

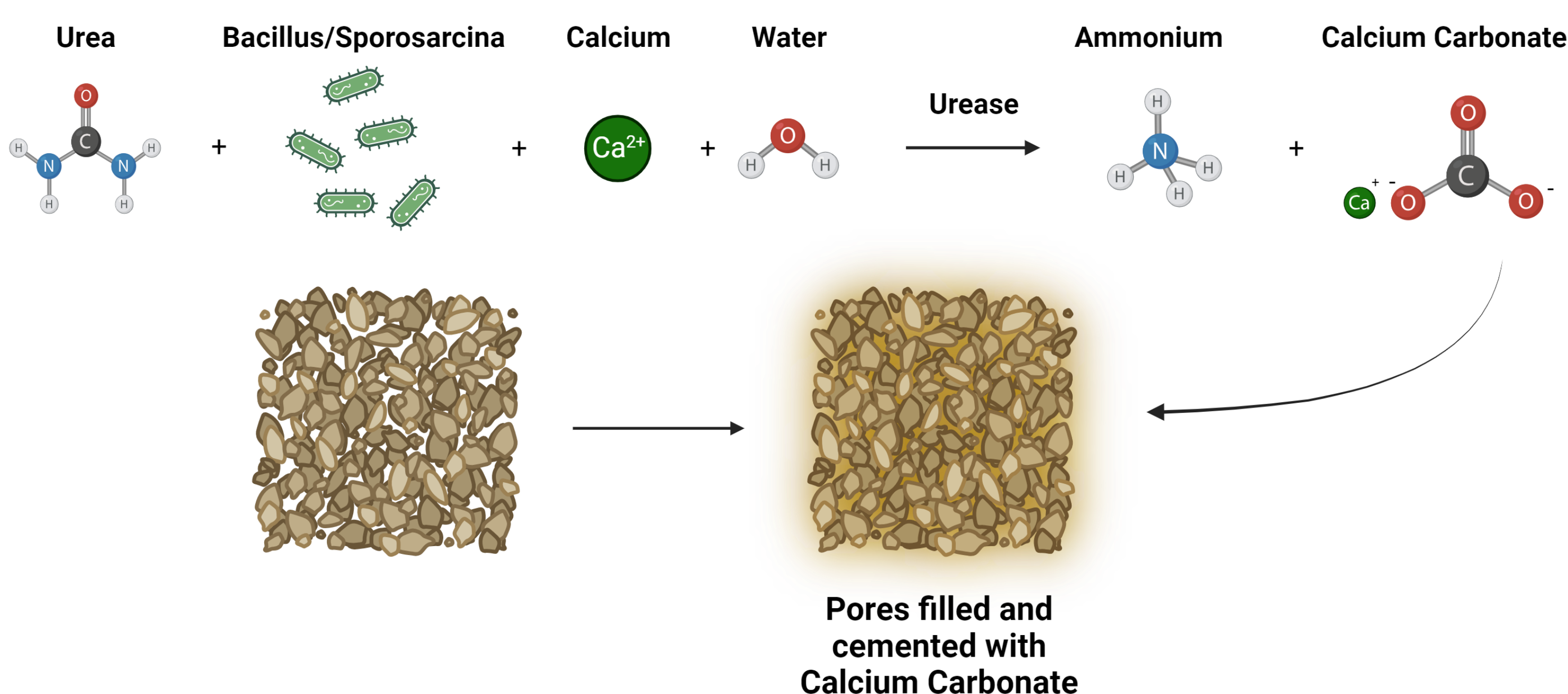
Can you build on quicksand?

- Soil aggregate stability refers to the ability of soil particles to bind together and resist breaking apart or disintegrating.



- Aggregates form through natural forces and organic substances, for example microbial by-products, cementing particles into micro- and macro-aggregates.
- MICP stands for Microbially Induced Calcite Precipitation. It is a biogeochemical process in which certain bacteria, often belonging to the genera Bacillus and Sporosarcina, are used to precipitate calcium carbonate in the presence of Calcium.

