Identification of faecal protein biomarkers for intestinal health in broilers

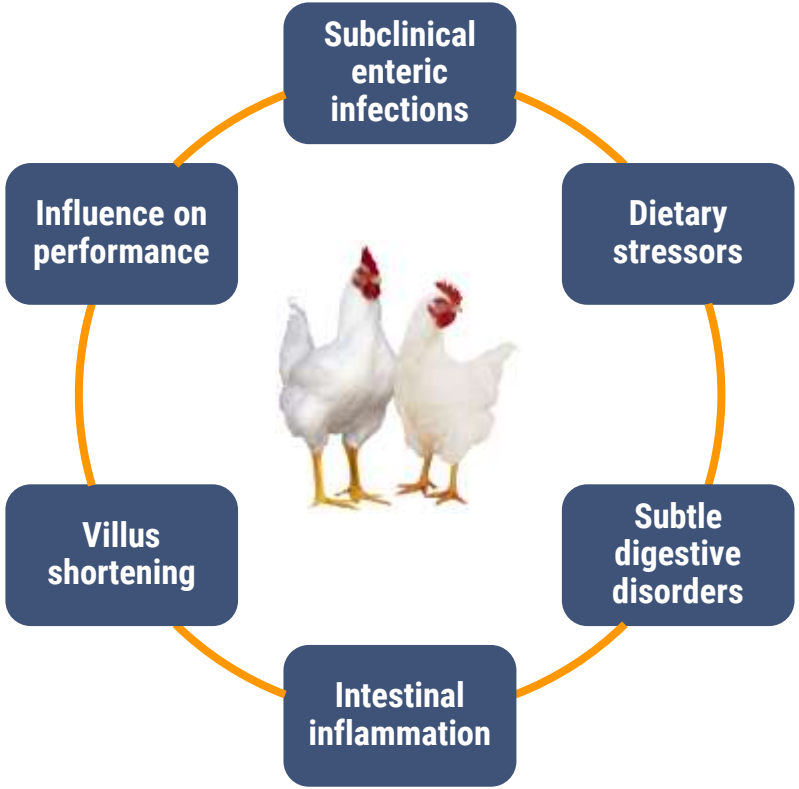
Fien De Meyer

Ghent University – Department of Pathology, Bacteriology and Avian Diseases
f.demeyer@ugent.be

European Poultry Conference 2018

AGENTSCHAP INNOVEREN & ONDERNEMEN
HOUGHTON TRUST

Gut health


Subclinical enteric infections
Dietary stressors
Subtle digestive disorders
Intestinal inflammation
Villus shortening
Influence on performance


BIOMARKERS

Identification of biomarkers in a developed *in vivo* model for gut damage

1) *In vivo* model

- Performance
- Macroscopic lesion scoring
- Morphology
- Immunohistochemistry

2) Identification of faecal proteins

1 What is the effect of predisposing factors on intestinal health?

D1	D12	D12-D17	D18-D20	D19	D26
Starter mash	Wheat (57,5%) based diet supplemented with rye (5%)	Antibiotic challenge	Bacterial challenge → *E. coli* → *C. perfringens*	Coccidiosis challenge → *Eimeria acervulina* → *Eimeria maxima*	Necropsy → Macroscopic scoring → Histology → Proteomics

