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The development of a novel Bio-Sensor system for the ultra- sensitive diagnosis of Anthrax Protective Antigen

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The treat of bioterrorism and the potential use of biological weapons against both military and civilian populations has become a major concern for governments around the world. Protective antigen (PA) is a component of anthrax toxin produced by Bacillus anthraxis, a spore-forming bacterium that can survive extreme conditions over long period. The anthrax toxin composed of three types of proteins: PA, lethal factor (LF), and edema factor (EF). Since early detection of PA in anthrax toxin can reduce the risk of death from biological warfare and terrorism, early detection method seen to be increased. However, most PA early detection is currently based on the conventional antigen-antibody system, and has detection limits in the nano- and pico molar range. Therefore, our works provide a novel sensor system that can replace antibody to polyvalent peptide as a detection probe has been developed. Herein, we developed a novel technique for ultra-sensitive detection of PA using an array of zinc oxide (ZnO) nanorod in conjunction with a FITC-labeled smart polymer. A peptide that binds with high affinity to PA83 was used in the synthesis of smart polymer. Furthermore, the use of ZnO as fluorescence enhancing substrates with smart polymer permitted a lower limit detection range (15 zM) of PA. This ultra-sensitive detection of PA demonstrates the possibility of using smart polymer and ZnO nanorod combination in biological sensor systems.

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