Efficacy of Tilapia Oral Vaccine Coupled with a Nanocomposite Biomaterial as Carrier for Vaccine Delivery

Fish diseases have seriously threatened and hampered the aquaculture industry. Low stress yet effective mass vaccination strategies for disease control and prevention are needed for sustainable aquaculture. Fishvax, a vaccine using a nanocomposite biomaterial for oral delivery, was developed and applied in this study for vaccination against *Aeromonas veronii*, a bacteria that can cause major disease outbreaks in fish.

The project team, based at the Institute of Biology, College of Science, University of the Philippines Diliman, was headed by Dr Anacleto Argayosa, in collaboration with Dr Rolando Pakingking Jr of SEAFDEC Aquaculture Department. The project was funded by the Department of Science and Technology, Philippine Council for Aquatic and Marine Research and Development, now the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development.

The vaccine is coated on the fish pellet and fed to the fingerlings during mass immunization. The encapsulation technique protects the bacterial antigens from destruction in the stomach and releases the microencapsulated, killed pathogen in the fish gut where immune cells process it from the systemic and gut-associated immune response. Antibody levels were analysed using enzyme-linked immunosorbent assay, and quantitative PCR of immunoglobulin M (IgM) mRNA in the spleen and other tissues such as the liver, head kidney and muscles were performed. Close to a 10-fold increase in IgM levels was observed in vaccinated fish, enough to give a relative percent survival of 67 percent in tank trials and 53 percent in grow-out field trials in fish cages versus the challenged and non-vaccinated fish, respectively.

©FAO/A.M. Argayosa

Sample of fish feed pellets with the nanocomposite biomaterial

In summary, oral vaccination of tilapia with inactivated *A. veronii* using phyllosilicate as the vaccine carrier potently induced humoral adaptive immune response and conferred significant protection against *A. veronii* infection. The potential of oral vaccine using phyllosilicate carrier against other motile Aeromonas septicemia causing *Aeromonas* spp. warrants further investigation.

This advancement in vaccine delivery system may improve tilapia production and reduce huge economic losses. Importantly, the platform technology can be developed for oral vaccine against other important fish pathogens including viruses. This initial work is continuing with the research on "Use of Fish Oral Vaccine in Tilapia Aquaculture System" funded by DOST – Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development in collaboration with an industry partner, Santeh Feeds Corporation.

Written by:

Mary Nia M. Santos

Aquatic Animal Health Section, Aquaculture Research and Development Division, Department of Agriculture, National Fisheries Research Development Institute Quezon City, Philippines

Rodolph Charles N. Rosel

Institute of Biology, College of Science, University of the Philippines, Diliman Quezon City, Philippines

Rolando V. Pakingking Jr

Aquaculture Department, Southeast Asian Fisheries Development Center, National Highway, Tigbauan, Iloilo, Philippines

Anacleto M. Argayosa

Biology Department, College of Arts, Sciences and Education, Trinity University of Asia Quezon City, Philippines (Corresponding author)

SEE ALSO

Argayosa, A.M., Pascua, C.S., Sumera, F., Yason, J.A.D.L. & Espigar, A.R. 2015. *Oral vaccine for fish.* World Intellectual Property Organization (WIPO). **https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2015030613**

Argayosa, A.M., Pascua, C.S., Sumera, F., Yason, J.A.D.L. & Espigar, A.R. 2017. IPOPHIL (1/2013/000256), p. 18. **https://onlineservices.ipophil.gov.ph/patgazette/IPASJournal/V20N110_INV_2nd.pdf**

Bantigue, A. 2013. UP Diliman Invention Wins 2013 Ambassador A.M.Y. Awards Grand Prize. UP Office of the Vice Chancellor for Research and Development. **www.ovcrd.upd.edu.ph/blog/2013/10/31/up-diliman-invention-wins-2013-ambassador-a-m-y-ip-awards-grand-prize/**

https://www.asiaresearchnews.com/html/announcements.php/aid/7955/cid/2/research/science/university_of_the_philippines_diliman/up_diliman_invention_wins_2013_ambassador_a.m.y._ip_awards_grand_prize.html