



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

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Project Title
Desalination: Can It Affect the Ocean's Carbon Dioxide Holding Capacity?

Abstract

Objectives/Goals
The purpose of my experiment is to determine whether or not the wastewater from desalination plants affects the ocean's ability to absorb CO₂ when released back into the ocean. This brine is 2x as saline as ocean water. The World's oceans are an important sink for CO₂, and increased desalination could have a big impact on Global Warming if it limits the amount of CO₂ that can be absorbed by the ocean.

Methods/Materials
I used a Soda-Stream to carbonate data sets of water: with no aquarium salt (Control), the average salt concentration of the ocean (A), 1.5x this value (B), and 2x this value (C). I used a Vernier PH probe and a KH kit to test each data set once before carbonation; after adding CO₂ I tested all 15 samples per set. Using an online PH, KH and CO₂ algorithm, I calculated CO₂ absorption. I then compared the results.

Results
I found that the more salt added to a solution, the more CO₂ it absorbs, but only up to a certain concentration. Set #B# showed an unanticipated peak at which the most CO₂ was absorbed. At the highest concentrations, however, less CO₂ is absorbed. In #C#, the salt concentration of desalination #waste water# absorbed about 619.927 less CO₂ in ppm than the simulated ocean water #A#.

Conclusions/Discussion
Repeated tests show that simulated desalination brine absorbs much less CO₂ in ppm than simulated ocean water. The results partially contradict my hypothesis, as I did not foresee the spike in set #B#. However, set #C# did absorb less CO₂ than #A#, which I did predict. If brine continues to be pumped into the ocean, over time less CO₂ will be absorbed, and will thus stay in our atmosphere. This expands my knowledge about Chemistry because I learned a lot about PH, KH, and how it can be applied to current issues.

Summary Statement
I showed that increasing the salinity of the oceans through returning desalination brine to them negatively impacts the ocean's ability to absorb Carbon Dioxide.

Help Received
I designed the project, tested all samples, and wrote it by myself. I received help from Healdsburg High School teacher Mr. Lee, who let me borrow the Vernier Lab Pro and PH probe, my science teacher Ms. Smith, who let me borrow the triple beam balance, and my father, who helped me measure out 500 ml of