FLUORESCENCE DEPENDENCE ON HYDROGEN PEROXIDE VAPOUR CONCENTRATION OF BACTERIAL SPORES

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Exposure to hydrogen peroxide vapour is an effective method for decontaminating various rooms and surfaces after pathogenic micro-organisms have taken hold. Previously, we have reported in [1] that monitoring the change of the autofluorescence spectrum of bacterial spores (more generally – biological indicators) during hydrogen peroxide vapour decontamination process is a sensitive and repeatable process that can be applied to get a good indication of the decontamination procedure's efficiency.

Here we report the experimental results when applying different H_2O_2 vapour concentrations (100ppm, 200ppm, 300ppm, and 400ppm). *G. stearothermophilus* spores were placed in front of the H2B fluorometer during the decontamination procedure and their autofluorescence signal was measured in real time. As could be expected, the higher H_2O_2 concentrations caused the signal to drop faster as well as to a lower final fluorescence level when compared to the lower concentrations studied (see Fig. 1). The fall-off of the autofluorescence signal can be well fitted with a biexponential decay function. The leading hypothesis for the explanation of the biexponential fall-off is that the faster component (decay time of 25-45s) represents the fluorescence quenching of tyrosine and tryptophan in the outer shell layers of the spores, while the slower component (decay time of 150-300s) is more tied to the denaturation of tryptophan-containing proteins in the inner shells and core of the spores.

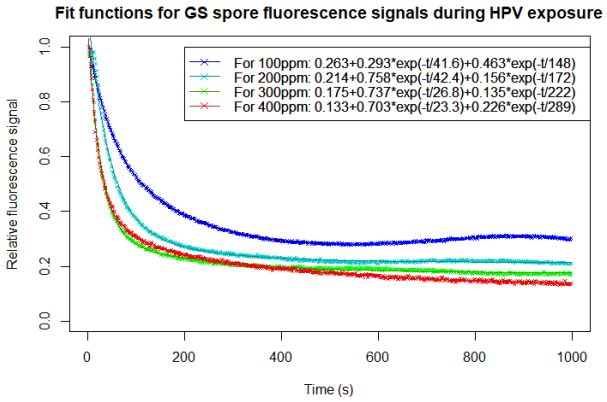

Fig.1. Time dependence of autofluorescence intensity of G. stearothermophilus spores (biological indicators) at 280nm excitation and monitoring 330nm emission in the presence of 100ppm, 200ppm, 300ppm and 400ppm hydrogen peroxide vapor in air.

References

1. Rebane, O; Kirm, M; Wilska, P; Sobolev, I; Poryvkina, L; Hakkarainen, H; Babichenko, S (2021). Real-time monitoring of hydrogen peroxide vapour decontamination of bacterial spores by means of UV fluorimetry. Proceedings of the Estonian Academy of Sciences, 70 (1) page 58

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