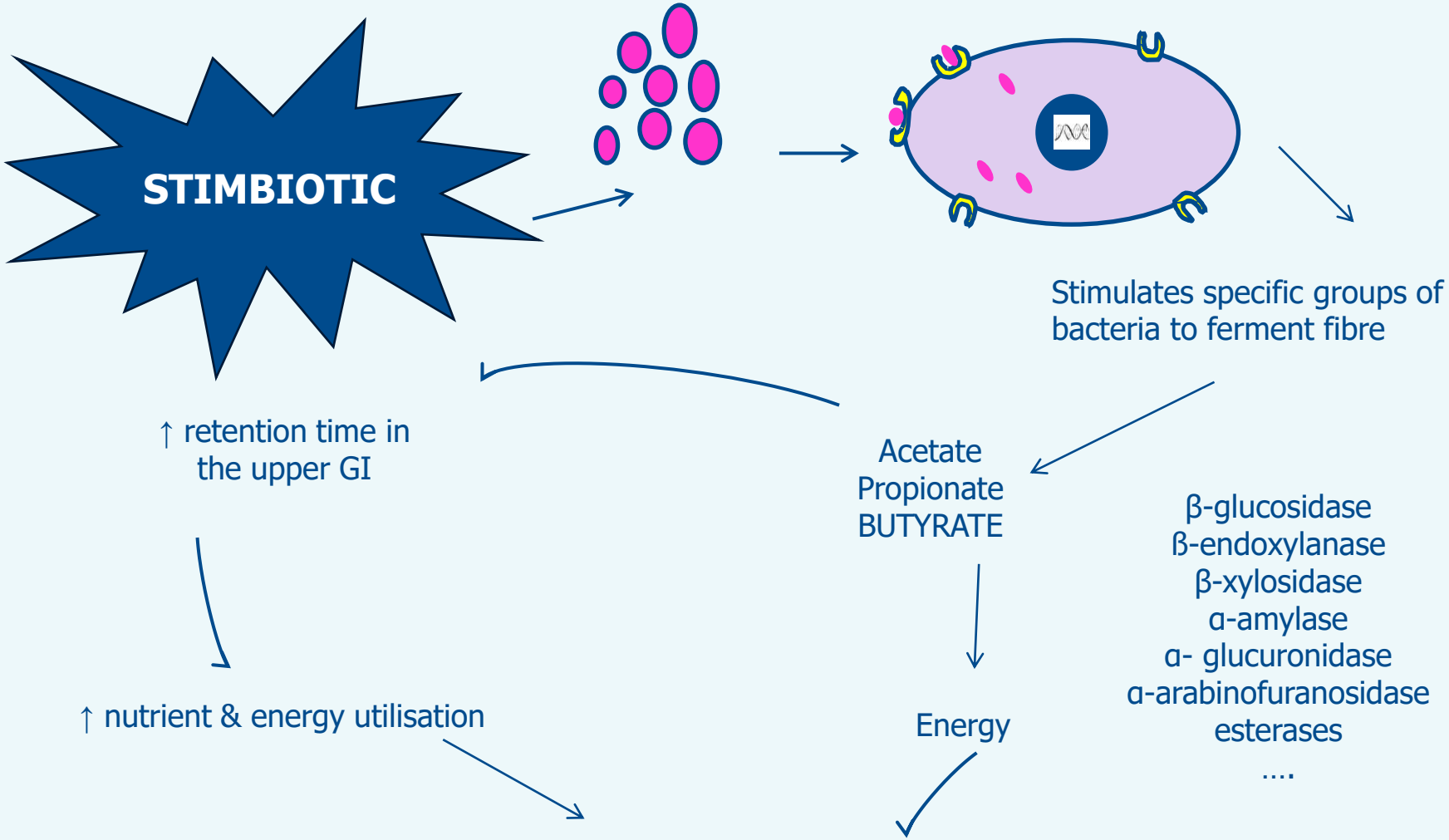
Stimbiotic
2019



"Any product able to stimulate a fibre-degrading microbiome to increase fibre fermentability without becoming the substrate for this microbiome growth"

