The Effect of Nanotechnology on Purifying Water Supply in the Developing World

Berry, Patrick (School: James Madison High School)
Baharmast, Matthew (School: James Madison High School)

The purpose of our experiment was to devise an effective yet cost-efficient means of killing microorganisms in drinking water. We created a self-sufficient attachment to Hippo Roller pushable water drums used for transporting water in the developing world. Our device was composed of a durable stainless-steel screen coated with carbon nanotubes and silver nanoparticles, costing under $12. Our device was then secured to the radius of the drum to filter water as the drum was pushed. Nanomaterials kill water-borne organisms through two main processes. Firstly, the carbon structure possess sharp, rigid edges at the microscopic level. Contact with these sharp edges by a microorganism results in the rupturing of its cell membrane, essentially causing the organism to bleed out. In addition, a combination of carbon and silver nanoparticles placed side by side creates an electromagnetic reaction disrupting the exchange of ions and inducing pathways for cellular death. The goal of our project was not only to discover the effectiveness of nanoparticles in our invention, but to do so with materials that could be easily applied in developing countries at a low cost. With our novel utilization of nanoparticles on a mesh in a barrel chamber, we tested the distance pushed on number of protists alive and dead. Through experimentation, we determined that there is a strong positive correlation between the distance traveled with our mechanism and the percentage of protists killed. At a distance of .25 miles, all protists were neutralized creating safe drinking water. Our extension to the Hippo Roller is practical for water sanitation use around the world

Awards Won:
Fourth Award of $500
U.S. Agency for International Development: USAID Science for Development Third Place Award of $2,000.
West Virginia University: Renewable Tuition Scholarship Awards
Arizona State University: Arizona State University Intel ISEF Scholarship