

Preventing Dysbiosis of an immature intestinal microbiota with an innovative nutritional solution

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Background

- Gut dysbiosis ⇔ cause of inflammation (Zeng *et al.*, 2017)
- In piglets, post-weaning syndrome = a spontaneous post-weaning enteric infection leading to dysbiosis and diarrhea (Gresse *et al.*, 2017)
- Food matrix and its components = a key factor to modulate gut microbiota homeostasis:
 - Prebiotic fibers known to modulate gut microbiota composition favoring Lactobacilli and Bifidobacteria (Slavin, 2013)
 - Hydrolysable polyphenols from tannins described as having antioxidant properties (Chung *et al.*, 1998)
 - Butyrate = important element for gut epithelial proliferation (Celasco *et al.*, 2014)

Aims

Evaluate the protective effect of a mix composed of a prebiotic fiber (Nutriose®), polyphenols (tannins), and a short chain fatty acid (Ca-butyrate) on the appearance of a spontaneous gut microbiota dysbiosis and inflammation

Methods

Model of spontaneous gut dysbiosis: freshly weaned piglets



weaning



end of the study

Fecal
sampling

FS

weight

W

D32

FS

D14

W

FS

D0

W

W

W

Groups of treatments:

Gp 1: Control Diet (CD) (n=54)

Gp 2: CD + Ca-Butyrate (n=54)

Gp 3: CD + Tannins (n=54)

Gp 4: CD + Nutriose[®] (n=54)

Gp 5: CD + Ca-butyrate + Tannins (n=54)

Gp 6: CD + Nutriose[®] + Tannins (n=54)

Gp 7: CD + Ca-Butyrate + Nutriose[®] + Tannins (n=60)



Tissue Sampling (n=18 piglets/group):

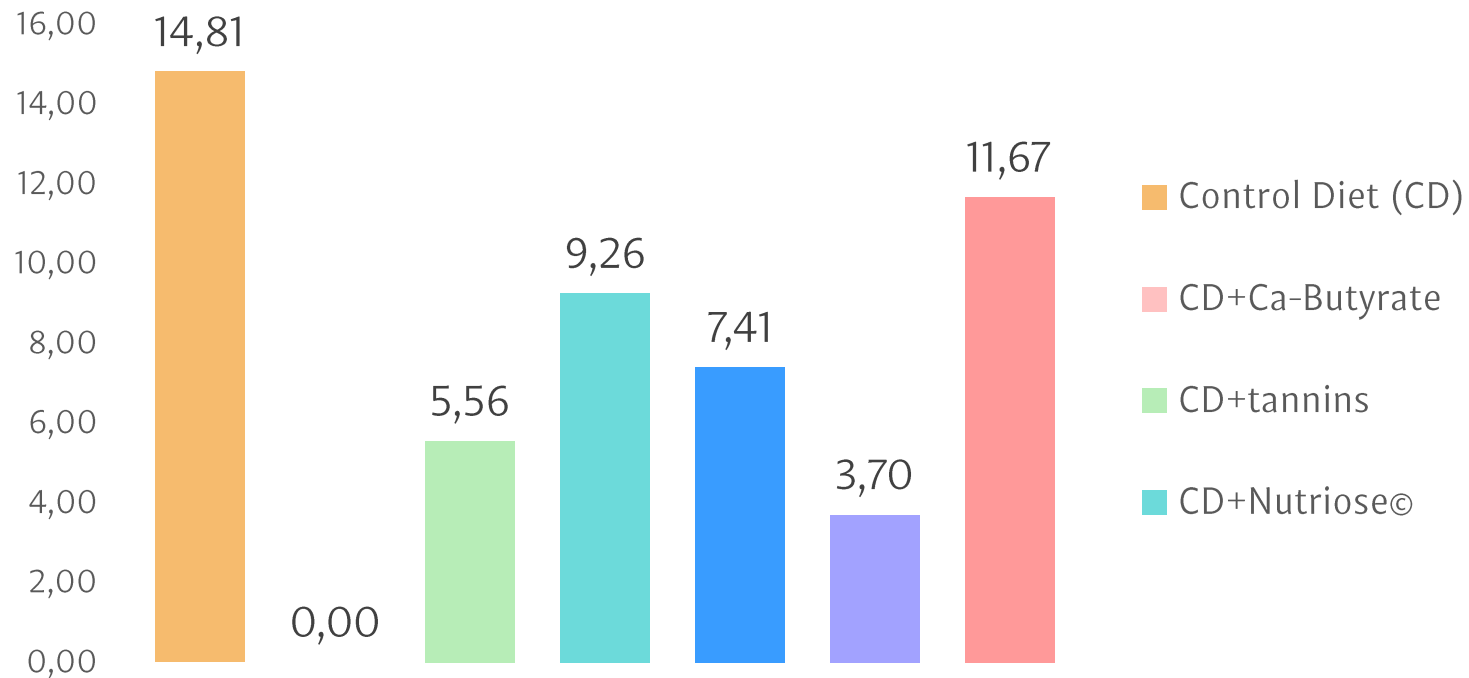
Blood : cytokines secretion (ELISA)

