Sunlight and air powers access to sterile water

May 4 2012

Researchers at the University of Hull (UK) are developing a way to produce constant supplies of sterile water, powered simply by sunlight and air. The device is aimed at remote communities where conventional systems using chemicals or electricity are not a viable option.

The research – funded by the Sir Halley Stewart Trust – will make use of molecules which, in response to sunlight, produce a form of oxygen that is highly toxic. Lead researcher from Hull's Department of Chemistry, Dr Ross Boyle, originally developed these molecules to attack cancer cells, but has spotted a new application for their use in the developing world.

"We know from earlier work that the same technique which works on cancer cells will destroy many species of bacteria including MRSA and E. Coli," says Dr Boyle. "It can also knock out at least one common parasite. And a major advantage is that it doesn't create resistance in micro-organisms."

The molecules – known as porphyrins – will be attached to small glass beads, which are packed inside a transparent tube. As water flows through the tube in natural light, the porphyrins on the beads react to create the toxic form of oxygen, killing the bacteria and parasites in the water to render it sterile. Dr Boyle already knows how to fix his molecules to a glass surface, so is confident that production of the beads will be straightforward.

"The device needs to be very simple, low-cost and easy to transport in order to be a realistic and practical option for remote rural communities," says Dr Boyle. "No special materials beyond the glass beads will be needed; an up-turned plastic drinking bottle may even be enough to hold them. The beads won't need refrigeration or special storage conditions, and will keep indefinitely if stored in the dark."

The system will also have no by-products, other than the used glass beads, as the toxic form of oxygen converts back to normal oxygen spontaneously and rapidly if it does not react with the microorganisms. The beads will have a set lifespan, but once spent can be recycled as ordinary glass or can be taken away to be recoated with the light-sensitive molecules for re-use.

Sterile water is vital for communities with limited access to healthcare services, to help wounds and sores heal effectively. It is usually made using chemicals such as hydrogen peroxide or chlorine – which are toxic and heavy to transport – or ultra-violet, which requires electricity. Other systems, such as filtration, tend to have limited use as filters clog with other particles present in the water.

Because Dr Boyle's device brings together existing technologies, he hopes to have a basic system up and running in his laboratory within a few months. He will then need to optimise the device under controlled laboratory conditions using cultured bacteria, to determine how fast the water should flow through the device and how long the lifetime of the beads will be.

Once he has a working prototype, this will go into trials in South Africa to ensure the final design is effective in the field.

Provided by University of Hull