



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Jenna K. Schurr	Project Number S2212
Project Title What Is the Effect of Ocean pH on the Fertilization Rate of Purple Sea Urchins (<i>Strongylocentrotus purpuratus</i>) Eggs?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to see if falling ocean pH levels would have an adverse effect on the fertilization rate of the purple sea urchin species <i>Strongylocentrotus purpuratus</i>.</p> <p>Methods/Materials Sea urchin gametes were collected after inducing spawning by injecting a 0.5 M solution of potassium chloride. Eggs were soaked in filtered seawater of pHs 7.6, 7.8, 8.0, and 8.2 (control). Eggs and sperm were then mixed on a slide with grid lines and observed under a compound light microscope. Two squares per slide were randomly selected, and the number of fertilized eggs divided by the number of total eggs in the square was recorded as the percent fertilization. Six different pairs of sea urchins were used. Per pair, each pH was tested three times.</p> <p>Results The lowest average percent fertilization was 50.52% for pH 7.6. The average percent fertilization was 65.83% and 64.84% for pH 7.8 and 8.0 respectively. The highest average percent fertilization was 76.20% for pH 8.2. Although the lowest fertilization rate was for the lowest pH and the highest fertilization rate was for the highest pH of 8.2, which corresponds to the average pH of seawater, the ANOVA p-value for this data was 0.310. This p-value indicates that the differences between the fertilization averages are not statistically significant. For each pH level, the standard deviation was greater than 16.71 and as high as 27.33 (7.6 pH).</p> <p>Conclusions/Discussion Because the results did not show that the change in pH has a statistically significant impact on the fertilization rate, the <i>S. purpuratus</i> gametes may just be more pH resistant than the <i>H. erythrogramma</i> gametes. As seen from the large standard deviation values, the percent fertilization varied greatly among the parent pairs tested. In particular, at the pH level of 7.6, the average fertilization rate was 50.52% with a standard deviation of +/- 27.33%, suggesting that the purple sea urchin parents may be influencing the gametes' resistance to pH differences. Also, while significant differences were not observed in the fertilization rates, effects of the pH was seen on the fertilization membranes. The lower the pH, often the more deformed the membrane appeared to be. The next steps in this research project would be to investigate the effects of even lower pH on the fertilization rates, the eggs and membranes themselves, and the development of the larvae.</p>	
Summary Statement This investigation of pH on the fertilization rates of purple sea urchins produced statistically inconclusive results; however, there may be an effect on the development of the fertilization membrane.	
Help Received Used materials and lab equipment provided by Cabrillo Marine Aquatic Nursery under the supervision of Dr. Kiersten Darrow and Mr. Andres Carrillo. Assistance with the statistical analysis provided by Mr. Andres Carrillo. Photographic assistance provided by Cabrillo Staff.	