Intestine : inflammatory parameters (PCR, ELISA, Histology)

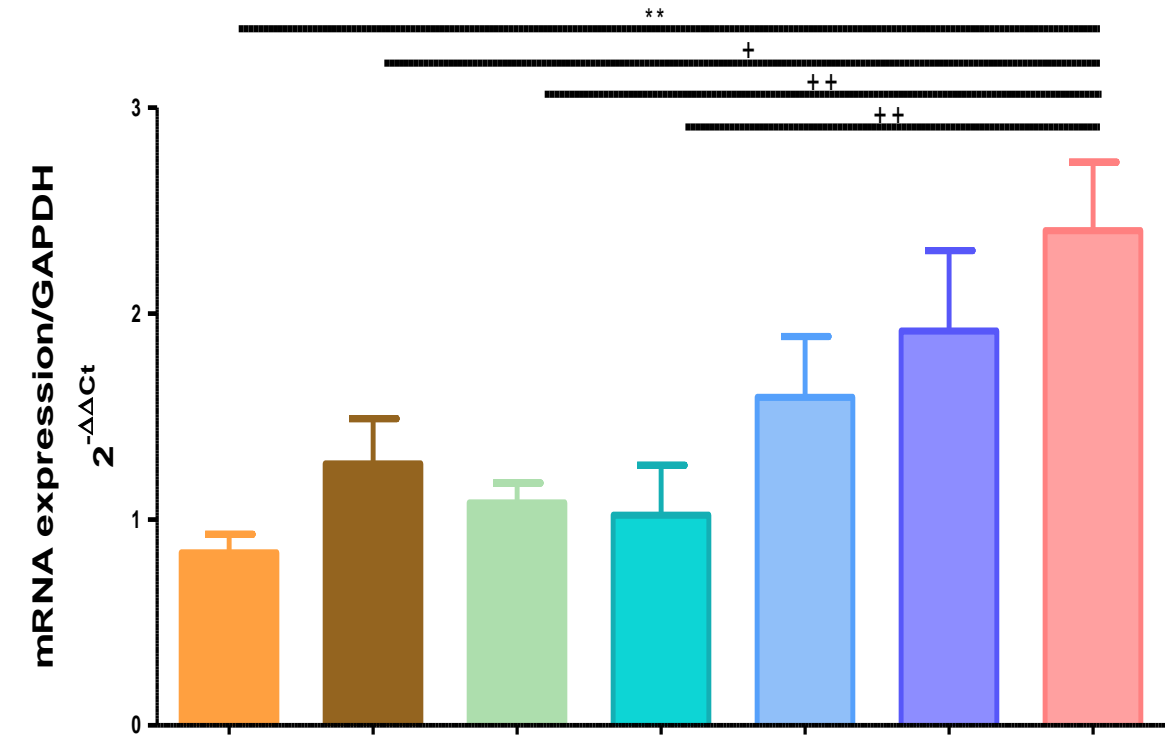
Caecal/fecal content : Metagenomics

Results

Mortality rate (%)



Ileal occludin gene expression (n=9)



