

Genetically Transformed *Legionella* for Application in Engineering Process Validation in the Built Environment

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STATUS: New X Continuation

Background

- *Legionella* is responsible for more outbreaks of waterborne diseases than all other human microbes combined. There is need to study the fate and transport of *Legionella* in the processes /operations commonly used in the production, treatment and transmission of water in municipal settings.
- The innovative methods for mitigating and controlling *Legionella* need to be evaluated in model distribution systems containing biofilm and concurrent microbial communities. However, *Legionella* is difficult to detect in environmental and field samples. Distinguishing *Legionella* colonies from some of the other environmental bacteria can be difficult. There is need for innovation in studying fate and transport of *Legionella* in engineering process validation in water distribution systems and in the built environments

Objectives

- To develop a *Legionella* mutant that can be used as microbial indicator for process validation at any stage in water treatment processes and practice

Approach

- Develop a genetically transformed *Legionella* by using a plasmid that has molecular system for induced gene expression based on cumate. The proposed work will be performed using a commercially available low copy number plasmid pBAC-lacZ.

Key Deliverables

- A genetically modified *Legionella* that is easy to detect and has application in the validation of engineering processes such disinfection and transport studies.

Key Finding

- Genetic transformation of *Legionella* was successfully achieved.
- The transformed *Legionella* has a higher growth rate than wild type.
- Genetic modification has resulted in
- Increased growth rate reducing time grow time from 5 days to 1-2 days
- Less stringent nutrient requirement can grow in regular media such as TSB and LB
- L-cysteine is not required
- Iron salt is not required
- Antioxidant is not required
- Less reliant on antibiotics
- The complex phenotypes in transformed *Legionella* are believed to be because of CymR gene used as a repressor in cumate-inducible systems.

Budget Requested

Within allocated budget

Project Duration

- January 2018 – December 2018