Faecal transplants in neonatal and weaning pigs

CPH-PIG seminar January 27th, 2022

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Background for both studies

Susceptibility to post-weaning diarrhoea (PWD)

↕

[Dou *et al.* 2017]

The gut microbiome during the first week of life

Characterisation of Early-Life Fecal Microbiota in Susceptible and Healthy Pigs to Post-Weaning Diarrhoea

Samir Dou[1], Pascale Gadonna-Widehem[1], Véronique Rome[2], Dounia Hamoudi[1], Larbi Rhazi[1], Lyes Lakhal[3], Thibaut Larcher[4], Narges Bahi-Jaber[1], Arturo Pinon-Quintana[5], Alain Guyonvarch[5], Isabelle L. E. Huërou-Luron[2]*, Latifa Abdennebi-Najar[1]*

Coprophagia [Sansom and Gleed, 1981]

The ingestion of sow's faeces by suckling piglets

BY B. F. SANSOM AND P. T. GLEED

↓

May affect post-weaning performance

[Aviles-Rosa *et al.* 2019]

Communication

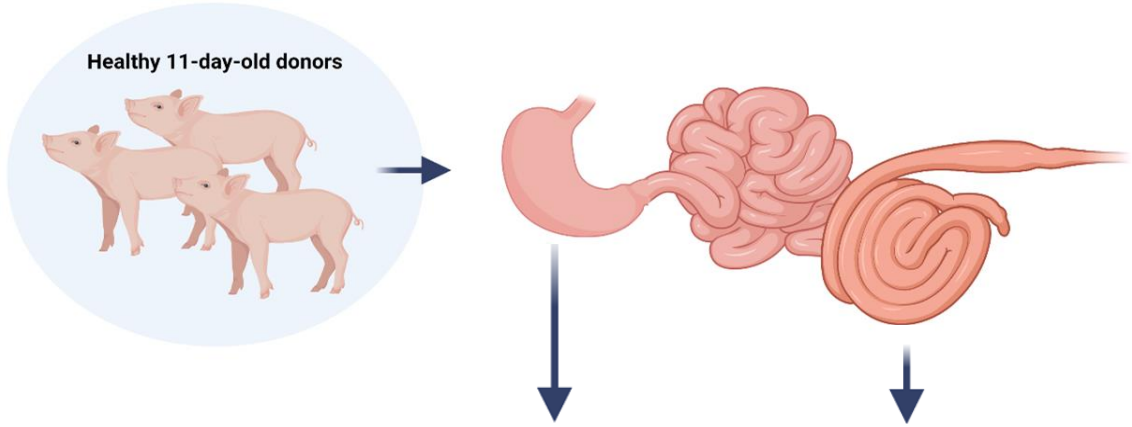
Preliminary Study: Depriving Piglets of Maternal Feces for the First Seven Days Post-Partum Changes Piglet Physiology and Performance before and after Weaning

Edgar O. Aviles-Rosa [1], Anoosh Rakhshandeh [2] and John J. McGlone [1,*]

Hypothesis: Early life microbial transplants from healthy suckling piglet donors can reduce PWD

AVANT

Intervention material



↑Lactobacilli [Xu *et al.* 2016]

Gastric microbiota transplantation

GMT

Faecal microbiota transplantation

FMT

Bacteria, viruses, metabolites, proteins…

GMT FMT FFT CON

Sterile saline

CON

Faecal filtrate transplantation

FFT

~~Bacteria~~, viruses, metabolites, proteins…

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 862829.

