

DETECTION AND SURVIVAL OF STAPHYLOCOCCUS SP. IN ESTUARINE WATERS.

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ABSTRACT

A new method of detection and quantification of Staphylococcus is proposed for the study of their inactivation in estuarine waters. The results indicate that in this environment the genus Staphylococcus shows strong survival capability outside the human host; its T_{90} is greater than for total coliforms (TC), faecal coliforms (FC) and faecal streptococcus (FS).

The genus Staphylococcus includes microorganisms which due to their high pathogenicity, are of great sanitary importance. Their aquatic environment population dynamics and inactivation processes have not been studied until now, because of three factors: their low concentration in waters; their inability to reproduce in this environment; and the lack of suitable selective media to permit quantification, (5). The principal objective of this study was to determine the effects of several chemicals on the recuperation of staphylococci populations, and on the growth inhibition of the associated flora commonly found on the selective detection media. The outcome of this research is the formula of a medium, highly selective for Staphylococcus, which has been named BFR (6). Twelve monthly experiments of staphylococci inactivation in estuarine waters of the Guadalhorce river (Malaga, Spain), were carried out over a period of twelve months, between July 1983, and July 1984, following the techniques described by Pearson et al. (9). Following membrane filtration (2) BFR was used as the medium for the count, then identification tests were carried out (7, 10).

Figure I. is a schematic representation of the inactivation processes of the four microorganisms, staphylococci, TC, FC, and FS, in an estuarine environment. The time required for a 90% population decline (T_{90}) in this medium varied from 47 minutes for Staphylococcus, 45 minutes for FS, 40 minutes for TC, and 30 minutes, the least, for FC. It may be clearly seen that the population decrease parameters of Staphylococcus, Tc, and FS are parallel.

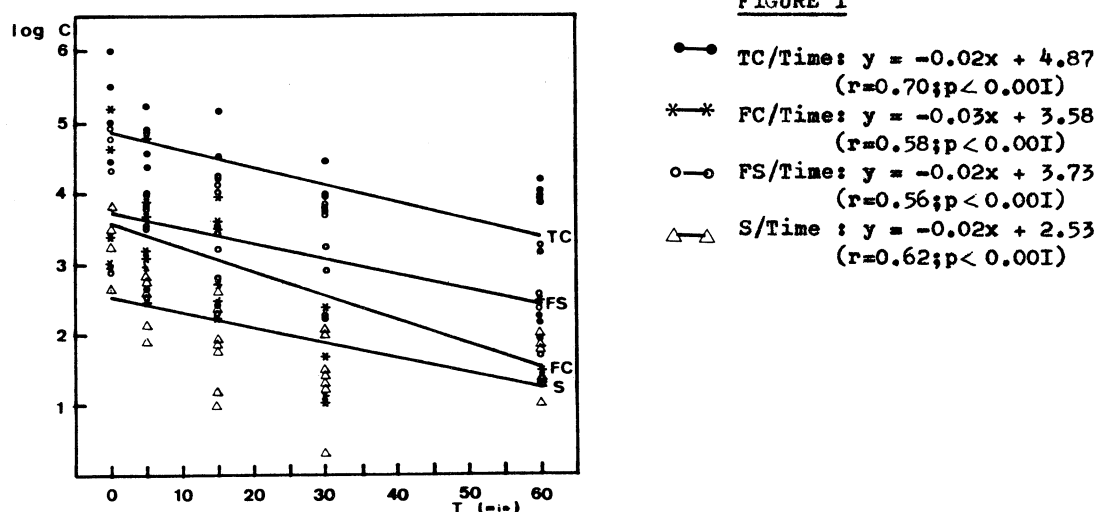
These results are very similar to those of Andriotis et al. (1) who cited TC and FC, T_{90} values of 61 and 56.4 minutes, respectively. Other authors present very different results as follows: Mujeriego et al. (8) report T_{90} values of 15 minutes for TC and FC, and 20 minutes for FS; while Borrego et al. (3), mention T_{90} values for FC, TC and FS, of 12, 13 and 14.5 minutes respectively.

The results of Bravo et al. (4), differ even more, with respective T_{90} values for TC, FC, and FS, of 19, 21.5, and 36.5 minutes. However, it must be pointed out that these authors were studying the surface plumes of submarine outfalls in which the physical factors affecting dilution and dispersion are more numerous and more marked than in estuarine zones.

The superior survival times of staphylococci possibly result from their being Gram positive cocci and the fact that they form irregular cell clusters may be an important factor in retarding the inactivation process. Moreover these microorganisms are well adapted for survival outside the human host as they are relatively resistant to

sunlight, drying and high salinity (5).

The high T_{90} of TC (40 minutes) may be explained by the sediment recycling that takes place in estuaries and by the fact that they belong to the group of microorganisms which have microcapsules and a glycocalix which protect them from the toxic effects of the marine environment. The low FC, T_{90} , on the other hand, is the result of the highly stressful marine environment for these organisms, particularly for their vegetative cells. For this reason the detection tests include a thermal shock for its selective effect; it acts principally on those cells previously stressed by the environment. TC are not affected as these microorganisms are at their optimum incubation temperature in the environment in which the other species in this study are found.



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