Student's six-foot water and solar-powered lens purifies polluted water

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Deshawn Henry working on the water lens that can heat a liter of water to between 130 and 150 degrees Fahrenheit in a little more than an hour, destroying 99.9 percent of bacteria and pathogens.

(Phys.org) —Water may appear to be an abundant resource, but in some parts of the world clean water is hard to come by.

That could change through the work of Deshawn Henry, a University at Buffalo sophomore civil engineering major, who researched how to improve a 6-foot-tall, self-sustaining magnifying glass.

Properly termed a water lens, the device uses another abundant resource—sunlight—to heat and disinfect polluted water. Since the frame for the lens can be constructed from commonly found materials—wood, plastic sheeting and water—the lens can be built for almost no cost, offering an inexpensive method to treat water.

The device may not look like much, but it can heat a liter of water to between 130 and 150 degrees Fahrenheit in a little more than an hour, destroying 99.9 percent of bacteria and pathogens.

"The water lens could have a huge impact in developing countries," says Henry, a Queens' native who performed the study under James Jensen, professor in the Department of Civil, Structural and Environmental Engineering.

"Millions of people die every year from diseases and pathogens found in unclean water, and they can't help it because that's all they have. Either they drink it or they die."

The lens consists of a plastic sheet covered with water supported by a wooden frame. The frame holds a small container of water below the lens in line with a focal point created from a concentrated ray of sunlight. Barring the weather, once assembled, the lens functions freely. Due to the sun's movement throughout the day, Henry needs to repeatedly shift the container to match the focal point.

Henry's research tested how altering the thickness of the plastic sheet and the volume of water over the sheet affected the efficiency of the lens. The device was tested with plastic sheets that were 0.7, 1 and 2 millimeters thick, and water volumes of four, six and eight liters.

The study found that adding more water to the lens improved efficiency, as larger areas of water transmitted more energy from sunlight.

However, thicker plastic sheets consumed more energy from light, lowering the lens' efficiency.

A plastic sheet that was too thin or excessive amounts of water could break the lens. Henry concluded that the 0.7-millimeter sheet could efficiently heat the container while supporting eight liters of water, but any more and the sheet could potentially break.

With 1.1 billion people lacking access to clean drinking water, Henry's work could make a difference in the world, says Jensen, who frequently mentors undergraduate students during summer research programs.

Henry studied under Jensen through the UB Louis Stokes Alliance for Minority Participation (LSAMP) program, which connects underrepresented students with research opportunities in STEM fields. LSAMP is one of many programs in the Office of Undergraduate Education focused on increasing experiential-learning opportunities for students.

"I have seen how intense research activities can inspire UB students and educate the next generation of innovators," says Jensen. "Deshawn's work would allow a family in sunny regions to treat drinking water without having to expend energy or rely on imported technologies."

Building a larger water lens that remains efficient is the next step in Henry's research. A family of five would need a lens at least three times the size of the device he constructed, which was designed to heat one liter of water at a time, says Henry.

Provided by University at Buffalo

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