Effects of the inclusion in broiler ration of *Pediococcus acidilactici* on performance and intestinal microflora

A.V. STELLA[1], M. FAVA[1], C. BERSANI[1], G. DEL DEGAN[1], G. SAVOINI[1], E. CHEVAUX[2]

[1]Dept. of Veterinary Sciences and Technologies for Food Safety, University of Milan, via celoria 10, 20133 MILAN, Italy ; [2]Lallemand SAS., BP 59, 31702 BLAGNAC Cedex, France

Pediococcus acidilactici exerts positive effects on the balance and function of the intestinal flora (Jin et al., 2000) with further benefits on improvement of animal performance. It strengthens the microbial ecosystem of poultry, contributes to diseases defence and protects poultry against several stress such as vaccination, environmental temperature changes. An improvement in feed intake, weight gain, and feed conversion rate was observed (Jin et al., 1998; Simon et al., 2001), even if the results are variable especially for data regarding dry matter intake (Van Eys et al., 2003). The aim of the study was to investigate the effect on growth performance and health status of the administration to broilers for a complete production cycle, from hatching to slaughtering, of a microbial feed additive containing $1.0*10^{10}$ cfu/g of *Pediococcus acidilactici* (CNCM MA 18/5M).

20350 broilers of the same genotype (Cobb 500) and coming from the same hatchery were used. The animals were assigned to 2 experimental groups, Treatment (Pa, 10^9 cfu/kg of feed of *Pediococcus acidilactici*) and Control (Ctr). In the Treatment and in the Control groups, there were 2050 female and 8125 male chickens, allocated in the same batch divided by physical barriers. The two batches of animals were reared according to the same experimental protocol and were comparable according to birth weight.
Broilers were housed in the same building with floors of 12.20mx80.30m (979.66m^2) and a density of 10.3 animals/m^2. Batches were bedded with shaving of white wood. Broilers had the same light duration (23h of light and 1h of dark) and room temperature (from 30±2 C° at arrival to 21±2 C° after the 25th day).
The diet was available *ad libitum* and offered crumbled in the first 10 days and then pelleted for the rest of trial. Broilers were fed with three different diets formulation, starter (1-20 days; % as fed, C.P. 22.30, C.F. 3.00, E.E. 8.00, Ash 7.50, Met. 0.50), grower (21-35 days; % as fed, C.P. 21.50, C.F. 3.00, E.E. 8.00, Ash 6.20, Met. 0.50), finisher (36 day-slaughtering; % as fed, C.P. 20.00, C.F. 3.00, E.E. 7.80, Ash 6.00, Met. 0.40). The ingredients of experimental diets were: cereals, products and by-products of oil seeds, products and by-products of cereal, oil seeds, minerals, DL-methionine, L-lysine. No antibiotic growth promoter was added and colistin was supplied as a coccidiostats since this molecule does not interfere with lactobacilli. Broilers had free access to drinking water at all times
Individual live weight of 200 subjects (100 female and 100 male broilers each group) was recorded weekly with an electronic weighing scale (range 0-5Kg +/- 5g). Group feed intake and mortality were recorded. Samples of caecal content from male broilers were collected at 20 and 55 days of life to determinate the *Lactobacillaceae* and *E.coli*/coliforms populations. Because of different ages at slaughtering, female subjects were investigated for 35 days from hatching, while male subjects have been monitored for 55 days.
Differences between groups were assessed using analysis of variance from general linear model procedure of SAS (1990). Growth performance and caecal bacterial content were analysed using a model that included treatment, sex, sampling time and for the growth performance values at day 0 as covariates.

Pa female broilers showed significant greater ($p<0.01$) live weight starting from 21 days of life. Growth performance of male subjects was not homogeneous during the whole experiment, indeed Pa broilers weight was heavier than Ctr subjects at 14, 28, 42, 55 days of life. The overall average daily gain (ADG) of Pa female broilers was significantly greater than Ctr animals ($p<0.01$), while the difference between overall ADG of Pa and Ctr male broilers tended to be significant ($p=0.07$).
The overall ADG of Pa subjects (Table 1), of both sexes, at 35 day of life was significant greater than Ctr animals ($P<0.01$).
Feed conversion ratio (FCR) for both sex at 35 days of life was lower when broilers fed *P. acidilactici* (Ctr=1.63 and Pa=1.60),

Table 1 : Average daily gain (ADG) of the broilers

Period	Ctr (g/d)	Pa (g/d)	p
0-7	9.9	10.1	0.5207
7-14	32.1	33.2	0.0216
14-21	51.5	53.0	0.1222
21-28	62.1	67.9	0.0011
28-35	72.0	70.3	0.5238
0-35	45.5	46.9	0.0013

Pa male broilers showed also a lower FCR at 55 days of life (Ctr=1.88 and Pa=1.82).The health status of the animals of both experimental groups was satisfactory, the number of dead animals of both sex, was 280 (2.7%) for Ctr and 289 (2.8%) for Pa group.

Caecal lactic acid bacteria population was increased by *P. acidilactici* supplementation (Ctr=$2.0*10^8$ cfu/g; Pa=$1.6*10^9$ cfu/g, P<0.01). *E.coli*/coliforms in caecal contents of Ctr subjects did not show difference during the trial (20 days $8.5*10^5$cfu/g, 55 days $3.3*10^7$cfu/g, P=0.50), while *E.coli*/coliforms in Pa subjects decreased (20 days $1.1*10^8$ cfu/g and 55 day $2.5*10^6$ cfu/g, P<0.05).

The supply of *P. acidilactici* positively affected growth performance of both female and male broilers. Moreover, this study seem to support the hypothesis of bacterial comparative exclusion, as it has been observed an increase of LAB population and a decrease of *E.coli*/coliforms from the beginning to the end of the experiment in broiler fed *P. acidilactici*.

References

JIN L.Z., HO Y.W., ABULLAH N., Ali M.A., JALALUDIN S. (1998) Effects of adherent Lactobacillus cultures on growth, weight of organs and intestinal microflora and volatile fatty acids in broilers; *Animal Feed science and Technology* **70**: 197-209

JIN L.Z., HO Y.W., ABULLAH N., ALI M.A., JALALUDIN S. (2000) Digestive and bacterial enzymes activities in broilers fed diets supplemented with *Lactobacillus* cultures; *Poultry science*; **78**: 886-891

SIMON O., JADAMUS A., VAHJEN W. (2001) Probiotic feed additives – effectiveness and expected modes of action; Jou*rnal of Animal & Feed Sciences*; **10**: 51-67

VAN EYS J., DEN HARTOG L. (2003) Separation of health, performance roles of probiotics may lead to understanding of mode of action; *Feedstuffs*; **78**: 24-29.