Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Impedance spectroscopy of micro-Droplets reveals activation of Bacterial Mechanosensitive Channels in Hypotonic Solutions AIDA EBRAHIMI, MUHAMMAD A. ALAM, Purdue University — Rapid detection of bacterial pathogens is of great importance in healthcare, food safety, environmental monitoring, and homeland security. Most bacterial detection platforms rely on binary fission (i.e. cell growth) to reach a threshold cell population that can be resolved by the sensing method. Since cell division depends on the bacteria type, the detection time of such methods can vary from hours to days. In contrast, in this work, we show that bacteria cells can be detected within minutes by relying on activation of specific protein channels, i.e. mechanosensitive channels (MS channels). When cells are exposed to hypotonic solutions, MS channels allow efflux of solutes to the external solution which leads to release the excessive membrane tension. Release of the cytoplasmic solutes, in turn, results in increase of the electrical conductance measured by droplet-based impedance sensing. The approach can be an effective technique for fast, pre-screening of bacterial contamination at ultra-low concentration.

Aida Ebrahimi
Purdue University

Date submitted: 24 Nov 2015 Electronic form version 1.4