Application of DNA vaccines in fish

A. Lepa¹, A.K. Siwicki¹, E. Terech-Majewska²

¹ Department of Fish Pathology and Immunology, Inland Fisheries Institute, Oczapowskiego 10, 10-719 Olsztyn, Poland
² Faculty of Veterinary Medicine, University of Warmia and Mazury, Oczapowskiego 13, 10-718 Olsztyn, Poland

Abstract

Vaccination is a most cost-effective way of controlling infectious diseases in fish. However, some vaccination techniques when applied to hatchery conditions are not as effective as we expect them to be. Modern molecular biology techniques offer a number of opportunities for improving existing bacterial or viral vaccines or creating new ones. One of the most promising trends in vaccinology is development of DNA vaccination. DNA vaccines are based on the gene encoding specific antigen, which is expressed in vaccinated organism and induces the host immune system. DNA vaccines, compared to conventional vaccines, have many advantages including ability to trigger wider immune response, bigger stability and possibility of large-scale production. To date, there are several reports indicating effectiveness of DNA vaccines used against fish pathogens.

Key words: fish, DNA vaccine

DNA vaccination consists in immunizing the organism by injecting it with genetically engineered DNA to produce an immunological response. This technique is based on the administration of purified plasmid encoding antigens and necessary regulatory elements to express them (Mor and Eliza 2001). Once the DNA reaches the tissue, the antigen is expressed using host cell machinery, under the control of the strong promoter. In fish vaccines, the immediate early promoter of the cytomegalovirus (CMV) has shown to give the best results (Heppel and Davis 2000). The pathogen specific antigen is produced in sufficient amount to elicit both humoral and cellular protective immune responses in the host (Davis and McCluskie 1999). Although various delivery strategies have been investigated [i.e. intramuscular (IM) injection, immersion, scarification of the skin, gene gun], it seems that an intramuscular injection is the most efficient and fre-