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Effects of Deuterium Oxide on Streptococcus mutans and Pseudomonas aeruginosa

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Abstract: A complex aggregation of microorganisms growing on a solid substrate is termed a biofilm and is considered to be an etiological agents. Pseudomonas aeruginosa and Streptococcus mutans are representative bacteria in such biofilms. It is well known that deuterium oxide (D₂O) causes toxic effects on a number of biological systems. We investigated the effects of D₂O on growth and biofilm formation of P. aeruginosa and S. mutans. These bacteria were incubated in medium containing D₂O (100%, 75% or 0%) at 37°C for 24hr, 48hr or 72hr. Growth of *P. aeruginosa* was inhibited by D_2O within the first 48hr. However, after 72hr, growth rate was seen to increase in the D₂O-containing medium compared with in medium without D₂O. In contrast, the growth of S. mutans in the D₂O medium was inhibited within 72hr. The biofilm formation of *P. aeruginosa* was increased in the D₂O medium. Biofilm formation of S. mutans in the D₂O medium increased compared with in the medium without D₂O, but this increase was only temporary in the case of *P. aeruginosa*. Compared to biofilm formation in 0% D₂O medium marked as 100%, the biofilm formation rate of S. mutans in 75% D₂O medium was 143% at 24hr, 146% at 48hr and 130% at 72hr. In other D₂O concentration media biofilm formation was lower. In 100% D₂O medium, biofilm formation rate decreased from 114% at 24hr to 56% at 72hr.

The biofilm formation rate of P. aeruginosa in 100% D_2O medium was 172% at 24hr, but decreased to 88% at 72hr. Biofilm formation of P. aeruginosa in 75% and 0% D_2O media showed no significant difference. We consider that these results were due to stress or alteration in bacterial metabolisms.

Key words: Deuterium oxide, *Streptococcus mutans*, *Pseudomonas aeruginosa*, Biofilm

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