A Customizable Biosensor for Real-Time Water Monitoring: Applications in Algae Systems

Quantitative BioSciences, Inc.

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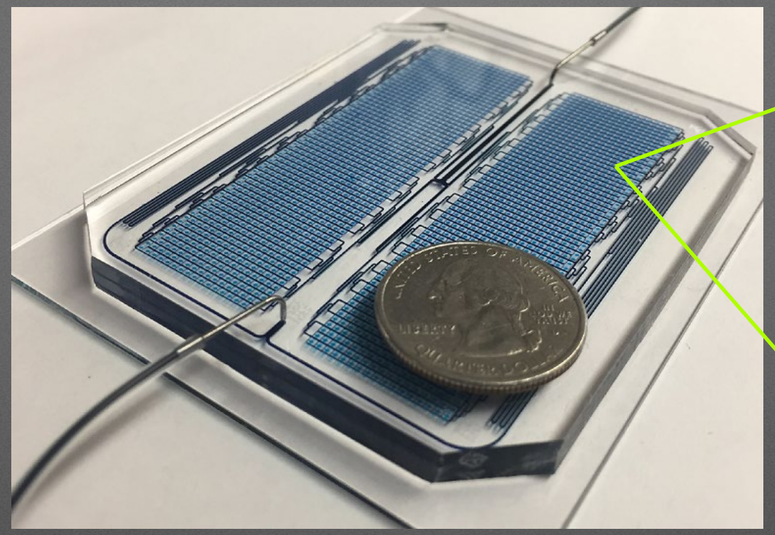
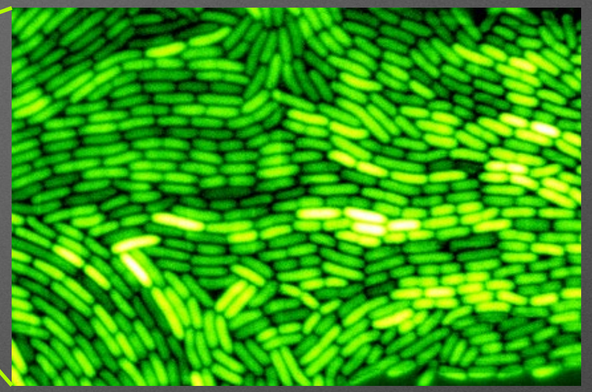
Company Overview

- QBI is a biotechnology small business focused on the development of water quality technologies (treatment and sensing)
- Our laboratory is located in San Diego, CA where we develop biosensors for water contaminants
- We also have a facility in Modesto, CA, where we are partnered with the Fiscalini Dairy
- We are developing a facility that uses algae for wastewater remediation, biogas purification, and animal feed production

Biosensor Platform Overview





- We have developed a biosensor platform that continuously monitors water for a suite of contaminants or other targets of interest
- Our biosensor platform uses microfluidic technology to house many sensor strains that fluoresce in response to specific targets
- Sensor enclosure shown above house the optics, electronics, and data processing system to convert cellular signals to concentrations on a continuous basis

Qube Biosensor Features

- **Customizable**: we use synthetic biology to develop sensor strains and have demonstrated the ability to design strains for specific needs
  - **How can we use this capability to best address pest monitoring?**
- **Flexible and Expandable**: no need for a new unit if targets of interest change; simply change the sensor strains on the sensor cartridge
- **Continuous operation and real-time results**: provides a major benefit over grab sampling, particularly for process control or for “smart dosing” applications

Target	Detection Limit (ppb)
Arsenic	5
Cadmium	2
Iron	20
Lead	30
Manganese	200
Mercury	1
Uranium	300
Zinc	50
Nitrate	25
Nitrite	250
Phosphate	25
Ammonium	250

Sensor Applications

- Algae pond productivity and health:
  - Smart nutrient dosing: demonstrate the benefit of continuous nutrient monitoring for optimizing growth at algae facilities
  - Monitoring for early warning for pond crash conditions
  - Pest monitoring: interested in ideas for the best approach

Conclusions

- We are interested to get some feedback about the general utility of the platform as well as what features might improve it:
  - How can we use our sensor to improve algae pond monitoring?
  - Are there deployment traits that would be useful for large scale algae facilities: size, power, environmental constraints?

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