



FUMIGATING BROILER HATCHING EGGS WITH LYSOZYME PRODUCT (INOVAPURE) TO REDUCE EGG SHELL MICROBIAL LOAD

Introduction

The transmission of pathogenic bacteria to hatching eggs is of major concern to the poultry industry. Pathogenic bacteria associated with hatching eggs may result in an infection that can increase the risk of embryo mortality or result in weaker chicks with poor subsequent growth performance (Brake and Sheldon, 1990; Patterson et al., 1990; Copur et al., 2010). A freshly laid egg is wet, warm, and the shell is easily penetrated by microorganisms as the egg cools down. The effectiveness of traditional hatchery sanitation and pathogen reduction practices for day-old chicks is limited if the eggs are already heavily contaminated with bacteria that can easily spread from egg to egg within an incubator. Formaldehyde has been a standard disinfectant in the poultry industry due to its bactericidal action and ease of application. However, prolonged exposure to formaldehyde has been reported as a health risk to workers (Occupational Safety and Health Administration, 1991). An alternative to formaldehyde that is less hazardous to humans, yet economical and efficient is required.

Lysozyme is a natural bacteriolytic enzyme that is widely present in animal tissues and secretions and is regularly isolated commercially from egg albumen. Lysozyme provides protection against bacterial infection by sticking to bonds in bacterial cell walls. Several studies have evaluated the antimicrobial activity of lysozyme in fresh vegetables and cheese production but research regarding the use of lysozyme as an alternative sanitizer for hatching eggs is limited.

Objective:

This research has two objectives: to compare the effectiveness of two sanitizers against *E. coli* penetrating eggshells; and to establish whether the applications of the test sanitizers on broiler hatching eggs can reduce the presence of *E. coli* in newly hatched chicks and improve hatchability, chick quality and broiler production parameters.



Trial:

The research examines the effectiveness of sanitation treatments in controlling *E. coli* presence on hatching eggs and whether it affects hatchability and growth performance. The sanitation treatments used distilled water as the solvent for concentrated liquid chemicals including Inovapure™, a commercially available lysozyme product (LP) extracted from hen egg white, and Power Quat, a quaternary ammonium (QA) based product used in food processing. LP was applied at 1.5% and 3%; QA at 0.125%. Two approaches were examined: (1) inoculating the eggs first with a prepared *E. coli* suspension, followed by sanitation treatment;

and (2) applying the sanitization treatment first, followed by inoculation with the *E. coli* suspension. Eggs exposed to each treatment regime were evaluated before incubation and following 48 h of incubation and hatching to assess presence of *E. coli* in the microbiological experiments. In the animal experiments, growth performance of the birds hatched from treated eggs was measured as the broilers were grown to 33 d of age.

Results:

Inoculated eggs fumigated with 3.0% LP and 0.125% QA showed comparable result in reducing the total amount of *E. coli* on the eggs. When eggs were sanitized prior to inoculation, 3.0% LP demonstrated ongoing bactericidal action to prevent *E. coli* penetration. No difference in hatchability, fertility rate or egg weight loss percent was found among sanitation treatments. At hatch, body weight or the ratio of yolk sac weight to yolk-free body weight were not affected. However, the application of sanitizers decreased the presence of *E. coli* in the yolk sac of newly hatched chicks. Feed consumption, body weight and feed conversion ratio were not affected by sanitation treatments. However average daily body weight gain was lower following QA application.



High-level contaminated egg

Low-level contaminated egg

Counting *E. coli* amount

Industry Impact: LP and QA provide favorable options to formaldehyde for sanitation of hatching eggs in hatcheries. These alternatives are effective, safe and non-toxic and do not affect growth performance of the broilers. Comparative studies determining the effectiveness and cost of LP compared to pure

lysozyme and other commercial hatching egg sanitizers would be useful.

References:

Brake, J., and B.W. Sheldon. 1990. Effect of a quaternary ammonium sanitizer for hatching eggs on their contamination, permeability, water loss, and hatchability. *Poult.Sci.* 69:517-525.

Copur, G., M. Arslan, M. Duru, M. Baylan, S. Canogullari, and E. Aksan. 2010. Use of oregano (*Origanum onites* L.) essential oil as hatching egg disinfectant. *Afr. J. Biotechnol.* 9:2531-2538.

Occupational Safety and Health Administration. 1991. Occupational exposure to formaldehyde. Response to court remand. *Fed. Reg-ist.* 55:32302-32318.

Patterson, P. H., S. C. Ricke, M. L. Sunde, and D. M. Schaefer. 1990. Hatching eggs sanitized with chlorine dioxide foam: egg hatchability and bactericidal properties. *Avian Dis.* 34:1-6.

Conclusion:

Overall 3% LP demonstrated acceptable activity against *E. coli* on eggshells, and provided ongoing bactericidal action to prevent *E. coli* penetration without negatively affecting growth performance. No difference in hatchability, fertility rate or egg weight loss percent was found among sanitation treatments.

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Funding provided by: Canada/Nova Scotia Growing Forward II Agreement; Chicken Farmers of Nova Scotia, Chicken Farmers of Newfoundland & Labrador