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QTI™
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18 Trial Meta-Analysis: Effect of CALSPORIN® when Supplemented to Diets of Growing Broilers

Commercial broiler chickens grown on litter tend to have recurring diseases due to pathogenic bacteria including *Clostridium* spp., *E. coli* and *Salmonella* spp. The industry practice of using sub-therapeutic antibiotics in animal feed was no longer allowed in the US by the FDA in 2015. Due to consumer pressure, any use of antibiotics in the rearing of livestock has created additional regulations from various retail channels. This change in practices for many farms has increased their challenges, leaving many to look for new strategies. As the industry has continued to adapt to production without antibiotics, we have learned that the earlier a probiotic is introduced into production diets, the greater the opportunity to positively impact the gut microbial balance throughout the production cycle.

Among these probiotics used to stabilize gut microflora and to improve broiler performance are direct-fed microbials such as CALSPORIN® (Calpis Co. Ltd, Tokyo, Japan) CALSPORIN® is a strain of *Bacillus subtilis* (C-3102) and is added to feed in spore form. Due to its unique modes of action, CALSPORIN® can be added to broiler feeds alone or in combination with other commonly used feed additives (yeast products, essential oils, phytogenic products, etc.) This article summarizes several trials in which broiler performance was evaluated using antibiotic-free diets with or without CALSPORIN® (Table 1).

U.S. Trials (11)

Two highly replicated pen trials (24 negative control and 48 CALSPORIN® pens each) were conducted at the University of Arkansas (Fritts et al., 2000). Three pen trials were carried out in the research facility of a commercial integrator using commercial feeds without antibiotics (Hooge et al., 2004). A stress trial was conducted with broilers in pens with 34-inch corrugated paper barriers around the base of each pen (to prevent cross contamination with spores), high stocking density (0.67 sq. ft/chick), and chicks with omphalitis. The barriers caused poor ventilation to birds and resulted in wet litter. These conditions resulted in large improvements in broiler weight and feed conversion ratio for CALSPORIN®-fed birds compared to negative controls (Hooge et al., 2004). Five pen trials were conducted in 2010 and 2011 with basal diets versus basal diets plus CALSPORIN® and have been published as abstracts at scientific meetings.

International Trials (7)

In order to prepare a dossier for submission to the E.U. for approval of CALSPORIN® for broilers, four pen trials showing efficacy as a "gut flora stabilizer" were required to be conducted in Europe. Although 300,000 cfu/g feed is a commonly used dose in the U.S. for improving broiler performance, the level tested in the E.U. was 500,000 cfu/g feed which may provide additional food safety in addition to improving broiler live performance. Pen trials on new or used litter were conducted at various research stations in the E.U., and meta-analyses of the data for each level of inclusion were performed by Medel and Gracia (2005; 2006).

According to Dr. Peter Silley (2006), UK regulatory consultant, CALSPORIN® is added to broiler feeds to favorably affect growth and feed conversion ratio by modulating the gastro-intestinal flora. Its modes of action were described as: 1) reduces harmful, disease-causing bacteria in the gastro-intestinal tract and zoonotic organisms of public health concern, and may increase beneficial lactobacilli [harmful bacteria damage the gut wall], and 2) helps to maintain a beneficial microbial population balance supporting efficient digestion and thereby improving growth and feed conversion ratio.

Three other international pen trials were conducted with broiler chickens on litter and fed basal diets or diets with CALSPORIN® at 500,000 cfu/g of feed by Aliakbarpour et al. (2012) and Calpis Co. Ltd Japan.

Overall Average (18 Trials)

As shown at the bottom of Table 1, a significant increase in body weight (+0.191 lb.; +4.05%; $P<0.001$) and a significant decrease in feed conversion ratio -0.062; -3.24%; $P=0.001$) was determined for +CAL treatment compared to nCON treatment when data was averaged across 18 trials. Mortality % was not significantly different between treatments but slightly numerically favored +CAL compared to nCON treatment (4.27 vs 3.81%; $P=0.146$).

Therefore, dietary CALSPORIN® is recommended as a gut microflora stabilizer which has been shown to improve body weight and feed conversion ratio of broiler chickens based on results of 18 litter pen trials in the U.S., E.U., China, and Iran comparing nCON and +CAL (300,000 or 500,000 cfu/g of feed) treatments.

References

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Table 1

Summary of U.S., E.U., China, and Iran broiler pen trials on new or used litter evaluating negative control (nCON) versus CALSPORIN®-supplemented (+CAL) diets analyzed by paired t-test

Reference	Age, days	Body wt, lb		FCR		Mortality, %	
		nCON	+CAL	nCON	+CAL	nCON	+CAL
U.S. trials (0 vs 300,000 cfu/g):							
Fritts et al., 2000	42	3.891	3.964	1.809	1.798	2.88	3.17
Fritts et al., 2000	42	4.336	4.546	1.780	1.759	1.58	2.08
Hooge et al., 2004	42	3.340	3.483	1.941	1.914	9.00	8.33
Hooge et al., 2004	42	4.182	4.277	1.789	1.768	2.25	2.58
Hooge et al., 2004	39	4.173	4.273	1.830	1.789	3.00	3.90
Hooge et al., 2004	49	5.384	5.848	2.111	1.965	3.48	4.62
VDRC, 2010-006 Stress	42	4.259	4.540	2.138	2.027	1.67	0.67
VDRC, 2010-012	42	4.768	5.048	1.940	1.885	0.33	0.67
VDRC, 2011-007	42	4.104	4.252	2.048	1.937	8.33	5.00
VDRC, 2011-010	42	4.388	4.746	2.100	1.987	0.67	1.00
VDRC, 2011-018	40	4.512	4.770	1.894	1.866	1.04	1.67
	42.2	4.303[b]	4.522[a]	1.944[a]	1.881[b]	3.112	3.063
Difference			+0.219		-0.063		-0.049
Relative change, %			+5.09		-3.24		-1.57
P value (n = 11)			**0.0001**		**0.0019**		0.760
International trials (0 vs 500,000 cfu/g):							
Imasde, 2005 (Spain)	42	5.569	5.757	1.975	1.876	11.36	11.93
Coren, 2005 (Spain)	42	6.264	6.281	1.819	1.813	6.44	3.50
IRTA, 2006 (Spain)	42	5.263	5.319	1.850	1.843	4.47	4.91
Imasde, 2006 (Spain)	42	5.825	5.926	1.924	1.873	5.68	3.22
Aliakbarpour et al. (Iran, 2012)	42	5.752	5.891	1.808	1.762	7.14	6.35
Calpis/QTI (China, 2006)	38	4.065	4.246	1.81	1.77	7.50	5.00
Calpis/QTI (China, 2007)	42	4.724	5.077	1.88	1.71	0.00	0.00
	41.4	5.352[b]	5.500[a]	1.868[a]	1.807[b]	6.084	4.987
Difference			+0.148		-0.061		-0.097
Relative change, %			+2.77		-3.27		-1.59
P value (n = 7)			**0.0120**		**0.0357**		0.103
Overall average	41.9	4.711[b]	4.902[a]	1.914[a]	1.852[b]	4.268	3.811
Difference			+0.191		-0.062		-0.457
Relative change, %			+4.05		-3.24		-10.7
P value (n = 18)			**0.0000**		**0.0001**		0.146

[a-b]Treatment