Microbial-Induced Calcite Precipitation



- It influences the engineering properties of soil, impacting factors such as compaction, shear strength, and permeability.



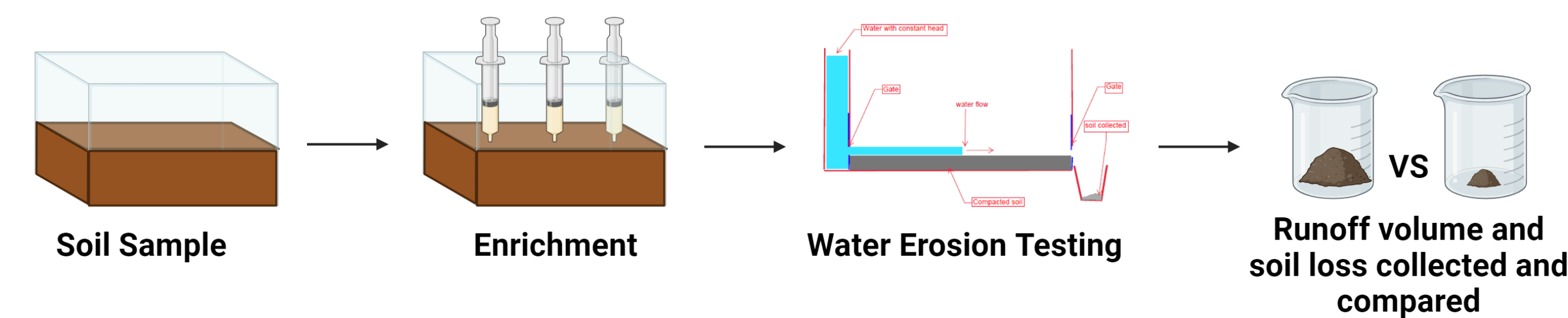
- Forest fire remediation and the stabilization of coastal soils are applications that could benefit from a novel method to increase aggregate stability. Which is why our research focused on two treatments, burned and unburned soil.



- Left to right, samples collected in the field, Oven for soil burning, our burned and unburned samples.

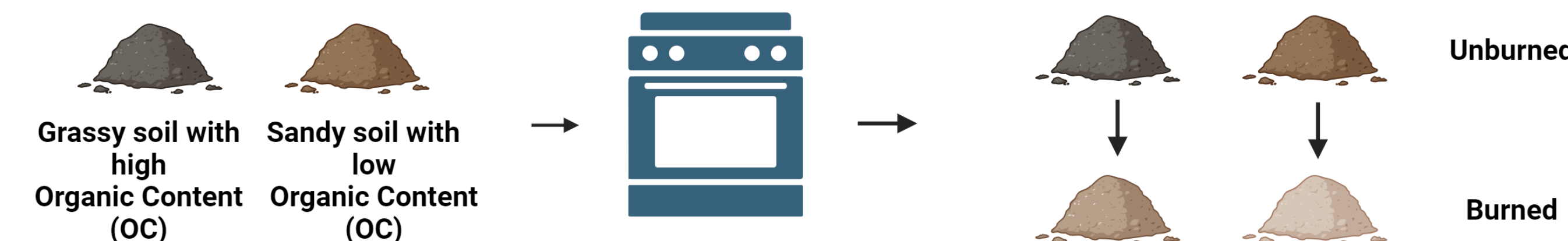
Hypothesis

- This study hypothesizes that amendment of soil with Urea will enrich the natural population of ureolytic bacteria which upon the addition of Calcium Chloride will result in the stabilization of soils.

