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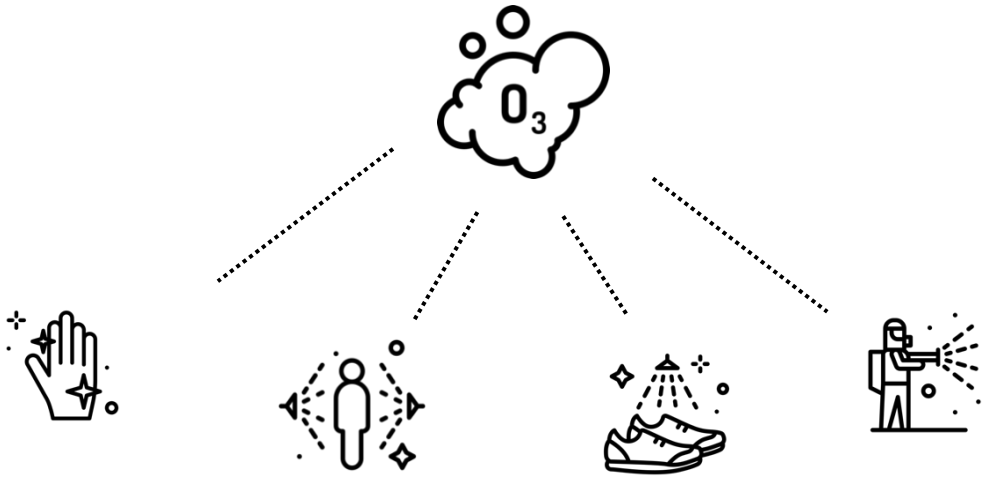
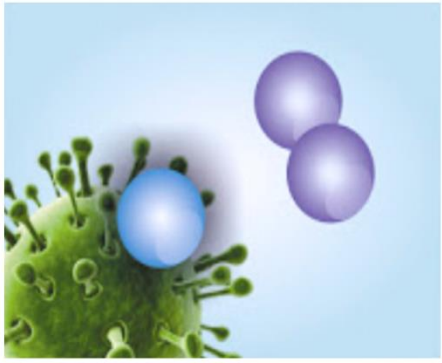
SAFEWAY

Effectiveness and safety of using ozone as a disinfectant

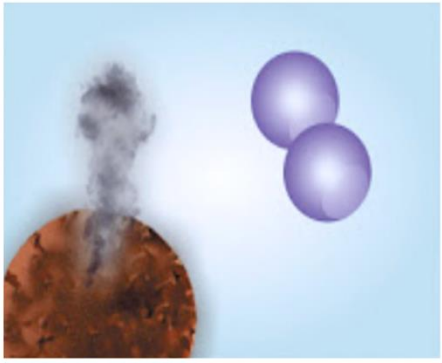


Did you know?

- Ozone has been **used as a disinfectant of water, food and surfaces** for many years.
- Several treatments where ozonated water was applied to wounds on the skin and eyes, obtained impressive results proving ozone's effectiveness as a disinfectant, as well as an **overall very safe procedure**.
- Ozone proved to be effective as a **disinfectant of surfaces** such as plastic, fabrics, rubber and wood.
- Several studies identified **anti-inflammatory properties** present on ozone treatments.
- Ozone is **extremely effective** as a disinfectant when used even in low concentrations.
- Ozone is **51% more powerful** than chlorine on eliminating bacteria.
- Ozone kills bacteria **3200 times faster** than chlorine.
- Ozone is the **most powerful microbiological control agent** available, with a very wide spectrum.
- Ozone **eliminates the necessity of using conventional disinfectants**.
- Ozone is **free of added chemicals**, not producing any toxic sub products.
- Ozone **stays in water only for the necessary amount of time** for an effective disinfection.
- Ozone is **clean and ecological**, with oxygen being its only sub product.



Ozone quickly attacks and eliminates the contaminants it finds.



After ozone acts, only water and pure air remain.

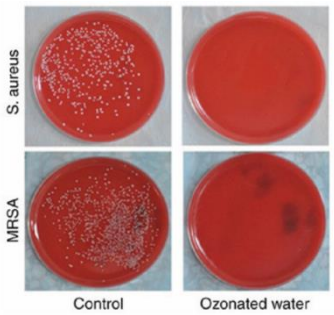
What does the World Health Organization has to say about this?

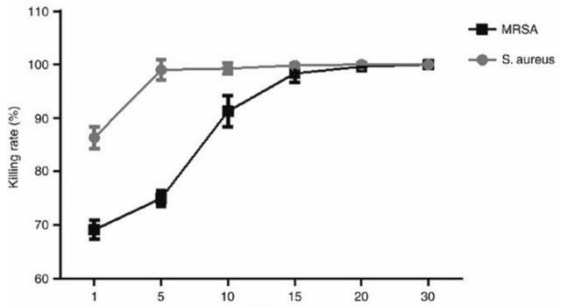
According to the World Health Organization, ozone is the most effective disinfectant against all types of microorganisms, being 3200 times more effective than chlorine in eliminating bacteria (ozone oxidizes cytoplasmic substances, while chlorine only destroys vital centers of cells, not being as effective).

