

## **Reagent Free Detection of E. coli O157:H7 in Water Samples Using an Antibody Functionalized Microwave Biosensor**

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Escherichia coli (E. coli) O157:H7 (O157), one of the most common Shiga toxin-producing E. coli, can cause water contamination leading to diarrhea and serious damages to health. Traditional methods for E. coli detection, which suffer from the shortcomings of sample transportation and long detection duration, are too slow in responding to E. coli outbreaks. Herein, this work presents a novel reagent free detection method using an antibody functionalized microwave biosensor to carry out rapid and sensitive E. coli detection. The key component of this biosensor is a functionalized microwave sensor whose surface has been immobilized with the antibody to specifically bind with E. coli. The resonance frequency shift has been used to indicate the existence and amount of E. coli in water samples. The reported microwave biosensor is capable to realize a limit of detection of 647 CFU/ml, and it can be down to 6.47 CFU/ml with the preconcentration step prior to the sensing procedure. The sensor has also been tested to detect E. coli in nature water systems, and worked with a portable vector network analyzer to receive signal, indicating the excellent feasibility of the proposed sensor for real-time E. coli detection.