By Christine W. Sindt, O.D., F.A.A.O.

The Next Step in Disinfection

Will ozone be the next improvement in contact lens care?

Over the past few years, there has been considerable concern about contact lens disinfection. Biofilms and resistant pathogens are responsible for numerous reports of microbial keratitis but are difficult for chemical systems to consistently eliminate. The ideal contact lens disinfection system is potent yet gentle to the eye, as well as fast and easy to use—which brings us to the discussion of this month's topic: ozone.

How It Works

Ozone, or activated oxygen, is a form of oxygen with three atoms (O_3) per molecule, rather than two (O_2). It disinfects through lysing and oxidative disruption of cell membranes.[1] Essentially, ozone causes irreversible damage to the fatty acids in cell membranes, proteins and DNA. Disinfection rate depends on concentration, temperature, pH and the organisms present.

For over a century, the disinfection power of ozone has been known. Currently, ozone is used with the help of portable ozone-generating machines in numerous water treatment facilities, air purification systems and health care facilities to decontaminate tools and surfaces. And now, ozone is available to disinfect contact lenses.

Ozone for Contact Lenses

The QuickPure device (Alab, LLC) makes ozone by treating oxygen in the air with an electrical corona. The corona breaks some of the oxygen molecules apart into oxygen atoms, which then combine with a free oxygen molecule to form triatomic oxygen, or ozone. Excess ozone is changed back to ordinary oxygen by passage through a catalyst before it is released to the atmosphere; therefore, it is environmentally safe.

To purify water and wet surfaces, it is necessary to dissolve ozone in the water. Although it is much more soluble in water than diatomic oxygen, it is still difficult, on a small scale, to achieve a concentration of dissolved ozone to be effective.

The QuickPure system solves this problem by using a patented diffuser to reduce the size of the ozone-containing bubbles by 80%.[1] Through this method, ozone can be dissolved about five times faster than standard size ozone bubbles. Once sufficient ozone is dissolved, it is necessary to have a long enough contact time for the ozone to destroy all the pathogens and biofilms present; the higher the ozone concentration, the shorter the disinfection time. Because the QuickPure ozone generator produces higher ozone concentrations (15,000ppm) at a much lower voltage than conventional small ozone generators, this lightweight, low-cost appliance takes only around three minutes to disinfect a contact lens.

The U.S. Environmental Protection Agency (EPA) has established values for what is called the concentration time (CT) factor, which research and experience have shown to kill the most resistant germs. Ozone concentration is measured in parts per million, and contact time is measured in minutes. QuickPure technology can substantially exceed the EPA CT factors. While the product is not currently approved for use, the manufacturer hopes to perform all the necessary tests and analyses to gain regulatory acceptance. RCCL

1. Communication with the manufacturer. (March 19, 2009).

For further information about this ozone disinfecting technology, visit www.quickpure.com.

Courtesy: W. Alan Burris, Ph.D., Alab, LLC

The Quickpure Ozone system disinfects contact lenses in approximately three minutes.