ISSN: 1391-8796
Proceedings of
5th Ruhuna International Science & Technology Conference
University of Ruhuna, Matara, Sri Lanka
February 15, 2018

Oral vaccination of DNA encapsulated chitosan nanoparticles enhances the transcriptional responses of IFN and IFN-stimulatory genes in zebrafish

Nikapitiya C.[1*], Dananjaya S.H.[2], Chandrarathna H.P.S.U.[2], Warnasooriya V. B.[3], De Zoysa M.[2], and Lee J.[1]

[1]*Department of Marine Life Sciences, School of Marine Biomedical Sciences, Jeju National University, Jeju Self-Governing Province 63243, Rep. of Korea*
[2]*College of Veterinary Medicine, Chungnam National University, Daejeon 34134, Rep. of Korea*
[3] *Department of Animal Science, Faculty of Agriculture, University of Peradeniya, 20400, Sri Lanka*

The use of oral vaccination in aquaculture has lagged behind injectable vaccines for a long time in protective immunity. In this study, we constructed the DNA vaccine using plasmid vector (pEGFPN2) and ORF012R gene of rock bream iridovirus (pEGFPN2-ORF012R). Then it was encapsulated to chitosan nanoparticles (CNPs) according to a complex coacervation method and denoted as pEGFPN2-ORF012R-CNPs. The pEGFPN2-ORF012R-CNPs had diameter of 189.5 nm. Encapsulation efficiency and loading capacity were determined as 92.57% ± 0.87% and 9.32% ± 0.19%, respectively. Final encapsulated product (pEGFPN2-ORF012R-CNPs) had +12.11 mV zeta potential. *In vitro* vaccine release assay showed that the plasmid DNA was sustainably released from the pEGFPN2-ORF012R-CNPs, up to 84.26% ± 3.16% of the total amount. By *in vitro* cell culture experiment we confirmed that the cloned pEGFPN2-ORF012R-CNP was expressed in HEK-293 cells. Oral vaccination was carried out by feeding of pEGFPN2-ORF012R-CNPs (250 ng/zebrafish/day) for 14 days. Quantitative real time PCR results clearly showed the transcriptional upregulation of IFN and IFN-stimulatory genes (Mx) in kidney and gut of zebrafish upon oral vaccination of pEGFPN2-ORF012R-CNPs compared to control fed diet, suggesting that CNPs is potential DNA vaccine delivery agent.

Keywords: Chitosan nanoparticles; Oral DNA vaccination; Zebra fish

Acknowledgements *This work was supported by a National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (2017010990).*

*Corresponding author: chamilani14@gmail.com