INTERNATIONAL FIBRESUMMIT

HINDGUT

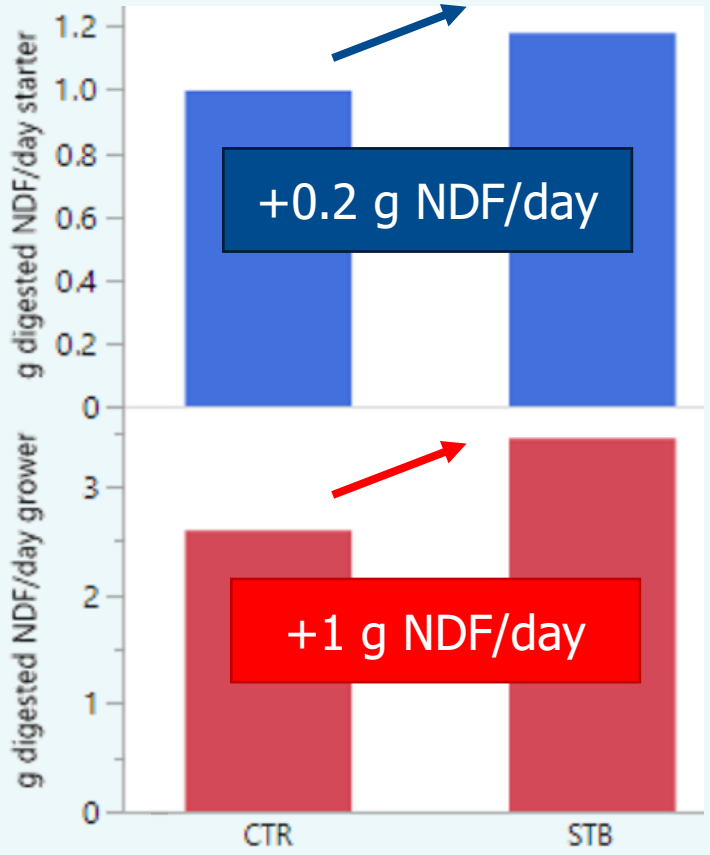


González-Ortiz et al., 2019

HINDGUT

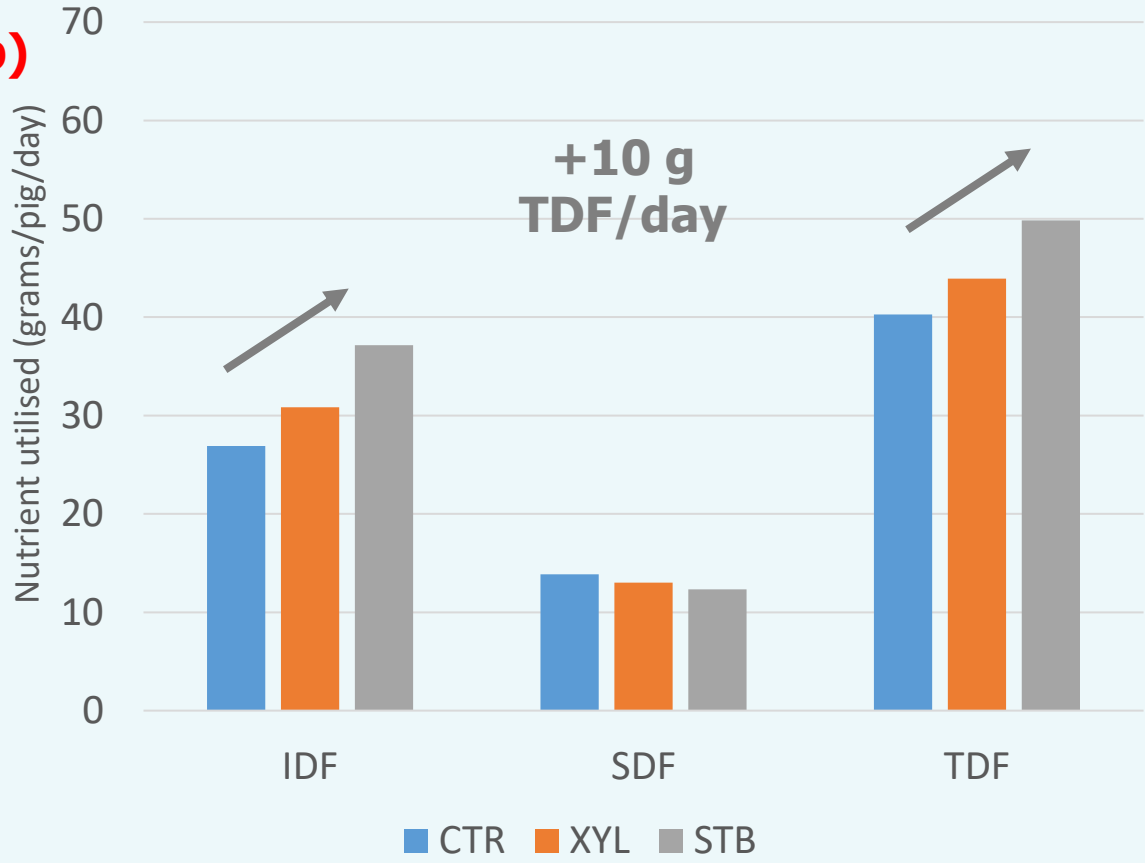
- Stimbiotic supplementation increases fibre utilisation in a) broiler chickens and b) piglets

