

# Immunomodulatory potential of Chitosan and Levamisole against bacterial diseases of *Penaeus monodon*

V. A.J. HUXLEY<sup>1</sup>, P. SUTHAN<sup>1</sup>, M. VICTOR JOSEPH<sup>1</sup> AND A.P. LIPTON<sup>2</sup>

<sup>1</sup>Biotech Research Laboratory, Department of Zoology, Thiru. Vi. Ka. Govt. Arts College, TIRUVARUR (T.N.) INDIA

<sup>2</sup>Marine Biotechnology Laboratory, Central Marine Fisheries Research Institute, Vizhinjam Research Centre, Vizhinjam, THIRUVANANTHAPUARM (KERALA) INDIA

Email: aldobiotech@yahoo.com

(Received: October, 2010; Revised: November, 2010; Accepted : December, 2010)

Effective eco-friendly disease management strategies are emerging as important criteria for sustainable shrimp farming due to problems such as development of resistant microbial strains by application of antibiotics and other chemo-therapeutants. Vaccine development for the crustaceans is impractical due to lack of specific immune system. However, the non-specific immunity can be enhanced using immunostimulants. They enhance the microbicidal activity of haemolymph and phagocytosis of the cells. Studies were made to evaluate the immunomodulating effects of chitosan and levamisole. Different parameters such as growth and survival stimulating potency, hematological index, phagocytic index and bacterial clearance were studied. Significant increment in the growth and immune index were noted in the shrimps fed with levamisole 150 groups. Challenge experiments were made with commercially important shrimp pathogens *Vibrio harveyi* in both control and experimental shrimps and 100% mortality observed in the control group, but in the experimental diet administered group showed protection in a considerable manner.

**Key words :** Shellfish, Disease-management, Immunostimulants, levamisole, Chitosan

Huxley, V. A.J., Suthan, P., Victor Joseph, M. and Lipton, A.P. (2011). Immunomodulatory potential of Chitosan and Levamisole against bacterial diseases of *Penaeus monodon*. *Asian J. Bio. Sci.*, **6** (1) : 33-40.

## INTRODUCTION

The world production of shrimp has declined drastically due to dreadful viral and bacterial epizootics, environmental crisis and consequent legal restrictions. In terms of economic loss in the aquaculture industry, disease has been cited as the single largest factor. In shrimp, viral diseases are the most devastating followed by bacterial outbreaks. Viral outbreaks cause very high mortality, reaching 100% within 3-10 days of onset of clinical signs. According to several reports, the majority of bacterial infections are attributable to *Vibrio* species (Lightner, 1993). Vibriosis in shrimp also causes death ranging from trivial to 100% (Lightner, 1988). There have been no remedies developed so far for such outbreaks.

The attempts made for controlling/preventing such devastating outbreaks using conventional antimicrobials and other chemotherapeutants were mostly unsuccessful and created severe environmental consequences. The uncontrolled and repeated use of antibiotics causes a major setback in the successful treatment of bacterial infections

due to the development of antibiotic resistant pathogens. Developing specific bacterins/vaccines are also impractical in crustaceans because of their poorly developed specific immune system. In Crustacea, the first lines of defense are elicited by haemocytes through phagocytosis, encapsulation and nodule formation. The phagocytic activity is enhanced considerably by the activation of prophenoloxidase (Pro-PO) system localized in the semigranular and granular haemocytes. The pro-PO inturn is activated by the immune enhancers. Considering these aspects, the disease resistance capacity could be enhanced successfully through the activation of such non-specific defense factors. Among the factors concerning the humoral defense system, the phenoloxidase (PO), the Pro-PO activating system, bactericidin and lectins are considered as important ones (Azad *et al.*, 1995).

Immunostimulants are delate substances, which enhance the non-specific defense mechanism and provide resistance against the invading organisms. Perusal of