Study overview

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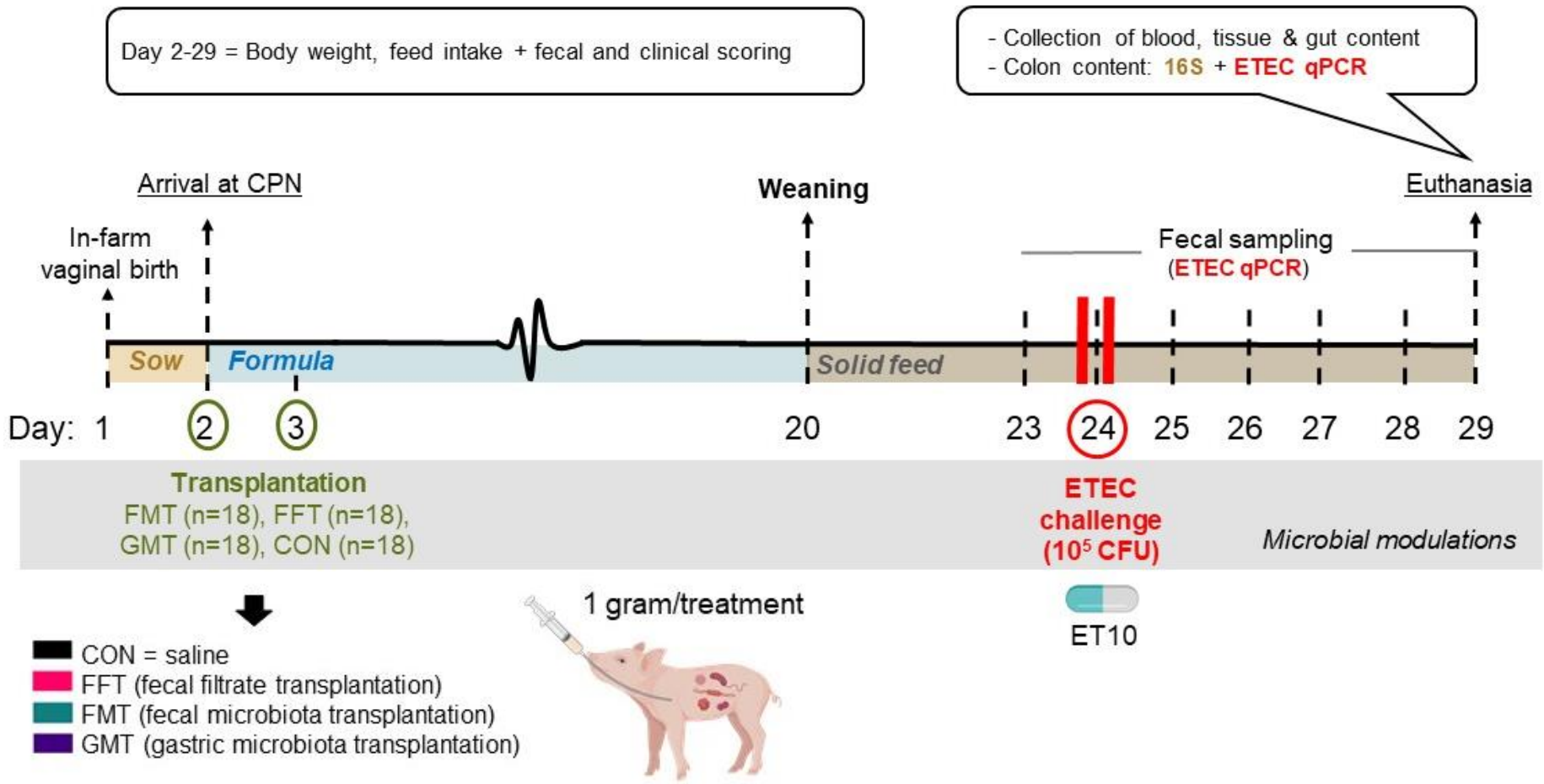
Study overview



