



H.F.R.I.
Hellenic Foundation for
Research & Innovation

Description of the funded research project
1st Call for H.F.R.I. Research Projects to Support Faculty
Members & Researchers and Procure High-Value
Research Equipment

Title of the research project: Development of trivalent vaccine(s) against viral nervous necrosis, photobacteriosis and vibriosis

Principal Investigator: Vasileios Bakopoulos

Reader-friendly title: TriVac

Scientific Area: Agricultural Sciences – Food Science & Technology / Veterinary Science

Institution and Country: Greece

Host Institution: University of The Aegean

Collaborating Institution(s):

Budget: 170,000

**Project webpage
(if applicable):**

Duration: 36 months

Research Project Synopsis

The main goal of this proposal is the development of a prototype trivalent vaccine(s) against the pathogens causing viral nervous necrosis (b-nodavirus, RGNNV genotype, Family Nodaviridae-VNNv hereafter), photobacteriosis (*Photobacterium damsela* subsp. *piscicida*-Phdp hereafter) and vibriosis (*Vibrio anguillarum* serotype O1-VaO1 hereafter) in European sea bass (*Dicentrarchus labrax*).

The formulation of a prototype trivalent vaccine for the prevention of viral nervous necrosis, photobacteriosis and vibriosis will be accomplished through the completion of the following major objectives-tasks: a) Preparation of antigens from the aforementioned pathogens using single-step or double-step procedures, b) Quantitative and qualitative analysis of humoral and cellular immune response of sea bass immunized with various single and combined antigen formulations from all three pathogens and c) Protection efficacy studies of prototype trivalent vaccine(s), composed by combinations of antigens from all three pathogens, realized through experimental infections with the respective pathogens.

Important element of the proposed research is the successful combination of single/double-step procedures for the isolation of antigens from the pathogens, thus keeping production costs low, and improved efficacy of the resulting trivalent vaccine(s) formulation(s).

Project originality

The proposal's objective is to develop efficient trivalent prototype vaccine formulations against fish VNN, photobacteriosis and vibriosis, representing innovative vaccine formulations that are not currently available and to our knowledge have not been yet researched in respect to their efficacy. This objective will be accomplished through a detailed analysis of all aspects of immune system stimulation caused by separate antigens from each pathogen and their combinations in order to investigate any phenomena of immunodominance / immunosuppression that may adversely affect the efficacy of these vaccines against each of the pathogens. To our knowledge published scientific information on this topic of antigenic-immunological interactions in fish is rare. Commercially available vaccines against bacterial pathogens contain formalin-inactivated whole bacterial cells of the pathogens as antigens. Our approach will be to investigate also components of bacterial pathogens such as ECPs, CPS or LPS as vaccine components in order to improve vaccine efficacy and reduce phenomena of immunosuppression. On top of this, these components will be isolated with single-step procedures in order to reduce procedural costs. Bacterial cells of the pathogens will be propagated in innovative complex culture media previously developed by the scientific responsible, that promote the synthesis of natural antigens and promote virulence as it has been previously demonstrated. Based on the aforementioned information we believe that the proposal entails many innovative aspects and both the knowledge acquired and published and the products developed will promote knowledge and applications in the field.

Expected results & Research Project Impact

Scientific benefits of the realization of this proposal include: i) elucidation of sea bass immune response against a plethora of important antigens and their combinations originating from the three most important pathogens of this fish species which is of great interest for Mediterranean mariculture, ii) identification of antigen-related immunodominance / immunosuppression phenomena of combinations of these antigens and their specific effect on the immune response, iii) development and efficacy assessment of trivalent vaccine formulations against VNN, photobacteriosis and vibriosis.

Outbreaks of VNN with serious mortalities occur every year in various parts of Greece and other Mediterranean countries. Both photobacteriosis and vibriosis represent constant threat for sea bass mariculture with mortalities recorded every year during spring and more important during summer and autumn coinciding with the development of VNN.

Further development and application of trivalent vaccines produced by the proposed research will protect animal capital and reduce mortality of fish in the field and increase the profit of aquaculture companies, reducing in parallel the need for use of antibiotics for the treatment of bacterial diseases. This may positively influence job maintenance or creation in the aquaculture sector almost entirely practiced in de-centralized regions of Greece and producing a product which in its majority is exported. Furthermore, the implementation of this proposal will provide specialization to PhD and MSc candidates and create conditions for reducing “brain drain” from Greece.

The importance of this funding

Selection and funding of this project will allow the expansion of my scientific experience and knowledge, as well as of the research involved in the project, proves the significance and necessity of the proposed research and will permit the development of a biotechnological high added value pharmaceutical product, which when further developed, will assist to the further growth of an important primary production sector in Greece.



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