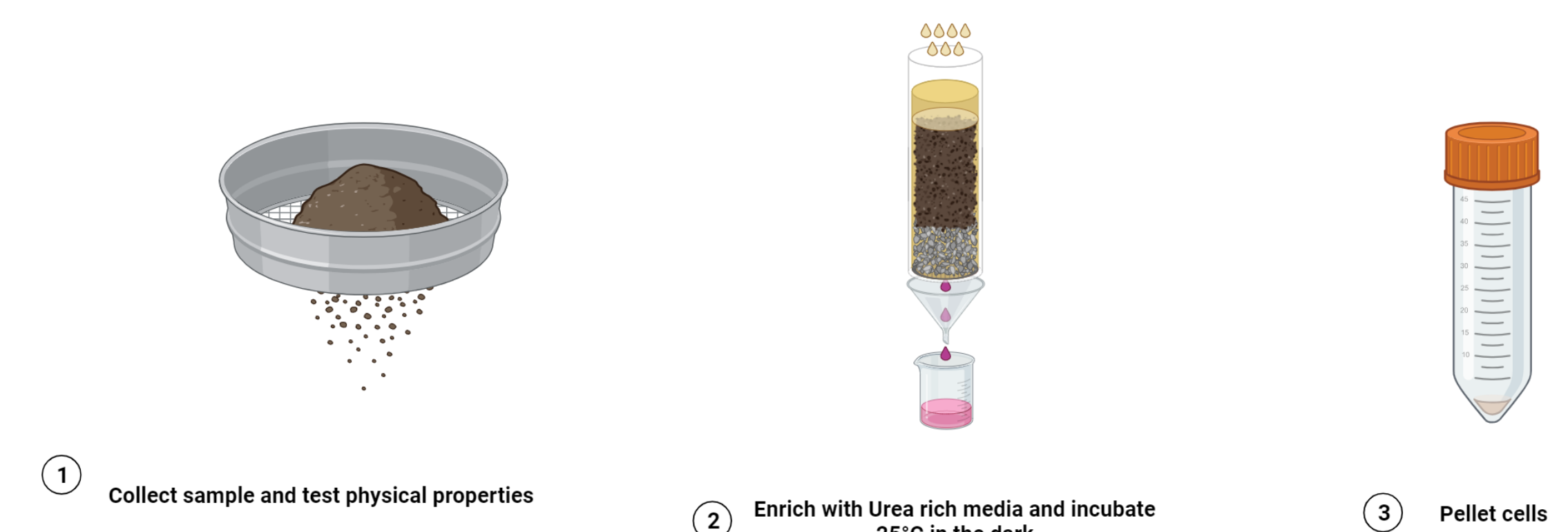


Experimental Design

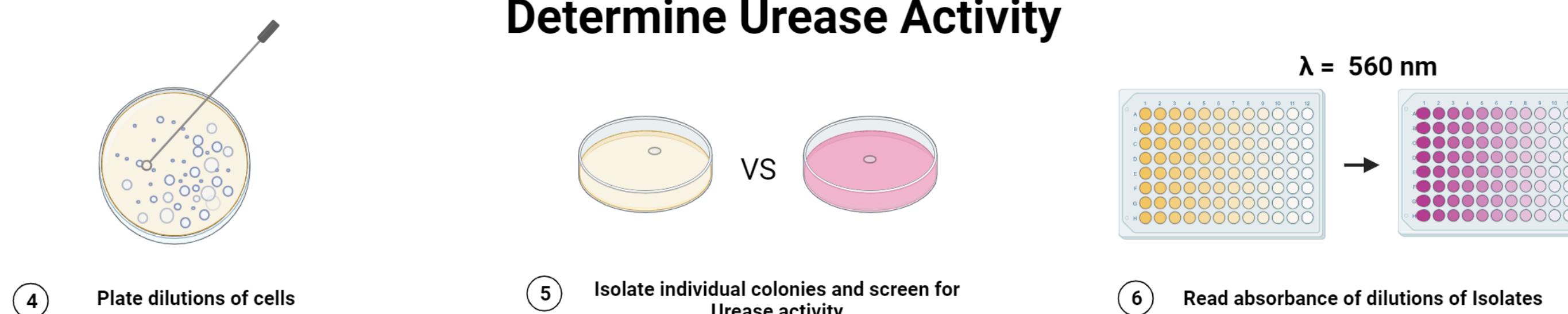
Two Treatments: Burned and Unburned