Organismo	Ozono (ppm)	Tiempo (segundos)	Supervivencia (%)	Referencia bibliográfica
pX174	0,04	480	0,1	de Mik (1977)
Poliovirus 1	0,20	360	1	Harakeh & Butler (1985)
NDV	2,00	417	1	Pérez-Rey (1995)
Poliovirus 1	0,21	120	0,1	Roy et al. (1982)
Poliovirus 1	1,50	8	0,5	Katzenelson et al. (1979)
Fago T2	1,30	70	0,003	Katzenelson (1973)
Fago T7	0,95	240	0,001	Lockowitz (1973)
Rotavirus SA- 11	0,25	10	0,001	Vaughn et al.(1987)
Hepatitis A	1,66	5	0,00001	Hall & Sobsey (1993)

(Source: comparative of several studies, made in Spain, about the effectiveness of ozone on the elimination of several types of viruses)

Ozonated water sterilizes 100% of S. Aureus and SARM bacteria.

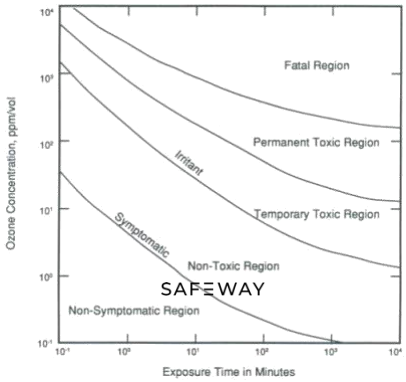




(Source: SONG et al., 2018, Molecular Medicine Reports)

Why does SAFEWAY use ozone?

Ozone, being a gas, is able to penetrate areas of difficult access, thus presenting a great advantage over other disinfectants. Having the versatility of being able to be dissolved in water, it is the ideal and complementary product to our SAFEWAY system, making it safer, more economical and of wide applicability. Still, the main reason why SAFEWAY solutions use the water ozonation system is the security it represents. When applied in accordance with WHO recommendations, this system eliminates all surface viruses, causing no irritation to the eyes or skin and not affecting clothing and footwear.



SAFEWAY's positioning: Non-Toxic, Non-Symptomatic Region.

What are the advantages of ozone over other disinfectants?

Ozone has a wide spectrum of action, not changing pH or temperature (which does not happen in disinfectants like chlorine, sodium hypochlorite or hydrogen peroxide). A good comparison of the effectiveness and safety of the use of ozone, by water ozonation process, is to observe the end of the process, in which there are no residues (only the oxygen molecule remains in the air) and the time required for a more effective disinfection is substantially reduced. In summary, ozone works effectively at lower concentrations and in shorter contact times than other disinfectants.

With the correct ozone generation system, via water ozonation, SAFEWAY is able to ensure greater levels of safety and efficiency than other products available on the market.

Finally, another major advantage of ozone-generating systems is the fact that they do not use any consumable except for water and, of course, electricity (there are therefore no increased costs with non-certified liquids and possibly harmful to human and animal health).

Disinfectant	Inactivation (mg · min/L)					
	0.5-log	1-log	1.5-log	2-log	2.5-log	3-log
Chlorine[1]	17	35	52	69	87	104
Chloramine[2]	310	615	930	1,230	1,540	1,850
Chlorine Dioxide[3]	4	7.7	12	15	19	23
Ozone[3]	0.23	0.48	0.72	0.95	1.2	1.43

CT values were obtained from AWWA, 1991.
[1] Values are based on a free chlorine residual less than or equal to 0.4 mg/L, temperature of 10°C, and a pH of 7.
[2] Values are based on a temperature of 10°C and a pH in the range of 6 to 9.
[3] Values are based on a temperature of 10°C and a pH of 6 to 9.

(Proven effectiveness of ozone versus other disinfectants – AWWA (American Water Works Association), 1991)

What do the competent authorities say about the use of ozone?

The European Union, namely through the Regulation for Biocidal Products, considers ozone as the biocide with the greatest spectrum of action and, at the same time, the least harmful for those who use it. Ozone is classified for disinfection of surfaces, materials, equipment, air conditioning systems, public places and also disinfection and air purification.

In the United States of America, according to the EPA (Environmental Protection Agency), the FDA (Food and Drug Administration), the OSHA (Occupational Safety and Health Administration) and the NIOSH (National Institute of Occupational Safety and Health), ozone should be considered as safe for human disinfection and exposure in the following parameters:

a) Maximum concentration of 0.05 ppm (parts per million) indoors;
b) Concentration between 0.08 / 0.10 ppm with exposure up to 8 hours when in open spaces.

What are the advantages of SAFEWAY over other products?

Through rigorously tested components, we were able to develop a complete disinfection cabin that respects three steps: 1. Temperature measurement; 2. Hand disinfection; 3. Disinfection of the body and clothing. We thus offer a complete, tested and safe solution. The components used, such as ozone generators through water, respect all the standards and limits recommended by the various entities mentioned in this document (always using the lowest of the recommended values, in order to guarantee extra safety, but maintaining the same effectiveness).

Is SAFEWAY's solution certified?

The SAFEWAY solution is CE (Europe) and FCC (United States) certified, as well as its components. Although there is still no certification system for the disinfection of people in the world, SAFEWAY has already proceeded with the notification of use to the Portuguese Directorate-General of Health.

What supports this information?

Ozone has been studied for many decades for its properties, as an effective and safe disinfectant, as an alternative to other disinfectant agents, since it represents an effective, safe and economical process (characteristics that are not verified with the use of other agents). In addition to its disinfectant properties, ozone is increasingly studied in the sense of being a repair and healing agent for wounds and lesions on the skin and eyes (both in humans and animals). In this sense, we consulted several specialists and researchers in the area who contributed with their technical know-how, safety standards and usage limits for a safe and effective application.

Entities mentioned in this document:

- World Health Organization
- American Water Works Association
- Environmental Protection Agency
- Food and Drug Administration
- Occupational Safety and Health Administration
- National Institute of Occupational Safety and Health
- Directorate-General of Health

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