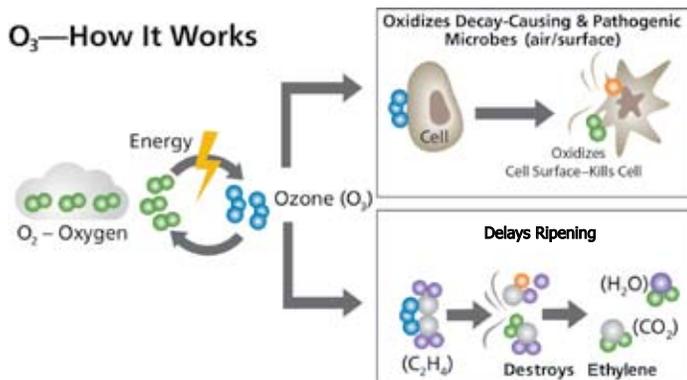


OZONE FACTS

What is ozone?

- ▶ Ozone is a highly reactive form of oxygen, consisting of three oxygen atoms (O₃). It is a strong oxidizer and antimicrobial agent that quickly breaks down to oxygen (O₂) after reacting with organic matter or microorganisms. Ozone is naturally generated in the atmosphere during lightning discharges.



Regulatory History & Status

- ▶ The FDA approved ozone for bottled water in 1982. In 1997, an FDA expert panel declared ozone to be generally recognized as safe (GRAS) for use in food processing. In 2001, the FDA approved ozone as a food additive/antimicrobial agent which may be safely used in the treatment, storage and processing of foods, including raw fruits and vegetables. There are no special labeling requirements for ozone-treated products.

Oxidizes ethylene

- ▶ Ozone oxidizes ethylene gas, with the reaction resulting in water, oxygen and carbon dioxide. Ozone is effective at reducing ethylene build up from produce in a container:

$$C_2H_4 + 6O_3 \rightarrow 2CO_2 + 2H_2O + 6O_2$$

Delays ripening

- ▶ Since ethylene stimulates ripening, the oxidation of ethylene by ozone delays ripening and senescence in many fruits, vegetables and flowers.

Reduces pesticide residues

- ▶ Ozone is effective at oxidizing and lowering pesticide residues on fruits and vegetables during shipment.

Effective antimicrobial, reduces spoilage and enhances food safety with no residue

- ▶ Ozone is a strong antimicrobial agent and is active against molds, yeasts, bacteria, spores, viruses and parasites. It helps to control these microbes on the produce, hard surfaces and in the air. Ozone leaves no hazardous residues, making it environmentally friendly.

Extends shelf life

- ▶ The shelf life of most fresh fruits and vegetables is limited by rapid ripening and decay. Ozone can reduce both of these and consequently it has been shown to extend shelf life. Ozone is an excellent supplement to good temperature management.

Ozone and mold growth

- ▶ Ozone inhibits fungal spore germination and production, fungal growth and prevents secondary spread within produce containers (nesting).

Ozone and odors

- ▶ Ozone readily reacts with many chemicals in the air and on surfaces and is effective at reducing odors. This prevents odor cross-contamination.

Certified organic

- ▶ Ozone is listed in the National Organic Program (NOP) final rule, which permits its use in products labeled as organic.

Has proven efficacy at levels well below OSHA limits

- ▶ Federal Occupational Safety and Health Administration (OSHA) has approved ozone as safe for workers (29 CFR 1910.1000) at effective levels. Ozone is detectable by human smell at 0.01 to 0.04 ppm (10-40 ppb). OSHA limits of exposure specify a 0.1 ppm (100 ppb) threshold for continuous exposure during an 8-hour period. The short-term exposure limit is 0.3 ppm (300 ppb) for exposure of less than 15-minutes (4 times per day).