Probiotic bacteria enhance production

by Eric Chevaux and Sylvie Roquefeuil-Dedieu, Lallemand Animal Nutrition, 19 rue des briquetiers BP 59, 31702 Blagnac, France.

When looking for safe, natural and scientifically proven solutions to optimise poultry performance while controlling sanitary conditions, probiotics represent a profitable and reliable solution.

Probiotics are live micro-organisms, either bacteria or yeast, which, when fed in adequate amount, exert a beneficial activity on the host digestive microflora, and subsequently on their digestive functions and health.

Probiotics have been empirically used and investigated for decades in human and animals, and their use is now backed by sound scientific evidence demonstrating their safety (safe for the environment, humans and animals, with no residues in animal products, eggs or meat, or any antibioresistance issues), modes of action, and efficacy in poultry.

They have shown the ability to enhance overall health status, resistance to pathogens and improve zootechnical performance.

Nevertheless, the term probiotic is a very general one, and not all probiotic products are equivalent. In fact, the efficacy of a probiotic relies on the biological activity of live micro-organisms and each bacteria or yeast strain is different. So, what is true for one probiotic strain will not necessarily be true for another strain, even in the same species.

Most importantly, we must keep in mind that a probiotic activity depends on internal and external factors, its mode and frequency of administration, as well as the probiotic dosage, mode of preparation and resistance to storage conditions.

Feedstuff batch (period)	1	2	3	4	5
Humidity (%)			13.0		
Crude protein (%)	**19.0**	**19.3**	**18.5**	**17.0**	**16.4**
Fat (%)	**9.3**	**9.8**	**9.2**	**8.5**	**8.1**
Fibre (%)	3.0	2.7	3.0	2.7	2.7
Ash (%)	16.7	16.8	15.7	16.2	16.3
Methionine (%)	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**
Vitamin A (IU/kg)			10,000		
Vitamin D3 (IU/kg)			2,800		
Vitamin E (mg/kg)			36		
Copper (mg/kg)			25		

Table 1. Average feedstuff analytical composition.

One probiotic which has been shown beneficial for poultry performance and health is Pediococcus acidilactici MA18/5M.

In particular, it was proven efficient in pathogen control under both experimental and large scale production conditions (S. enteritidis, E. coli, S. typhimurium and C. perfringens – some pathogens of significance for both poultry production and human food safety).

P. acidilactici MA18/5M also improves feed conversion rate and zootechnical performance in various species. A new trial was conducted by the Milan University Department of Veterinary Sciences and Technologies for Food Safety together with the Parma University Department of Animal Production to assess the effect of P. acidilactici MA18/5M probiotic on the performance of Hy-line W36 hens.

Milan university trial

The trial was conducted in Modena, Italy, involving 144 Hy-line W36 laying hens.

The hens were divided between two equivalent groups of 72 birds each: Control and Bactocell. They were housed in the same shed, under identical conditions and environment, in 48 identical cages (three hens/cage), 24 cages allotted to each treatment group.

The trial covered a whole laying cycle, starting at week 23, after a four-week adaptation period to the experimental diet, until the hens were 72 weeks old, for a period of 49 weeks (53 weeks of supplementation in total including the adaptation period).

The animals were fed ad libitum with the same basal diet, supplemented or not with P. acidilactici MA18/5M (commercial name Bactocell, Lallemand, France) at a dose of 10^9 CFU/kg feed, or 100g Bactocell/ton feed.

The feed formula was slightly changed during the cycle in the attempt to meet the requirements of every phase of the laying period. Crude protein (CP), fat and methionine contents were gradually reduced with the increase in birds age (Table 1).

Table 2. Effect of Bactocell on laying hen performance parameters.

