

The potential impact of probiotics on the gut-brain axis in layers

With increasing consumer expectations for animal welfare, egg production in cages raises questions. On a global perspective, egg production has been growing every year, whether in intensive farming (modern facilities with vertical housing), cage-free systems or free range.

by Prof. Ibiara C.L. Almeida Paz, São Paulo State University, Brazil, and Alberto Yocytaca Inoue, Sales and Marketing Manager South America, and Jean-Christophe Bodin, Sr. Product Manager Poultry, Chr. Hansen. www.chr-hansen.com

Limited scientific data exists comparing the welfare of laying hens kept in cages versus alternative housing systems. As a result, very little evidence is available to support the assumption whether welfare is enhanced or not in one system or the other. Furthermore, all systems of housing have their own inherent problems. Three common commercial egg production systems are in use around the world:

● **Cages:** Birds are in cages in either environmentally-controlled or open-fronted sheds. Cages might be enriched to improve welfare.

● **Free-range:** Birds are loose-housed and have daily access to the outdoors. The

range of housing can be highly variable but may be similar to that used for barn production.

● **Floor houses:** Birds are loose-housed on litter but have no access to the outdoors. Barn houses also have nest boxes and a dust-bath area and may be single-tiered or multi-tiered (aviaries).

In addition, enriched cages have also been developed in Europe. These cages include a nest box, dust bath, and perch. However, as there is no evidence that non-cage systems are superior for bird welfare, the issue becomes predominantly an ethical one of what society perceives as appropriate.

Why do probiotics play a role in animal behaviour?

For laying hens, the intestinal health, among other factors, must be considered to achieve proper nutrient absorption, disease prevention and optimal bird performance. In poultry production, the main objective of specific probiotic use is the reduction of stressor impacts on final performance (for example, egg production, feed efficiency).

In human health, over recent years, the amount of research on probiotic strains that interact with cognitive functions has increased through the microbiota-gut-brain axis.

In addition, it has been reported in different publications that some



Gut brain axis synthetic representation: 90% of serotonin (molecule of happiness) is produced in the intestine.

specific strains of probiotics including *Bacillus subtilis* affect behavioural patterns.

The cellular mechanism underlying these behaviour changes on layers fed GalliPro MS are still unclear but could be similar to the ones described in humans and mice.

Indeed, certain supplemented probiotics – by their action on the commensal microbiome – will lead to the release of neuroendocrine factors which affect neurotransmitters such as serotonin (involved in a feeling of well-being) and neuronal regulators such as tryptophan, through the microbiota-gut-brain axis.



In the poultry industry, beside improvements in productivity, the use of probiotics in diets is assumed to be key to positively influence broilers or layers' welfare.

What can we expect?

In order to evaluate the effects of a 1:1 combination of *B. subtilis* and *B. licheniformis* in GalliPro MS (GPMS) on laying hens at the end of the production cycle, two experiments were simultaneously carried out.

Experiment 1 was performed with 288 white laying hens (H&N Nick Chick) and Experiment 2 with 288 brown laying hens (Lohman Brown Lite) to observe a potential genetic effect. In both experiments, layers were 71 weeks old, the same experimental design and the same data collection methodology were used. Two randomised treatments with 12 replicates/treatment: Control, Control + 400g/T of probiotic (GalliPro MS).

Continued on page 8

Fig. 1. Behaviour parameters (White layers).

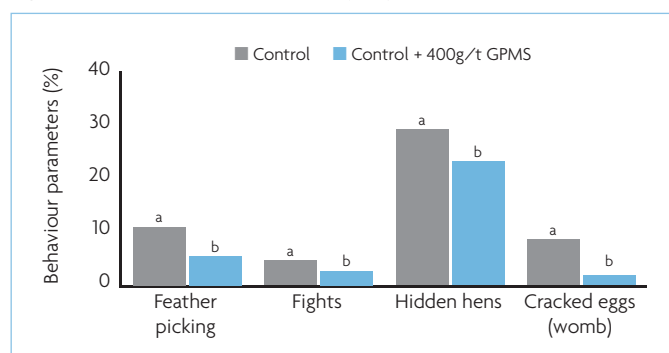
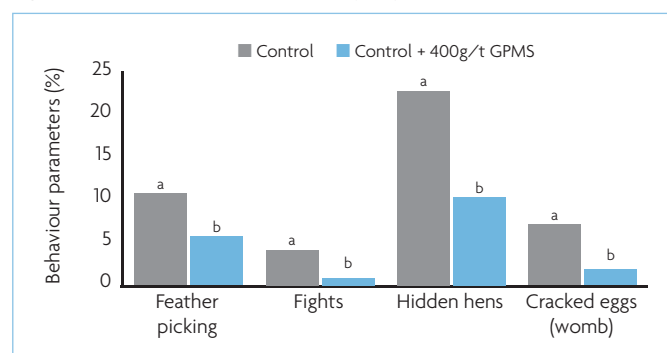