Control group

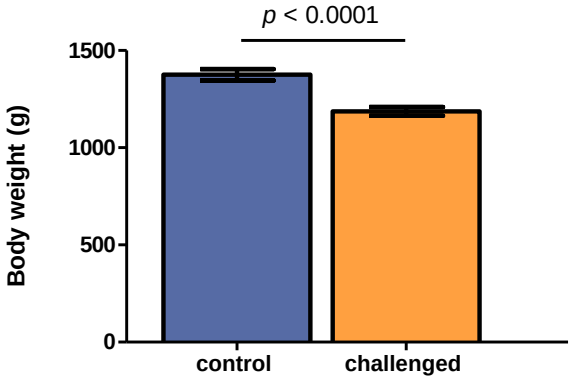
Challenge group

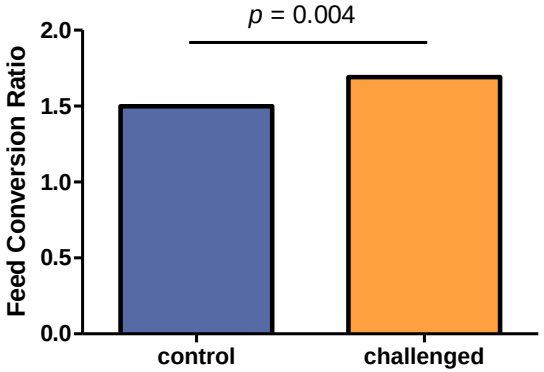
1) *In vivo* model

Performance

3 per replicate
9 replicates
2 treatments

Day 26





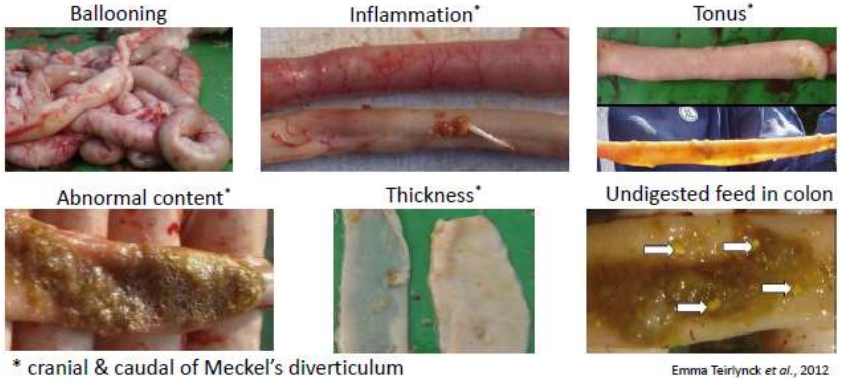
Decreased body weight

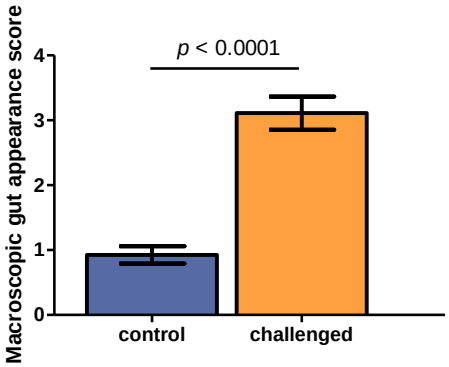
Increased feed conversion ratio

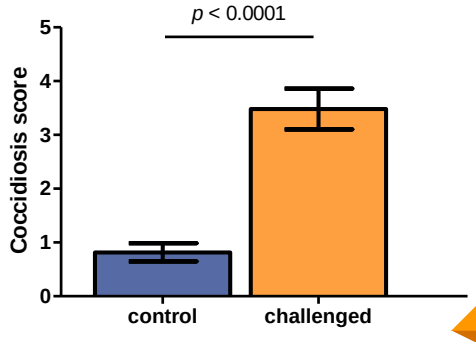
Macroscopic lesion scoring

3 per replicate
9 replicates
2 treatments

Day 26







Johnson & Reid (1970)

- *E. acervulina*
- *E. maxima*
- *E. tenella*

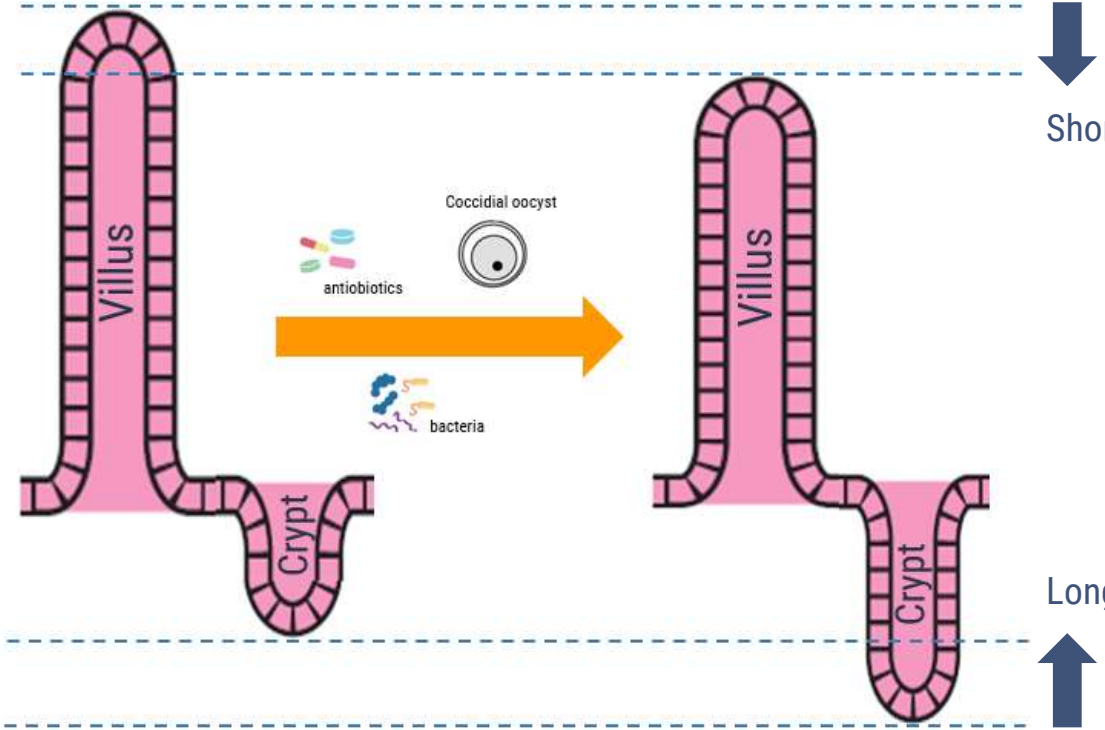
scored 0 (absent) to 4 (severe)
➔ total score = sum

