

Incidence of *Escherichia coli* and *Staphylococcus aureus* during Seafood Processing

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This paper gives an account on the incidence of *Escherichia coli* and *Staphylococcus aureus* during different stages of seafood processing from seafood processing plants in and around Cochin. *E. coli* and *S. aureus* were isolated from cuttlefish, squid, peeled and undeveined (PUD) shrimps and samples of water, ice, utensils, processing tables and workers' hand. Contamination with these organisms was found to be more in cephalopods and PUD shrimps than other samples. Some of the finished products got contaminated with these organisms during handling operations.

Key words: *Escherichia coli*, *Staphylococcus aureus*, seafood processing

The demand and supply of seafood has been hitherto concentrating on species like shrimps, squids, cuttlefish, seer fish and pomfrets (George, 1995; Badonia *et al.*, 1996). At the same time there is rise in incidence of food poisoning (Gilbert, 1983). As future of the international fish trade is closely tied up with industry's ability to prepare high quality and safe product (Bhaskaran, 1994), more stress on microbiological quality aspects is imperative (George, 1997). Major microbial hazards that affect the quality are due to the presence of bacteria such as *Salmonella* spp., *Vibrio* spp., *Escherichia coli*, *Staphylococcus aureus* and *Listeria* spp. Taking these aspects into consideration, this work has been carried out to find out the source of contamination of *E. coli* and *S. aureus* during seafood processing.

Materials and Methods

Eight seafood-processing plants were selected in and around Cochin for this study. Samples of raw material, finished product, water, ice, swabs from processing tables and workers' hands were collected systematically. Approximately 100 g each of the raw material and finished product were drawn aseptically. Swab samples from processing tables, worker's hand and utensils were taken using a sterile template of 5x5 cm. The swab was immediately transferred into 100 ml sterile phosphate buffer. All the above samples were held at <5° C until analysis.

One litre each of water samples were aseptically collected in sterile bottle and 1kg each of ice used for processing was also collected aseptically in a sterile stainless steel container. They were transported to the laboratory in insulated boxes. All the samples were analysed within 2 h of collection.

10 g of the sample was homogenized in 90 ml of sterile phosphate buffer for 1min using a stomacher (Seward Medical, London.) Appropriate serial dilutions were made in sterile 9 ml phosphate buffer and plated in duplicates on Tergitol 7 agar for *E. coli* and Baird Parker agar for *S. aureus*. Confirmation was carried out as per the methods specified in US FDA Bacteriological Analytical Manual (Lancette & Bennett, 1995).

Results and Discussion

Incidence of *E. coli* and *S. aureus* in raw material samples was found to be 30% each, in sanitary samples 13.6% and 4.5% and in finished product 20% and 10%, respectively (Table 1).

Table 1. Incidence of *E. coli* and *S. aureus* during different stages of seafood processing

Samples	Total no. of samples	No. of samples with <i>E. coli</i> (>20.g ⁻¹)	No. of samples with <i>S. aureus</i> (>100.g ⁻¹)
Cuttlefish	1	1	-
Squid tentacles	3	1	1
Octopus	1	-	-
Squid fillets	1	-	1
Squid whole clean	2	-	1
Tiger prawn	1	1	-
PUD shrimps	1	-	-
Water	13	2	1
Ice	13	2	-
Utensils	6	2	1
Processing tables	6	-	-
Workers' hand	6	-	-
Frozen squid tentacles	3	2	-
Frozen squid whole cleaned	6	-	1
Frozen squid ring	4	-	-
Frozen squid fillets	2	-	-
Frozen cuttlefish whole cleaned	7	2	-
Frozen tiger prawn	4	-	-
Frozen PUD shrimps	4	2	2

Results showed a reduction in the number of organisms from raw material stage to finished product stage and at the same time some of the sanitary samples were found to be contaminated. As it has been established that offshore waters do not contain *E. coli* and *S. aureus* (Iyer, 2000), the source of contamination could be handling (Solo-gabridae, 2000), water (Warburton *et al.*, 1998), ice and utensils.

In this study, it is also observed that these organisms were mainly noticed in cephalopods and frozen PUD shrimp samples. This could be due to the fact that many stages of handling are involved in the processing of these products. Similar observation was made by Yesudhasan (2000) who isolated *E. coli* from cooked and peeled frozen shrimp. Moreover, these cephalopods are exported to countries like Japan, which insist that chlorine-free water should be used for processing.

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