	Control	Bactocell	Variation (P)
Initial hen weight (g)	1320.30	1315.60	Non significant
Final hen weight (g)	1713.40	1694.20	Non significant
Average feed intake (g/cage/day)	297.30	296.70	Non significant
Average water intake (L/group/day)	12.12	12.35	+ 0.23 (P <0.05)
Laying rate (%)	84.03	86.04	+ 2.01% (P <0.01)
No. eggs/cage/week	17.51	18.07	+ 0.56 (P <0.01)
Average proportion of L size eggs week/cage (%)	17.36	21.24	+ 3.88% (P <0.05)
Average egg weight (g)	60.21	60.52	+0.31 (P <0.1)
Exported egg mass/week/cage (g)	1063	1093	+30 (P <0.01)
FCR (kg feed/eggs produced)	2.01	1.95	-0.06 (P <0.01)

Improved laying rate

Results of the 49 week trial are summarised in Table 2. Egg production is significantly increased with Bactocell in the diet. The weekly egg number per cage is increased from 17.51 to 18.07, resulting in a 2.01% improvement of the average laying rate, when:

$$\text{Laying rate} = \frac{\text{Daily egg No.}}{\text{Ideal egg No.}} \times 100$$

(= one egg/hen/day)

Egg size is also increased with Bactocell supplementation. Average egg weight is lightly increased, and when looking at commercial classification, the proportion of L size eggs (63-73g) was significantly increased by 3.88% on average, while other egg sizes (XL, M and S) did not significantly vary.

These effects on both egg number and egg size result in overall improvement of egg yield with Bactocell (Fig. 1 overleaf).

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The weekly exported egg mass/cage is increased by 2.8% (an extra 28kg/ton of eggs produced). This observation is in accordance with previous findings.

While egg yield is increased, Bactocell treatment had no significant effect on hen weight gain or average daily feed intake during the whole trial, showing that the increased egg yield is not the fact of increased feed consumption and is not detrimental to the birds' body weight either.

As a result, feed conversion rate is improved, meaning that feed utilisation is greater with the probiotic treatment (Fig. 2).

Thus, we can hypothesise that this may be linked to the positive effect of P. acidilactici MA18/5M on the hens' gut microflora and digestive function, as demonstrated in another study conducted by Di Giancamillo et al. (2008) in piglets.

During the trial, hen health and sanitary conditions were monitored daily and did not show any difference between the two treatment groups.

The investigators of the trial concluded that the administration of Bactocell to laying hens enhanced productive performance, such as egg production, weekly exported egg mass, rate of L egg size and feed conversion rate with no detrimental effects on the other parameters. While this trial shows that Pediococcus acidilactici MA18/5M is a profitable solution to increase laying hen performance and feed value, the benefits of this particular probiotic do not stop there.

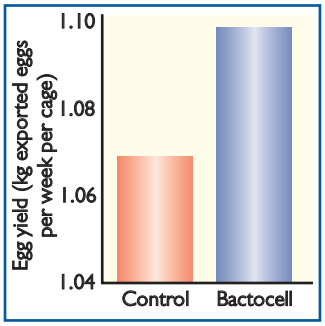

Fig. 1. Daily supplementation with Bactocell improves overall egg yield.

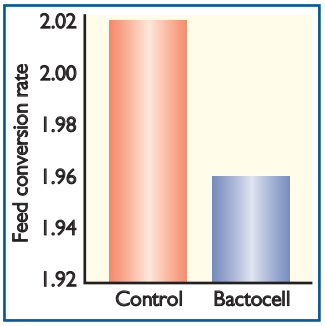

Fig. 2. Bactocell activity in the hens' digestive tract results in improved feed conversion rate.

Better egg quality

Indeed, a previous trial by Dr Awaad from Cairo University, in Egypt has shown that Bactocell supplementation had a positive impact on egg quality and shell resistance – other aspects of economical significance.

During a 12-week trial involving 32 Hy-line hens in total, Bactocell improved egg yolk colouration, decreased the number of meat and blood spots in albumen or yolk, and increased the albumen/yolk ratio, when compared with the control group.

Shell thickness and shell weight ratio were also improved, resulting in improved egg resistance.

Interestingly, Dr Awaad's study also showed a positive effect on lowering the egg yolk cholesterol level, as well as the hen serum cholesterol level. These effects on egg cholesterol content can be seen as additional benefits in terms of consumer's health.

At a time when cereals and feedstuff price rises put extra pressure on poultry farmers, solutions which allow them to optimise the value of feed are of great interest.

But these solutions must remain in line with public concern for feed and food safety and the consumer's demand for natural, healthy and environment friendly food products.

Well documented probiotic strain P. acidilactici MA18/5M, when added continuously to the feed, can help meet these objectives by improving both feed value and resistance to digestive pathogens (such as S. enteritidis, E. coli, S. typhimurium and C. perfringens, as previously described), while improving egg quality and size. ■

References are available from the author on request