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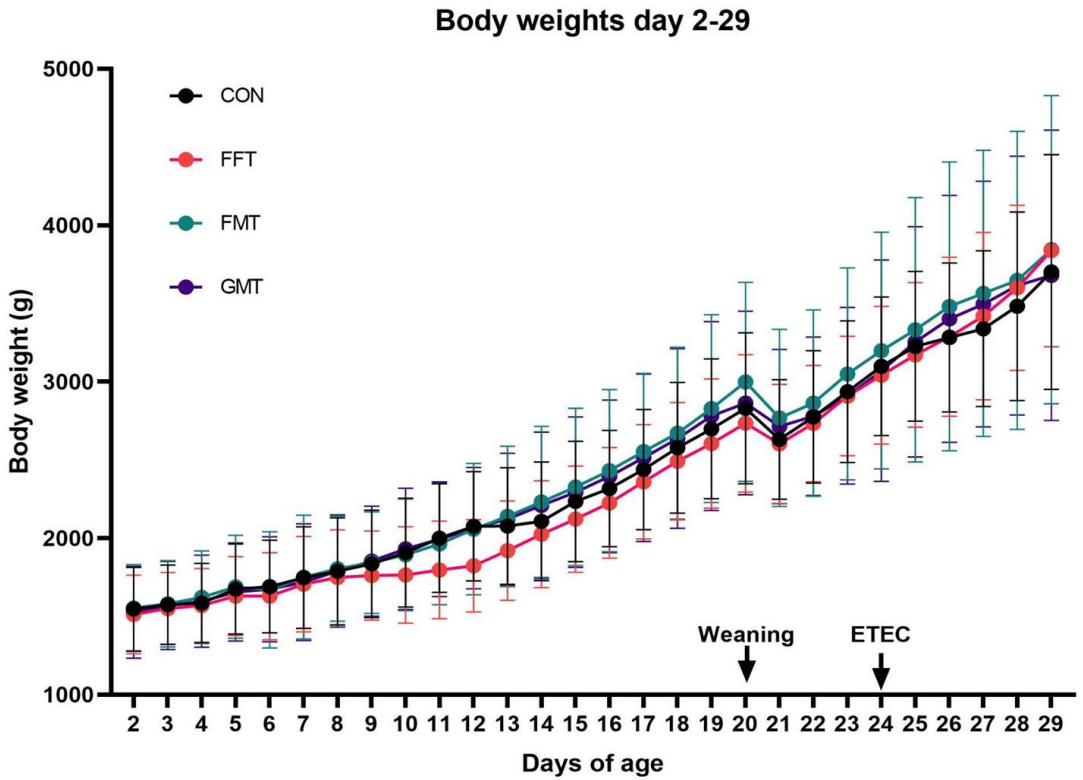
Results – growth



