

## The use of bioelectrochemical system to detect the pathogenic organisms: Electrochemical activity of *Streptomyces*

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Microbial infectious diseases remain a serious public health problem due to the fast-spreading of microbial pathogens, and biological contaminants, in the environment. Since the detection of pathogenic bacteria is necessary to the prevention and identification of health problems, the sensitive detection assays are urgently needed. However, reliable, sensitive, quantitative, and rapid assays for pathogenic microorganisms are not yet readily accessible. Thus, based on the electrochemical communication between the viable cells of pathogens, *Streptomyces* as a target organism, and the nano-electrode a new microbial sensor has been designed for the desirable objective. From the electrochemical and biochemical investigations, the MWCNT-Paste electrode (40% w/w) was used for studying the electrochemical behaviors of *Streptomyces*. As a result, the cyclic voltammogram of viable *Streptomyces* cells exhibited an efficient oxidation current. The oxidation peak height was found to be proportional to the viable cell numbers which enable the electrochemical monitoring of the growth rate at low cells numbers.

Understanding the mechanism of the extra-cellular electron-transfer is essential for the design and optimization of the proposed assay, therefore, a mechanistic study has been carried out. At the end, the electron transport chain of *Streptomyces* showed a great impact on the generated electrical current.

In conclusion, the proposed microbial sensor could be used as a platform for the effective environmental protection and quality control monitoring of the microbial pathogens in medical and environmental samples.

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