Anyone who wants to enjoy bathing in natural bodies of water in or near areas populated by humans or livestock may encounter unsafe levels of enteric bacteria. Contemporary methods of assessing water quality have a slow turn-around time so we have taken steps to perfect a biosensor for rapidly indirectly quantifying the presence of enteric bacteria in natural water samples through the detection of quorum sensing factors. Previous iGEMS have exploited the LuxR/pLux system for the detection of a variety of N-acylhomoserine lactone autoinducers. We have taken steps to further perfect a biosensor based on this device by transforming a gram-positive bacteria host to eliminate any background autoinducer signal and to build-in an enzymatic “read-out” to obtain an analog output. We envision the development of a handheld monitor that uses this iGEM biosensor, immobilized on input paper strips, to rapidly detect unsafe levels of pathogenic bacteria in water samples.

**RATIONALE**

**The Problem:** To Swim or Not?

Recreational swimming in bodies of water or near areas of human habitation or public pools comes with risks of infection by waterborne human pathogenic bacteria.

Conventional method:
- Culture on selective media

However:
- 1 to 2 day for results - water quality can change hourly…
- Special facilities required (incubator, media prep, etc.)

**Some major pathogens found in water:**
- **E. coli**
- **Pseudomonas**
- **Shigella**
- **Salmonella**
- **Vibrio**
- **Leptospira**

**SOLUTION:** DEVELP A HANDHELD WATER QUALITY TESTING DEVICE

**Desired attributes**
- Portable - no lab needed!
- Rapid detection speed
- Selectivity for human pathogens
- Designed for an average person to use

**A BIOSENSOR OPERATING SYSTEM**

**Advantages:**
- High selectivity based on species-specific recognition
- Speed of response
- Signal amplification
- Performance works at ambient temperature

**WHAT TO DETECT?**

Homoserine lactones – Bacteria use these to assess their numbers in the environment

- Stable chemical signatures
- Species Specific
- Concentration directly correlated with number of cells

**Lux System for HSL Detection**

**Alternate chassis**
- 37C growth optimum for E.coli: need to operate best at ambient temperature
- E. coli possesses the Lac Z gene for β-galactosidase

**Reporter**
- Cost to detect absorbance as opposed to fluorescence in a handheld electronic/iGEM hybrid device

**Response of transformed E. coli and Agrobacteria the presence of P. aeruginosa T9002 K498000**

**CONCLUSION**

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DETECTION OF BACTERIA 2010

MIT November 5 – 8th

(like this glucometer)