# Role of Cathepsin L in the Pathogenesis of Enterocytozoon hepatopenaei Infection in Litopenaeus vannamei

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**Abstract**

*Litopenaeus vannamei* (white shrimp) is one of the most economically important aquaculture species globally. Due to its rapid growth rate and high market demand, global production reached 6.8 million tonnes in 2022. However, the productivity of white shrimp farming is continually threatened by pathogens and diseases. *Enterocytozoon hepatopenaei* (EHP) is a microsporidian pathogen that continuously affects white shrimp aquaculture, posing a significant threat to the industry. EHP primarily infects the shrimp hepatopancreas. Due to the gradual destruction of the shrimp digestive system, infected shrimp commonly exhibit stunted growth or significantly reduced growth rates. Although EHP infection does not cause immediate acute mortality, it results in a gradual health decline, eventually leading to progressive mortality. In this study, hepatopancreas tissue samples were collected from white shrimp infected with EHP. Half of the hepatopancreas tissue samples were classified into various degrees of damage using histopathological analysis. The other half were analyzed using Next-Generation Sequencing (NGS) to investigate differential host gene expression during infection. The results indicated a downregulation of digestion-related genes, while cathepsin L showed increased expression. Cathepsin L, a member of the cysteine protease family, is involved in immune regulation, protein degradation, and cellular autophagy. It is hypothesized that cathepsin L may participate in the shrimp immune defense system against EHP infection or play a role in cellular breakdown and tissue repair associated with pathological changes in the hepatopancreas. Moreover, upregulation of cathepsin L may lead to hyperactivation of autophagy or protein degradation, exacerbating hepatopancreas damage and ultimately hindering shrimp growth.

**Keywords:** Litopenaeus vannamei, Enterocytozoon hepatopenaei, Cathepsin L

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