Control of microorganisms by singlet oxygen

Ayako Fujimura, 1 Yuichi Toshitoku, 1 Nobutaka Suzuki, *1 Hideya Sato, 2 Reizo Kanazawa 3
1. Grad. School of Biosphere Science, Hiroshima University, Higashi-Hiroshima 739-8528, Japan
2. Optec Co., Oshima, Koto-ku, Tokyo 136-0072, Japan
3. Daikin Environmental Institute, Miyukigaoka, Tsukuba 305-0841, Japan

Recently, the control of microorganisms has been increasing in importance, because food poisoning and infection disease by microorganisms happen often. Additionally, environment-conscious techniques of control of microorganisms, that is less burdensome for natural environment sought-after. Thus, we tried to purify environmental contamination by microorganisms with dyes (Rose Bengal and phthalocyanine). The dyes generate singlet oxygen (\(^{1}\text{O}_2\)), a molecular species of active oxygen by visible light irradiation.

In this paper, we would like to describe “control of microorganisms by singlet oxygen that (1) inhibits growth of \textit{Escherichia coli}, (2) decontaminates water bloom and (3) kills \textit{Ichthyophthirius multifiliis}.
(1) Singlet oxygen decreases colony forming units of \textit{E. coli}. It indicates that \(^1\text{O}_2\) influence \textit{E. coli}.
(2) Singlet oxygen decontaminates water bloom containing \textit{Microcystis aeruginosa}.
(3) Singlet oxygen showed high mortality to \textit{Ichthyophthirius multifiliis} that causes white spot disease to goldfish (\textit{Carassius auratus}). These results suggest a possibility that the \(^1\text{O}_2\) generating system is a simple, safe and effective technique that is applicable to water purification.