Isolation of microorganisms capable of attaching tightly on solid surfaces in saline solution and utilization of their products

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Summary

Microorganisms which attach to solid surfaces and form biofilm has attracted attention in recent years. Extrapolymeric substances (EPSs), mainly consisting of proteins, polysaccharides, and lipids, are deeply concerned with biofilm formation. It is expected that EPSs vary in their structures, chemical components, and biological functions depending on microorganisms themselves and culture conditions.

In the present research, microorganisms were isolated from different origins to screen a candidate for a biofilm former on metal surfaces. Among 11 isolates, strain WW2, isolated from wastewater, was selected as a microbe giving high cell density (1×10^8 cells/cm^2) on stainless steel surface. The strain was classified into *Enterobacteriaceae* family and identified as *Providencia* sp. based on the 16S rDNA homology. The amount of cells attached to stainless steel surface was increased with increasing NaCl concentration up to 15 kg/m^3, whereas specific growth rate was almost constant in the range of NaCl concentration.

To investigate the interaction between strain WW2 and metal surfaces, stainless steel and copper wires were immersed in the culture of WW2 cells with or without shaking. Scanning electron microscopy and energy-dispersive X-ray spectroscopy analyses revealed that biogenically produced H_2S by strain WW2 precipitated copper ions as copper sulfide on the wire surface under a static culture condition.

Recently, it has been reported that DNA migration as well as transmission of metabolites and signal molecules occurs among microorganisms in biofilm. The examination on DNA adsorption to WW2 cells showed that only WW2 cells grown on the metal surfaces had ability to adsorb DNA molecules, suggesting that WW2 EPSs, can be a "bio-bond" for condensing biomolecules like DNA.