1) *In vivo* model

Morphology of duodenum

3 per replicate
9 replicates
2 treatments

Day 26



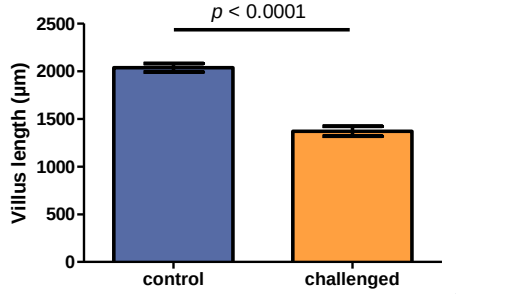
Shorter villi

Longer crypts

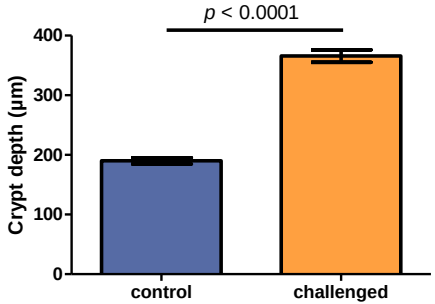
Morphology of duodenum

3 per replicate
9 replicates
2 treatments

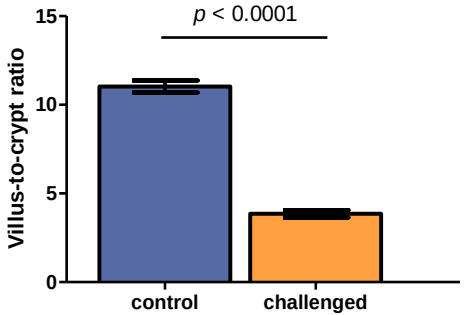
Day 26



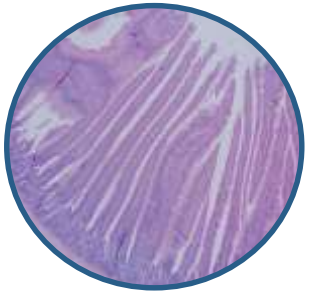
Decreased villus length



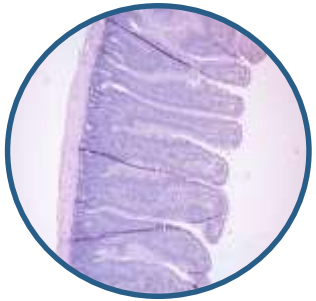
Increased crypt depth



Decreased villus-to-crypt ratio



Control



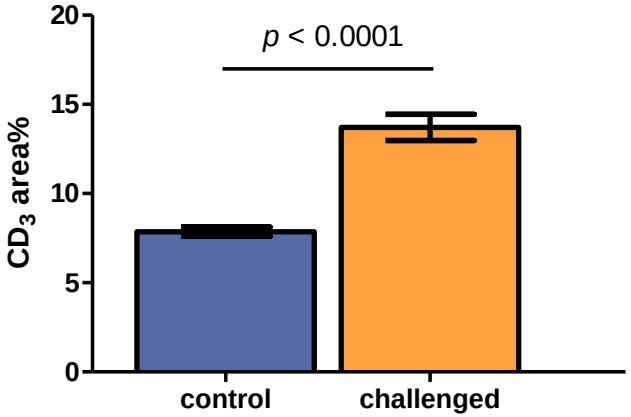
Challenge

1) *In vivo* model