a)



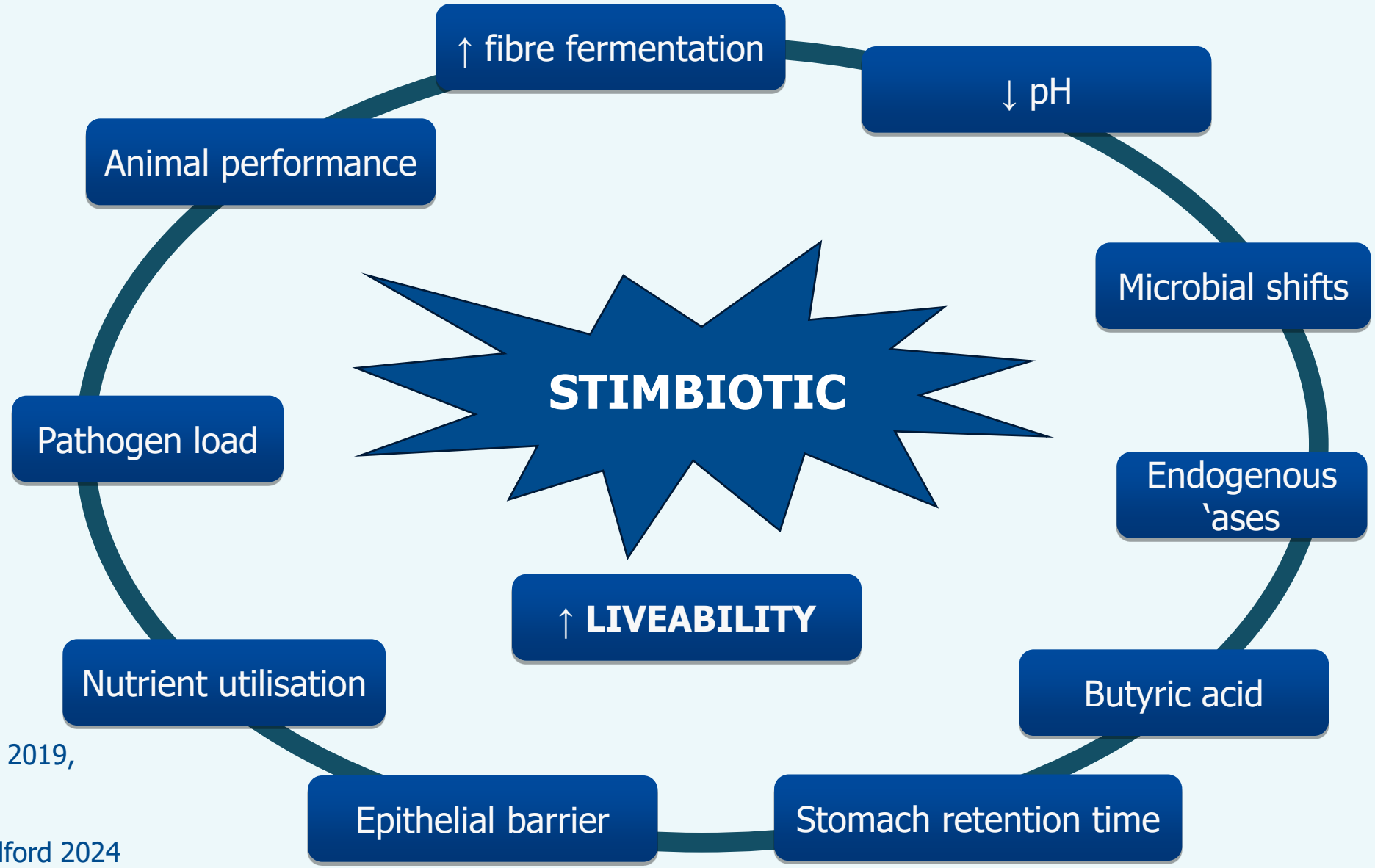
Simic et al., 2023

b)



Acosta et al., 2025-Under review

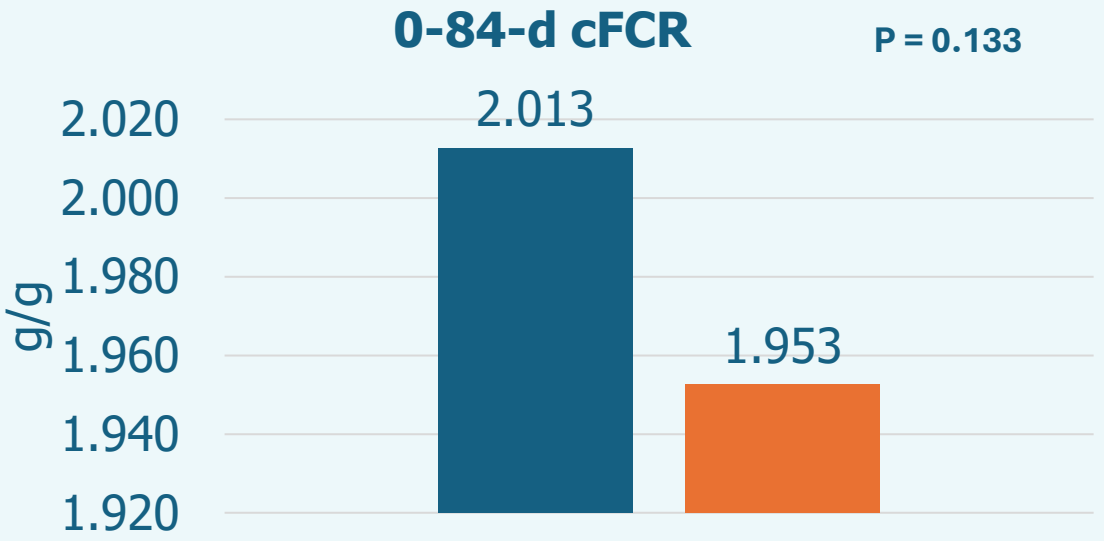
HINDGUT



Cho et al., 2020,
Gonzalez-Ortiz et al., 2019,
Simic et al., 2023,
Davies et al., 2024
Gonzalez-Ortiz & Bedford 2024

HINDGUT

-)) CQR (USA, 20-2T)
-)) Turkey hen performance ♀
-)) 0 to 12 weeks of age (84-days old)
-)) Crumble & pellet feeds (corn-SBM)
-)) 4 feeding phases
-)) 2 treatments
  - Control
  - Signis
-)) 9 pens/treatment
-)) 20 birds/pen
-)) 360 birds in total



6 points improvement on cFCR driven by lower FI

	0-28 Phase 1	28-42 Phase 2	42-56 Phase 3	56-84 Phase 4	0-84 Overall
Control	1.67%	0.56%	0.00%	0.00%	2.23%
Stimbiotic	0.56%	0.00%	0.00%	0.00%	0.56%
δ Mortality	-1.11	-0.56	0.00	0.00	-1.68

FINAL CONSIDERATIONS

The most important additive is intelligence

FINAL CONSIDERATIONS

1. There are many factors to consider to support gut function depending on the age of birds and/or on the specific region of the gastrointestinal tract. There is not a unique solution.
2. Promoting a higher acidic environment in the upper gut will ease the digestion and absorption of protein and minerals.
3. It is important to keep the integrity of the epithelium in the best conditions in a challenge situation.
4. Stimbiotics increase fibre utilisation than otherwise would be excreted in the manure.
5. Effective feed additives are a complement to other management strategies.