Enteropathogenic *E. coli* and Other Coliforms in Marine Fish

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One hundred and twenty six samples of marine fish (96 from landing centre and 30 from retail market) and swabs from deck surfaces of 34 fishing boats were examined for coliforms including enteropathogenic *E. Coli*. Forty out of 96 fish samples from landing centre, 24 out of 30 from retail market and 11 out of 34 fishing boats revealed coliforms. On further tests, 5, 7 and 4 coliform isolates from the three groups respectively were found to be *E. coli*. Two of the *E. coli*. isolates, one from sciaenids and one from cat fish, were found to be enteropathogenic serotypes 055 and 0111. Enteropathogenic serotypes of *E. coli* are reported from sciaenids and cat fish for the first time in this country.

Coliform group of bacteria are known to be valuable indicators of sanitary quality of foods. Even among the organisms of this group, presence of *E. coli* indicates a higher probability of faecal contamination than the undifferentiated coliforms because of the definite association of the former with human faceal material and the relatively wider distribution and hardier nature of the other coliforms. In addition to being a valuable indicator of recent faecal contamination, *E. coli* in fish can also pose a direct health hazard. Some of the *E. coli* strains especially those belonging to the enteropathogenic serotypes are known to cause gastroenteritis in children and adults (Cruickshank, 1968; Anon, 1967). Certain strains of *E. coli* which are resistant to antibiotics are endowed with the ability to transfer their antibiotic resistance, through an episomal factor, to other intestinal organisms, including pathogens such as salmonella and shigella, thereby creating therapeutic problems.

Stephen *et al.* (1975) isolated enteropathogenic *E. coli* from sardines, mackerels and estuary mussels and Rao & Stephen (1975) provided evidence to indicate that these sea foods might have served as a source for an outbreak of gastroenteritis among children of fishermen in the fishing town of Coondapoor on the south west coast of India. In view of the potential importance of the occurrence of coliforms especially enteropathogenic *E. coli* in fish, the present study was undertaken.

Materials and Methods

Ninety six samples of fish from landing centre and 30 fish samples from retail market at Kakinada, Andhra Pradesh, were collected in sterile containers and meat, aseptically collected from each sample was used to inoculate Desoxycholate citrate agar plates. After incubation of the plates for 24 to 48 hours at 37°C aerobically, the plates were examined for coliforms colonies, which were then used for surface streaking on Eosin-Methylene blue agar plates. After 24 hours of incubation at 37°C, colonies exhibiting metallic sheen and resembling *E. coli* were picked on to nutrient agar slants for further study. Isolates identified as *E. coli* on the basis of morphological and biochemical characters were tested with polyvalent and '0' group antisera against the common enteropathogenic serotypes.

Swabs from deck surfaces of 34 fishing boats were collected and used for inoculation on desoxycholate citrate agar plates. Further processing of the colonies appearing on these plates was the same as described above in respect of fish samples.

Results and Discussion

Prevalence of coliforms and *E. coli* in fish from landing centre and retail market as also the extent of contamination of deck surfaces of fishing boats with these organisms is presented in Table 1.

Coliforms were isolated from 40 (41.67%) out of 96 fish samples from landing centre while they could be recovered from as many as 24 (80%) of 30 market fish samples. Five (12.5%) out of 40 coliform isolates of fish from landing centre turned out to be *E. coli* while 7 (29.17%) out of 24 coliforms from market fish were *E. coli*. The prevalence of *E. coli* among fish from landing centre worked out to 5.2% as against 23.3% in respect of market fish. Thus it is seen that not only a larger proportion of fish from retail market were contaminated with coliforms as compared to fish from landing centre, but also a greater percentage of coliforms from market fish were *E. coli* in comparison to the occurrence of *E. coli* among coliforms isolates from fish of landing centre. Coliforms do not constitute the normal intestinal flora of marine fish as is the case in domesticated land animals where *E. coli* is a part of the normal intestinal flora and gains access to the tissues due to agonal invasion during the last stages of death. So, coliform contamination of fish is exogenous due to contact with unclean surfaces and substances and this can be substantially reduced, if not eliminated by the adoption of suitable hygienic measures.

In order to ascertain the role of the decks of fishing boats in the contaminnation of fish with coliforms, swabs from deck surfaces of 34 boats were examined for coliforms. Eleven (32.35%) out of 34 fishing boats revealed contamination of the decks with coliforms. It was also interesting to note that out of these eleven, four were contaminated with faecal coli. Deck surfaces of fishing boats not only serve as a source of non-faecal coliform contamination but also contribute to the contamination of fish with the more hazardous *E. coli*.

Two of the *E. coli* isolates, one from sciaenids and the other from cat fish, on serotyping were found to belong to the enteropathogenic serotypes 055 and 0111 respectively. The only other report where enteropathogenic serotypes of *E. coli* recovered from fish was that of Stephen *et al.* (*loc cit.*). They could isolate enteropathogenic *E. coli* from 15 out of 30 samples of mackerel, 8 out of 30 samples of sardine and 7 out of 20 samples of estuary mussels. The serotypes reported to have been isolated were 055, 0111, 086, 0119 and 0127. One significant difference between the present report and that of Stephen *et al.* (*loc cit.*) is that while they isolated enteropathogenic *E. coli* from swabs of surface slime intestinal and cloacal contents, recoveries in the present study were made from fish meat. Enteropathogenic *E. coli*, in addition to being commonly associated with gastroenteritis in children, are also known to

Table 1. *Occurrence of coliforms and E. coli in fish and on deck surfaces of boats*

Source	No. of samples examined	No. revealing coliforms	No. revealing *E. coli*
Landing centre fish	96	40 (41.67)	5
Retail market fish	30	24 (80)	7
Deck surfaces of fishing boats	34 swabs	11 (32.35)	4

Figures in parenthesis are percentages

cause disease in adults. Mc Naught & Stevenson (1953) recovered enteropathogenic serotypes of *E. coli* from cases of enteritis among adult hospital patients and Ferguson & June (1952) and June *et al.* (1953) induced experimental infections in adult volunteers. Enteropathogenic serotypes of *E. coli* including 055 and 0111 were also reported from cases of diarrhoea in human beings in India (Banerjee *et al.*, 1957; Omprakash, 1962; Gupta *et al.*, 1962; Bhat *et al.*, 1964). According to Ewing *et al.* (1956) and Edward & Ewing (1962) the two serotypes 055 and 0111 isolated in the present study, are among the 12 '0' serotypes commonly associated with human diarrhoea. Recent studies by Stephen *et al.* (*loc cit.*) and Rao & Stephen (*loc cit.*) on an outbreak of gastroenteritis among children of fishermen of fishing town of Coondapoor located on the south-west coast of India provided an interesting association, based on epidemiological and microbiological evidence, between the seafoods and gastroenteritis in children.

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