Testing compounds as potential sole carbon sources of strains isolated from Hot Lake phototrophic mat

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Introduction

Hot Lake is a meromictic, epsomitic lake (Fig.1). It has a phototrophic microbial mat that reassembles every year. The mat community is subjected to large fluctuations of salinity and solar irradiance. Metabolic profiling of the mat community has detected that the most abundant carbon molecules are osmolytes such as sucrose. To date, 70 isolates have been obtained from Hot Lake. We are studying which organisms can consume these carbon sources to obtain a better understanding of how energy and element cycling is occurring naturally in the Hot Lake mat community.

Figure 1 Photograph of Hot Lake taken in July of 2013

Goal

Currently, the strains are being grown in an undefined medium (unknown quantities of ingredients) that contains yeast extract as the carbon source. Our goal is to identify compounds that can serve as sole carbon sources in order to allow us to characterize the physiology of the strains in defined media (known quantities of ingredients).

Future work

Testing which strains can utilize carbon sources known to be produced members of the Hot Lake mat community. Testing predictions made by genome sequencing and metabolic reconstruction of Hot Lake isolates.

Experimental Design

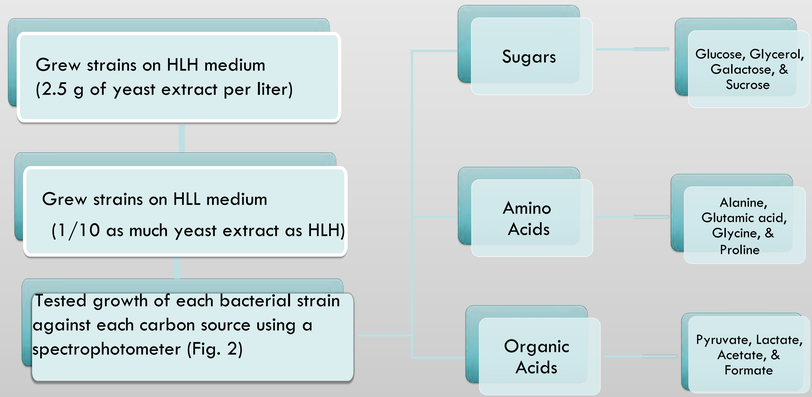

Figure 2 Example of different levels of turbidity (left to right: low, moderate, and high) after three days of growth.

A positive control (yeast extract as the carbon source) and a negative control (no carbon source) were inoculated for each strain. After three days of growth, the absorbance of each culture was measured using a spectrophotometer at a wavelength of 600 nm (Fig. 2). The negative control of each strain was used as a blank to subtract growth not attributable to each carbon source.

Results and Discussion

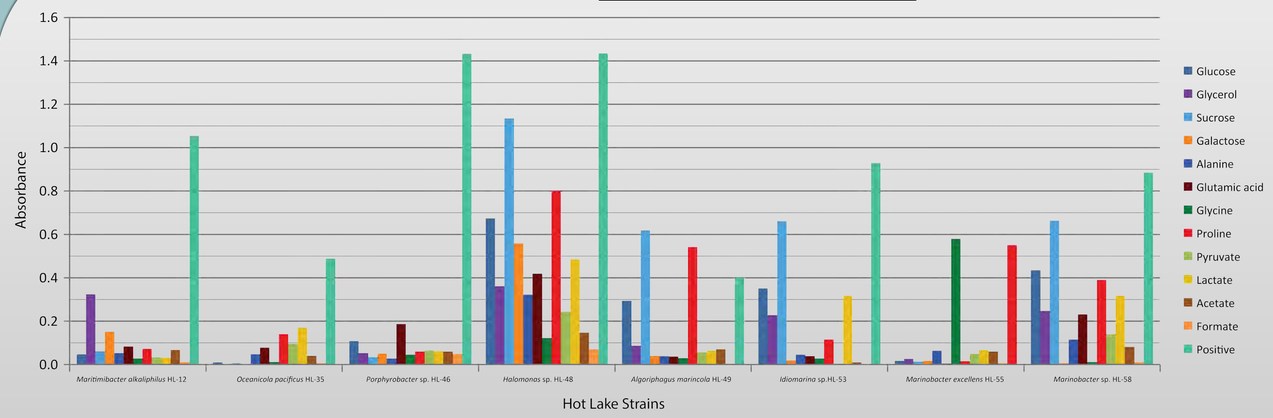

Figure 3 Graph showing the absorbance of the strains with each carbon source.

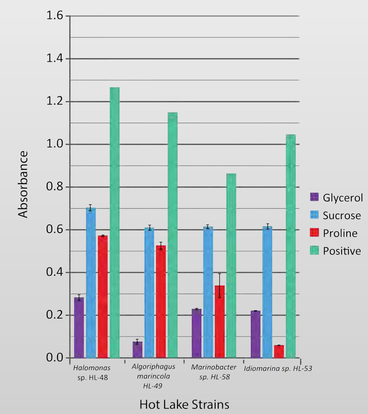

Figure 4 Graph showing the average absorbance of a subset of strains grown in triplicate with a standard deviation to demonstrate

Glucose, glycerol, sucrose, proline, and lactate were each able to be utilized as sole carbon sources by at least half of the strains (Fig. 3). To confirm these results, a subset of the strains were grown in triplicate on a subset of the carbon sources (Fig. 4). The resulting average absorbances were similar to those obtained previously (see Fig. 3). Two of the compounds tested, sucrose and proline, are known to function as intracellular organic osmolytes in bacteria. This allows for the possibility that these compounds were promoting growth by functioning not only as carbon sources, but also as compatible solutes.