Vibro parahaemolyticus in cultured shrimps and their environment in South Iran

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Key Words:
Vibrio parahaemolyticus; shrimp culture; shrimp larva; hatcheries.

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Abstract

Samples of water, sediment and shrimp obtained from hatcheries and culture ponds were collected over a period of four months and were analyzed for *Vibrio parahaemolyticus.* Samples included the following: two samples of shrimp larva from two hatchery ponds (WLH); 14 samples of water, sediment and shrimp from 14 culture ponds supplied with shrimp larvae from the same hatchery ponds that were obtained one month after farm stocking (WC1, SeC1, and SC1, respectively); 14 samples of water, sediment and shrimp from the same 14 culture ponds, obtained 3 months after farm stocking (WC3, SeC3, and SC3, respectively); and 14 shrimp samples, from the same 14 culture ponds, collected from market (SM). Twelve samples of Persian Gulf Shrimp (SPM) were also obtained from the market and analyzed. *V. parahaemolyticus* was detected in 21.4% (3/14) WC1, 7.1% (1/14) SeC1, 35.7% (5/14) SC1, 42.8% (6 out of 14, of which one was Kanagawa-positive) WC3, 14.3% (2/14) SC3, 35.7% (5/14) SM, and 12% (3/12) SPM. No instance of WLH and SeC3 was detected. The isolation of *V. parahaemolyticus,* especially if Kanagawa positive, suggests a probable health risk for people wishing to consume raw or under-cooked shrimp.

Introduction

Substantial evidence exists to suggest that seafood is high on the list of foods associated with outbreaks of food-borne diseases (Davies *et al*., 2001; Huss, 1997; Hosseini *et al*., 2004). When assessing the risk from seafood, it is important to have information on the abundance of the pathogens responsible for causing health concerns (Davies *et al*., 2001). When researching this, it is worth noting that the microbial status of seafood after catch is closely related to environmental conditions and microbiological quality of the water (Feldhusen, 2000).

Bacteria of the genus *Vibrio spp.* are indigenous to aquatic ecosystems in which shrimp occur naturally or are farmed. Some of the *Vibrio* species such as *Vibrio parahaemolyticus* may be considered as a risk for human infection (Gopal *et al*., 2005; Vaseeharan and Ramasamy, 2003). The hemolysin produced by this organism plays a significant role in the pathogenesis of enteric human disease (Varnam, 1991). Strains of *Vibrio parahaemolyticus* can be divided into two epidemiologically significant groups on the basis of their ability to exhibit hemolysis on special blood agar _Wagatsuma agar. Strains which show B-type hemolysis on Wagastuma agar are called Kanagawa positive (K^+). Traditionally, only K^+ strains have been considered virulent (Varnam, 1991). In this study, samples of farmed shrimp species, *Paeneus indicus,* obtained from various hatchery and rearing period stages and the subsequent marketing, water and sediments of rearing farms, were analyzed alongside the marine shrimp (as a wild shrimp) species, *Paeneus semisulcatus*, for *Vibrio spp*. (Huss *et al*., 1997).

Materials and Methods

Samples of water, sediment and shrimp obtained from hatcheries and culture ponds were collected between July and October, 2007; in Boushehr, a southern province of Iran. Samples were collected over four periods of time:

1. Two samples of shrimp larva (species *Paeneus indicus,* including water and shrimp larva) were collected from two hatchery ponds (WLHOne month after farm stocking; 14 samples of water, sediment and shrimp from 14 culture ponds supplied with shrimp larva from the original hatchery ponds were collected (WC1, SeC1, and SC1, respectively),
2. Three months after farm stocking; 14 samples

of water, sediment and shrimp from were collected from the 14 culture ponds (WC3, SeC3, and SC3, respectively).

3. Fourteen shrimp samples, from the same 14 culture ponds, were collected from market (SM). These abbreviations used only as a cod for analysis.

4. The samples were analyzed for *Vibrio parahaemolyticus*, according to the methodology of the American Public Health Association (APHA, 1997). Twelve shrimp samples of Persian Gulf *Paeneus semisulcatus* (SPM) were also obtained from the market and analyzed. Five random samples (five times sampling) were taken simultaneously from each sampling.

Results

Table 1 shows the results of *V. parahaemolyticus* detection in the samples taken of shrimp, water, and sediment. *V. parahaemolyticus* was detected in 21.4% of water samples from the 14 rearing farms obtained 1 month after farm stocking (3/14), as well as 42.8% of the samples from 14 rearing farms obtained 3 months after farm stocking (6/14, of which one was Kanagawa-positive) and 7.1% of sediment samples from the 14 rearing farms, obtained 1 month after farm stocking (1/14). Positive samples were also found in 35.7% of shrimp samples from 14 rearing farms, obtained 1 month after farm stocking (1/14), in 14.3% of shrimp samples from 14 rearing farms, obtained 3 months after farm stocking (2/14), in 35.7% of shrimp samples from the same 14 rearing farms that were collected from market (5/14), and in 12% of Persian Gulf shrimp samples obtained from the market (3/12). *V. parahaemolyticus* was not detected in samples obtained from the two hatchery ponds and from samples of sediment obtained 3 months after farm stocking at the 14 rearing farms.

Discussion

V. parahaemolyticus is indigenous to the marine environment and affected by the salinity of water (Davies *et al*., 2001). In this study, this bacterium was isolated from the farm shrimps during analysis. In this case, it is assumed that the salinity of the water ponds has risen locally and this the main reason for the isolation of these halophytic bacteria (Basti *et al*., 2006; Vaseeharan and Ramasamy, 2003). Epidemiological investigations have revealed a strong tie between the Kanagawa phenomenon (KP) and the pathogenicity of *V. parahaemolyticus* (Su and Liu, 2007).

According to the results (table 1), the low but detectable rates of Kanagawa-positive strain of *V. parahaemolyticus* which was obtained in this study suggest a probable risk for the health of people consuming raw or undercooked shrimp.

Table 1: Result of *V. parahaemolyticus* analysis in the samples obtained in this study.

Samples	Total number	*V. parahaemolyticus* (Kanagawa phenomenon)
WLH[a]	2	-
WC1[b]	14	3 (-)
SeC1[c]	14	1 (+)
SC1[d]	14	5 (-)
WC3[e]	14	6 (+)
SeC3[f]	14	-
SC3[g]	14	2 (-)
SM[h]	14	5 (-)
SPM[i]	12	3 (-)

a = samples of shrimp larva (including water and shrimp larva) from hatchery pond. b = samples of water from culture ponds obtained one month after farm stocking. c= samples of sediment from culture ponds obtained one month after farm stocking. d = samples of shrimp from culture ponds obtained one month after farm stocking. e = samples of water from culture ponds obtained 3 months after farm stocking. f = samples of sediment from culture ponds obtained 3 months after farm stocking. g = samples of shrimp from culture ponds obtained 3 months after farm stocking. h = samples of shrimp from the same culture ponds, collected from market. i= shrimp samples of Persian Gulf shrimp obtained from market.

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