

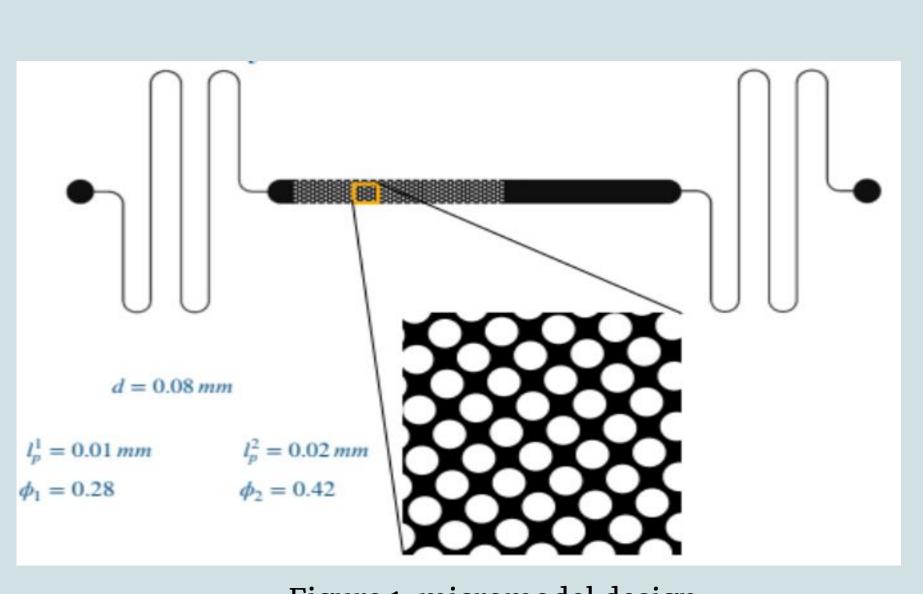
## Introduction

Freshwater Scarcity is a growing issue everywhere Regionally:

- lake levels decreasing
- salinity is increasing
- changing natural ecology/habitats

Evaluating if bacteria is capable of precipitating Struvite

- a phosphate mineral
- has the potential to be an efficient means of desalination
- based on study conducted by Dayana Arias shown that Bacillus Subtilis can partially desalinte Chilean seawater
  - utilizes biomineralization



#### Figure 1, micromodel design

#### Methods

#### Bacteria solution created

- 1mL bacteria : 4mL deionized water
- 1mL solution : 4mL salt water
- 4 different concentrations of salt, 0,2.5,5,10gNaCl Varied concentrations test halotolerance of bacteria
- Microfluidics
  - Salt solutions injected into micromodel • porosity mimicking sand

#### Results visualized by recording utilizing a Leica microscope

Dayana Arias, Grecia Villca, Antonio Pánico, Luis A. Cisternas, Ricardo I. Jeldres, Gerardo González-Benito, Mariella Rivas, Partial desalination of seawater for mining processes through a fluidized bed bioreactor filled with immobilized cells of Bacillus subtilis LN8B, Desalination, Volume 482, 2020, 114388, ISSN 0011-9164, https://doi.org/10.1016/j.desal.2020.114388. (https://www.sciencedirect.com/science/article/pii/S0011916419324233)

## **Evaluating Varying Bacterias' Capacity to desalinate water via** Precipitating Calcium, Magnesium, Phosphate, and Sodium Chloride Ions

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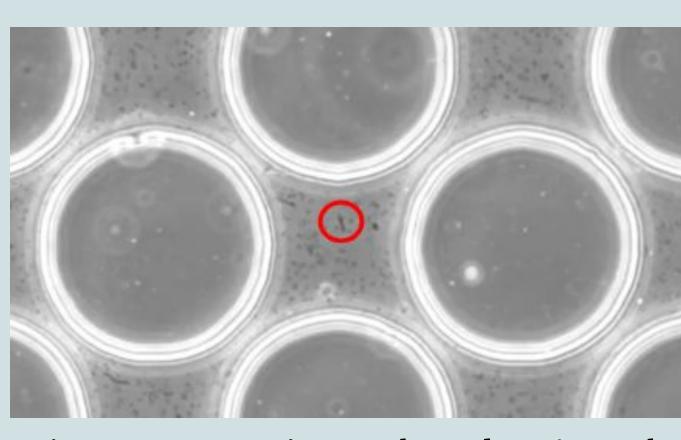
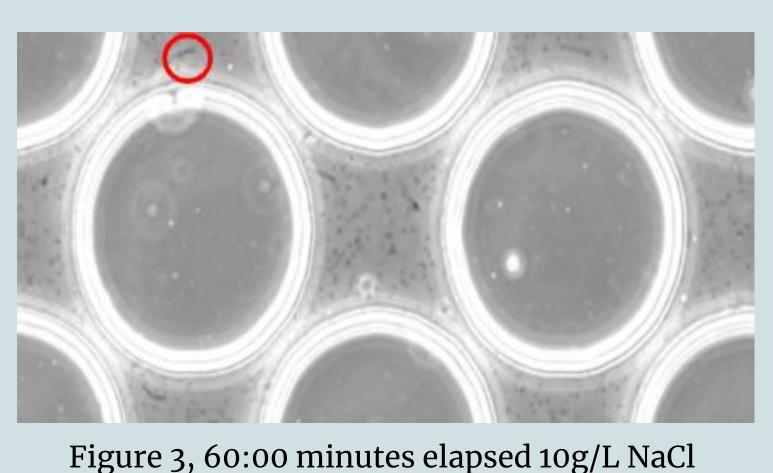
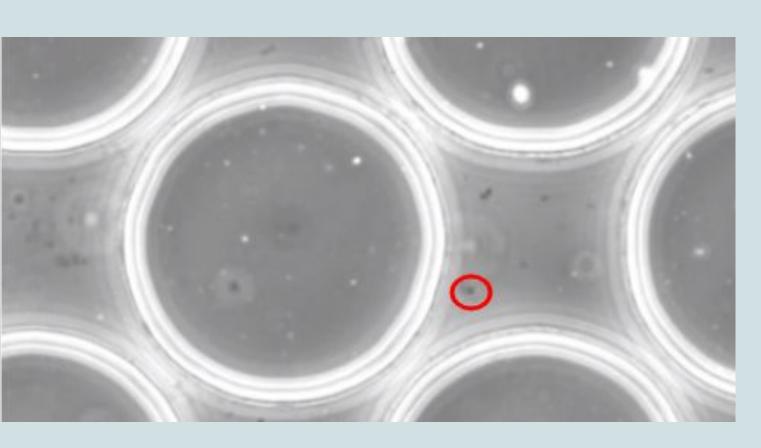


