

# Improved performance parameters following oral live non-pathogenic *Escherichia coli* vaccination in piglets against post-weaning diarrhea

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**Introduction & objective:** Post-weaning *Escherichia coli* diarrhea (PWD), also called post-weaning enteric colibacillosis, in pigs remains a major cause of economic losses for the pig industry, due to either piglet death, or poor weight gain in surviving piglets [1,2]. PWD typically causes mild to severe watery diarrhea between 5 and 10 days after weaning and is primarily caused by enterotoxigenic *Escherichia coli* (ETEC). The most common adhesins found on ETEC from PWD in pigs are associated with fimbriae F4 (previously called K88) and F18, while the predominant enterotoxins are heat-labile toxin (LT), heat-stable toxin a (STa), and heat-stable toxin b (STb [3,4,5,6]. Therapy to control PWD typically consists of antibiotic treatment, addition of therapeutic doses of zinc oxide (ZnO; >2000 ppm, 14 days) and changes in feed composition of the post-weaning diets. The objective was to compare vaccination with Coliprotec<sup>®</sup> F4 (PrevTec Microbia), to two standard therapeutic approaches, namely ZnO (2500 ppm) and diet adaptations in combination with individual antibiotic treatment. The active vaccine strain in Coliprotec<sup>®</sup> F4 is one of the components of the bivalent Coliprotec<sup>®</sup> F4F18 (PrevTec Microbia) vaccine.

**Material and methods:** In a commercial 600-sow farm (DanBred sows x Piétrain) with PWD caused by F4-ETEC, piglets were vaccinated at 18 days of age with Coliprotec<sup>®</sup> F4. At weaning, piglets were randomly distributed into 5 groups with different treatments (Table 1). During the 7-week post-weaning period several technical production parameters (weight, average daily weight gain, feed intake, feed conversion rate, antibiotic treatment, mortality) were recorded. Statistical differences between groups were calculated using JMP<sup>®</sup> program.

**Results:** A summary of the obtained results is given in Table 1.

**Table 1.** Summary of trial outline and obtained performance results. Statistically different numbers are given with different superscripts.

Group	A	B	C	D	E
Vaccination	+++	+++	+++	---	---
Adapted safe diet	---	---	---	+++	---
ZnO (2500 ppm, 14 days)	---	---	---	---	+++
Feeding strategy (number of feed phases)	1	2	3	3	3
Weight at weaning (kg)	5.29 <sup>a</sup>	5.34 <sup>a</sup>	5.31 <sup>a</sup>	5.33 <sup>a</sup>	5.44 <sup>a</sup>
Weight at 21 dpw* (kg)	7.45 <sup>a</sup>	7.69 <sup>a</sup>	7.42 <sup>a</sup>	7.01 <sup>b</sup>	8.74 <sup>c</sup>
Weight at 50 dpw (kg)	18.01 <sup>a</sup>	18.41 <sup>a</sup>	18.16 <sup>a</sup>	17.51 <sup>b</sup>	16.94 <sup>c</sup>
ADWG <sup>°</sup> (0-21 dpw) (g/d)	106 <sup>a</sup>	110 <sup>a</sup>	97 <sup>a</sup>	71 <sup>b</sup>	157 <sup>c</sup>
ADWG (22-50 dpw) (g/d)	358 <sup>a</sup>	365 <sup>a</sup>	372 <sup>a</sup>	358 <sup>a</sup>	276 <sup>b</sup>
ADWG (0-50 dpw) (g/d)	248 <sup>a</sup>	258 <sup>a</sup>	254 <sup>a</sup>	230 <sup>a</sup>	226 <sup>a</sup>
Feed consumption (0-21dpw; kg)	4.23 <sup>a</sup>	4.05 <sup>a</sup>	3.80 <sup>a</sup>	3.29 <sup>b</sup>	5.37 <sup>c</sup>
Feed consumption (0-50dpw; kg)	21.43 <sup>a</sup>	20.58 <sup>a</sup>	20.38 <sup>a</sup>	20.36 <sup>a</sup>	21.62 <sup>a</sup>
FCR <sup>®</sup> (kg feed/ kg growth)	1.69 <sup>a</sup>	1.58 <sup>a</sup>	1.59 <sup>a</sup>	1.67 <sup>a</sup>	1.88 <sup>b</sup>
Mortality (%)	4.7 <sup>a</sup>	3.9 <sup>a</sup>	3.1 <sup>a</sup>	12.5 <sup>b</sup>	7.0 <sup>b</sup>
Treatment incidence <sup>†</sup>	59.37 <sup>a</sup>	57.03 <sup>a</sup>	82.03 <sup>b</sup>	246.09 <sup>c</sup>	8.59 <sup>d</sup>
Average fecal score (0-4)	1.95 <sup>a</sup>	1.89 <sup>a</sup>	1.96 <sup>a</sup>	2.39 <sup>b</sup>	0.72 <sup>c</sup>
Financial net result (€/pig) compared to safe formulation	€ 5.28 <sup>a</sup>	€ 5.31 <sup>a</sup>	€ 5.23 <sup>a</sup>	€ 0.00 <sup>b</sup>	€ 0.95 <sup>c</sup>

\* dpw – days post-weaning; ° ADWG – average daily weight gain; ® FCR – feed conversion rate; † treatment incidence - number of treated piglets per 100 piglets in trial

**Conclusions & discussion:** This comparative study clearly shows that vaccination against PWD with Coliprotec<sup>®</sup> F4 has several advantages on technical performance parameters. The type of diet (1-, 2- or 3- phase diet) did not have a significant effect on performance parameters. Overall, vaccination with Coliprotec<sup>®</sup> F4 combined a reduction of weight loss with reasonable antibiotic use. The use of safe diet formulation is not a sustainable solution, whereas supplementation of ZnO did not result in the most optimal results throughout the entire study period. In conclusion, control of PWD through oral vaccination is a good option in order to protect piglets from the negative clinical effects of F4-ETEC infection in the post-weaning period with a clear economical gain due to improved weight gain and reduced antibiotic use.

**References:** [1] van Beers-Schreurs et al., 1992. *Veterinary Quarterly* 14, 29-34. [2] Fairbrother et al., 2005. *Animal Health Research Reviews* 6, 17-39. [3] Kwon et al., 2002. *The Veterinary Record* 150, 35-37. [4] Frydendahl, 2002. *Veterinary Microbiology* 85, 169-182. [5] Chen et al., 2004. *Veterinary Microbiology* 103, 13-20. [6] Vu Khac et al., 2006. *BMC Veterinary Research* 2, 10.