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酸素ラジカル処理による出芽酵母の増殖効果

Proliferation of *Saccharomyces cerevisiae* by oxygen radical treatment

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Introduction: There are many reports that microorganisms were inactivated using non-equilibrium atmospheric-pressure plasma (NEAPP). We have focused on inactivating spores of *Penicillium digitatum* by NEAPP.[1] We found that ground-state atomic oxygen [$O(^3P_{j=0,1,2})$], one of the reactive oxygen species, is the dominant factor responsible for inactivating *P. digitatum* spores with an atmospheric-pressure oxygen radical source.[2, 3] On the other hand, it is expected that NEAPP have an effect on promoting cell proliferation or activation of cell function. Effects of only neutral oxygen radicals on promotion of cell growth have not been reported. In this study, we investigated the effects of only neutral oxygen radical treatments on the growth and bactericidal effect of budding yeast, which is one of the famous model organisms.

Experimental: The budding yeast (*Saccharomyces cerevisiae* W303a) was suspended with phosphate buffered saline. The spore suspensions were treated for 1.5 or 3 min by an oxygen radical source, which only generates neutral radical species.[4, 5] They were located 10 mm downstream from the radical exit of the oxygen radical source set at a $O_2/(Ar+O_2)$ flow rate ratio of 1.2% with a total flow rate of 5 slm. Recovered cells were arranged to be 1.0×10^6 cells/ml and cultured with yeast extract peptone dextrose medium at 30°C. The degree of proliferation was estimated by counting cells.

Results and discussion: Figure 1 shows the number of control yeast cells and radical-treated cells after 24, 48 and 72-hour cultivations. The number of control cells was 1.1×10^8 cells/ml after 72-hour cultivation. On the other hand, the number of cells with 1.5 min treatment was 1.6×10^8 cells/ml, which indicates that cell proliferation is promoted by oxygen radicals. On the other hand, the number of cells with 3-min treatment was 8.3×10^7 cells/ml, which indicates that cell proliferation is inhibited. These results suggest that proliferation activity is promoted and depends on dose of oxygen radicals.

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[4] M. Iwasaki, et al., Appl. Phys. Lett., **92**, 081503 (2008).

[5] H. Inui, et al., Appl. Phys. Express, **3**, 126101 (2010).

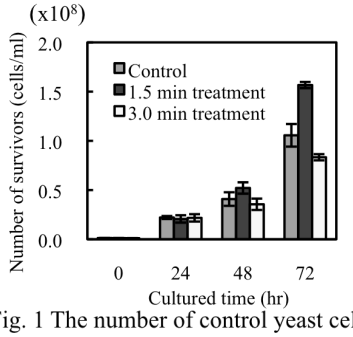

Fig. 1 The number of control yeast cells and radical-treated cells after cultivation.