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Study on immune-enhancing and protective effects of three Lactobacillus species on Nile tilapia (*Oreochromis niloticus*) vaccinated against *Streptococcus agalactiae*

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Abstract

Lactobacillus probiotic enriched diets can modulate host immune response. In this study, we investigated whether the three species *Lactobacillus plantarum*, *L. bulgaricus* and *L. rhamnosus* up-regulated two T-cells specific antigens and exerted the protective effect when administrated with formalin-killed *Streptococcus agalactiae* in Nile tilapia. For this purpose, a total of 180 Nile tilapia (average body weight 45.8 ± 22 g) were randomly divided into 6 experimental groups, i.e.: one control group and 5 vaccinated groups: Formalin killed cell (FKC); FKC+ Adjuvant; FKC+ *L. plantarum*; FKC+ *L. bulgaricus* and FKC+ *L. rhamnosus*. All groups were fed with normal commercial pellets and three groups were fed with pellets sprayed with three different lactobacilli. The results showed that the survival rate in the groups of Formalin killed cell (FKC) combined with oral administration of lactobacilli was from 70.0% to 75.0%. Protection in the control group amounted to 31.3% illustrating a significant difference with other experimental groups. In this research, gene expression of CD4 and CD8 which have essential functions in the immune response quantified by qRT-PCR in the head kidney, skin, and spleen was reported in the form of fold change. The analysis of fold change (Mean ± SD) related to CD4 and CD8 at 30- and 60-days post-immunization (dpi) respectively showed an increase in fold change in all probiotic groups compared to the FKC group in two of which it was significant at the level of $p<0.05$. The results revealed that vaccination with FKC administrated lactobacilli-enriched diets increased the expression of genes related to immune response which can indicate higher protection against *Streptococcus agalactiae* in the probiotic groups compared with FKC vaccination alone similar to the results observed in FKC coupled with adjuvant vaccination.

Key words: Vaccine, *Streptococcus agalactiae*, Lactobacillus, CD4, CD8

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