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Study of the prevalence of *Staphylococcus aureus* in marine and farmed shrimps in Iran aiming the future development of a prophylactic vaccine

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Abstract. *Staphylococcus aureus* is the most important pathogen found in sea foods. Food poisoning in human may happen due to the consumption of aqua products contaminated with this bacteria and its enterotoxin. The procedures carried out to maintain and preserve the quality of these products, from the time they are fished and transported to stores until they are consumed, can play a major role in the generation and growth of pathogenic bacteria and toxins. A total of 300 samples were collected, including (fresh and frozen, farm and marine). Consistent with the Iran National Standards, a number of phenotypical and molecular assays were utilized for screening *S. aureus* in order to detect *Staphylococcus aureus.* They study was conducted from September 2013 to March 2014. Baird Parker agar containing egg-yolk and tellurite emulsion were used for isolation. Isolates were identified using the following criteria: production of coagulase, DNase, catalase, mannitol fermentation, hemolytic zone on 5% sheep blood agar, VP test and Gramstaining A total of 74 samples (24.6%), were contaminated with *Staphylococcus aureus*. Due to the presence of *Staphylococcus aureus* in shrimps, it is necessary to enforce quality control standards by the fisheries and carefully monitor fishing, farming, preparation, freezing, and transporting marine products, and ensure the health of workers. The results of this study also showed it is necessary to produce and develop a vaccine to prevent the disease and sea-food poisoning caused by *Staphylococcus aureus*.

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1.Introduction:

Sea food is one of the most essential nutritional needs of every community. Often, consumption of contaminated shrimp cause gastrointestinal diseases in human (*1,2*). Staphylococcal food poisoning causes vomiting, diarrhoea,

and abdominal cramps within two to six hours after the ingestion of food contaminated with SEs *(3,4).* This bacterium does not require any particular nutritional or environmental factors for growth. The bacteria can also grow in substrates with a low water activity of 0.86, over a wide temperature range of 7 to 48 C, and at pH values ranging from 4.2 to 9.3 *(2).*

Several studies in other countries have investigated the potential paths of transmission of this dangerous strain by human carriers or environment, such as transport and packaging, contaminated hands of workers, and the contact of infected respiratory secretions with seafood products (*5,6,7,8*). In some parts of the world, more than 50% of food poisoning is caused by SEA. In Great Britain and America, SEA and SEB are the cause of more than 69% of all food poisonings *(5,6*). The symptoms are more severe in children, pregnant women, elderly, and patients who are undergoing tumor therapy or are taking immune suppressing drugs; due to quick digestion and proper absorption of protein and minerals, these population groups consume more shrimp, therefore the safety of these products becomes more critical (*7*). On the other hand, because of its tissue, shrimp meat has a high potential for corruption. Improper conditions during fishing and storage and non-standard transportation provide a good ground for pathogens growth (*7,8,9*). Unfortunately improper cooking method used for these products is the most important reason for causing disease*(5*).

All these factors increase the risk of gastroenteritis and food poisoning caused by contaminated food. Food borne diseases are a large group of the global diseases and are one of the most important problems in every community *(9*). *S. aureus* is considered as the third most important cause of food borne illnesses reported worldwide (9,10,11). This bacterium is one of the most common agents in food poisoning outbreak (*3,4*). In Iran, food poisoning outbreaks by *S.aureus* have increased during recent years. This might be due to changes in the environment, the development of the food service industry, and communal feeding. PCR-based techniques are commonly used for typing, as they are easy, fast, and cost-effective (1). There is no data published on the characterization of *S.aureus* strains in sea foods in Iran.

The purpose of the present study was to assess *Staphylococcus aureus* in shrimps supplied in Tehran fishery center.

2.Materials and methods:

2.1 *Samples Collection and Culture*

The experiments were approved by the Institute of Standards and Industrial Research of Iran (*12,13,14*). A total of 300 samples (fresh and frozen), including 150 marine shrimps, 150 farmed shrimps, with the healthy appearance were selected and studied from September 2013 to March 2014. The shrimp samples were caught from south seas (Persian Gulf, Oman Sea, Indian ocean) and aquacultures, and the shrimps were brought to the Tehran fishery.

In a sterile condition and near a flame, 1gr of each sample was cut with a sterile scalpel, was mixed with 9 CC Gulity (*s, aureuse* enrichment, Selective Media/ Merck, Germany) containing 0.1% potassium tellurite and the solution was suspended. Tubes were incubated at 37˚c for 24-48 hours. After passing the desired time, tubes that had deposits or were black, were cultured in Baird Parker (Merck,Germany) With 0.1% potassium tellurite and egg emulsion, though Linear Culture method; afterward, they were incubated at 37˚c for 24- 48 hours in sterile conditions.