Feeding *Saccharomyces cerevisiae* to *S. enteritidis* and *C. jejun* challenged poultry: prevalence reduction of pathogens in cecum, skin and fecal microbial population.

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INTRODUCTION

Probiotics have been shown to be involved in protection against a variety of pathogens in chicken including *Escherichia coli* (Chateau *et al*., 1993), *Salmonella* and *Campylobacter* (Stern *et al*., 2001), *Clostridium* and *Eimeria* (Dalloul and Lillehoj 2005).

Saccharomyces cerevisiae demonstrated antagonistic activity against various pathogens both *in vivo* and *in vitro,* including the contamination of *Salmonella* and *Campylobacter* in ceca and feces. It seems that yeast can survive the low pH environment of the proventriculus and gizzard of chickens to reach the intestine and ceca acting as a pathogen adherent microflora (PAM) and binding pathogens that may enter the gastrointestinal tract before the bacteria can attach to the chicken's intestinal wall. At the moment, no relevant data are available on the effect on *Saccharomyces cerevisiae* on neck and breast skin contamination by *Salmonella* and *Campylobacter.*

OBJECTIVE

The aim of this trial was to investigate the effect of live yeast supplementation in broiler chickens on *Salmonella enteritidis* and *Campylobacter jejuni* in feces, cecum and on contamination of breast skin and neck skin.

MATERIAL AND METHODS

A total number of 480 Hubbard female chickens, 1d old and coming from the same hatchery, were divided in 2 groups of 24 pens each, located in one room.

Experimental groups

All animals in the experiment were randomly allotted to one of the two dietary treatments at the arrival in the experimental facilities:

•**Control (C)**: basal diet (meal) + *S. enteritidis* at 1x10^5 cfu/bird and *C. jejuni* inoculated at 3x10^5 cfu/bird (oral gavage);

•**Treated (Y):** basal diet with supplementation of Levucell® SB20 (*Saccharomyces cerevisiae boulardii* I-1079) at a concentration of 1x10^9 CFU/kg feed + *S. Typhimurium* at 1x10^5 cfu/bird and *C. jejuni* inoculated at 3x10^5 cfu/bird (oral gavage);

Diet Composition

Diet composition and chemical analyses are presented in table 1 and 2. Three feeding phases (0-10, 11-20, 20-35) were used.

Recorded parameters

Feedstuff chemical composition was analysed for each group at the beginning of the trial and at each feeding phase. Body weight (BW) was recorded starting from the arrival in the Experimental Centre. Subsequently, average daily gain (ADG) was calculated. Feed intake (FI) per pen was recorded, and feed conversion rate (FCR) calculated per pen at the end of each feeding phase. Fresh droppings were collected at end of each feeding phase. On day 10 post infection (PI), 10 animals per replicate were slaughtered and pooled ceca content were analysed for *Salmonella* and *Campylobacter* detection and enumeration. On 1 subject per replicate, neck and breast skin were tested for presence of *Salmonella* and *Campylobacter*. On day 38, all the remaining chickens were slaughtered and analysed as described for day 10 PI.

Statistical analysis

Experimental data were analysed by a General Linear Model (GLM) procedure of SAS (Version V8,1999, SAS Inst, Inc., NC, U.S.A.) considering two experimental periods from 0 to 20 days and from 20 to 38 days.

RESULTS

Growth performance was not affected by the dietary treatment (final BW C 1.960, Y 1.973). No differences were detected between the experimental groups for coliforms (P=0.10) fecal content, while higher yeast and lactobacilli (P=0.01) count was detected in Y birds than in C group (table 3). At day 38, *Salmonella* enumeration and frequency tended to decrease in Y group in feces (-25%; P=0.06) (figure 1), cecum (-25%; P=0.06) (figure 2), breast (-33%; P=0.08) (figure 3) and neck (-41%; P=0.03) (figure 4). No *Campylobacter* was detected in feces at 10d (P<0.01) or 28d (P=0.06) (figure 5) post infection (PI) in Y birds for all the trial. At first slaughtering time, *Campylobacter* colonization was significantly lower in yeast-fed birds in cecum (-42%; P=0.01) (figure 6), and breast skin (-58%; P=0.04) (figure 7). The presence in neck skin was not detected on day 10 PI in Y (P=0.01) as opposed to C birds that were *Campylobacter* positive (figure 8). At the second slaughtering time, *Campylobacter* in Y group, tended to decrease in feces (-25%; P=0.06) (figure 5), cecum (-25%; P=0.13) (figure 6) and neck skin (-33%; P=0.6) (figure 8), while it was significantly reduced in breast skin (-42%; P=0.02) (figure 7).

