

Effect of Tonisity Px™ Administration on Intestinal Morphology

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Introduction

Tonisity Px™ is a novel isotonic protein drink formulated to nourish the intestinal enterocytes. The protein and amino acid profile of Px delivers key energy-producing substrates to the enterocyte which could in turn have an impact upon intestinal morphology.

Aim

The aim of these studies was to assess the impact of Px on intestinal morphology.

Histopathology Assessment

Sections were cut at a distance of 10%, 50% and 90% along the length of the small intestine, corresponding to duodenum, jejunum and ileum. Villus height, crypt depth, villus and crypt density, and intestinal mucosal thickness were measured using ImageJ software with a Leica ICC50 HD camera mounted on a Leica DM1000 microscope. Villus height: crypt depth ratio was calculated.

Statistical Analysis

Gut morphology variables were analysed by a generalized linear model with the package GLM using R software.¹ In study 16-004 the farrowing treatment group (Px or Nil), the intestine section (duodenum, jejunum or ileum) and the study day were included as fixed effects. In study 16-003, weight class (Heavy, Medium, Light) and weaning feed group (Px-Gruel, Water-Gruel or Dry creep) were also included as fixed effects. Interactions were explored but were not significant, so they were not included in the model. Tests were two-tailed and carried out with a risk $\alpha = 5\%$. P-values of $P \leq 0.05$ were considered statistically significant, while $0.05 < P \leq 0.10$ was considered a near-significant trend.

Study 16-004 Effect of Px in Farrowing (Days 2-8) on Intestinal Morphology

12 litters
Px 500 mL/litter/day on days 2-8
Negative control group
Histopath at d9
Started ordinary creep feed on d10
Histopath at d21

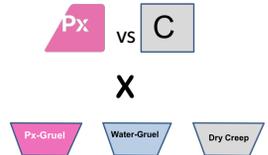


	Villus height (µm)	Crypt depth (µm)	Villus height/crypt depth ratio	Intestinal mucosal thickness (µm)	Villus density (No./mm)	Crypt density (No./mm)
Px	443	148	3.6	584	8.7	18.3
Control	409	139	3.6	536	9.3	20.6
SE	16.5	5.1	0.16	19.8	0.22	0.55
P-value	<0.001	0.199	0.962	0.087	0.037	0.003
Difference	+ 8.3%	+ 6.5%	0%	+ 9.0%	- 6.5%	- 11.2%

Measured values are least squares means. SE: standard error

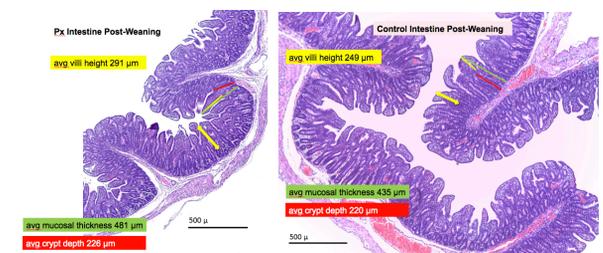
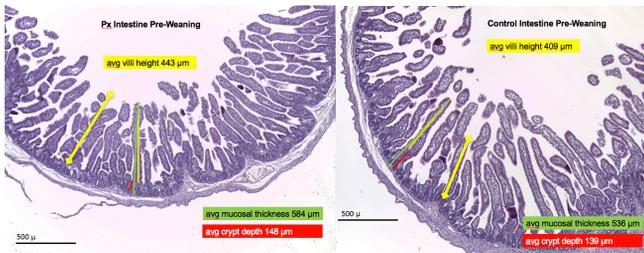
Study 16-003 Effect of Px on Intestinal Morphology of Piglets After Weaning

52 litters
Px 500 mL/litter/day on days 2-8
vs. negative control group
Pre-weaning and post-weaning Px-gruel
vs. negative control group with dry creep
vs. positive control group with water-gruel
Weaned on d19
Gruel finished by d24
Histopath at d24 and d28



	Villus height (µm)	Crypt depth (µm)	Villus height/crypt depth ratio	Intestinal mucosal thickness (µm)	Villus density (No./mm)	Crypt density (No./mm)
Px	291 ± 10.4	226 ± 7.1	1.4 ± 0.06	481 ± 15.9	7.6 ± 0.17	21.8 ± 0.79
Control	249 ± 9.3	220 ± 6.4	1.2 ± 0.05	435 ± 14.2	8.0 ± 0.15	20.5 ± 0.71
P-value	0.003	0.512	0.018	0.033	0.064	0.211
Difference	+ 16.8%	+ 2.7%	+ 16.7%	+ 10.6%	-5.0%	+ 6.3%

Measured values are least squares means ± standard error



Results: Pigs that received Px during the first week of life had significantly taller villi compared to pigs that had no Px. Px pigs also tended to have a thicker mucosal layer. Villus height increased by 8.3% ($P < 0.001$) and intestinal mucosal thickness increased by 9.0% ($P < 0.087$) by day 9 in the Px pigs. In the post-weaning group, villus height increased by 16.8% ($P < 0.003$) and intestinal mucosal thickness increased by 10.6% ($P < 0.033$) in the Px pigs. These differences were irrespective of whether or not the pigs had Px-gruel, water-gruel or dry creep feed in weaning.

The only discriminator – even at d28 – was whether or not the pigs had been given Px from d2-8 of life.

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¹<http://www.R-project.org>

Tonisity Px