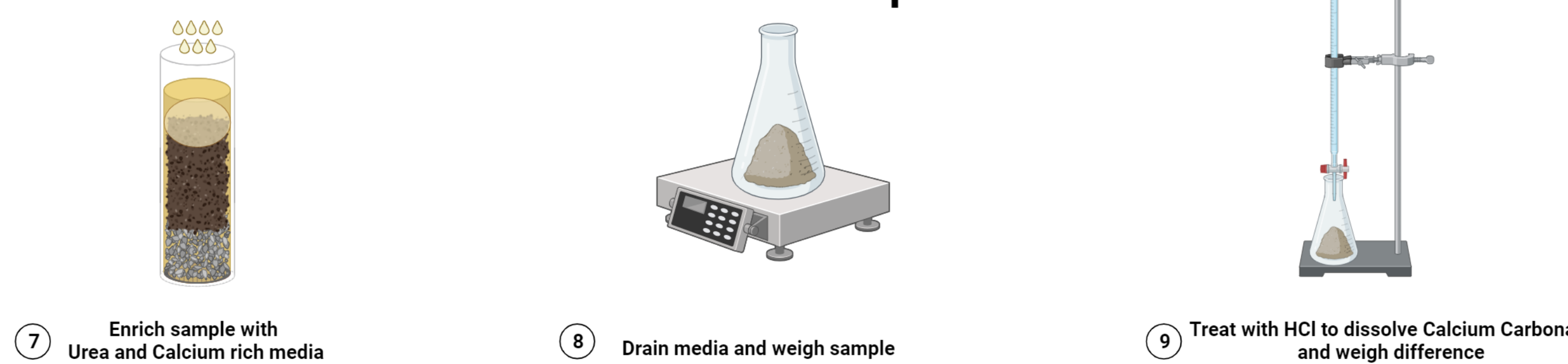
Enrich Native Population



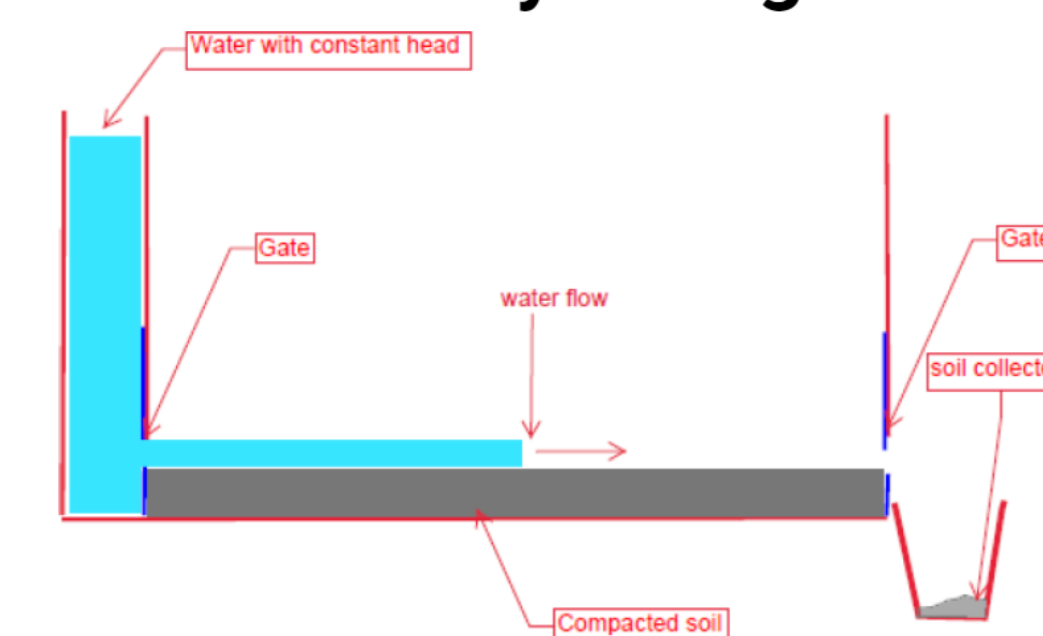
Determine Urease Activity



Quantify Calcium Carbonate Precipitation

