Detection of C-reactive protein by Liquid-gated Carbon Nanotube Field Effect Transistors (LG-CNTFET): A promising tool against antibiotic resistance

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Respiratory tract infections have the highest rates of antibiotic prescriptions[1] where symptoms like fever, cough and rigors are regularly misinterpreted and bacterial infections cannot be distinguished from viral ones. Nevertheless, it has been recently suggested that C-reactive protein (CRP), a protein produced by the liver in response to infection, could serve as a potential biomarker for the precise differentiation of these two types of infections.[2] Thus, its quick and accurate detection would potentially reduce the unnecessary antibiotic use.

To this end, we present an easy and sensitive approach for the selective detection of C-reactive protein (CRP) by liquid-gated carbon nanotube field effect transistors (LG-CNTFET). Herein, CNT-networks were deposited between electrodes via controlled dielectrophoretic deposition and then functionalized with a novel specific antibody and a polyethylene glycol (PEG) layer in order to overcome the Debye screening. Successful fabrication and functionalization was confirmed by scanning electron microscopy and chemiluminescence immunoassays. The results showed a selective and reproducible detection down to picomolar concentrations in PBS buffer without complicated microfluidics. The simplicity and high sensitivity of this sensor platform make it a promising tool for the quick and precise differential diagnosis of viral and bacterial infections.

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