Means ± SD, n = 15-16

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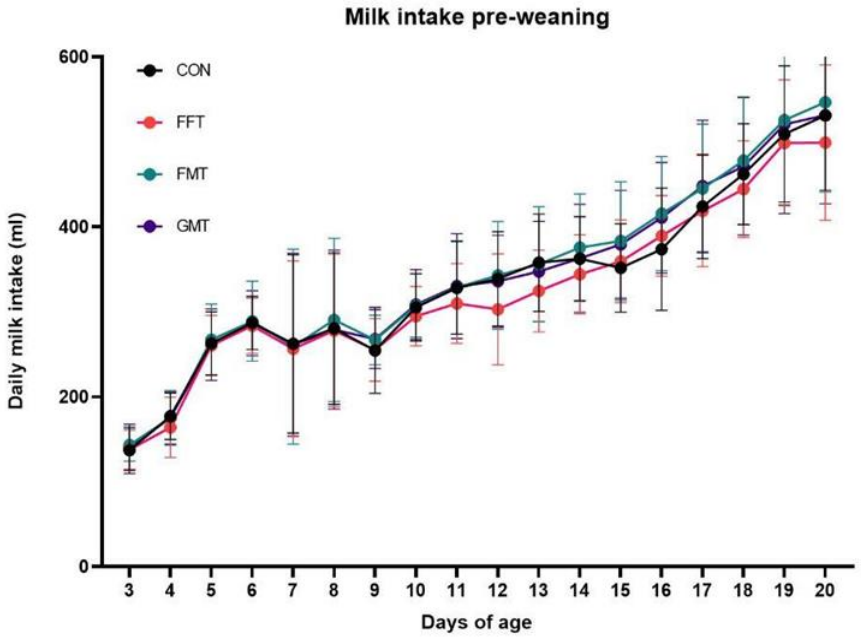
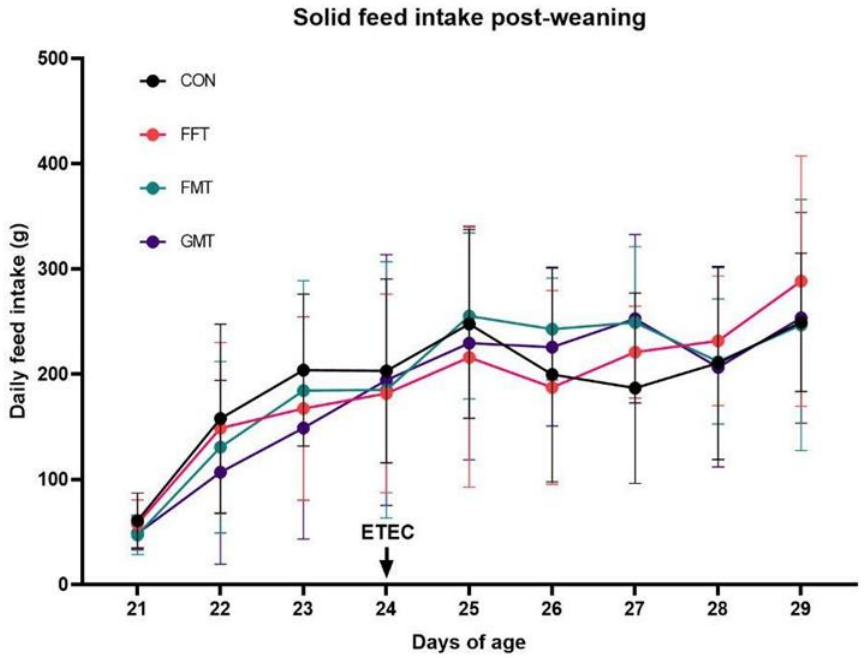
Results – feed intake





Means ± SD, n = 15-16

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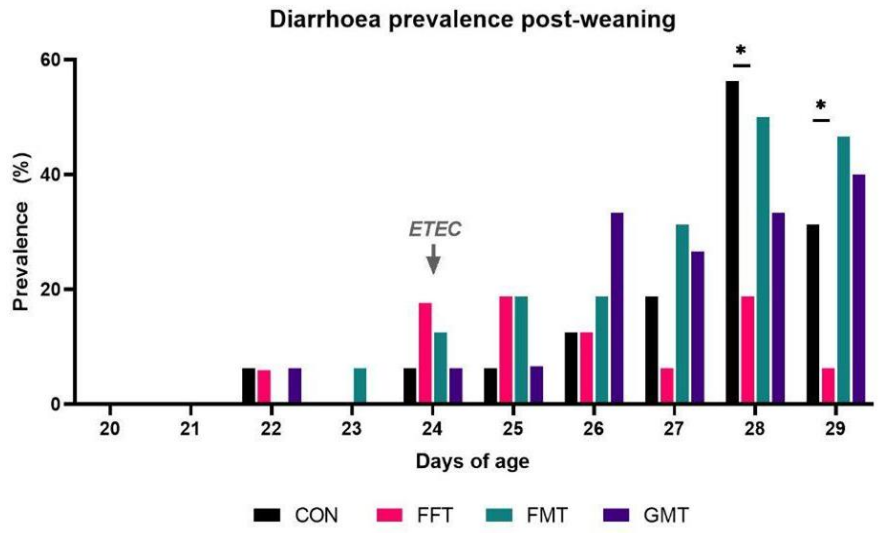
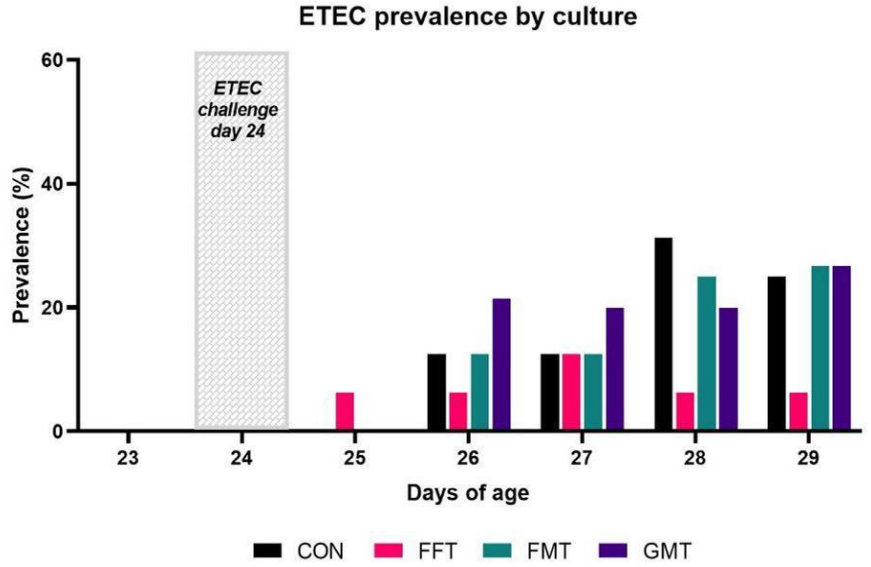
Results – post-weaning diarrhoea





