# Enterotoxigenic E.coli In Coimbatore Drinking Water

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**Citation**

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**Abstract**

Water is one of the potential carriers of pathogenic microorganisms and can endanger health and life of humans and animals. About 50% of deaths (4.6 million) in children under 5 years of age occur due to diarrhoeal diseases caused by drinking polluted water[1]. Kudoh and Zen-Yoji[2] Studied 7 outbreaks of diarrhoea caused by Escherichia coli serotype O11 and O159, out of which two outbreaks were caused by contaminated water supply. In India, more than 70% of the epidemic emergencies are either waterborne or water related. Although a substantial amount of work has been carried out on common water-borne pathogens in India, unfortunately only a little information is available on the emerging waterborne pathogens. A regular surveillance of resource and drinking water is one of the major mainstays of containing dreaded and often fatal waterborne diseases[3].The use of antibiotics to combat these infections is a very common practice. The drug resistance displayed by Escherichia coli is indicative of indiscriminate use of antibiotics. This warrants the initiation of steps to prevent public health hazards[4]. Resistance of Escherichia coli to antibiotics is not only an obstacle for the control of this infection but also poses a great threat to public health through transferable resistance determinant (R-factor) on enteric flora or other enterobacteria in man through direct colonization with resistant bacteria[5]. The aim of the study was to isolate, serogroup and examine the antibiogram of Escherichia coli, present in drinking water sources in Coimbatore.

## INTRODUCTION

Current safe drinking water act regulations require the analysis of potable water for total coliforms, a group of closely related bacteria in the family enterobacteriaceae. Two quantitative methods are presently certified for this analysis, the Multiple Tube Fermentation (MTF) and the Membrane Filter (MF) technique[6]. Coliforms are historically used as indicator microorganisms to serve as a measure of fecal contamination and thus potentially of the presence of enteric pathogens in drinking water.

## RESULTS AND DISCUSSION

A total of 150 water samples were collected randomly from municipal water supplies in sterilized screw capped bottles, transported to the laboratory in cold condition and processed within 6 hours of their collection. The bacteriological examination according to American Public Health Association (APHA) included indicator of fecal pollution such as Total Coliforms (TC), Fecal Coliforms (FC) and Fecal Streptococci (FS). TC and FC were estimated by MTF method using lactose broth. FS were also estimated by MTF method using azide dextrose broth. The tubes for TC and FS tests were incubated at 37□C and for FC test at 44.5□ C. Suspensions from positive TC tubes (gas production in the inverted Durham's tubes) were streaked on Eosin Methylene Blue (EMB) agar and Mac Conkey agar and incubated at 37□C for 24-48 hours. Colonies showing typical characteristics of Escherichia coli, Klebsiella, Enterobacter and Citrobacter (lactose fermenting) were isolated, purified and maintained on nutrient agar. Their identity was confirmed by morphological biochemical characterization following Bergey's manual of determinative bacteriology[7]. In vitro drug susceptibility of these isolates were determined by disc diffusion method. The Escherichia coli isolates were Serogrouped at the National Salmonella and Escherichia centre (NSEC), Central Research Institute, Kasauli (Himachal Pradesh, India).

The mean values of TC, FC and FS were 53.5, 20.5 and 15.2/ml water respectively. From the 150 random samples, 16 isolates of Escherichia coli, 69 isolates of Citobacter, 5 Enterobacter and 6 Klebsiella isolates were identified. Fecal coliform load was considerably high in 40% of the samples. Escherichia coli, which is an indicator of fecal contamination, was isolated from 16% and Citrobacter from 69% of samples.

At the NSEC, Central Research Institute, except one all the isolates were identified into 11 already known serogroups

(Table.1). One isolate could not be identified with any of these already existing serogroups. The serogroups O20, O69 and O153 occurred frequently. Isolation of O148, O153, O25 and O168 are of special importance since they are well known Enterotoxigenic Escherichia coli (ETEC) [8]. The serogroup O4 is an important uropathogenic Escherichia coli . The Serogroups O154 is an Entero Aggregative Escherichia coli (EAEC), which causes diarrhoea in children[9]. Some of the Escherichia coli serogroups isolated in this study were also isolated by other workers from drinking water sources[10], poultry[11] and bovine[12]. This suggests that transmission of Escherichia coli from animals to drinking water sources. Isolation of serogroups O20 and O3 is of special importance since they are well established human enteropathogens. The serogroup O69 is a shiga toxin producing Escherichia coli (STEC) [12].

In vitro susceptibility of these 16 isolates of Escherichia coli revealed cent percent sensitivity to no single antimicrobial drug. Higher susceptibility was observed to ciprofloxacin and gentamycin. Higher efficacy of gentamycin and ciprofloxacin against different serogroups of Escherichia coli has been reported by other workers[10]. Bacitracin, co-trimoxazole and streptomycin were less effective against these isolates. All isolates of O4, O107 and O148 were resistant to co-trimoxazole and bacitracin and all the isolates of O25, O107, O148 and O153 were resistant to chloramphenicol and streptomycin. However within certain serogroups, susceptibility to different antimicrobial agents of different isolates differed.

With increasing industrialization, water sources available for consumption and recreations have been adulterated with industrial as well as animal and human wastes. As a result water becomes a formidable factor in disease transmission. A defective water delivery system and inadequate environmental sanitation were a potential source of contamination of drinking water. Hence, this study suggests proper disinfection measures must be carried out in the municipal water supplies.

**Figure 1**

Table: 1. Serogroups and antibiotic resistance of from drinking water in Coimbatore, Tamilnadu.

| Serogroups | Total Isolates | Number of isolates resistant to antibiotics(mcg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ciprofloxacin(5) | Gentamycin(10) | Chloramphenicol(30) | Co-trimoxazole(23.75) | Streptomycin(10) | Bacitracin(10) | Erythromycin(15) |
| O3 | 1 | - | - | 1 | 1 | 1 | 1 | 1 |
| O4 | 1 | - | - | - | 1 | 1 | 1 | 1 |
| O12 | 3 | 2 | - | - | 3 | - | 3 | 3 |
| O20 | 1 | - | - | - | - | - | 1 | 1 |
| O25 | 1 | - | - | 2 | 1 | 2 | 1 | 1 |
| O69 | 2 | 1 | 1 | - | 2 | - | 3 | 2 |
| O107 | 1 | - | - | 1 | 1 | 1 | 1 | 1 |
| O148 | 1 | - | - | 1 | 1 | 1 | 1 | 1 |
| O153 | 2 | - | - | 2 | - | 2 | - | 1 |
| O154 | 1 | 1 | - | - | - | - | 1 | - |
| O168 | 1 | 1 | - | - | - | 1 | 1 | - |
| Untyped | 1 | - | - | 1 | 1 | 1 | - | - |
| Total (Percent) | 16 | 5(26) | 1(5) | 8(42) | 11(58) | 10(53) | 14(74) | 12(63) |

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