CI-11. GMR-Based Salmonella Detection System: Approaching 1 CFU Detection. *M.A. Torija*[1], K.D. Dorfman[2], L. Maldonado-Camargo[3], C. Rinaldi[3], J. Sheats[2] and S. Sreevatsan[4] *1. Ad tech, NVE Corporation, Eden Prairie, MN; 2. Chemical Engineering and Material Science, University of Minnesota, Minneapolis, MN; 3. Department of Chemical Engineering, University of Florida, Gainesville, FL; 4. College of Veterinary Medicine, University of Minnesota, St. Paul, MN*

NVE Corporation, the University of Minnesota (UMN), and the University of Florida (UF) have designed a fast, high sensitivity, low cost, bench-top salmonella detector, using a unique combination of two biodetection tools: hydrodynamic chromatography and magnetic nanoparticle (MP) conjugation. Biochemical aptamers bond to MPs and to *Salmonella* bacteria. The motional behavior of the aptamer-bacteria conjugate in solution is different from unconjugated aptamer MP pairs. These conjugates flow through a microchannel and past a magnetoresistance-based MP sensor for detection. The prototype depicted in Fig. 1 proved the feasibility of the concept and the path to implementation in a commercial device. NVE fabricated the GMR sensor, and the UMN used wet potassium hydroxide back side etch to create the microfluidic channel under the sensor, leaving a 200 nm thick, silicon nitride film between sensor and channel. UF produced the oxide nanoparticles using thermal decomposition of an iron oleate precursor, replaced the surface by an exchange reaction with a PEG-silane, which reacted with a di-carboxy PEG of 4600 Da and attached to an aptamer selective for *Salmonella*. Experiments in a secure environment with live *Salmonella* and pulsed magnetic field excitation showed an oscillation amplitude change of the output sensor bridge. The most significant results are summarized in Fig. 2. Water and unbound *Salmonella* + MNP separately gave similar signals. The *Salmonella* bound to MNPs change the oscillation sign and amplitude while the concentration profile was confirmed visually. We estimate the number *Salmonella* cells detected at 10 bacteria. This work was funded by NSF-STTR -1321460.

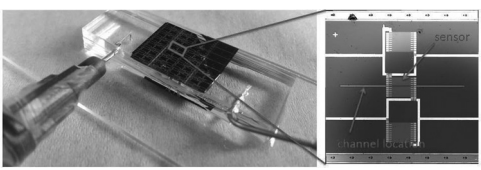

Figure 1 Basic integration design of the prototype and the channel integration

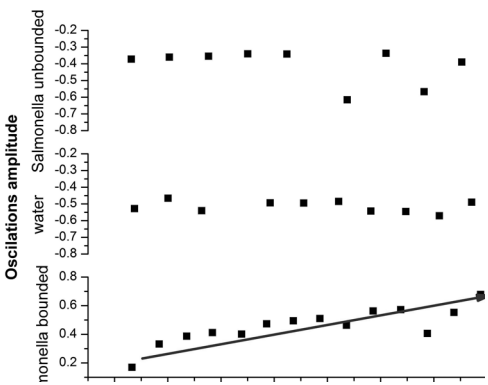

Figure 2 Oscillation changes for water, unbound salmonella and salmonella-particle