

Listeria monocytogenes is a bacterium that causes listeriosis, an infection with potentially life-threatening complications for high-risk people—immunocompromised, elderly, and fetus/newbornsⁱ—or if it migrates from bloodstream to nervous system (CDC)(CFAN, *Bad Bug Book* 99)(Jackson et al., 1116)ⁱⁱ. Case-fatality ratesⁱⁱⁱ can range from 15%–30% (overall) to 80% (fetal/newborn) (CFAN, *Bad Bug Book* 99). Listeriosis can also present with less severe, but still debilitating, symptoms that mimic influenza, leading to underdiagnoses or misdiagnoses (CDC)(Scallan).

While *Listeria* can be killed by maintaining proper cooking temperatures, refrigerated foods commonly thought safe, such as soft cheeses, can become contaminated (Jackson et al., 1116). *Listeria* does not need oxygen to survive, meaning very strict disinfection, sanitization, and cross-contamination-avoidance protocols must be in place from production to consumers (CDC)(CFAN, *Bad Bug Book* 99)(Eglezos & Dykes, 795).

A cheese-processing plant sought additional measures above their normal sanitation protocols to meet corporate goals of keeping *Listeria* off finished products and reducing environmental contamination. Ozone generation, then proper pre-occupancy ventilation, commenced over a weekend to avoid any human contact, after a monthly deep cleaning. Results from 360 samples showed the significant reduction of *Listeria*, from the post-cleaning 85% to a >98%^{iv} reduction after ozone generation. Moreover, the ozone gas penetrated and effected reductions where standard sanitations methods could not. To combat likely recontamination occurrences of the subtly harmful and tenacious *Listeria*, the facility operators incorporated ozonation generation to their protocols. They reported a year later that there'd been no harmful or damaging effects in the facility (Eglezos & Dykes, 796–7).

Contamination of produce before it is harvested is another ongoing problem that must be tackled to prevent consumer infection. Postharvest disinfection often causes harmful by-products, like chlorine residue, while chemical fungicides lead to concerns over environmental pollution (Hirneisen et al., 838) (Bataller et al., 151).

The highly contagious nature of norovirus^v can lead to epidemics in closed quarters of travel or habitation (Boyce). Hirneisen et al. outlined how ozone disinfectant is not only successful with bacterial pathogens, but can also inactivate human norovirus surrogates to >99% (836, 838).

Bataller et al. proposed postharvest use of ozone instead of Amistar fungicide after testing seven fungi species that cause papaya rot (152). They concluded the ozonation was an effective alternative when applied within 24 hours postharvest by either ozone-treated water or ozone gas to specified fruit groups. Further, they recommended similar treatment applied to other fruit varieties (Bataller et al., 155).

Overall, ozone is a highly effective biocide, inactivating fungi, bacteria, and viruses. And unlike most alternatives, it leaves no harmful residue because it decomposes to simple oxygen.

Works Cited

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ⁱ Via infected mothers

ⁱⁱ From 1998-2014, the CDC tracked 58 outbreaks with 180 illnesses, including 146 hospitalizations and 31 deaths (14 fetal) (Eglezos & Dykes, 2018).

ⁱⁱⁱ The percentage of how many people die out related to how many people were infected.

^{iv} Of the 27 sampling sites, 24 had zero detection; remaining 3 sites with detection before/after were 7/1, 2/1, and 1/1.

^v With a 1 to 2 day incubation period, "norovirus has become the most common cause of acute gastroenteritis in the US" (Boyce).