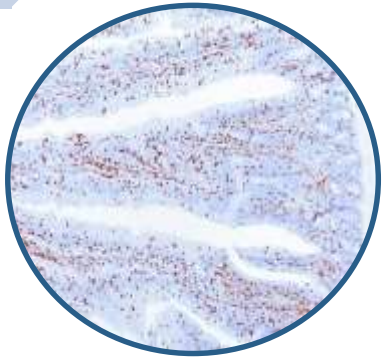
Immune cell infiltration in duodenum

3 per replicate
9 replicates
2 treatments

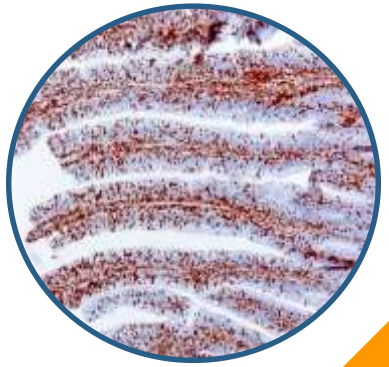
Day 26



Increased CD_3 area %



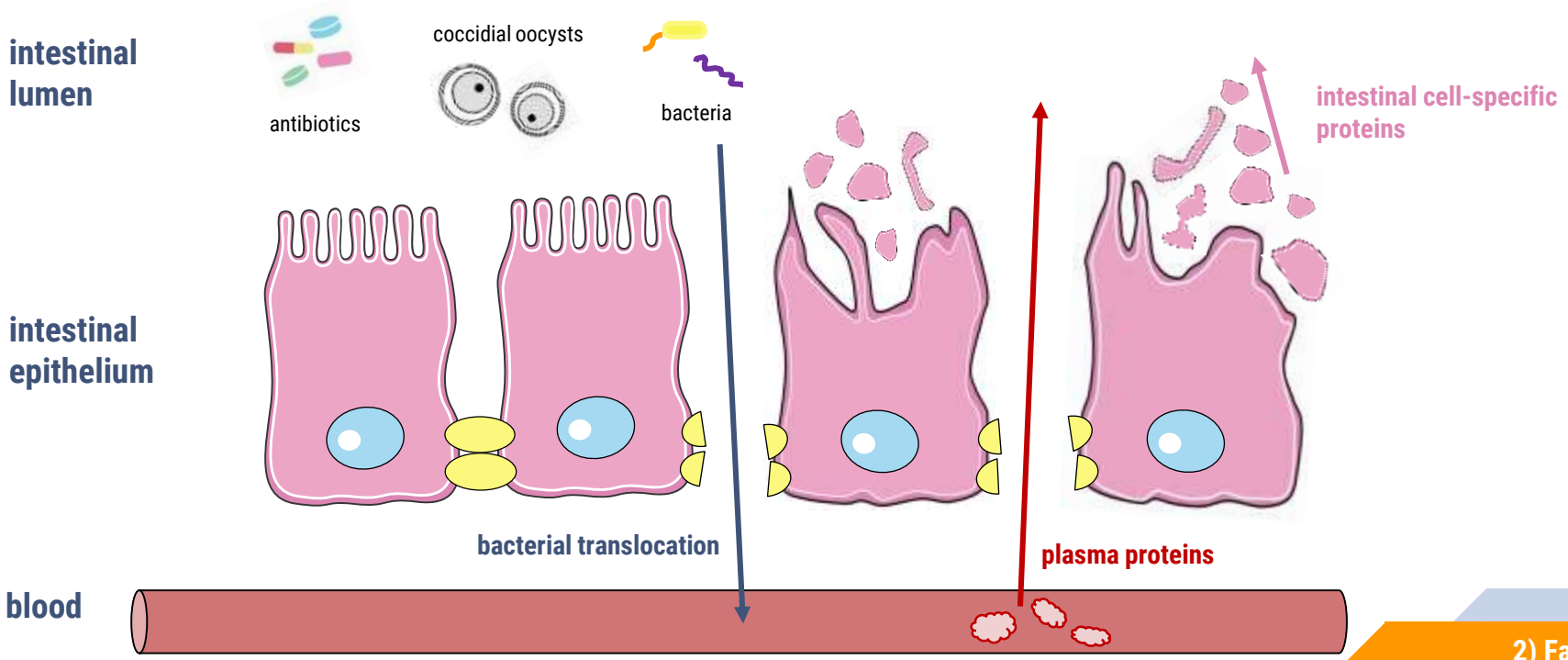
Control



Challenge

1) *In vivo* model

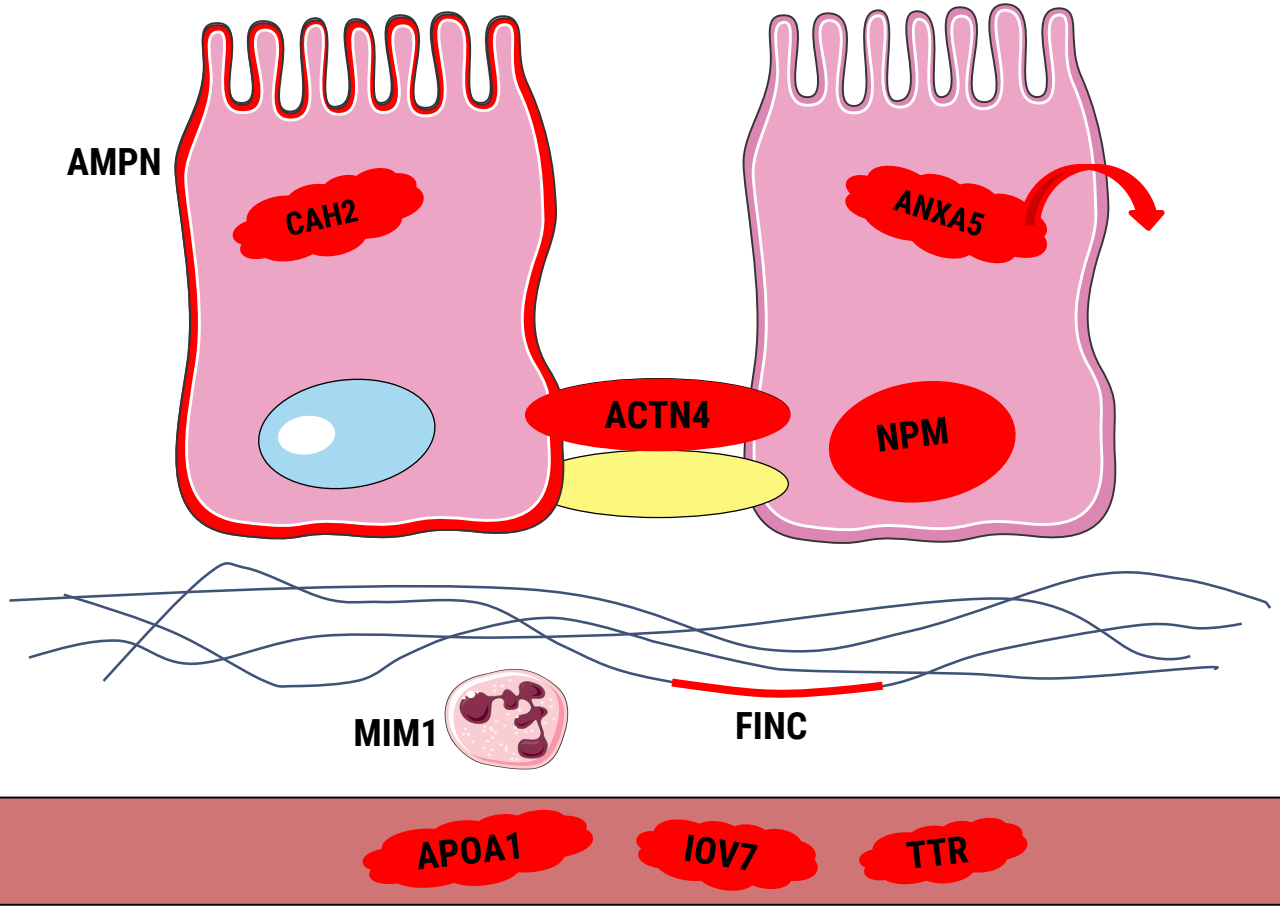
2 Identification faecal protein biomarkers



Proteomics

1 per replicate
9 replicates
2 treatments

Day 26



Correlations between proteins &
- villus length
- CD_3 area%
- macroscopic gut appearance score

2) Faecal proteins

Conclusion

1 Effects of predisposing factors on intestinal health

- Lower body weight & higher feed conversion ratio
- Worse condition of gut wall
- Less nutrient absorption and higher inflammation level

→ *In vivo* model can be used as tool to evaluate intestinal damage

2 Identification of faecal proteins which are correlated with parameters characterizing condition of the gut

→ basis for development of diagnostics

Thank you!

GHENT UNIVERSITY

Department Pathology, Bacteriology and Avian Diseases
Prof. Dr. Filip Van Immerseel
Prof. Dr. Richard Ducatelle

AGENTSCHAP INNOVEREN & ONDERNEMEN

HOUGHTON TRUST