** Significantly different (p<0.01) from control

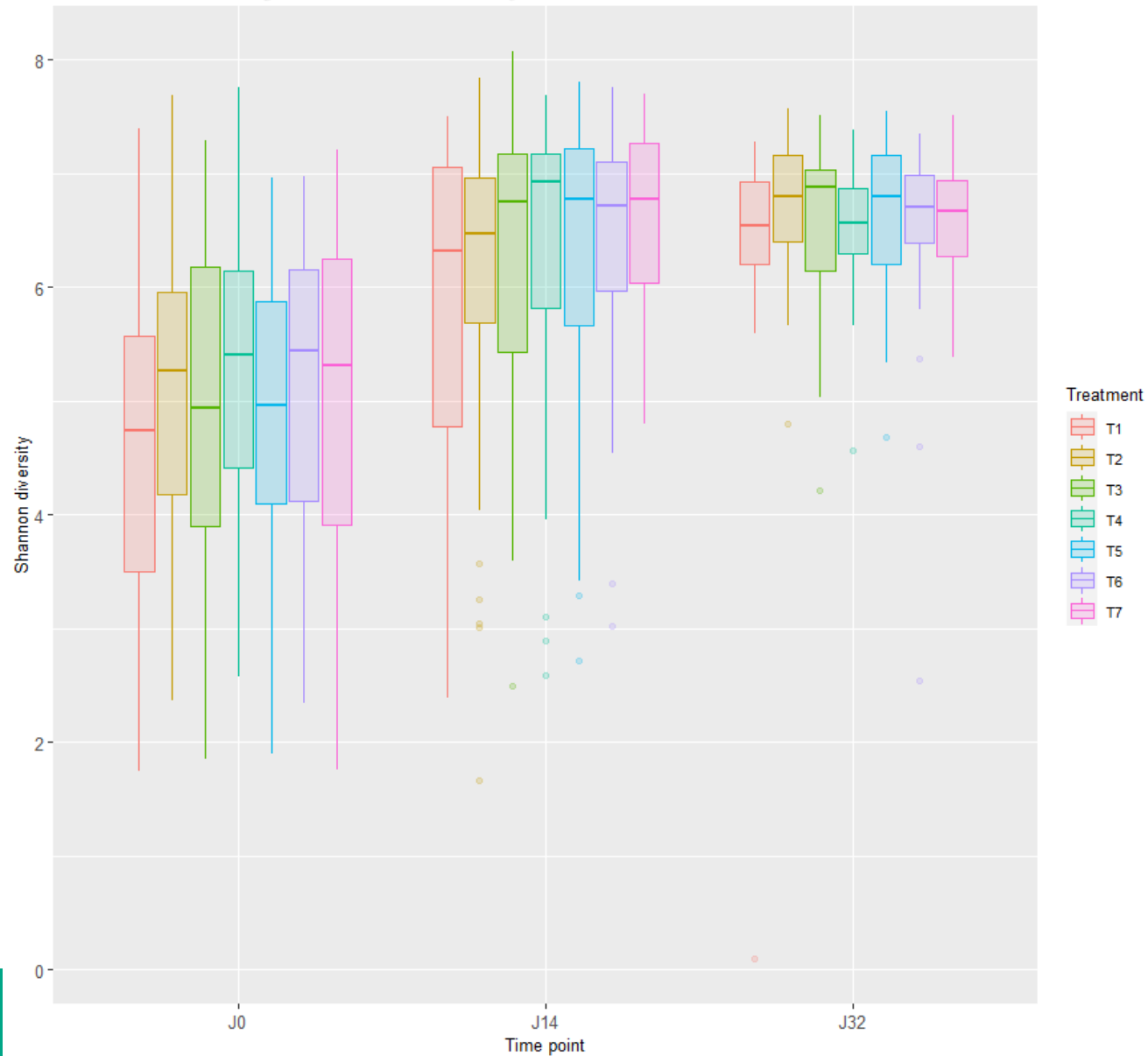
+,++ Significantly different (p<0.05; p<0.01) from single treatment

