# Ozone
## for
## Environmental sanitising and sanitation rinsing

Restaino et al (Restaino 1995) has shown that ozonated water is highly effective in killing both gram positive and gram negative food associated bacteria.

The Restaino study shows that ozonated water can effectively kill spoilage organisms. (*Pseudomonas aeruginosa* and *Zygosaccharomeyces bacilli*), Faecal contaminants *(Enterococcus faecallis* and *Escherichia coli*) and food bourne pathogens (*listeria monocytogenes*, *Bacillus cereus, Salmonella typhimurium, Yersinia enterocolitica* and *Staphylococcus areus*).
More than 5 log reduction of *Salmonella typhimurium and Escherichia coli* was reached instantaneously in ozonated water with or without the addition of 20 ppm of soluble starch.

Among gram-positive bacteria, *listeria monocytogenes*, was signifficantly the more sensitive (5 log immediate reduction).
More than 4.5 log units each of *Candida albicans and Zygosaccharomeyces bacilli* cells were killed instantaneously in ozonated water, whereas less than 1 log unit of *Aspergillus niger spores* were inactivated after 5 minutes of exposure

In the Restaino study, the gram negative bacteria were substantially more sensitive to ozonated water than the gram positive bacteria either in the absence or in the presence of added organic material

This point is of importance for ozonated water application in cooling coils, because these air conditioner components are preferentially colonized by gram-negative bacteria (Hugenholtz 1992)

The sensitivity of the gram-negative pathogens and *Lysteria monocytogens* suggests that ozonated water might be applicable for killing these organisms on food surfaces such as fruit and vegetables and in the food industry , Environmental surfaces, particularly in dairy factories. In the food industry, the use of ozone has been investigated food preservation (reduction of micro-organisms on meat and poultry carcasses and in chilling water), Shelf life extension (extension of shelf life of marine fish, equipment sterilization, and improvement of food plant effluents ( Bancroft 1984 Haraguchi, Sheldon 1986).

*Lysteria monocytogens* is also broadly recognised as growing on cold surfaces as cooling coil of chiller units

Rinsing is of premium importance during the course of a sanitation process. Ottaviani, states that once deterging is completed, a thorough rinsing of the surface with abundant water, ought to be done, therefore avoiding further

interference of the alkalis with some disinfectants, such as quaternary ammonium compounds, atmospheric or chlorine (Ottaviani 1993). materials left on the surface by improper cleaning, or by a scanty rinse after cleaning, may inactivate most chemical disinfectants.

Oxidizing effect of ozone is broadly recognised and may be of great help to alleviate biofilm matrix remaining after cleaning.

Videla et.al (Videla 1995) could demonstrate ozonated water efficiency not only to kill bacteria but also to facilitate the detachment of bacterial biofilms formed on stainless steel.

Biofilm partly detached can be more easily drained off. Future disinfection operations have more chance to address surfaces and not existing cleaning residues. Ozone enhances flocculation (ECNZ), oxidises oils reduces scale build-up.

Ozonated water used in sanitation rinsing will thoroughly remove residues of cleaning agents

Previous Studies on the effects of ozone on microbes have involved the use of pure culture and organisms naturally contaminating foods and water.

Broadwater et al. (Broadwater 1973), studying the effects of ozone on washed vegative cess, reported that .12mg/litre for *Bacillus Cerueus* and 0.19 mg/litre for *Escherichia coli* were the minimal lethal threshold concentrations after 5 minutes of exposure

Fetner and Ingols (Fetner 1956) reported 0.4 to 0.5 mg/litre as the threshold concentration for *Escherichia coli* after I minute at 1 degree Celsius

In Restiaino study (restaino 1995), the results of bacterial reduction were achieved at a concentration of 0.15 to 0.20 mg/litre

## References


Vidella 1995 Vedaela 11.A. et al Using ozone to control biofilms, *Enviromental effects, July 1995*

Hugenholtz, 1992 Hugenholtz. P. and Fuerst J.A., Heterotrophic *bacteria in an airhandling system, Applied and Environmental Microbiology,* 1992, Vol 58, N0, 12 P, 3914-20.

Ottaviani 1993 Ottaviani F., Cleaning and disinfection principles and applications in food factories, *a Bio Orbit manual* 1993.

ECNZ Water and Wasteater treatment: Ozone in it's electric, *ECNZ, TN 1*

Haraguchi Haraguchi T., U, Simidu and K, Aiso, Preserving effect of ozone to fish*, Bull. Jpn, Soc, Sci Fish*, 35:915-19

Restaino 1995 Restaino l. et.al, Efieciancy of ozonated water against variouse food related microranisms, *Applied and Environmental Microbiology,* Vol 61, No 9 P, 3471-75, 1995

Broadwater 1973 Broadwater W.T, et. al, Sensitivity of three selected bacterial species to ozone, *Appl,Microbial.,* 26:391-93, 1973

Fetner 1956 Fetner TH, and Ingols F.S A comparison of the bacterial activity of ozone and chlorine against *Escherichia Coli* lo, J. Gen Mirobiol., 15:381-85, 1956

Bancroft K.P et al, Ozonation and oxidation competition values, *Water Res.,* 18:473-478, 1984

Sheldon 1986 Sheldon B.W and Brown A.L, Efficacy of ozone as a disinfectant for poultry carcasses and chill water, *J food sci,* 51:305-309