ETEC qPCR

Means ± SD, n = 15-16

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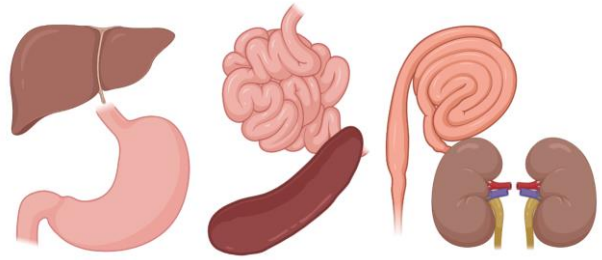
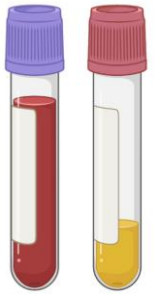
Results

Organ weights

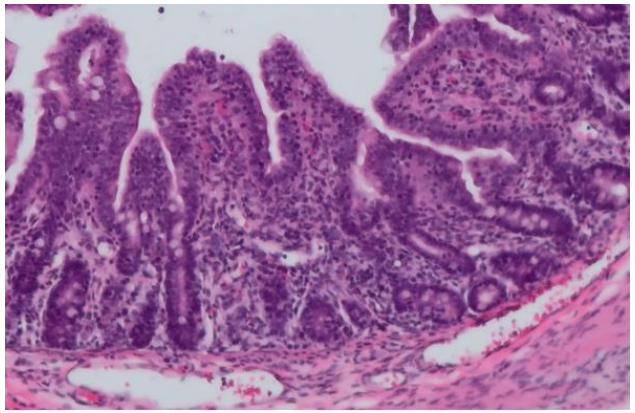


Blood parameters

- Hematology
- Biochemistry
- Serum cytokines
- Acute-phase proteins



Small intestinal morphology and histology



Brush border enzymes

- Peptidases:
  - Aminopeptidase A
  - Aminopeptidase N
  - Dipeptidyl peptidase IV
- Disaccharidases:
  - Lactase
  - Maltase
  - Sucrase

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Conclusion - AVANT

- **FFT reduces diarrhoea on day 28-29 post weaning**
- FMT and GMT = similar to controls

Future results:

- 16S rRNA-amplicon sequencing (day 29)
- ETEC qPCR (day 23-29)

