ASSESSING RECREATIONAL WATER QUALITY VIA MAGNETIC ISOLATION OF BACTERIA

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Water quality monitoring represents a vital aspect of public health: from drinking to recreational waters. For instance, in the U.S., 27 outbreaks related to environmental water exposure were reported (2013-2014) [**1**]. In drinking and recreational water quality monitoring, fecal indicating bacteria (FIB) are used as indicators of possible pathogenic contamination, for which safe exposure levels range between 1 and 126 CFU/100 mL for drinking and recreational waters, respectively. This work presents a method for water quality assessment that rapidly isolates bacterial targets (i.e. FIB) from water samples using bio-functionalized magnetic microdiscs and a magnetic separation microfluidic device.

Magnetic microdiscs used in this work are 'bacteria-sized' (1.5-µm diameter, 80-nm thickness) and possess a large magnetic moment which lead to their effective isolation. Magnetic material used for the microdiscs is Permalloy ($Ni_{80}Fe_{20}$), which is sandwiched between two 5-nm layers of gold. Gold-surface bio-functionalization is achieved via gold-thiol bonds. Therefore, thiolated capture probes are used to selectively target FIB. The magnetic separation microfluidic device is used to isolate microdisc-FIB conjugates in a localized area, ready-to-inspect under a microscope, at flow rates as high as 0.12 mL/s, which allows filtering 100 mL samples in less than 15 minutes.

Proof-of-concept results have shown *E. coli* isolation from water samples using aptamer-functionalized microdiscs at levels of 100 CFU/100 mL in less than an hour [**2**]. Also, preliminary results on selectivity have shown that using different capture probes during the bio-functionalization step (i.e. lectins and DNA aptamers) can help isolate different bacterial targets (i.e. total coliforms and *E. coli*).

This work envisions expanding the use of capture probes to target other FIB targets that are of interest for recreational water quality monitoring, such as, *Enterococci*. Also, sample analysis is expected on field samples obtained from close/local lakes/beaches (i.e. Lake Alice, Crescent Beach).

PRESENTER BIO: Keisha Y. Castillo-Torres is a graduate research assistant within the Interdisciplinary Microsystems Group (IMG) and the UF ECE Department. She is working towards her PhD degree under the advisement of Dr. David Arnold on the application of magnetic microdiscs for the detection of waterborne bacterial pathogens for water quality monitoring.