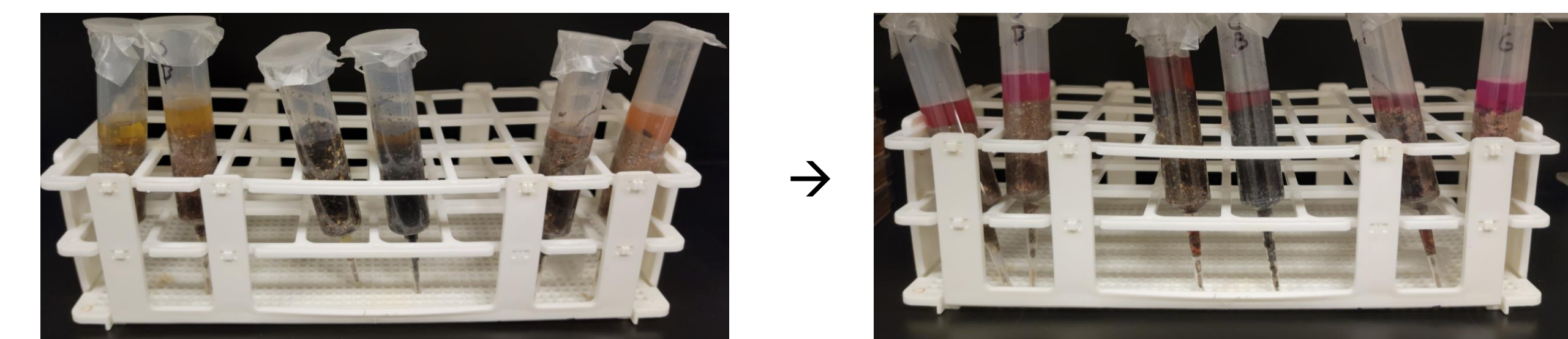


Enrich on a Macro-scale and determine aggregate stability change

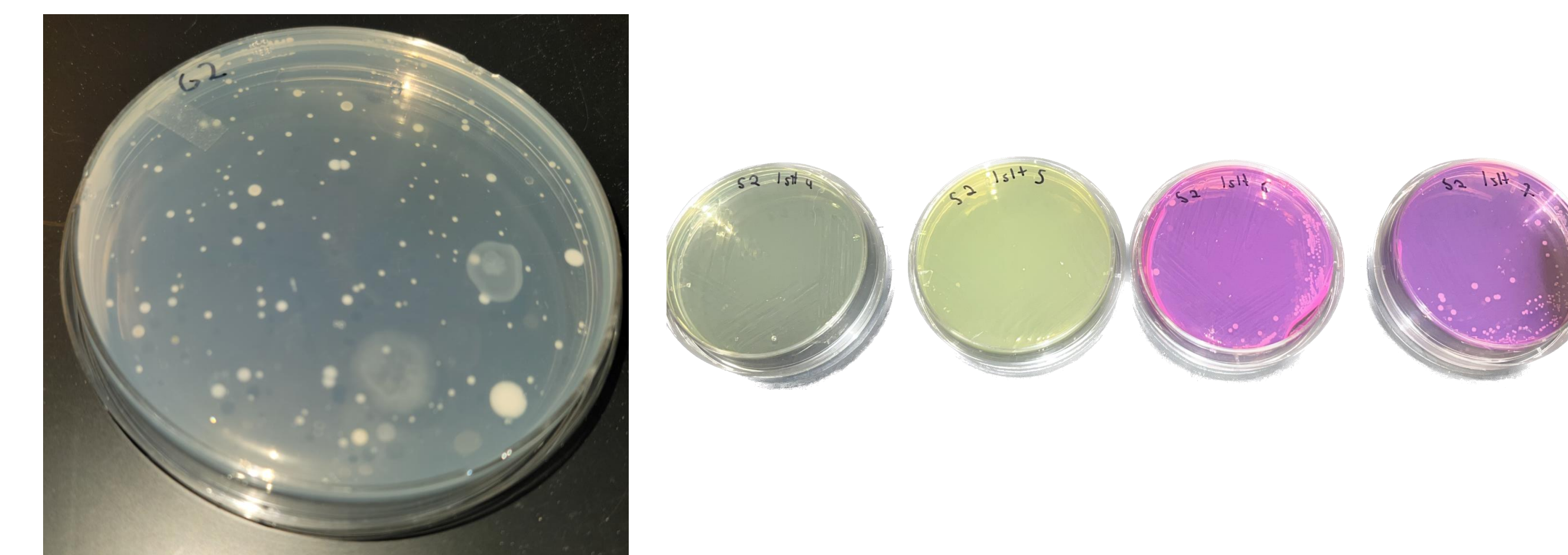


