ORAL FEEDING WITH LIVE YEAST: IMPACT ON SOME GALT (GUT-ASSOCIATED LYMPHOID TISSUE) PARAMETERS AND CELL PROLIFERATION IN WEANING PIGLETS.

Alessia Di Giancamillo*, Valentino Bontempo*., Giovanni Savoini*, Richard Paratte*, Eric Chevaux, Vittorio Dell'Orto*, Cinzia Domeneghini*, Julien Delforge**

**University of Milan, Dept. Veterinary Sciences and Technologies for Food Safety, Milan, Italy ; **Lallemand SAS, Blagnac, France*

Introduction

Live yeast dietary supplementation has been reported to produce a variety of beneficial responses in growth rate, feed intake, feed efficiency, milk composition, egg production (Kornegay *et al.,* 1995). It is well known that probiotics display a lot of beneficial effects on gastrointestinal tract : production of essential nutrients at colonic mucosa level, beneficial effects on intestinal immunity, recovery in case of disturbed gut mucosal barrier, prevention of microbial translocation, and competition with microbial pathogens.

The aim of this study was to investigate the effects of a live yeast on piglets growth and selected histometrical and morpho-functional aspects of the gut during the first month after weaning under field practical conditions.

Material and Methods

352 weaned piglets of average 6.5 kg L.W. were allotted into four groups : two groups coming from control (C) sows, the other two coming from treated (T) sows (i.e. 10^6 cfu[1]/g of feed of Levucell® SB – CNCM I-1079, Lallemand, France). Treated sows were fed with the live yeast from 85 d of gestation throughout lactation. Piglets were respectively fed a starter diet supplemented with 0% yeast (C) and 0.01% of the same yeast (i.e. 2.10^6 cfu/g) (T), so that the following experimental groups resulted : CC, TC, CT and TT. Individual body weights and feed intakes were recorded at 0, 15, and 30 d. post-weaning (PW). After 30 d. post-weaning, 5 female piglets per group were slaughtered (n=20). Serial microtome sections (4 µm-thick) were examined to determine the depth of intestinal crypts (C), the height of intestinal villis (V), the V:C ratio, the mitosis index, the mucosal cells in S-phase of the cell cycle, the mucous glycoconjugate profile, the thickness of the adherent mucous gel and the mucosal macrophages. Cells were expressed as the percentage of the total number of counted cells. The data were analyzed by ANOVA using the GLM procedure of the SAS Institute, Inc. (1985). Cells counts were co-variated for the number of recorded cells.

Results

At 30 days PW, the treated piglets (TT, CT) were heavier than control even though the difference was not significant (20.00 kg *vs* 19.63 kg). In addition, average daily gain (ADG) of treated (TT, CT) piglets resulted significantly higher than control piglets (0.43 kg/d *vs* 0.46 kg/d; P<0.001). TT and CT piglets showed higher ADG than CC and TC animals during the post-weaning period. Histometric analysis (Table 1) in the ileum of CT and TT animals resulted in an increase in villus (V) height (P<.01) and crypt (C) depth (P<.01), as well as in a decrease in V:C ratio (p<.01) compared with controls. The counts of proliferating epithelial cells resulted in an increase of mitosis in CT/TT piglets compared with CC/TC animals (P<.05). CC/YC animals showed a thicker adherent mucous gel in the ileum than CY/YY piglets (P<.01), whereas CY/YY groups were associated with a higher mucous cells count The mucosal macrophages were appreciably more numerous in animals supplied with live yeast (CT/TT) than in piglets without any supply (CC/TC) (P<.01).

Table 1 : Piglets ileum histo-morphological parameters

	CC (n=5)	YC (n=5)	CY (n=5)	YY (n=5)	SEM
Villous µm	195.13^{A}	193.46^{A}	242.97^{B}	242.99^{B}	3.19
Crypts µm	129.93^{A}	136.40^{A}	177.70^{B}	176.64^{B}	2.14
V:C ratio	1.53^{Aa}	1.42^{Bb}	1.39^{B}	1.39^{B}	0.02
Mitotic cells %	41.97^{a}	43.50^{a}	49.18^{b}	48.87^{b}	2.05
Macrophage TLD %	4.00^{A}	4.02^{A}	4.82^{B}	4.93^{B}	0.07
Mucous layer µm	2.89^{A}	2.70^{A}	1.83^{B}	1.70^{B}	0.09
Goblet cells					
200µm-villis	9.6^{A}	11.7^{AC}	12.5^{BC}	18.8^{B}	0.78
100µm crypts	9.7^{A}	10.9^{A}	14.6^{B}	18.4^{B}	0.47
Liver kg	0.48	0.61	0.53	0.54	0.02
Intestine kg	1.99	2.06	2.04	2.00	0.09

A, B, C different : p<0.01 ; a, b different : p<0.05

Discussion

The higher number of intestinal proliferating cells in CT and TT groups may not prelude to possible hypertrophic aspects due to equal weight of the intestine in both groups. The higher mitotic index found in the treated piglets likely supports a good intestinal capability of restoring the mucosal thinning which frequently occurs at weaning (Isolauri et al., 1998). This is in accordance with the producing parameters : good conditions of the intestinal mucosa likely allow better ADG and growth performances (Jurgens *et al.,* 1997). The increase of macrophages may support a good defensive capacity of ileal mucosa in the treated piglets, above all against viral pathologies.

Conclusion

Inclusion of 0.01 % of live yeast (CNCM I-1079) to post-weaning diet had beneficial effects on piglets growth performance and likely promoted a proper intestinal efficiency by a fast restoration of the mucosal thinning after weaning. Thus, live yeast administration may possibly assist animals in intestinal disorders by the gut trophic action and the positive effects upon mucosal macrophages, as well as inhibiting the colonisation of pathogens by blocking their attachment to the intestinal mucosa.

References

Konergay E.T. *et al*., 1995. *Journal of Animal Science* 73, 1381-1389.
Isolauri E. *et al.*, 1998. *American Journal of Clinical Nutrition*. 73:444S.
Jurgens M.H. *et al.*, 1997. *Journal of Animal Science* 75, 593-597.

[1] Colony forming unit