Fig. 2. Behaviour parameters (Brown layers).



Continued from page 7

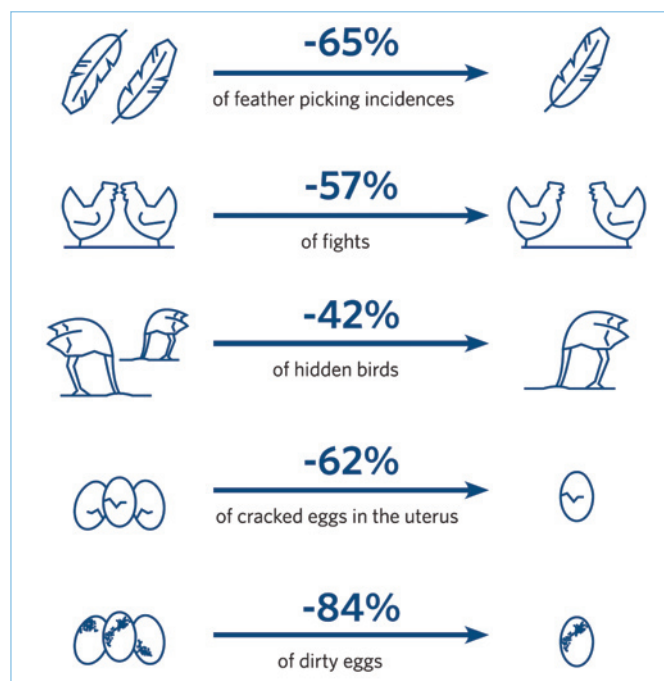
The trial period was 84 days and birds were housed in a Californian barn (conventional system) with eight birds per cage.

Classical performance parameters were collected on a daily basis, such as feed intake, egg production, egg weight, feed conversion ratio and dirty eggs (%). In addition to these data, behaviour and welfare assessments (once a week) were recorded. Parameters, such as percentages of feather picking, fights, hidden hens or cracked eggs in the womb were measured as indicators of animal welfare.

The results of experiments 1 (White layers) and 2 (Brown layers) for behaviour and welfare parameters are summarised in Figs. 1 and 2.

Summary of results

Supplementation with GalliPro MS either in White or Brown layer birds' diets, leads to significant welfare improvements. Indicators like lower percentages of agonistic behaviour, feather picking, fights, hidden hens and cracked eggs in the womb were positively affected with the use of a probiotic. In both experiments, it was reported that for both white or brown layers, GalliPro MS inclusion improved behaviour and made the



Improvement of behaviour parameters (%) and egg results.

birds calmer over the 84 day trial period. In parallel with these observations, the results obtained for laying performance also demonstrated significant improvements in the two trials with

probiotic supplementation, independently of layers' genetic and probiotic dosages ($p < 0.05$).

A low percentage of dirty eggs is commonly seen as a good indicator of gut health. It often illustrates a

lower dysbacteriosis occurrence through better pathogenic bacteria control and a better intestinal microbiome.

Positive impact on egg production

These effects can be explained by several major mechanisms:

- Specific strain of *Bacillus subtilis* which has the ability to colonise the top of intestinal villi, has two major benefits to the bird's intestine:
 - Protection of villi for a larger absorption surface through competitive exclusion.
 - Releasing enzymes locally to improve indigestible nutrients digestibility.
- Specific strain of *Bacillus licheniformis* which produces lichenysin peptide active to inhibit *Clostridium* spp. and thus potential reduction in dysbacteriosis or enteritis.

The agonistic behaviours in laying hens were significantly reduced when using GalliPro MS. Such results open a new era for probiotics, as GalliPro MS was demonstrated to be beneficial both for performance and animal welfare in layers. ■

References are available from the authors on request