Body Weight Gain – Food intake

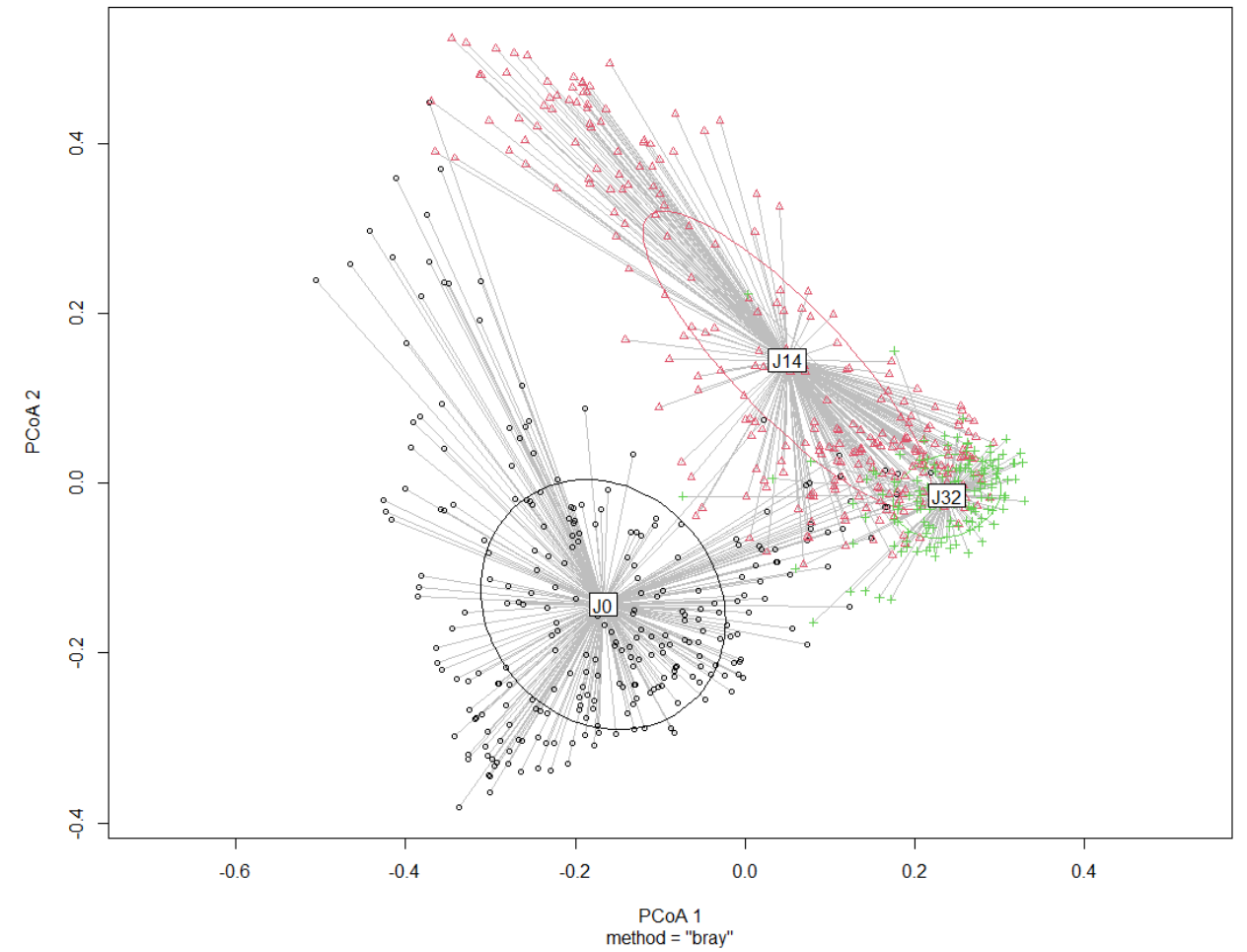
Day 0-35 (total)	Control Diet (CD)	Std + Ca-Butyrate	Std + tannins	Std + Nutriose®	Std+But+tannins	Std+Nut+tannins	But+Nut+tannins	SEM	P value
ADG, g/d	308 ^b	367 ^a	355 ^a	338 ^{ab}	346 ^{ab}	334 ^{ab}	362 ^a	14	0.046
ADFI, g/d	422	489	467	459	460	462	455	19	0.361
G:F, g/g	0.58 ^c	0.68 ^a	0.65 ^{ab}	0.65 ^{ab}	0.62 ^{bc}	0.64 ^{ab}	0.65 ^{ab}	0.02	0.037
ADWI, mL/d	3590	3420	3050	4100	3450	3480	2670	340	0.139
W:F, mL/g	8.6	7.1	6.6	9.0	7.8	7.8	6.2	0.7	0.106

Results

Alpha diversity (Shannon index)



Beta diversity (Bray-Curtis ordination)



Conclusion

- A clear effect of Ca-butyrate on the survival rate of animals but not of the mix
- Improvement of the ingredients on weight gain
- Stimulatory effect of the mix on occludin gene expression : improvement of intestinal homeostasis?
- Total number of microorganisms and its densification and diversification in agreement with the literature (Kim & Isaacson, 2015)
- Trend of a higher density and a more homogenous microbiota profile in the group treated with the mix of 3.



If confirmed, the combination of two or three ingredients could be of great interest for people at risk of dysbiosis