Reliability and Efficiency of 3D Printed Microfluidic Devices when Used in Ocean Acidification Testing

Saleh, Ibrahim (School: Greely High School)

Microfluidics is a technology that operates with fluids in sets of miniature channels. Using small samples allows for reduced cost, harmful waste, reaction time, and analysis time. Microfluidics can eliminate large lab setups and high-cost equipment when diagnosing disease (Cheriyedath, 2016). 3D printing is becoming more widely used as a method to fabricate microfluidic devices because it is more efficient. Microfluidic research allows low-income countries, who do not have access to sufficient laboratory facilities, to test for diseases (Weibel and Whitesides, 2013). While previous studies focus on decreasing the cost of microfluidic devices, the goal of this research was to engineer microfluidic devices using CAD software and 3D printing, then test reliability and efficiency. Multiple models were compared and evaluated to test transparency and resolution. Results with two millimeter diameter channels were optimal due to the 3D printer's restrictions. Yellow was found to be the most transparent filament when put against other colors. Microfluidic devices were then adapted for use in ocean acidification testing. Nitrogen pollution in the ocean causes large algal blooms to form. When these blooms decay, carbon dioxide is released. Ocean acidification occurs when carbon dioxide is absorbed by the ocean, causing it to become more acidic (Friends of Casco Bay, 2017). A microfluidic device was created to test for pH. The pH of vinegar and ocean water was tested using Universal Indicator in a basic 3D printed microfluidic device.