

Poster 27

Application of plant based nanoemulsions for controlling human salmonellosis.

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Purpose

Salmonella Enteritidis (SE) is a major foodborne pathogen that causes over 1.3 M annual illnesses in the United States. Around 47 % outbreaks of Salmonella are associated with consumption of poultry products. With ban on the use of antibiotics growth promoters in poultry, significant research is investigating the potential of antibiotic alternatives such as phytochemicals for controlling Salmonella in chickens. Trans-cinnamaldehyde (TC) is a phytochemical obtained from cinnamon with proven anti-Salmonella efficacy in chickens. However, the low solubility of TC oil thwarts its application as an oral supplement via drinking water. In this study, TC nanoemulsion (TCNE) was prepared with Gum Arabic and lecithin emulsifiers to enhance dispersion of hydrophobic TC oil in water. Thereafter, the efficacy of in-water supplementation of TCNE in reducing SE cecal colonization in broiler chickens was studied.

Methods

In two trials, 96 broiler chicks (day-old; 16 birds/treatment/trial) were randomly allocated to 6 groups (Control, emulsifier control, TC 0.03, TC 0.06, TCNE 0.03, TCNE 0.06). Starting day 8, birds in TC 0.03, 0.06 and TCNE 0.03, 0.06 groups were supplemented with TC oil and nanoemulsion, respectively, in drinking water till end of trial. On day 14, the birds were inoculated with a four-strain cocktail of SE (~9 log CFU/bird) by oral gavage. On days 21 and 28, 8 birds/group were sacrificed followed by SE enumeration in cecal contents. In addition, liver and jejunum tissues were processed for histopathology. Data were analysed using one way ANOVA ($P < 0.05$).

Results

TCNE had a size of ~ 100 nm, PDI of <0.3 and Zeta potential of -30 mV. Administration of TCNE in drinking water at 0.03 and 0.06 % reduced SE colonization by ~ 2 log CFU/g of cecal content in both trial 1 and trial 2 as compared to respective controls ($P < 0.05$) on day 21 & 28. No change in feed or water consumption was observed in any treatment groups as compared to controls. Histopathology evaluation of liver and jejunum tissues from TCNE treated chickens did not reveal any adverse changes. Follow up biodistribution analysis is currently underway.

Conclusion

TC nanoemulsion could potentially be used to control SE colonization in broiler chickens.

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