mCURE Lab Presentation

Samyukta Vakkalanka
Bio Lab Report

Introduction

In this lab, we examined the effects of temperature on the specific growth rate and used this to extrapolate the oxygen consumption rate of three different strains of SAR 116 collected from the hypoxia zone in the Gulf of Mexico/Louisiana shelf.

Marine Hypoxia

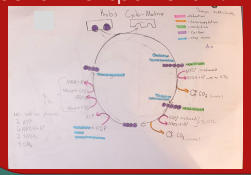
Marine hypoxia is the phenomena of the creation of oxygen depleted zones in the ocean. The bacteria studied in this lab was collected from one of these dead zones.

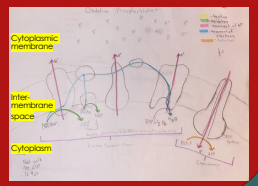
Causes

Marine hypoxia can be linked to seasonal cycles of fluctuations in the amount of dissolved oxygen in the water. The most notable cause, however, is eutrophication. This is when there is runoff of plant fertilizer (containing nitrogen and phosphorus) from rivers that results in overgrown phytoplankton blooms that sink to the bottom of the ocean before being eaten.

Cellular Respiration

Many organisms (Including the bacteria studied in this experiment) need oxygen to survive. They use O_2 to make energy through cellular respiration in the electron transport chain.





Redox Tower

The combination of O_2 and glucose works well for cellular respiration because there is a large enough energy difference in reduction potential, the driving factor of the different phases of energy production. However, in the absence of oxygen, such as in a hypoxia zone, other molecules may be used (if there is a big enough difference in potential energy).

Temperature

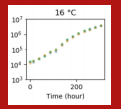
Over the past centuries, the global temperatures have been rising. The ocean temperature in particular has had significant increases. By studying the effects of temperature on microbes living in the ocean (a group which makes up the majority of marine biomass), scientists can predict the effects of different temperatures on organism's ability to survive. In addition, knowing the optimal temperature for growth provides ease for future experiments.

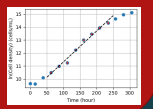
The Experiment - Method

To accomplish the purpose of this experiment (to determine the optimal temperature of three different strains of SAR 116 and to predict the oxygen concentration graph based on consumption rates), the specific growth rate had to be found first. This was accomplished by dilution to extinction using artificial seawater that contained exact amounts of salts, vitamins, and metals.

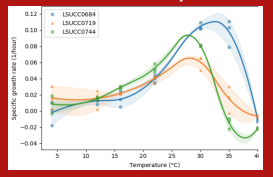
The Experiment - Calculations

To calculate the specific growth rate, first the growth curve had to be found. Flow cytometry was used to graph cell density over time. The exponential phase of the curve is then isolated. If the cell density undergoes a natural log transform, the slope of the linear regression of the exponential phase is the specific growth rate.

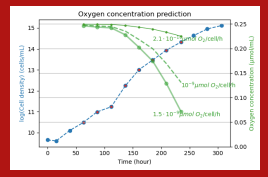




The Experiment - Results



Graph of the temperature vs. specific growth rate of the different trials



Oxygen concentration prediction at various consumption rates

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