Results

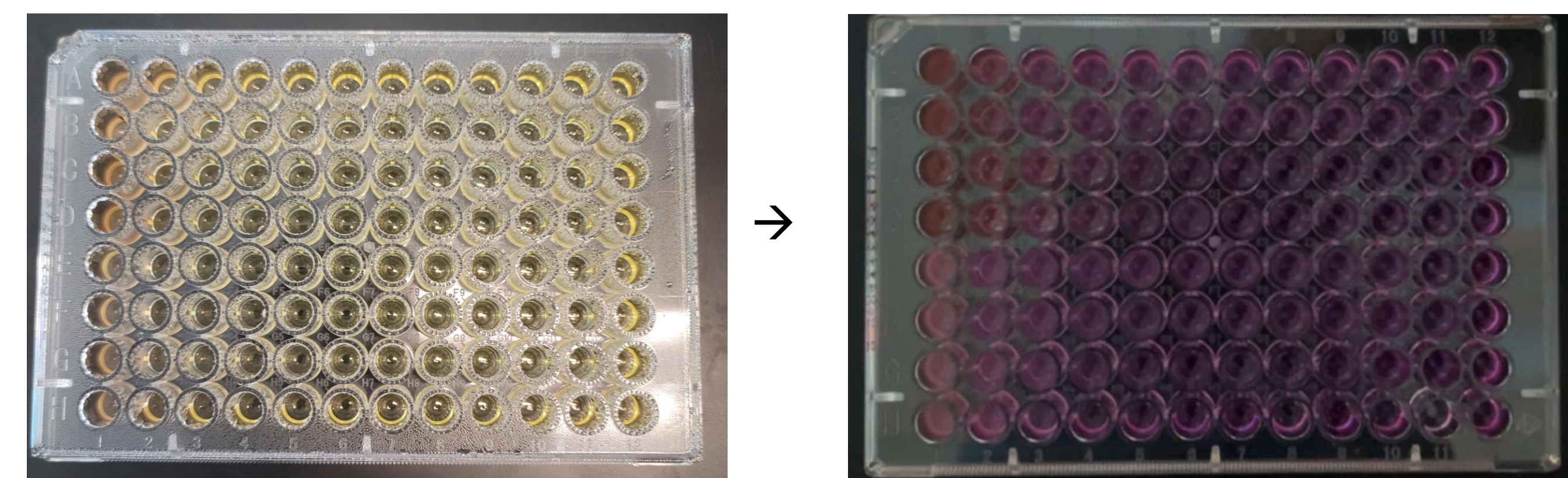
- This research is ongoing as it is funded by an Undergraduate Internal Grant.



