What Does Activated Oxygen, by way of Ozonation, Do?

The Disinfecting power of Ozone: Ozone kills germs that cause decay[4].

Bacteria

When a high enough concentration of residual ozone (ozone that is not instantly reacting with substances in the environment) comes in contact with bacteria, the ozone reacts. Kinetic energy is released, and the single "activated" atom of oxygen is liberated, destroying the cell wall of the bacteria. Once the cell wall is ruptured, the cytoplasm is dispersed, and thus it is impossible for the bacteria to reactivate. This is a process known as cell lysing.

Due to the fact that the ozone does not need to penetrate the cell wall, activated oxygen kills pathogens 3,125 times faster than chlorine, and without any chemical toxic residue left behind by the ozone.

How much ozone is needed for disinfection? Ozone's kill rate is proportional to its residual concentration. In one study, at 500 to 600 micrograms of ozone per m3 for one hour, 99% reduction in all bacterial species was observed [5]

The above studies were done by testing ozone against air-borne bacteria. In fact, ozone kills bacteria 6,000 times faster than chlorine, when used in water.

Virii

Ozone eliminates viruses in a similiar manner as bacteria. Ozone breaks apart lipid molecules at sites of multiple bond configurations. Once the lipid envelope of the virus is fragmented, its DNA or RNA core cannot survive.

With non-enveloped viruses, also called "naked viruses", ozone reacts with the amino acids and capsid proteins, forming protein hydroxides and protein hydroperoxides.

Viruses have no defense against oxidative stress.

Fungi

While fungus is more resistant to ozone than bacteria and viruses, ozone still gets the job done. Fungus inhibited and destroyed by ozone include: Candida, Aspergilus, Histoplasma, Actinomycoses, and Cryptococcus. The presence of many disulfide bonds had been noted in these types of virii, making this a possible site for oxidative inactivation by ozone.

The Cleansing Power of Ozone:
Activated Oxygen Oxidizes and Decomposes Matter

Ozone oxidizes and/or ionizes many forms of matter. The great benefit of this process, considering practical applications, is ozone's ability to alter, decompose and/or neutralize materials that are toxic, without creating additional toxic compounds from the use of ozone (as is the case when using chemical compounds).

Ozone will oxidize metals (except gold, platinum, and iridium) to oxides of the metals in their highest oxidation state:

$2\ Cu^{2+} + 2\ H+ + O_3 \text{---> } 2\ Cu^{3+} + H_2O + O_2$

In many cases, these oxidized metals are far easier to remove from any environment than when in their elemental form... Especially when **methods of sorption** are used in the removal process![6]

Ozone transforms oxides into peroxides:

$SO_2 + O_3 \text{---> } SO_3 + O2$

Ozone will convert cyanides into cyanates (which are one thousand times less toxic):

$CN- + O_3 \text{---> } CNO- + O_2$

Activated Oxygen Removes Pesticides and Antibiotics from foods[7]

Safe concentrations of ozone, when used by bubbling ozone gas through water, can actually decontaminate fruits and vegetables. Not only has research shown that many of the most dangerous pesticides can be removed via ozonation, but this process can extend the shelf life of foods by greatly reducing bacterial counts in the produce.

Furthermore, the same research has demonstrated that antibiotics in meats can also be removed via ozonation. Utilizing ozonation with food prior to consumption results in a great reduction of the toxic chemical load that is present in modern produce and meats.

Bibliography and References

1 Written by Jason R. Eaton**,** copyright reserved, 2006

2 According to Raymond Huey and Peter Ward of the University of Washington, as quoted in the April 8, 2005 edition of the journal ***Science***.

3 From "Modeling Stratospheric Ozone Chemistry", Erica Harvey and Robert Sweeney, Fairmont State College

4 The disinfecting power of ozone is well-established scientific fact. Ozone's effect on bacteria, mold, fungi, and virii, as well as the methods of action, have been well documented. Here, we site only a few references:

> Pope, Daniel et al: The Effects of Ozone on Legionella Pneumophilia and Other Bacterial Populations in Cooling Towers; Fresh Water Institute and Department of Biology, Rensselear Polytechnic Institute, Troy, New York, 12181.
>
> Thanomsub B et al:Department of Microbiology, Faculty of Medicine, Srinakharinwirot University, Bangkok 10110, Thailand, "*Effects of ozone treatment on cell growth and ultrastructural changes in bacteria*", Journal of General Applied Microbiology. 2002 Aug;48(4):193-9.

5 Heindel T.H., Steib R., and Botzenhart K. of the University Tubingen, microbiology studies from 1994, 1995, and 1996.

6 September 1, 1996, through August 31, 1997, "MERCURY ADSORPTION IN SIMULATED FLUE GAS OF COAL- FIRED BOILERS BY OXIDATION".ICCI Project Number: 96-1/2.4A-3, G. A. Kudlac, McDermott Technology, Inc. Project Manager: Ron Carty, ICCI

7 Numerous ozonation studies have been done that demonstrate that ozonating produce in water, by bubbling ozone gas beneath the produce in the water, removes pesticides and antibiotics from the produce. Here, we source two such studies: