

# Ozone Used For Air Purification



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By Dr. James L. Marsden, Ph.D.

Scientists have long recognized the value of ozone as a natural anti-microbial. It is widely used to control harmful bacteria, mold, viruses and other biological hazards in water. At very low levels, ozone can inactivate airborne hazards that may be present in indoor environments. Ozone is natural component of the earth's atmosphere and many scientists consider it to be nature's method of cleaning our air.

Most anti-microbial treatments need to be controlled in order to obtain the desired effect on biological hazards and still be safe for people and the environment. For example, Chlorine at low concentrations is often used to purify water. The use of Chlorine at high concentrations would be dangerous to consumers and therefore, great care is taken to assure that the technology can be used safely. This concept is known as the principle of risk/benefit. Almost everything in our environment can be harmful in the wrong amount. This is true for the basic requirements for life – water, food and oxygen as well as millions of technologies that are used to maintain our quality of life. Another example is the common condiment – mustard. We consume mustard daily without giving it a second thought. Of course, it is completely safe for its intended purpose. However, mustard can also be used to produce the deadly gas that was used during World War I. Its effect was so devastating that it was banned after the war. In the right form and concentration, it is safe; in the wrong form and concentration, it can be deadly. Like any other technology or component of our environment, a risk benefit can be established for ozone.

Ozone is a naturally occurring pale blue gas. It is actually an oxygen molecule with an extra atom attached, the chemical symbol is O<sub>3</sub> (the oxygen molecule we breathe is O<sub>2</sub>). The extra oxygen atom makes it a fairly aggressive oxidizer. Much more so than pure oxygen, which is also an oxidizer. An interesting fact about ozone is that once it oxidizes a pollutant or organic, it loses one of its oxygen atoms and turns back into pure oxygen (O<sub>2</sub>). Ozone is made in nature by Ultra Violet (UV) Energy from the sun striking oxygen molecules as well as by lightning. The fresh clean air you smell after a thunderstorm is due to the cleaning effect that the lightening produced ozone performs on the air. Ozone is also made by electric motors, such as you find in your refrigerator, fans, washers, dryers, HVAC blowers. In addition, the corona wires used in copy machines also create ozone.

Without the benefit of a risk/benefit analysis, a zero tolerance for ozone could be established. This would mean we should have our refrigerator, washer/dryer, garbage disposals, HVAC blowers, fans and copy machines outside of our living and working areas. Needless to say, this is ridiculous and unnecessary. Federal Agencies differ on acceptable levels of ozone, for example the FDA states maximum continuous levels of .05 ppm and OSHA has set 24 hour exposure level of .04ppm. OSHA has set much higher levels for shorter periods, such as 8 hours is .08ppm.

We totally agree with these levels, and accordingly our equipment is designed not to exceed these safe levels. (A recent independent study however by a Top National Hotel chain found some rooms with natural background ozone levels of .08 ppm and outdoor ozone levels frequently exceeding .10 ppm).

Some regulatory agencies in federal and state governments have taken positions on ozone that are not supported by sound science. For example, some agencies have published position papers that actually state “that at safe ozone levels of .04-.05 ppm no benefits are achieved”. When you read their papers you will find in the reference section, research dating back to 1913! Our detection and instrumentation technologies are light years ahead of 1913, 1950 or even 1990!

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Other federal agencies embrace ozone as an air sanitizer at levels of .04ppm or less. You can routinely find ozone based air purifiers in major commercial food processing plants to reduce airborne microbials, thereby protecting our food source. These systems are routinely approved by the USDA and FSIS (Food Safety Inspection Service). FSIS is particularly concerned about worker safety and often requires Ozone Air Monitoring to assure levels do not exceed .04ppm. We have installed these systems in every major type of food group production facility, as well as most Fortune 500 Food Processors. These companies have routinely performed exhaustive studies on the efficacy and safety of this equipment, before purchasing and implementation in their respective facilities.

Ozone at levels of .02 ppm combined with other oxidizers are proving very useful for Homeland Security Projects to help fight BioTerrorism. We are working with a U.S. National Laboratory on developing products that will destroy viruses and bacteria that could be used to combat biological weapons of mass destruction.