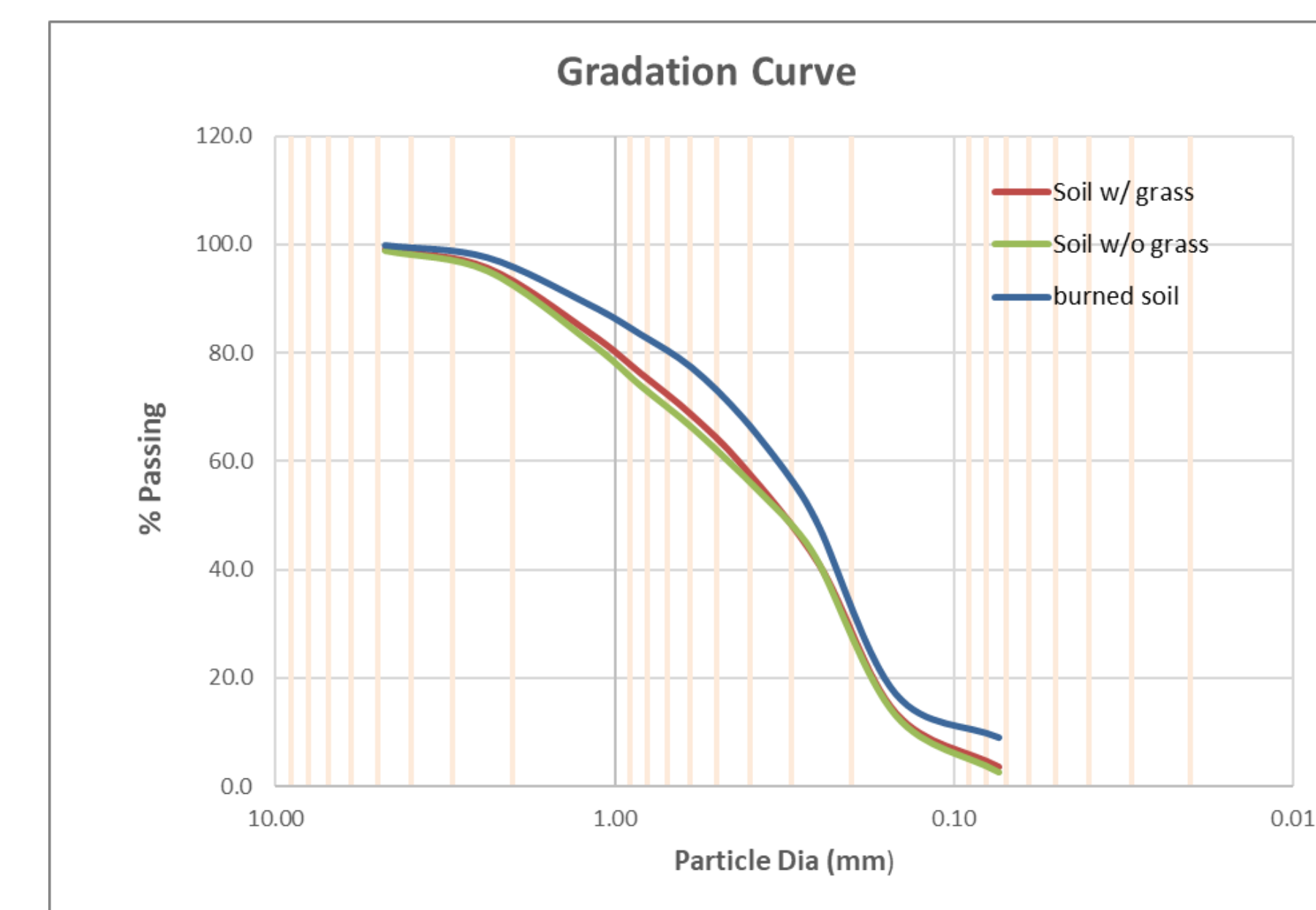
- Before and after of enriching the soil samples with urea broth.



- Plated cell dilution on the left and isolates with positive reaction on right.



- Reaction after plating soil dilutions for a Preliminary Urease Activity Assay.



- Gradation Curve of soil's sieve analysis.

Ongoing Research

- The next steps are to quantify the Urease Activity of all the isolates that tested positive. Using a gravimetric approach, we'll quantify how much calcium carbonate is being deposited in the samples. Lastly, we'll have to enrich samples on a macro-scale to test how the treatment impacts aggregate stability using a modified water flume.