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Pilot study – Faecal filtrate transplantation on farm

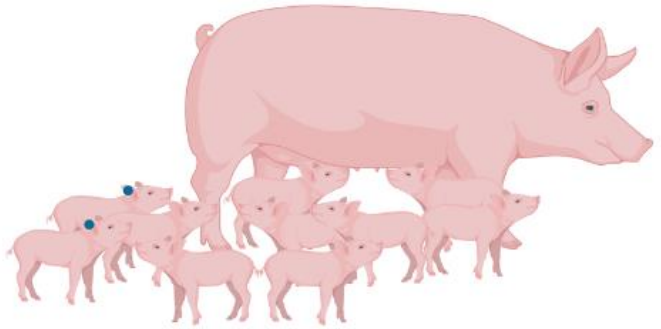
Hypothesis: Early life microbial transplants with maternal donor materials from gestational high parity sows can reduce PWD

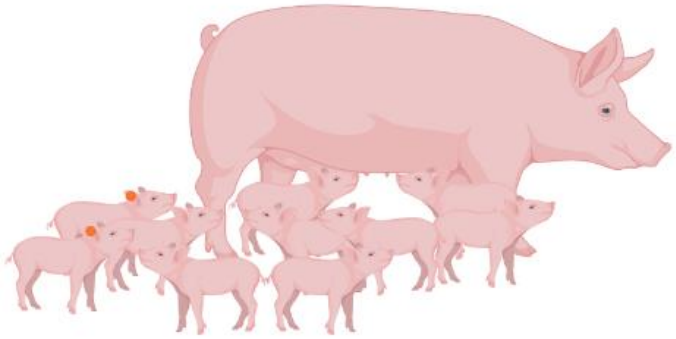
Study overview and intervention material

Created in BioRender.com

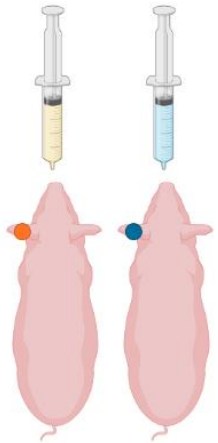
Experimental timeline:

Suckling period day 1-27
CON *n* = 18 (9 litters), FFT *n* = 20 (10 litters)





