Bacteria-immobilized Preparation as the Microbial Probe for Electrochemical Susceptibility Test

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Electrochemical measurement of respiratory activity based on a multilayered composite of bacteria has been developed for susceptibility test. Here, we firstly report the successful fabrication of graphene oxide (GO)/polyvinyl alcohol (PVA)/*Escherichia coli* (*E. coli*)/GO/graphite rod (GR) composite, where the GO/GR composite was prepared by chemical oxidation and then the *E. coli* was confined at the surface of GO/GR composite by in site culture and crosslink of GO/PVA in sequence. Although it induced 29.07% decrease in the sensitivity of immobilized *E. coli* to toxic chemicals, the presence of GO/PVA could promote the storage stability for 20 days in term of relative bioactivity. The GO/PVA/*E. coli*/GO/GR composite was used as the bacterial probe in the electrochemical sensor for susceptibility test of antibiotics, and the IC₅₀ values were determined to be 8.01 mg/L, 6.51 mg/L, 9.93 mg/L and 4.07 mg/L for gentamicin, amikacin, amoxicillin and cefixime, which were identical with those obtained with standard Kirby-Bauer disk susceptibility (KB) testing. The vancomycin, only affecting gram-positive bacteria, exhibited an inhibition ratio of 34.5% at the concentration of 16.0 mg/L in the electrochemical susceptibility test, agreeing with the result from KB testing.

Keywords: electrochemical biosensor, nanocomposite, antibiotic efficacy testing, immobilized microorganisms, electrochemical susceptibility test.

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