

## DIE-OFF RATE OF *STAPHYLOCOCCUS AUREUS* IN SEA-WATER

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All strains of coagulase positive *Staphylococcus aureus* are pathogens, causing a wide range of infections. They have been found to be shed by bathers under all conditions of swimming. Being salt tolerant they may survive in the marine environment, presenting a potential health hazard to bathers on crowded beaches.

The effect of solar radiation, temperature, salinity and predation on the survival of *S. aureus* was studied in laboratory experiments using  $2^k$  factorial designs. Survival of studied bacterial group was expressed as  $T_{90}$ , the time required for a 90% reduction in bacterial number.

The number of *S. aureus* was determined by membrane filtration using a Baird-Parker Base Agar (Biolife). The culture of *S. aureus* for survival experiments was supplied by the Institute of Public Health, Split, Republic of Croatia.

$T_{90}$  values under light conditions ranged from 8.0 to 11.9 hours, and under dark conditions from 115.1 to 422.5 hours. Survival of *S. aureus* was statistically significantly longer than survival of all faecal indicator groups (TUDOR *et al.*, 1990). An inverse relationship existed between survival of *S. aureus* and all studied factors. The largest negative effects were the main effects of solar radiation, temperature and predation, while the largest positive effects were the interactions between solar radiation and temperature, and between solar radiation and predation (Tab.1).

The results showed that solar radiation was the dominant factor in controlling the survival of *S. aureus*. The effect of temperature was also very important but partially obscured by the effect of solar radiation. The importance of predation in elimination of *S. aureus* from marine environments was established as statistically significant under experimental conditions. Effects of predation were more expressed under dark than under light conditions, indicating an interference effect between solar radiation and predation. Thus, solar radiation was detrimental not only to survival of *S. aureus* but also to survival and/or activity of predators inhibiting the effect of predation. Under natural conditions salinity was a less important factor controlling the persistence of *S. aureus*, suggesting their high salt tolerance.

Tab.1. Results of multifactor ANOVA comparing the main and 2-factor interaction effects of solar radiation (R), temperature (T), salinity (S) and predation (P) on the survival of *S. aureus*.

| SOURCE OF VARIATION          | SS      | df | MS      | F     | P      |
|------------------------------|---------|----|---------|-------|--------|
| <b>MAIN EFFECTS</b>          | 1.89 E5 | 4  | 4.72 E4 | 26.31 | <0.005 |
| R                            | 1.17 E5 | 1  | 1.17 E5 | 64.96 | <0.001 |
| T                            | 5.30 E4 | 1  | 5.30 E4 | 29.53 | <0.005 |
| S                            | 5.18 E3 | 1  | 5.18 E3 | 2.89  | n.s.   |
| P                            | 1.41 E4 | 1  | 1.41 E4 | 7.86  | <0.05  |
| <b>2-FACTOR INTERACTIONS</b> | 7.32 E4 | 6  | 1.22 E4 | 6.80  | <0.05  |
| R x T                        | 4.84 E4 | 1  | 4.84 E4 | 26.94 | <0.005 |
| R x S                        | 4.62 E3 | 1  | 4.62 E3 | 2.57  | n.s.   |
| T x S                        | 2.20 E3 | 1  | 2.20 E3 | 1.23  | n.s.   |
| R x P                        | 1.29 E4 | 1  | 1.29 E4 | 7.19  | <0.05  |
| T x P                        | 5.03 E3 | 1  | 5.03 E3 | 2.80  | n.s.   |
| S x P                        | 1.26 E2 | 1  | 1.26 E2 | 0.07  | n.s.   |
| <b>RESIDUAL</b>              | 8.98 E3 | 5  | 1.80 E3 |       |        |

n.s. - not significant ( $P>0.1$ )

### REFERENCES

TUDOR M., SOLIC M. and KRSTULOVIC N., 1990.  $T_{90}$  of total coliforms, faecal coliforms and faecal streptococci in the Kastela Bay. *Acta Adriat.* 31 : 67-74.

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