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Application of Insoluble Fibroin Film as Conditioning Film for Biofilm Formation

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The aim of this study is to investigate microbial attachment to insoluble fibroin film. The insoluble fibroin film used had tensile strength and contact angle values of 28.79 MPa and 70°, respectively. The attachment of *Escherichia coli*, *Bacillus subtilis*, *Enterobactor cloacae*, *Sphingomonas yanoikuyae*, and *Pseudomonas stutzeri* to insoluble fibroin film occurred rapidly and was maintained for 72 h. The role of the hydrophobic/hydrophilic interactions between microbial attachment and the substratum was investigated using the contact angle. Alginate film (10% or 50% $CaCl_2$ treatment), latex, and urethane had contact angle values of 39°, 15°, 74°, and 116°, respectively. The number of attached *E. coli* cells to insoluble fibroin film was higher than that to urethane. Microbial attachment to the substratum is affected by cell surface characteristics such as hydrophobicity/hydrophilicity. Attachments for the lower-contact-angle microbes were higher than those for the higher-contact-angle microbes. Although the insoluble fibroin film has a relatively higher contact angle value, it has an ability of immobilizing a variety of microbes. These results suggest that the high microbial attachment to insoluble fibroin film is caused not only by the hydrophobicity but also by the characteristics of fibroin.

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