Inoculation day 1-6



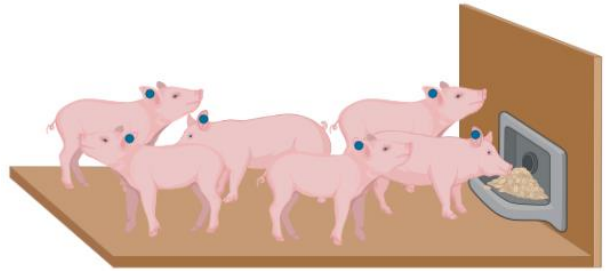
1 gram/treatment

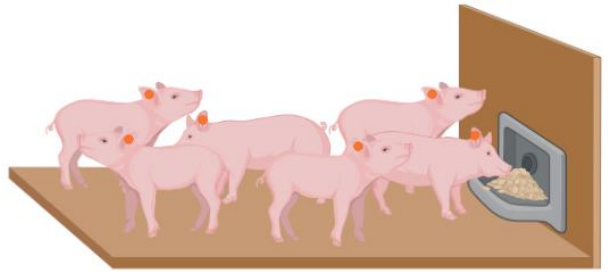
Euthanasia day 27

CON *n* = 6

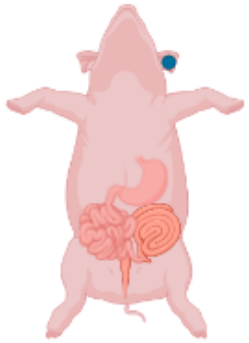
FFT *n* = 7

Weaning period day 28-35
CON *n* = 6, FFT *n* = 8





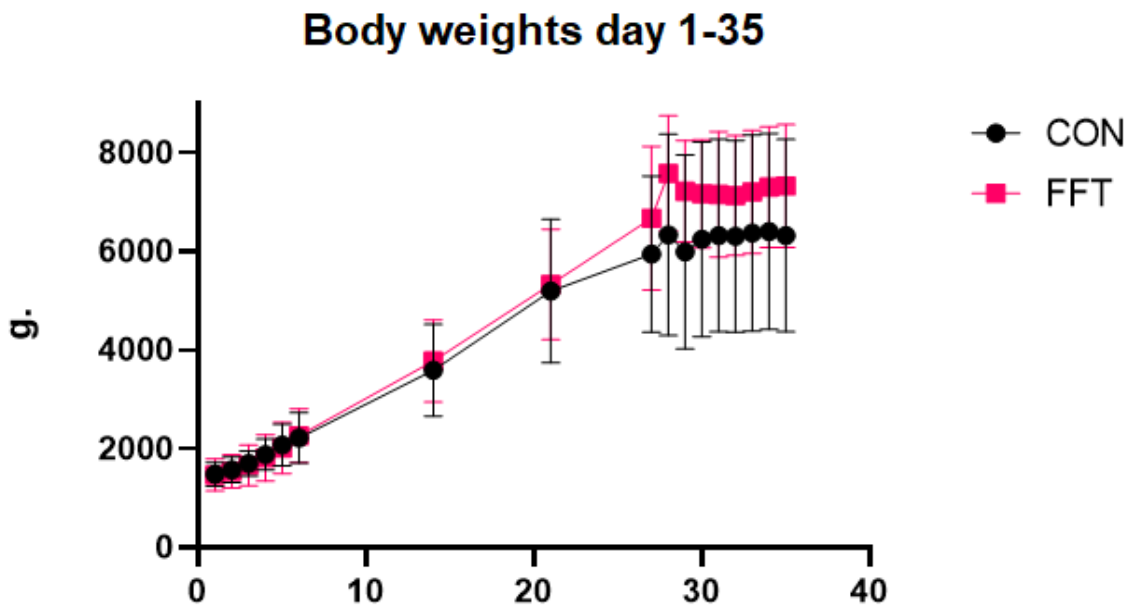
Euthanasia day 35



CON *n* = 6

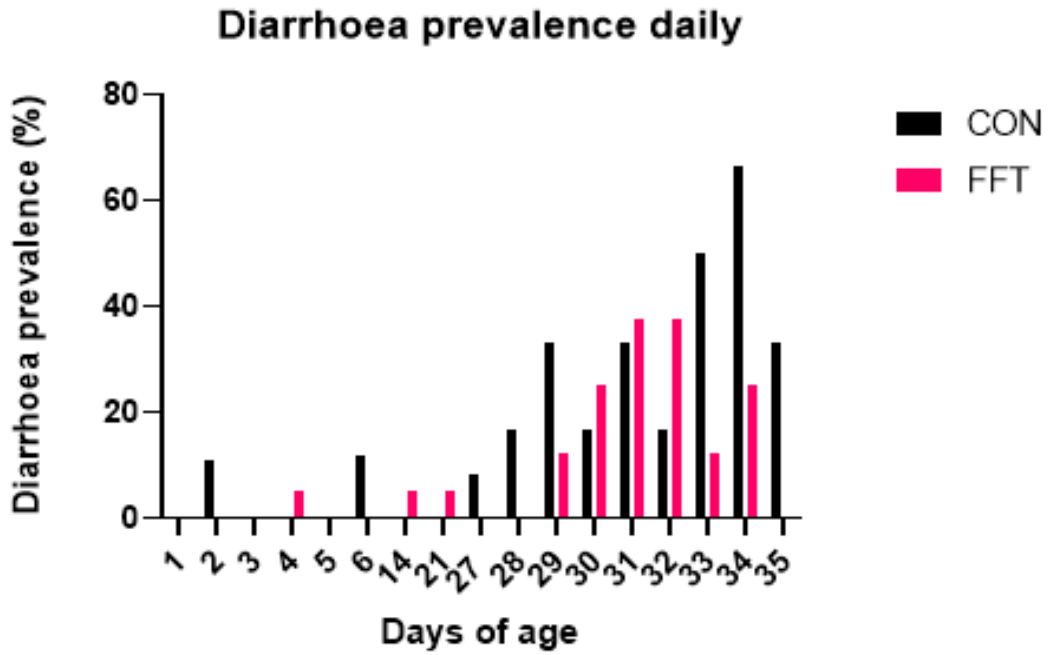
FFT *n* = 8

Preliminary results - growth



	CON	FFT	P-value
Suckling period	2654.9 ± 660.8; n=18	2781.4 ± 696.3; n=18	0.445
Weaning period	6285.0 ± 1972.26; n=6	7258 ± 1184.16; n=8	0.278
Whole period	3192.8 ± 1269.0; n=6-18	3192.8 ± 1444.94; n=8-20	0.483

Preliminary results – diarrhoea prevalence



Average prevalence	CON	FFT	P-value
Suckling period	6.2±5.8; n=18	1.9±2.7; n=20	P=0.09
