Development of Bright and Constant Lighting Using Luminescent Bacteria

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New emergency power sources are continually being sought, particularly for use during natural disasters when power supplies are interrupted. Luminescent bacteria are currently widely used for toxicity testing; however, their potential application as cost-effective and versatile sources of lighting has not been widely reported. I therefore examined light production using these bacteria, and also considered how the light intensity could be modulated by modifying the growth medium. Two bacterial culture experiments were conducted to compare the luminescence characteristics of luminescent bacteria. One used 11 media each containing different saccharides as carbon sources, and the other used growth media supplemented with different cyclodextrin concentrations. Monosaccharides were assumed to be associated with high emission intensities and multiplication as they can be degraded quickly to produce energy. Since cyclodextrin inhibits quorum sensing, the media were supplemented with cyclodextrin to clarify its effect on lighting intensity. Emission intensity was measured using a voltmeter connected to a solar panel, and multiplication was measured using a spectrophotometer. The findings showed that glucose promoted multiplication but repressed luminescence, and that maltose produced the most intense light. Luminescence was prolonged by 360 h in the presence of high cyclodextrin concentrations (≥30 mM) In conclusion, no correlation was observed between the luminescence and multiplication, and luminescence duration was extended by high cyclodextrin concentrations. Finally, specific concentrations of maltose and cyclodextrin were optimal for producing light. The light produced was sufficient for reading a newspaper for 33 h and for illuminating emergency exit signs for 423 h.