AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: http://www.ajptr.com/

A Study on Contamination of Water by Salmonella in and Around Coastal Regions of Trivandrum District, Kerala State, India

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ABSTRACT

During June 2013 to October 2013, a total of 100 water samples were collected from various coastal regions of Trivandrum district, Kerala state, India. These samples were examined for the presence of pathogenic bacteria especially the pathogenic *salmonella species*. Water samples were collected in sterilized screw caped glass bottles, transported to the microbiology laboratory of Noorul Islam Institute of Medical Sciences, Neyyattinkara, Trivandrum, Kerala and processed according to the standard protocols for the identification of pathogenic *Salmonella species*, within 6 hours. The type of water included in the present study were pond water, river water, household water, well water, municipality supplied tap water and packaged bottled water. The present study revealed that the pond water, river water and household water were contaminated with pathogenic *Salmonella species*. The packaged bottled water and municipality supplied tap water devoid of *Salmonella* contamination. So based on the present study it is strongly suggested that water should be boiled before use or use packaged bottled water of good quality for drinking purposes.

Keywords: *Salmonella,* Selenite F broth,Wilson and Blair Medium, Gram staining.

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Received 30 July 2014, Accepted 02 August 2014

Please cite this article as: Aruni IS *et al.*, A Study on Contamination of Water by Salmonella in and Around Coastal Regions of Trivandrum District, Kerala State, India. American Journal of PharmTech Research 2014.

INTRODUCTION

The drinking water plays an important role in the transmission of many pathogenic microorganisms in a community[1]. Contaminated water and food caused more than three million death worldwide in 2011. Among these more than 80 % of deaths were reported in children under the age group of five. According to world health Organization 1.8 million people die each year form diarrheal diseases[2]. The water borne diseases are more commonly found in developing countries[3]. In India more than 70% of the epidemic emergencies are either water borne or water related. Among the water borne diseases of bacterial origin, typhoid, bacillary dysentery and diarrhoea are common in India. In Kerala outbreak of enteric fever and cholera were reported from coastal regions of Trivandrum District[4]. Hence the present study was conducted to find out the quality of various water sources, the presence and the prevalence of water borne pathogenic bacteria especially the *Salmonella species*, in and around the coastal regions of Trivandrum district, Kerala state, India.

MATERIALS AND METHOD

During the period of June 2013 to October 2013, 100 water samples were collected from coastal regions of Trivandrum district. These included the places such as Poovar, Vizhinjam, Kovalam, shankumugham, Puthenthope and Valiyathura. The water samples taken for the study included pond water, river water, household water, packaged drinking water and Municipality supplied tap water. The samples were collected in a sterilized screw capped glass bottles and transported to the microbiology laboratory of Noorul Islam Institute of Medical sciences Trivandrum, within 6 hours of collection. Noorul Islam Institute of Medical Sciences is a 450 beded tertiary care hospital and academic centre, located in Neyyattinkara Taluk, Trivandrum district Kerala. This hospital's Microbiology laboratory also provides service as a referral centre for many other clinics in Trivandrum District and others parts of Kerala.

Identification of *Salmonella* species in water

All the 100 water samples were processed for the presence of *Salmonella species* by recommended protocols[1]. Isolation and identification of *Salmonella species* was performed by enrichment method[2].100 ml of each water sample were enriched overnight at 37^0 C in 100 ml double strength Lactose broth. After overnight incubation a loop full of turbid broth from this double strength lactose broth is transferred to Selenite F broth. The Selenite F broth was then incubated over night at 37^0 C in an incubator. After overnight incubation a loop full of culture from this broth was subcultured onto Wilson and Blair Medium and incubated over night at 37^0 C.

Next day noticed the colony morphology and Gram staining was done with suspected *Salmonella* colonies. Gram staining showed Gram negative rods. Further identification was done by Motility test by Hanging drop preparation, followed by Biochemical reactions. The Biochemical reactions included Catalase production, Glucose utilization, Oxidative Fermentative Test, Urease production test, Indole production test, Methyl Red test, Voges Proskauer test, Citrate utilization test, Hydrogen sulphide production test and sugar fermentation test. All these tests were done as described by Cowan and Steel[1].

RESULTS AND DISCUSSION

Out of 100 water samples taken for the study, *Salmonella* were isolated from nine contaminated stagnant pond water samples. Four river water samples showed the growth of *Salmonella* and two house hold water samples showed the moderate growth of Salmonella. The packaged Drinking water and Municipality supplied Tap water has not shown any growth of Salmonella colonies **(Table 3).**

Table 1Type of water samples taken for the study.

Type of water	Number of samples
Pond water	20
River water	15
House hold water	22
Packaged drinking water	25
Municipality supply tap water	18

Table 2 The places from which water sample has collected

Place	Number of samples
Poovar	20
Vizhinjam	20
Kovalam	15
Shankumugham	15
Puthenthope	15
Valiyathura	15

Table 3 *Salmonella* contamination of different types of water samples

Type of water	Number of salmonella isolates
Pond water	9
River water	4
House hold water	2
Packaged drinking water	Not found
Municipality supply tap water	Not Found

Salmonellosis is a major public health problem in developing countries especially, the coastal areas where there is more waste accumulation, fecal contamination etc[5,6]. The present study

demonstrated the presence of *Salmonella species* in water samples of coastal regions of Trivandrum district Kerala. The isolates were more in pond water compared to other water sources like river water household water etc. In addition to the pond water the river water and the household water were minimally contaminated with *Salmonella species*. But the packaged drinking water and municipality supplied tap water were devoid of *Salmonella* contamination. There was no remarkable difference in water samples taken from different places.

Lee *et al* in 1993 reported that the rates of *salmonella* isolation is related to the fecal coliforms[7]. So it was determined that in the present study places the stagnant pond water was more with *salmonella* which may be caused by the contamination of fecal matter, animal carcasses and organic waste products.

The present studies related to the isolation of *Salmonella* from water sample showed a comparable report. Barrow *et al* in 2003 reported from the viewpoint of public health, human salmonellosis was reported an increase recently in France and United states of America[8,9]. In another study conducted in 1996 by Ezdihar observed that 610 water sample in Sudan, isolated 45 *Salmonella* which counted for 7.4 % of total isolates. In a study conducted by Yagab[10] and Mohammaed in 1987 found out that 58 *Salmonella* isolates form 1488 water samples in Korea[11].

It is clearly correlated that the presence of *Salmonella* in water samples, in the coastal regions of Trivandrum district is mainly due to the disposal of wastes in river and ponds, contamination of water with fecal matter and unhygienic practice of drinking unboiled water. Household water may contaminated with pipeline supplies and proximity to the sewage system.

CONCLUSION

The present study revealed that the water sources in the coastal regions of Trivandrum district, Kerala were contaminated with pathogenic *Salmonella species*. So it is suggested to safe guard against waterborne pathogen and strongly recommended to boil water before use.

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