Weaning period	33.3±17.8; n=6	16.1±12.9; n=8	P=0.04*
Whole period	22.9±19; n=6-18	9.0±11.6; n=8-20	P=0.03*

Results

AVANT

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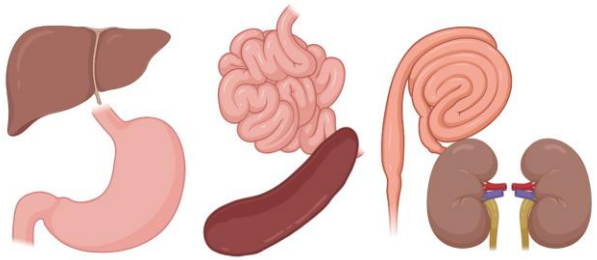

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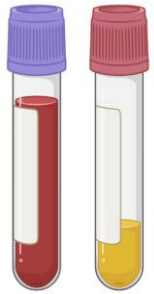

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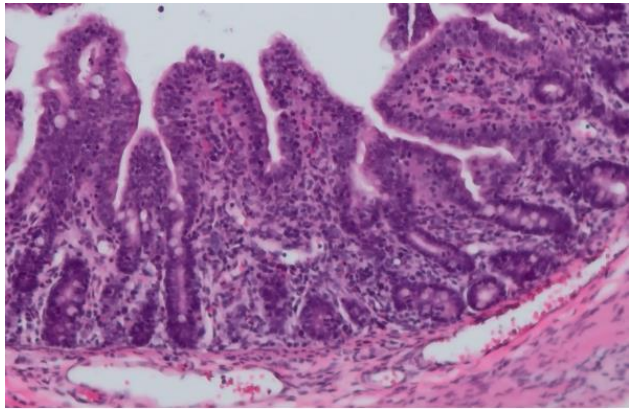

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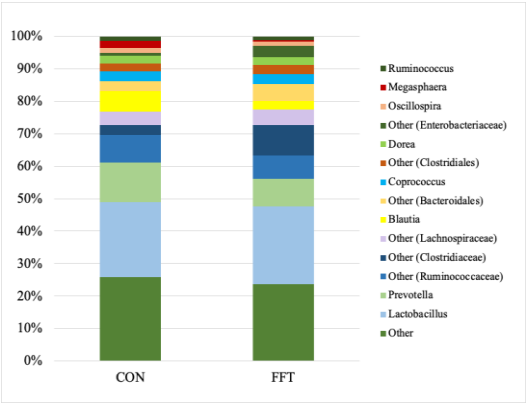

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Conclusion – Pilot study – FFT on farm

- **FFT reduces diarrhoea post-weaning**

Thank you for your attention!

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