CONCLUSIONS

In conclusion, results of this study showed that the frequency of *Salmonella* colonization was reduced in the yeast group. Similarly, Line *et al.* 1998 reported a reduction in yeast-treated birds compared with the challenged-no yeast treatment group. The frequency of *Campylobacter* colonization was significantly reduced in cecum, feces, neck skin and breast skin, also the mean log numbers of *Campylobacter* were likewise reduced by yeast treatment. The present study supports the fact that the inclusion of Levucell® SB20 (*Saccharomyces cerevisiae boulardii* CNCM I-1079*)* can significantly control *Campylobacter* carriage in chickens with some positive results also on *Salmonella* contamination, thus reducing the contamination of carcasses with both food borne pathogens.

REFERENCES

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Table 1. Diet composition of basal diet.

	0-10d	11-20d	21-38d
Composition (%as fed)			
Corn meal	59.12	62.11	65.36
Soybean meal (47%CP)	29.00	25.50	22.00
Corn gluten meal (57%CP)	3.00	2.00	2.00
Extruded soybeans	3.00	3.00	2.50
Animal fat	2.00	3.00	3.75
Dicalcium phosphate	1.90	1.70	1.70
Calcium carbonate	1.03	1.10	1.10
Wheat bran	0.20	0.20	0.20
Soybean oil	---	0.50	0.50
Sodium chloride	0.20	0.30	0.30
DL-methionine	0.15	0.15	0.15
Mineral premix	0.13	0.13	0.13
Sodium bicarbonate	0.10	0.05	0.05
Choline chloride (75%)	0.07	0.10	0.10
Avatec 150 G	0.06	0.06	0.06
L-Lysine	0.04	0.10	0.10

Table 2. Chemical composition of basal diet.

	0-10d	11-20d	21-38d
Composition (%as fed)			
DM	89.90	89.90	90.00
CP	23.40	23.40	17.90
EE	6.60	6.60	8.20
Ash	5.18	5.18	3.71
NDF	20.90	20.90	29.10
Lysine	1.07	1.02	0.94
Methionine	0.26	0.38	0.50
Ca	0.89	0.79	0.92
P tot	0.83	0.83	0.81

Table 3. Fecal presence of coliforms, yeasts and lactobacilli of the chicken broilers.

		Group		SEM	P		
					Treat.	Day	Trt* Day
Item	**Day**	**C**	**Y**				
Coliforms (Log$_{10}$CFU/g)	**0-38**	8.82	8.41	0.48	0.1	<0.01	0.01
Yeast (Log$_{10}$CFU/g)	**0-38**	0.77^{B}	1.79^{A}	0.17	<0.01	<0.01	<0.01
Lactobacilli (Log$_{10}$CFU/g)	**0-38**	7.56^{B}	7.93^{A}	0.24	<0.01	0.87	0.76

^{A,B} P≤0.01
^{a,b} P≤0.05

Figure 1. Enumeration and frequency of *Salmonella* in feces.

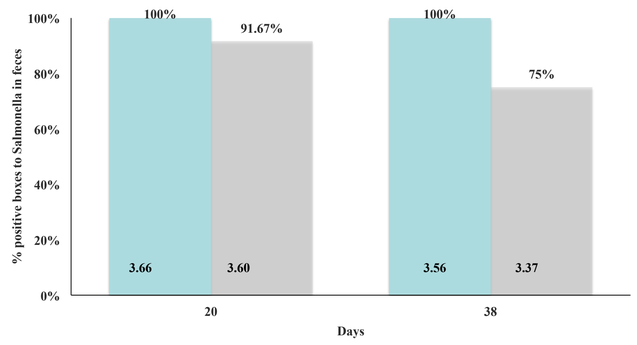

Figure 2. Enumeration and frequency of *Salmonella* in cecum.

