Spectral modulation of bioluminescence from *Vibrio fischeri* strain Y1 cells

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The modulation of bioluminescence (BL) of *V. fischeri* Y1, producing yellow fluorescent protein (YFP) and Y1-blue fluorescent protein, was characterized in a seawater complete liquid medium at varying concentrations of O2 and hydrogen ion. Moreover, the relationship between the density of a single cell and the BL spectral distribution was studied based on the sucrose density-gradient centrifugation method. From the measurement of BL during the period of the cycles of aeration on and off, it was found that an increase in the O2 concentration leads to the enhancement of the yellow BL (~ 535 nm) and that the BL spectral modulation reversibly occurs in accordance with the aeration on-off cycle. In this case, the fluctuation of the blue-green BL intensity was not significant. The enhancement of the yellow BL intensity due to the supply of O2 was somewhat greater in weakly acidified media (~ pH 6), where the yellow BL band is not so clear. By contrast, supplying O2 to *Photobacterium phosphoreum* cells, producing lumazine protein responsible for the blue-shifted BL, took no recognizable effect on the spectral distribution, although the total BL was considerably intensified. These results may suggest that the change in the respiratory activity affects the properties of YFP, possibly being present close to the cell membrane, to cause the reversible spectral modulation of *V. fischeri* Y1 BL. It was also found that an increase in a single cell density of *V. fischeri* Y1 causes an increase in the ratio of the yellow BL intensity at 535 nm to the blue-green one at 470 nm. The observed increase in the intensity ratio with an increase in the single cell density might indicate that there is a possibility that *V. fischeri* Y1 cells also modulate the spectral distribution in the cell cycle.