

E.COLI AND FAECAL STREPTOCOCCI IN SHRIMPS

P.R.G. Varma

E. Coli is a Gram-negative, rod-shaped non-spore forming bacteria. The primary habitat of *E. coli* is the intestinal tract of man and a few warm-blooded animals. Therefore, its presence in food is generally considered as an indication of faecal contamination in foods.

Natural water gets contaminated with *E. coli*. Possibility of a direct contamination of food with faecal material is remote and if at all happens it does not exceed 25 mg. of faecal matter per 10 kg of food which will in turn give rise to 100 Enterobacteriaceae, 10 group D streptococci and a few clostridia per gram of food. But whatever may be the type of contamination, once the organisms have entered into a food product in considerable numbers, it is very difficult to get rid of them completely. Even if the organisms are completely removed by some chemical treatment, the wholesomeness of the food cannot be guaranteed as many of the viruses and intestinal parasites which are comparatively resistant to such treatments may be present in the product in viable forms. Hence, it is better to process the material hygienically than to remove the contaminated bacteria in the final stage of processing.

Offshore water does not contain *E. coli* whereas incidence of this organism is usually noted in near-shore waters. In India, *E. coli* has been isolated from beach seawater throughout the year. Fishing in these waters or washing the boat deck and fish containers using near-shore waters are known to contaminate the catch with *E. coli*. Inadequately cleaned and disinfected boat deck and other containers used on-board trawlers act as sources of contamination. Contamination is also known to occur from ice and from unclean workers. It goes without saying that when the temperature is also favourable, the contaminated organisms multiply rapidly and further aggravate the situation.

The incidence of *E. coli* in utensils, palm of workers, water, ice and various fishery products is indicated in the Table 1.

Table 1 Incidence of *E.coli* fish products and environment

Item	Number of samples analysed	% Incidence of <i>E.coli</i>
Utensils	300	16
Palm of workers	300	10
Water	800	25
Ice	800	18
HL shrimp frozen	400	13
PD shrimps frozen	600	26
PUD shrimps frozen	250	30
Cooked shrimps frozen	350	6
Cooked lobsters frozen	30	10
Cuttlefish frozen	50	12
Squids frozen	30	0
Cat fish frozen	8	13
Seer fish frozen	40	20
Froglegs frozen	120	3

E. coli is very sensitive to sub-zero temperature. About 95% reduction in the count of *E. coli* takes place during freezing at -40°C while complete destruction takes place during frozen storage at -20°C in a period of about four to five months.

Faecal *Streptococci*

They are Gram-positive, non-spore forming non-motile Cocci. The primary habitat of faecal streptococci is the intestinal tract of man, animals and birds. Their presence in food material has been accepted as an indication of faecal contamination is in *E. coli*. These indicator organisms are not present in off-shore waters or in the fish muscle collected from such waters. However these organisms are normally encountered in the following areas.

1. From near-shore waters.
2. Contaminated boat-deck, fish boxes and other contact surfaces.
3. Polluted process-water
4. Unclean workers
5. Poor Sanitary condition in the processing units.

The incidence of faecal *streptococci* in fishery products and factory environments is given in the Table 2.

Table 2 Incidence of faecal *streptococci* in fishery products and factory environment

Item	Number of samples analysed	% Incidence of Faecal <i>streptococci</i>
Utensils	300	43
Palm of workers	300	50
Water	800	34
Ice	800	55
HL shrimp frozen	400	92
PD shrimps frozen	600	94
PUD shrimps frozen	250	96
Cooked shrimps frozen	350	56
Cooked lobsters frozen	30	50
Cuttlefish frozen	50	96
Squids frozen	30	80
Cat fish frozen	8	50
Seer fish frozen	40	55
Froglegs frozen	120	95

Experiments have given clear indication that faecal *streptococci* are comparatively resistant to many adverse conditions. They undergo least fluctuation during processing. About 30% reduction of faecal *streptococci* takes place during freezing (-40°C). During subsequent storage at -20°C much reduction does not take place in count.

As faecal *streptococci* are more resistant to freezing and frozen storage compared to *E. coli* they are considered to be better indicators of the sanitary conditions under which the material is processed. Characteristics of *E. coli* and faecal *Streptococci* are given in Table 3.

Table 3 Characteristics of *E. coli* and Faecal *Streptococci*

Characteristics	<i>E. coli</i>	Faecal streptococci
Morphology	Rods	cocci
Gram reaction	Negative	Positive
Incidence in intestinal tract	10^7 to 10^9 /g faeces	10^5 to 10^8 /g of faeces
Incidence in faecal matter of various animal species	Absent in some	Present mostly
Specificity to intestinal tract	Generally specific	Generally less specific
Occurrence outside intestinal tract	Common in low numbers	Common in higher numbers
Ease of isolation and identification	Relatively easy	More difficult
Response to adverse environmental conditions	Less resistant	More resistant
Relative survival in frozen foods	Generally less	High
Relationship to food borne intestinal pathogens	High	Low
Destruction during freezing (-40°C)	95%	30%
Destruction during frozen storage (-20°C)	Complete destruction in 4-5 months	Practically no destruction
Relative survival in dried foods	Low	High

