

The Prevalence of *Vibrio cholerae* and *Vibrio parahaemolyticus* Virulence Genes and Multiple Antibiotics Resistant (MAR) Assessment from Local Shrimp Farm in Sarawak

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ABSTRACT

Excessive and improper antibiotic use in animals raised for human consumption can increase the risk of antibiotic-resistant infections, causing more harm and higher treatment costs. This study examined the virulence genes and antibiotic susceptibility of *Vibrio cholerae* and *V. parahaemolyticus*, two bacteria that can affect public health. A total of 32 water samples were collected from August to December 2021 from a shrimp farm in Sarawak. *Vibrio cholerae* ($n = 10$) and *V. parahaemolyticus* ($n = 10$) presumptive isolates were identified and purified using selective agar and duplex-PCR method. The results showed that 70% of *V. cholerae* isolates contained *rtxA* and 90% of *V. cholerae* isolates contained *rtxC* while *tdh* and *trh* were not found in *V. parahaemolyticus* isolates. Antibiotic susceptibility testing showed that all *V. cholerae* and *V. parahaemolyticus* isolates were resistant to at least one antibiotic with the mean Multiple Antibiotic Resistance (MAR) indices of 0.34 for *V. cholerae* and 0.24 for *V. parahaemolyticus*. The MAR index of 0.20 and greater indicates that antibiotics are heavily contaminating the shrimp farm water. This study highlights the need for the proper administration of antibiotics in shrimp farming environments to reduce the risk of antibiotic-resistant infections caused by *V. cholerae* and *V. parahaemolyticus*. Water treatment should also be implemented before being released back to the environment to lessen the negative impact brought by the rearing of shrimp from a highly contaminated source.

Keywords: Antibiotic resistance, shrimp farm, *Vibrio cholerae*, *V. parahaemolyticus*, virulence genes

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INTRODUCTION

A significant and valuable aquaculture product, shrimps are widely traded on a global scale. Governments in developing nations like China, Thailand, Indonesia, India, Vietnam, Ecuador and Bangladesh are compelled to encourage shrimp farming as a way to fight poverty due to the high demand for shrimps (World Wildlife Fund, 2022). In Malaysia, shrimp export during 2017 and 2018 contributed RM 0.8 billion of profit in 2017 and RM 1 billion in 2018 (Fisheries Development Authority of Malaysia, 2020). According to the same source, shrimp goods also had the greatest export values when compared to other fishery products in those years, respectively. With high value of consumption of shrimp, there also comes the risk of the infection from shrimp sources.

Vibrio species, including *V. parahaemolyticus* and *V. cholerae*, have been found to be associated with shrimp and pose a risk to human health.

Recent studies showed that *V. parahaemolyticus* have been prevalent in shrimp farms in Malaysia, Indonesia, India and Thailand (Yano *et al.*, 2014; Narayanan *et al.*, 2020; Sarjito & Sabdono, 2021; Haifa-Haryani *et al.*, 2022). Ingesting seafood contaminated with pathogenic *V. parahaemolyticus* can cause gastroenteritis, an inflammation of the stomach and intestines that leads to symptoms such as abdominal pain, diarrhoea, vomiting and fever (Broberg *et al.*, 2011). While most cases of *V. parahaemolyticus* infection are mild, in rare cases it can cause a more severe form of the disease that requires hospitalisation (Broberg *et al.*, 2011). The looming