NOTES

Inactivation of *Vibrio parahaemolyticus* in Drinking Water

Vibrio parahaemolyticus inhabits the marine environment, especially coastal and estuarine water and it is therefore associated with the fishes harvested from these environments. Food poisoning with this organism often follows with the ingestion of contaminated marine products. *V. parahaemolyticus* has now been recognized as one of the important causative agents of food poisoning throughout the world.

V. parahaemolycus is a halophilic bacterium and it can grow in or on ordinary media containing 1–8% sodium chloride, but it grows best in the presence of 2–4% salt (Sakazaki, 1979). It is reported that the organism is killed in distilled water within one min (Takeuchi *et al.* 1957). Information regarding the effect of drinking water on *V. parahaemolyticus* is scanty. The aim of the present study was to find out the effect of drinking water available in Cochin area supplied through the public distribution system on *V. parahaemolyticus*.

Three strains of *V. parahaemolyticus* - one numbered strain (NCMB – 1902), one kanagawa positive strain (V.P 49) and one kanagawa negative strain (V.P 56) were employed for this study. The strains were streaked on brain heart infusion agar slants supplemented with 2.5% sodium chloride and incubated at 37°C for 24 h. A part of the slant culture was transferred into 1 ml sterile 3% NaCl solution, emulsified and then resuspended in 100 ml sterile drinking water. Immediately 0.2 ml of the suspension was withdrawn and plated on surface dried brain heart infusion agar plates supplemented with 2.5% NaCl, in duplicate, by spread plate method and thereafter one min interval for 15 min. The plates were then incubated at 37°C for 24 h and the number of colonies were counted.

Drinking water was collected from Cochin area, supplied through the public distribution system and was analysed for pH, total dissolved solids, chlorides, total hardness, temporary hardness, permanent hardness, hardness due to calcium and magnesium, alkalinity, sulphate, copper and iron as per APHA (1960) methods and albuminoid ammonia, free and saline ammonia (Taylor, 1958).

The inactivation curves for the three strains are given in Fig. 1.

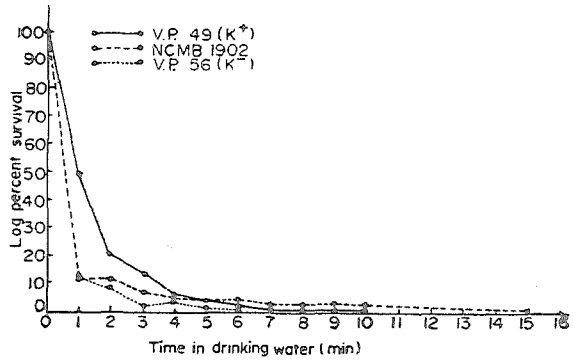

Fig. 1. Inactivation curves for three strains of *V. parahaemolyticus*.

The time of exposure to drinking water required to inactivate 90% of the cells (D_{10}) of three strains of *V. parahaemolyticus*, namely, NCMB–1902, V.P. 49 and V.P. 56 are 2.3, 3.4 and 1.6 min respectively. The levels of different salts and organic substances present in the drinking water sample is given in Table 1.

Studies of Lee (1972) have shown that the time of exposure to distilled water required to inactive 90% of the cells was between 0.9 and 4.4 min, but Takeuchi *et al.* (1957) reported that *V. parahaemolyticus* cells are killed in one minute in distilled water probably by the osmotic destruction of the cells. For this reason thc washing of the fish and of equipments such as containers, chopping board, kitchen knives, dishes etc. with drinking water may effect some decrease in the

number of viable *V. parahaemolyticus* cells, although it is also known that traces of salts and organic substances present in fresh water allow their survival (Yanagisawa & Takeuchi, 1957). The longer survival of *V. parahaemolyticus* in tap water may be due to this effect.

Table 1. *The levels of different salts and organic substances present in drinking water*

pH	6.8
Free and saline ammonia, ppm	0.04
Albuminoid ammonia, ppm	0.04
Hardness, total as $CaCO_3$, ppm	34.00
Hardness permanent as $CaCO_3$, ppm	32.00
Hardness temporary as $CaCO_3$, ppm	2.00
Hardness due to Ca, as $CaCO_3$, ppm	22.00
Hardness due to Mg, as $CaCO_3$, ppm	12.00
Phenolphthalein alkalinity as $CaCO_3$, ppm	Nil
Methyl orange alkalinity as $CaCO_3$, ppm	22.00
Copper as Cu, ppm	0.003
Iron as Fe, ppm	0.02
Chlorides as Cl, ppm	7.10
Sulphate as SO_4, ppm	19.00
Total dissolved solids, ppm	85.00
Loss on ignition, ppm	27.00
Free chloride, ppm	0.02

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