Towards Using Microbes for Sustainable Construction Materials: a Feasibility Study

Sarah–Jane Haig[1,2], Steven Sachs[1], and Max Stephens[1]

[1]Department of Civil & Environmental Engineering,

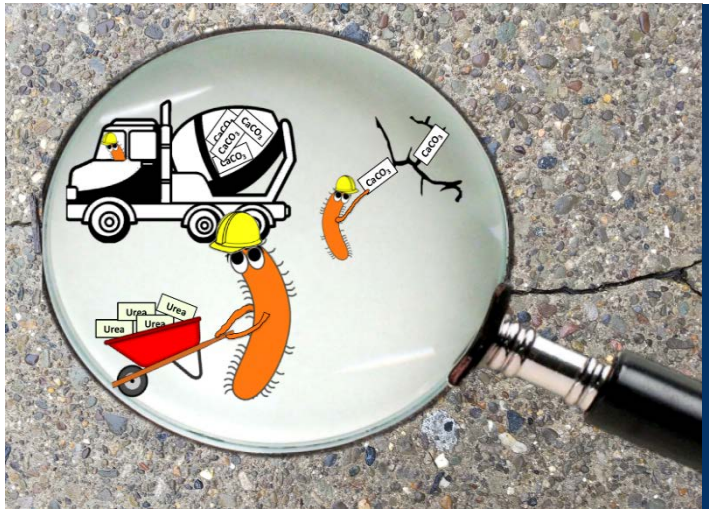
[2]Graduate School of Public Health, University of Pittsburgh, PA, USA

THE PROBLEM

- Reinforced concrete is susceptible to damage.

- Current repair strategies include cementitious patching and/or chemical treatment.
  - Expensive: estimated to cost $18-21 billion per year
  - Causes pollution issues

A POTENTIAL SOLUTION: BIOCONCRETE



BIOINSPIRED SUSTAINABLE CONCRETE

Using & understanding microorganisms & their metabolic processes to repair cracks in concrete is a promising new approach to solve a grand challenge for engineering.

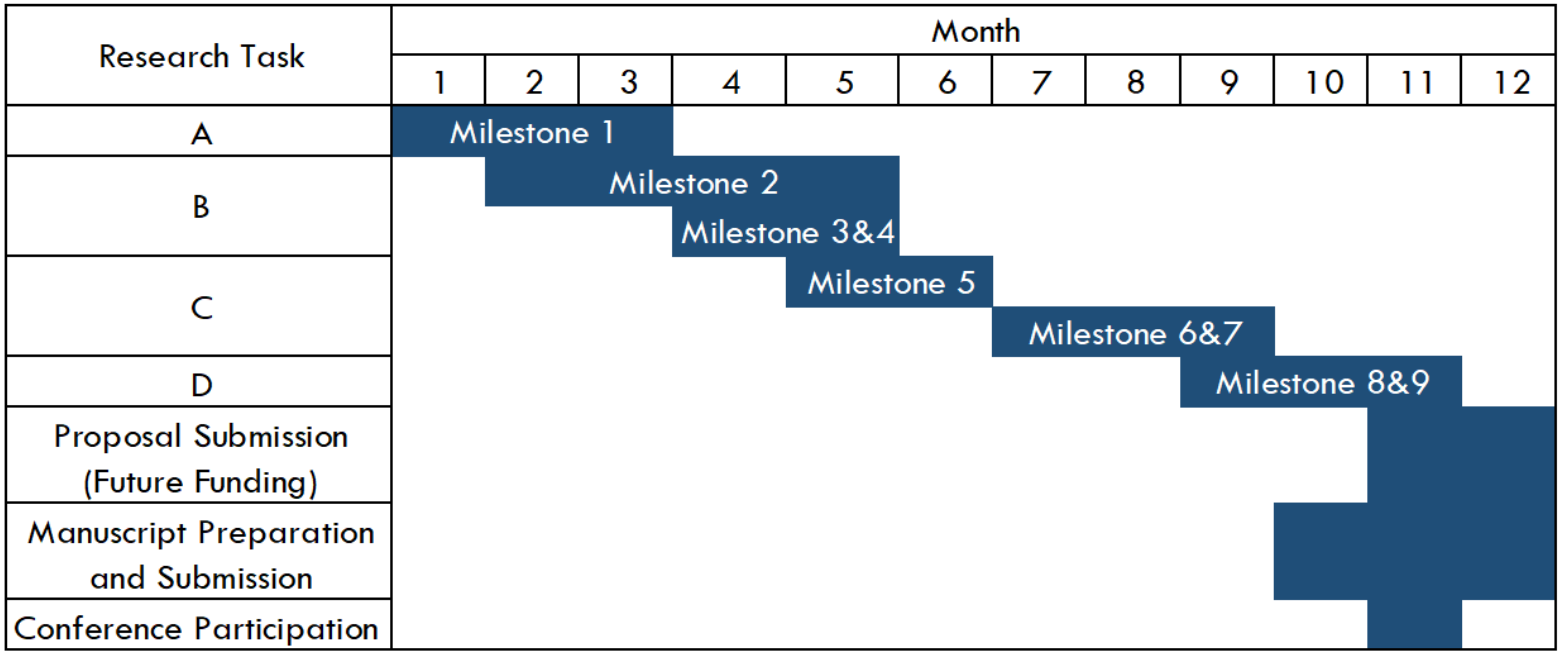
RESEARCH OBJECTIVES

Demonstrate the feasibility of using microbes to provide self-healing properties to RC structures – preventing water and chloride ingress.

APPROACH - TASKS

- **Task A:** Literature Review (Milestone 1)
- **Task B:** Isolate Microbes from Reinforced Concrete. (Milestones 2 – 4)
- **Task C:** Development & Evaluation of Concrete Mixes. (Milestones 5 – 7)
- **Task D:** Bench-Scale Self-Healing & Leaching Tests. (Milestones 8 and 9)

SCHEDULE



- Starting May 13th
- 2 students over the summer will work on *Milestones 1 - 2*

APPLICATION OF RESEARCH PRODUCT

- Results from this feasibility study will provide a first step towards the development of a new reinforced concrete design which:
  - Has a longer service life
  - Is more economical
  - Is more environmentally friendly / sustainable

- If feasible, BioConcrete can be scalable for applications to a wide range of infrastructure and buildings
- Results will be used to expand BioConcrete concept to address other durability issues in RC (e.g. corrosion)