The Chinese Government uses our low level ozone (.02 ppm) systems to reduce the risk of SARS in subways and buses. Low Level ozone systems are embraced by many hospitals and nursing homes for odors, airborne viruses, bacteria and mold control.

We are also working with one of the world's largest cruise ship/ theme park and hotel chains who conducted a one (1) year independent study and determined that our air systems (containing low levels of ozone and other oxidizers) did in fact reduce airborne mold, bacteria and odors. With perhaps one of the most important test results coming from one of their independent controlled studies showing that it is in fact possible to achieve a six log reduction (99.9999%) of the Norwalk virus. This is the virus that has given a bad name to the cruise ship industry and that often requires them to have to turn back ships due to large scale outbreaks of Norwalk virus. We are proud to say our technology is now being employed by this chain in their hotel rooms, cruise ships, animal care facilities, as well as ice machines, dumpsters, etc. They did extensive research and testing before implementing our technology. What they didn't do is rely on a 1913 research paper!

Our technology is state of the art, which is constantly being upgraded and improved by our R & D personnel. Unfortunately our government works slowly and often one agency is more up to date than another. Let's look at a risk analysis of ozone in the same manner as our Government Agencies, Major Food Processors, and other Fortune 500 companies would. First, can ozone hurt you? The answer is yes, even though there are no documented deaths due to ozone exposure; we know that high concentrations of ozone can kill. I find this analogous to our requirement to breathe oxygen to live. Our air is about 20% oxygen, but if we breathe high concentrations of oxygen for a prolonged period of time it can kill us. Doctors often prescribe moderately high levels for patients with breathing problems because the risk of too much oxygen outweighs the risk of not enough.

The United States started chlorinating our water supply around the turn of the last century at the same time much of Europe decided to use ozone to purify its water supply. Many believe the U.S. went with chlorine due to a strong chemical lobby. Could this be true? We have known for many decades that chlorine reacts with organics and produce Trihalomethane compounds, known carcinogens; yet we continue to clean our water and much of our food with chlorine. High levels of chlorine are regularly used to clean vegetables, fruit, poultry, even grain. Now why did our nation's water suppliers and food processors continue to use chlorine even though we've known for decades it causes cancer?

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Again risk analysis comes in to play. It is far more dangerous to eat chicken contaminated with salmonella or vegetables laced with E-coli, than the risk of cancer associated with chlorine. Could there be a better way? Yes, the Europeans started using it in the late 1800's, it is ozone.

Ozone technology is now used by over 400 municipal water treatment plants. From L.A. to West Palm Beach, most Municipal Water Treatment Plants and most private water bottling plants use ozone to purify the water! We have supplied producers of every major food group with our ozone based air and water technology.

Can the government agencies that have taken negative positions on ozone change these positions? Sure it happens all the time; just last week our government scientist changed their position on sun exposure. The old position was any unprotected sun exposure was dangerous and could cause skin cancer. The new position is some sun exposure is good and necessary for good health, specifically vitamin D absorption. A risk analysis concluded that the risk of possible skin cancer was lower than the risk of disease caused by a Vitamin D deficiency. Perhaps some of our government agencies will see the light and update their position on low levels of ozone.

In summary, the use of most drugs or devices always comes with some level of risk. The question is, "is the risk worth the reward"? We can find studies that back up almost any position. A study that states we should not intentionally breathe ozone is probably correct, but does this mean we should do away with all ozone devices? Surely not. Chlorine for example, has thousands of research papers written about it. The ill effects of chlorine have killed thousands of people through misuse and possibly millions through delayed cancer. However, it has saved hundreds of millions of people worldwide by its ability to kill water borne diseases. Can you find a study that says chlorine kills? Sure you can also find many studies that tout its virtues. Now of course we are rapidly phasing chlorine out and replacing it with ozone that is far safer. But can ozone hurt us? Sure, too much of almost anything can hurt you, remember even too much oxygen can kill us.

If an air cleaning device delivers some low level ozone below Federal safe limits and this device reduces airborne mold, bacteria and viruses, which would be better for your health? For sure the answer is the air cleaned with low levels of ozone! On the other hand if you live on a tropical island with no air pollutants you would not need a low level ozone air purifier as there is little risk of air pollution on the island.