Detection of Escherichia coli O157:H7 using smartphone-based luminometry

Claudia Coronel*[1] and Euiwon Bae

[1]Purdue University [West Lafayette] – West Lafayette, IN 47907, United States

Abstract

Modern smartphone technology has made accessibility and portability to information effortless and immediate, and they can be easily modified for biotechnology applications. Bioluminescence has proved to be a useful tool to monitor growth of bacteria under different conditions. When adapted to smartphones, they could become a powerful device that is able to monitor and upload reports of presence and growth of pathogens infected with a luminescent reporter phages. Thus, this technology shows promise for food safety and environmental monitoring applications. In this study, a smartphone-based bioluminescence detector has been developed for the mentioned benefits. Preliminary studies have been carried out using the bacteriophage PhiV10*nluc*, which was previously engineered by integrating the *nluc* cassette from the deep-sea shrimp *Oplophorus gracilirostris,* which produces bioluminescence when the substrate luciferin (Nano-Glo®) is added. Phage PhiV10nluc has the advantage of being host-specific for the pathogen *Escherichia coli* O157:H7 and forms lysogens upon infection. Due to the intense blue light (maximum emission of 460nm) produced by hosts harboring the modified phage, the infection of different concentrations of *E. coli* O157:H7 were monitored, determining a detection limit around 106 Colony Forming Unit (CFU)/ml. However, improved hardware monitoring and algorithm implementation is being developed to increase the sensitivity to detect lower concentrations of 10ˆ4-10ˆ3 CFU/ml. This innovative technology looks promising for future applications in real time monitoring and detection of a variety of pathogens.

Keywords: Smartphone, reporter phage, luminescence, real, time monitoring

*Speaker