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Gelatine-based biosensor for molecular screening of aspirin and paracetamol via surface enhanced Raman spectroscopy

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Abstract

Polypeptide gelatine has been used extensively in microbiology to enhance cellular adhesion and growth. Likewise, fabrication of biochemical sensors using a variety of organic material and nanomaterials is a growing research area particularly in experiments involving single molecular screening. Both fields of study exploit the various interactions that occur at molecular level such as charge-charge binding, hydrogen bonding and van Der Waals forces. In this work, a thin film gelatine based biosensor, containing amino acids such as glycine, proline and hydroxy-proline was synthesized on glass slides using the self-assembly method. Further -adaption involved coating gold nanoparticles onto the substrate to enhance chemical binding and improve signal intensity and sensitivity. Pharmaceutical drugs aspirin and paracetamol were used as analytes to explore the qualitative and quantitative capabilities of the sensor in molecular screening through surface enhanced Raman spectroscopy (SERS). The results showed a distinguishable qualitative difference between the Raman spectra of gelatine-drug (Gel-D) and gelatine-gold-drug (Gel-Au-D) fabricated sensors. Similarly in both Gel-D and Gel-Au-D, the peak areas of the functional groups found in both aspirin and paracetamol increased with drug concentration, yielding satisfactory calibration curves. The gelatine based biosensor thus holds potential as an in vitro sensing platform for screening of pharmaceutical drugs.