

Effectiveness of *Lactobacillus acidophilus* 2B4 as Biocontrol to Prevent *Salmonella enteritidis* Infection on Laying Hens

Niken Ulupi¹, Irma Isnafia Arief^{1,*}, Bram Brahmantiyo² & Kharisma Eka Riwayati¹

¹Department of Animal Production and Technology, Faculty of Animal Science,
Bogor Agricultural University, Bogor, 16680, Indonesia,

*Email: irma_isnafia@yahoo.com

²Indonesian Research Institute for Animal Production, Bogor,
Jl. Veteran III, Banjarwaru PO Box 221, Bogor 16002, Indonesia

Abstract

Laying hen is raised and selected to produce eggs. Poultry could be infected by several kinds of *Salmonella enterica* such as *S. enteritidis* as a specific bacterium which is carried by chickens. *Salmonella enteritidis* can depress the hen weight by dehydration and contaminate the egg which is very dangerous for human health. Regarding this negative effect, the preventive treatment to eliminate *Salmonella enteritidis* contamination in eggs becomes a major concern. This research aimed to determine the optimum dosage and frequency applied of probiotic *L. acidophilus* to avoid contamination of *Salmonella enteritidis* in ovary and egg of laying hens. The result showed that probiotic treatment could increase feed consumption, egg production, however, in the other hand decreased the feed conversion. Among other, probiotic treatment was effective to reduce the population of *Salmonella enteritidis* in ovary and egg of laying hens. The optimum dosage of *L. acidophilus* probiotic was within population of 109 cfu/ml and frequency of twice a day was the most effective as biocontrol.

Key words: *L. acidophilus*, laying hen, probiotic, *Salmonella enteritidis*

Introduction

Food security is a major issue in national development program. Food is a basic requirement for the fulfillment of - human rights for everyone. Food safety issues are major concern in public health policy. Foodborne disease and food contamination incidents occurred in various countries, not only in developing countries where sanitation and hygiene conditions are generally poor, but also in developed countries. One of the emerging pathogen is *Salmonella enteritidis* transovarian contamination of grade A eggs. These eggs are contaminated since the start of its formation in the body because its parent is infected by *S. enteritidis* in ovaries (Gantois *et al.*, 2009).

Table 1. Performance of layer hens

Performance	R1	R2	R3	R4
Feed consumption (g/hen/day)	111.81 ^a	112.80 ^a	118.29 ^b	118.54 ^b
Egg production (%)	67.64 ^a	70.31 ^a	75.91 ^b	81.97 ^c
Egg weight (g/egg)	59.43	58.89	59.57	59.58
Feed conversion	3.34 ^a	3.48 ^a	3.36 ^a	2.72 ^b
Mortality	0	0	0	0
Haugh Unit (HU)	96.40 ^(AA)	94.00 ^(AA)	94.59 ^(AA)	95.30 ^(AA)

Different superscript in the same line means significantly different ($P < 0.05$), except HU

Probiotic treatment affected the amount of feed intake. R4 treatment indicated more efficient than other treatments. There was a difference between R2 and R4 treatments. Egg production of R4 was highest than the others. This was presumably because use of feed consumed by chickens R2 to improve declined condition due to the administration of *Salmonella enteritidis*. While at R2 and R4 the improved function of the body condition has been taken over by the probiotic *L. acidophilus* 2B4. R4 was better than R3. It meant that probiotic given twice per day was more effective to enhance performance than R2.

Based on the weight of eggs, there were not significant differences in all treatments. This finding was consistent with the Indonesian National Standard (1995) which states the criteria and the weight of eggs for egg consumption are extra large (more than 60 grams), large (55-60 g), moderate (51-59 grams), small (45-50 grams), and extra small (less than 46 grams). Viscosity of the albumin can be characterized by higher albumin (Sirait, 1986). The high albumin is used to determine the value of Haugh Units of eggs. The higher Haugh Unit value indicates the higher quality of the eggs (Sudaryani, 2000). Haugh Unit values of this treatment were more than 90 for each treatment, therefore, Haugh Unit value of each treatment was categorized into AA (USDA, 1964). *Salmonella* contamination on ovarium and egg of layer hens was described in Table 2.

At day-5, addition of probiotic *L. acidophilus* 2B4 could decrease *Salmonella* in layer hens (R3 and R4). After infection of *S. enteritidis* by oral administration at day 5-9, *Salmonella* could also be decreased by addition of *L. acidophilus* 2B4 twice per day. R4 was better than R2 and R3. *S. enteritidis* is invasion bacterium that invades from gastrointestinal tract to blood and reach ovarium. After *Salmonella* invasion, addition of probiotic *L. acidophilus* 2B4 twice per day (R4) could reduce *Salmonella* on ovarium at day-20. It was better than addition of probiotic only once per day (R3). Administration of probiotics enhances intestinal antibodies to alien antigens, and reduce colonization of pathogens in gastrointestinal tract (Haghighi *et al.* 2006).

- gor Agricultural University.
- Bacteriological Analytical Manual (BAM). 2007. *Salmonella*. <http://www.fda.gov/Food/ScienceResearch/LaboratoryMethods/BacteriologicalAnalyticalManualBAM/ucm070149.htm> (06/06/2010)
- Gantois, I., R. Ducatelle, F. Pasmans, F. Haesebrouck, R. Gast, T. J. Humphrey, & F. V. Immerseel. 2009. Mechanisms of egg Contamination by *Salmonella enteritidis*. dalam: S. Cutting (ed). Federation of European Microbiological Societies. Blackwell publishing, Belgium.
- Hagighi, HR., J. Gong., CL. Gyles, MA. Hayes, H. Zhou, B. Sanei, JR. Chambers and S. Sharif. 2006. Probiotics Stimulate production on natural antibodies in chickens. *Clinical and Vaccine immunology* 13 (9) : 975-980.
- Indonesian National Standard (1995). *Kualitas Telur*.
- Sirait, C.H. 1986. *Telur dan Pengolahannya*. Pusat Penelitian dan Pengolahan Peternakan, Bogor.
- Steel, R.G.D. and J. H. Torrie. 1986. *Principles and Procedure of Statistics*. McGraw Hill Book Co. Inc., New York.
- Sudaryani, T. 2000. *Kualitas Telur*. Penebar Swadaya, Jakarta.
- Ulupi, N., A. S. Tjakradidjaja, & B. Brahmantiyo. 2009. Paket teknologi probiotik sebagai agen biokontrol dalam upaya pencegahan *Salmonella enteritidis transovarian* pada ayam petelur. Laporan penelitian. Fakultas Peternakan, Institut Pertanian Bogor, Bogor.
- U. S. D. A. 1964. *Egg Grading Manual Agriculture*. Hand Book No. 75.