Something in the Water: Creating an Origami Microfluidic Device for Developing Communities

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Arsenic contamination of drinking water is a worldwide problem. It is recognized that at least 140 million people in 50 countries have been drinking water containing arsenic at levels above the WHO guideline, 10 microgram/L. Current methods are dangerous, expensive, and require trained professionals for operation. 6 - 11 million more tube wells still need to be tested. I created a paper device to test for arsenic that can be folded into varying shapes, creating 3D paper microfluidic channels. Liquids wick through the paper by capillary action, while carrying and mixing reagents. I evaluated various channel widths, waxes, papers, and fabrication processes. Soy mixed with oil based wax, coupled with photo emulsion resulted in a portable, microfluidic test chip. Using a cell phone I quantified the exact color of the reagent mixtures on the paper. Then I mapped the RGB values to a XYZ graph. I compared the distance between the control and my chip test using the pythagorean and theorem. If the chip result was the same as the control the distance would be 0. The distance result was 0.006, which is not a significant difference. The origami test was able to analyze tap water for arsenic at 10 microgram/L and accurately quantified 16 elements in water.

Awards Won:

Second Award of $2,000