

塗膜表面における細菌増殖挙動の可視化： 蛍光観察に基づく抗菌性評価

Fluorescence-Based Visualization of Bacterial Growth on Coating Surfaces for Evaluating Antibacterial Activity

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Abstract

Antibacterial surface coatings are widely studied for preventing infections. However, conventional evaluation methods such as ISO 22196 : 2011 rely on endpoint colony counting and do not provide spatial or temporal information on bacterial growth. In this study, we developed a novel *in situ* evaluation method that enables continuous visualization of bacterial growth on centimeter-scale substrates using green fluorescent protein-expressing *Escherichia coli*. A simple fluorescence imaging system consisting of an LED light source, optical filters, and a digital camera was employed to monitor bacterial growth directly on surfaces. Key experimental parameters, including substrate size and the gap between the substrate and an overhead transparent film, were systematically optimized to ensure reliable growth conditions. Bacterial growth was quantitatively evaluated using average fluorescence intensity and spatial intensity profiles. The applicability of the method was demonstrated by successfully visualizing and quantifying the effect of a nontransparent antibacterial coating material. This method provides a robust platform for accurate spatial and temporal assessment of antibacterial surface activity.

キーワード：抗菌塗膜、蛍光観察、可視化

Keywords : Antibacterial coating, Fluorescence observation, *in situ* visualization

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1. はじめに

不特定多数の人物が頻繁に触れる場所への病原体の付着は感染症の主要な感染経路の一つである。そのため、これを防ぐ抗菌・抗ウイルス塗膜への関心は世界的に高まっており、その有効性を信頼性高く評価する標準化手法の確立が求められている。