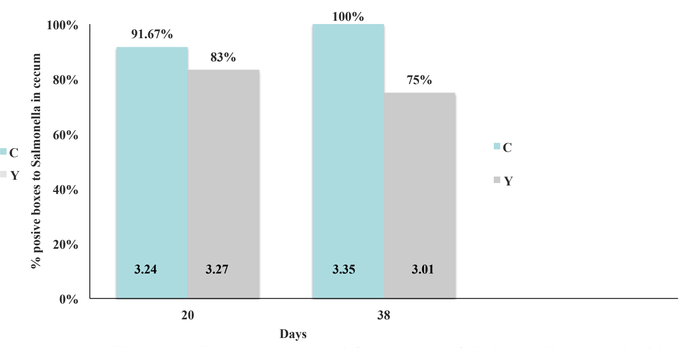

Figure 3. Enumeration and frequency of *Salmonella* in breast skin

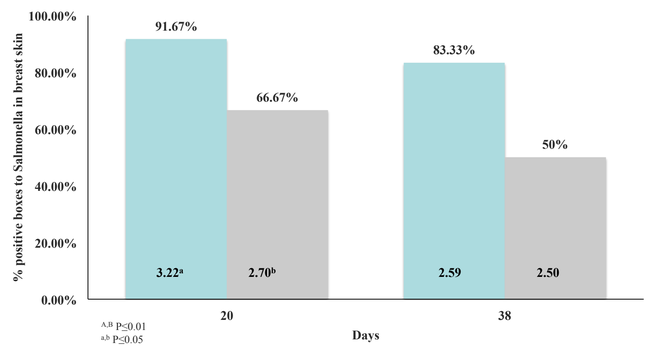

Figure 4. Enumeration and frequency of *Salmonella* in neck skin

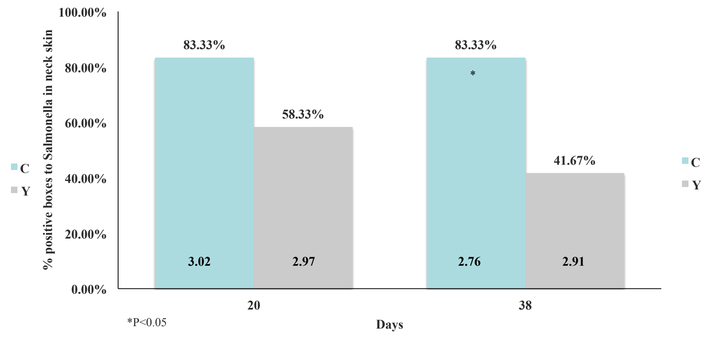

Figure 5. Enumeration and frequency of *Campylobacter* in feces

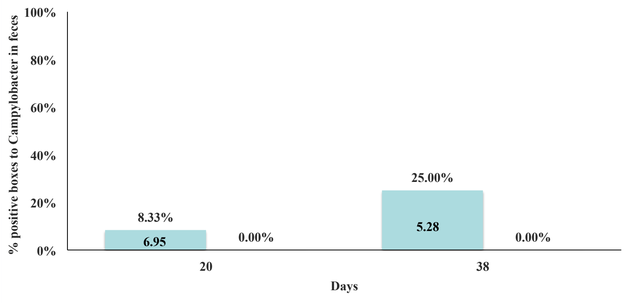

Figure 6. Enumeration and frequency of *Campylobacter* in cecum

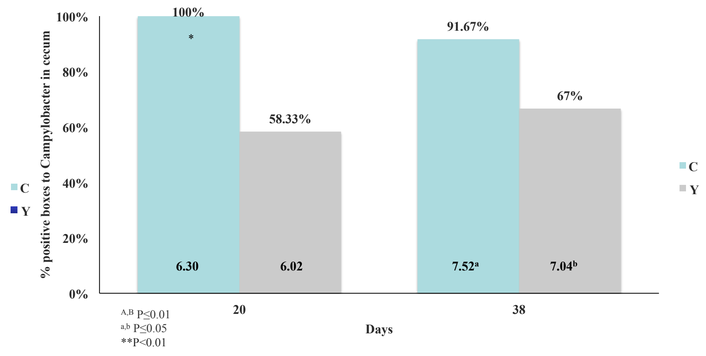

Figure 7. Enumeration and frequency of *Campylobacter* in breast skin

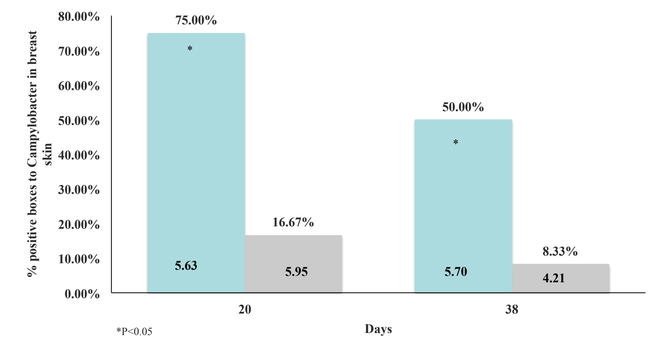

Figure 8. Enumeration and frequency *Campylobacter* in neck skin