Figure 2, 45:00 minutes elasped 10g/L NaCl



## Overview

In this study, various species of bacteria are being tested to see if they can precipitate Struvite in saline water. • to evaluate if bacteria are a viable solution to increase efficiency of desalination processes • findings of study will potentially influence solution to the issue of freshwater scarcity Globally and regionally



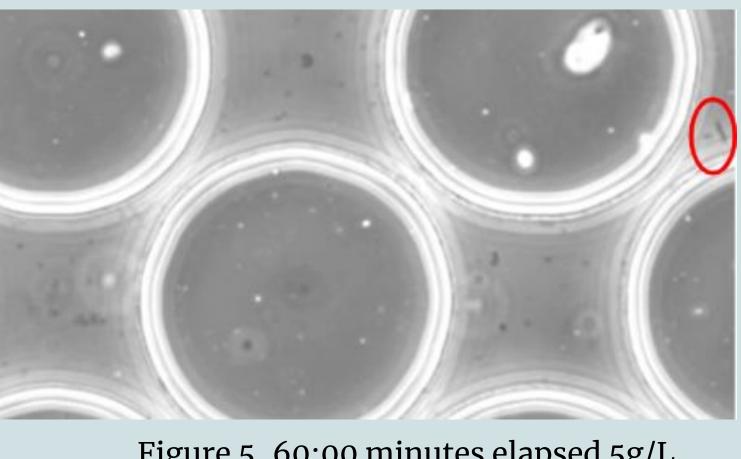


Figure 4, 45:23 minutes elasped, 5g/L NaCl







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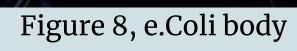


# Preliminary Results

- Visualized results for
- halotolerance of E. Coli
- the experiment
- Findings

- seawater
- Struvite







Significance of results • E.coli is halotolerant • moves freely throughout the micromodel • supports objective • if bacteria survives these conditions, it can precipitate minerals in this environment Next Steps

- magnesium and phosphates
- - minerals.

Figure 5, 60:00 minutes elapsed 5g/L

Figure 7, 60:00 minutes elapsed, 2.5g/L NaCl



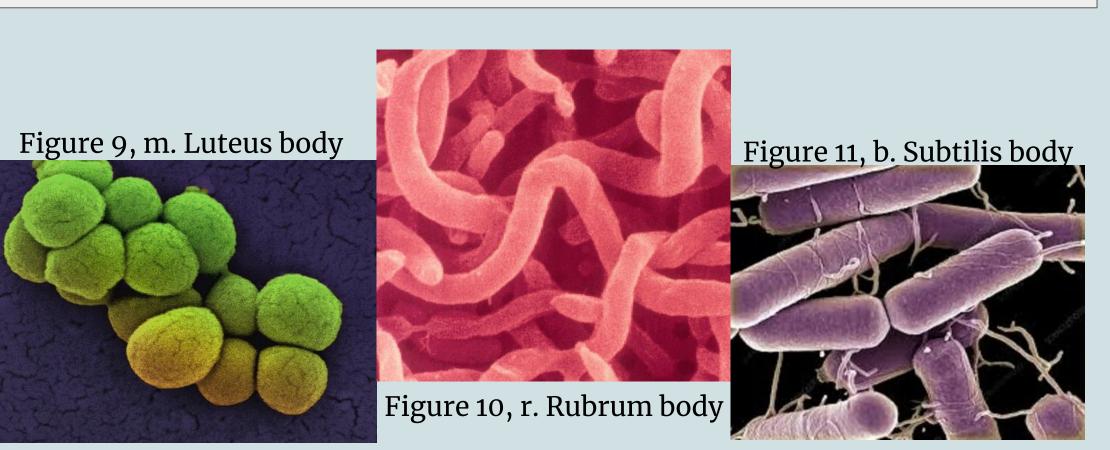
• all four concentrations of NaCl

• Figures 2 and 3 show the movement of a single bacteria through micromodel in final 15 minutes of

• shows E.Coli is capable of surviving 10g NacCl/L

• bacteria survived for full hour in each concentration • E.Coli is likely to survive in conditions replicating

• has the potential to desalinate it by precipitating



## Discussion

• other components can be added to the water • steps will be replicated utilizing 3 other bacteria • each with a different body shape • difference of body shapes is to see if there will be

change in movement and/or precipitation rates of

