# Ozone therapy

**Ozone therapy** is a form of [alternative medicine](https://en.m.wikipedia.org/wiki/Alternative_medicine) treatment that purports to increase the amount of oxygen in the body through the introduction of [ozone](https://en.m.wikipedia.org/wiki/Ozone). Various techniques have been suggested, with purported benefits including the treatment of [cancer](https://en.m.wikipedia.org/wiki/Cancer), [AIDS](https://en.m.wikipedia.org/wiki/AIDS), and [multiple sclerosis](https://en.m.wikipedia.org/wiki/Multiple_sclerosis), among others. An overview of the history and practice of ozone therapy was published by AM Elvis and JS Ekta in 2011.[[1]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-1)

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| [**Alternative medicine**](https://en.m.wikipedia.org/wiki/Alternative_medicine) |
| [Person undergoing ozone IV therapy](https://en.m.wikipedia.org/wiki/File:Ozone_IV_Therapy_AMA_Skincare.jpg)  Person undergoing ozone IV therapy |

Ozone therapy is sold as an alternative treatment for various illnesses. Beginning in 1991 the [FDA](https://en.m.wikipedia.org/wiki/FDA) has prosecuted and sent to jail several people presenting themselves as medical doctors and selling ozone therapy products as a medical cure or operating medical clinics using ozone therapy for healing human illness.[[2]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Knotts-2)[[3]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Whitlock-3) Arrests following similar activity have been made in other countries as well.[[4]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Malaba-4)[[5]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Thai-5) At least 10 deaths have been related to ozone therapy or its lack of usefulness, in nine cases there had been investigation and in eight it was discovered that the practitioners had used false credentials.[[6]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-6)

## Proposed uses[Edit](https://en.m.wikipedia.org/w/index.php?title=Ozone_therapy&action=edit&section=1)

Ozone therapy consists of the introduction of ozone into the body via various methods, usually involving its mixture with various gases and liquids before injection, with potential routes including the [vagina](https://en.m.wikipedia.org/wiki/Vagina), [rectum](https://en.m.wikipedia.org/wiki/Rectum), [intramuscular](https://en.m.wikipedia.org/wiki/Intramuscular) (in a muscle), [subcutaneously](https://en.m.wikipedia.org/wiki/Subcutaneously)(under the skin), or intravenously (directly into veins). Ozone can also be introduced via [autohemotherapy](https://en.m.wikipedia.org/wiki/Autohemotherapy" \o "Autohemotherapy), in which blood is drawn from the patient, exposed to ozone and re-injected into the patient.[[7]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-ACS-7)

This therapy has been proposed for use in various diseases, including cancer, AIDS, multiple sclerosis, [arthritis](https://en.m.wikipedia.org/wiki/Arthritis), [heart disease](https://en.m.wikipedia.org/wiki/Heart_disease), [Alzheimer's dementia](https://en.m.wikipedia.org/wiki/Alzheimer%27s_dementia), [Lyme disease](https://en.m.wikipedia.org/wiki/Lyme_disease), though supportive evidence for these applications is limited. Theories about the ability of ozone to kill tumor cells with oxygen have no credible scientific basis.[[7]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-ACS-7) For treatment of HIV/AIDS, although ozone deactivates the viral particles [outside the body](https://en.m.wikipedia.org/wiki/In_vitro), there is no evidence of benefit for living patients.[[8]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-8)

The United States [Food and Drug Administration](https://en.m.wikipedia.org/wiki/Food_and_Drug_Administration) initially stated in 1976, and reiterated its position in 2006, that when inhaled, ozone is a toxic gas which has no demonstrated safe medical application, though their position statements primarily deal with its potential for causing inflammation and [pulmonary edema](https://en.m.wikipedia.org/wiki/Pulmonary_edema) in the lungs. They also emphasize that in order for ozone to be effective as a germicide, it must be present at concentrations far greater than can be safely tolerated by humans or other animals.[[9]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-9) More recent reviews have highlighted that different routes of administration may result in different therapeutic and side effect profiles,[[10]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Zanardi-10) though a statistically robust meta analysis of available research has not been performed to date.

Ozone has been suggested for use in [dentistry](https://en.m.wikipedia.org/wiki/Dentistry), but existing evidence does not support its use.[[11]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-11)[[12]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-12)

Some reviews have suggested ozone as potential treatment for [herniated discs](https://en.m.wikipedia.org/wiki/Herniated_disc) [[13]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-13) and diabetic neuropathy.[[14]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-14)

There is some controversy about its use by athletes in an attempt to increase performance; although its use is not disallowed in and of itself, it can be mixed with banned substances for administration prior to injection.[[15]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-15)

## Safety[Edit](https://en.m.wikipedia.org/w/index.php?title=Ozone_therapy&action=edit&section=2)

Much of the concern related to ozone therapy revolves around the safety of blood ozonation. It is well established that when inhaled by mammals, ozone reacts with compounds in tissues lining the lungs and triggers a cascade of pathological effects including [pulmonary edema](https://en.m.wikipedia.org/wiki/Pulmonary_edema).[[10]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Zanardi-10) Saul Green has argued that since ozone has the capacity to oxidize organic compounds in an atmospheric environment, it should also logically oxidize blood components and [endogenous](https://en.m.wikipedia.org/wiki/Endogenous) human tissues.[[16]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-16) High levels of inhaled ozone are known to be toxic, though single-dose inhalation of lower levels is not.[[17]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-17)Proponents suggest that its effects are tissue dependent, though the subject is still debated.[[10]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Zanardi-10)[[18]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-18)

Serious complications reported from the use of this therapy include the development of [hepatitis](https://en.m.wikipedia.org/wiki/Hepatitis) and also include five reported fatalities.[[19]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-MJA-19) There is some concern about an association with [heart attacks](https://en.m.wikipedia.org/wiki/Myocardial_infarction) after autohemotherapy,[[20]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-20) though this association has been contested as well.[[21]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-21)

## History[Edit](https://en.m.wikipedia.org/w/index.php?title=Ozone_therapy&action=edit&section=3)

In 1856, just 16 years after its discovery, ozone was first used in a health care setting to disinfect operating rooms and sterilize surgical instruments.[[22]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Chemical_Technology_Encyclopedia_pp_82-3-22) By the end of the 19th century the use of ozone to disinfect drinking water of bacteria and viruses was well established in mainland Europe.[[22]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Chemical_Technology_Encyclopedia_pp_82-3-22)[[23]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-23)

In 1892 [*The Lancet*](https://en.m.wikipedia.org/wiki/The_Lancet) published an article describing the administration of ozone for treatment of [tuberculosis](https://en.m.wikipedia.org/wiki/Tuberculosis).[[24]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-24) During [World War I](https://en.m.wikipedia.org/wiki/World_War_I), ozone was tested at [Queen Alexandra's Military Hospital](https://en.m.wikipedia.org/wiki/Queen_Alexandra%27s_Military_Hospital) in London as a possible [disinfectant](https://en.m.wikipedia.org/wiki/Disinfectant) for wounds. The gas was applied directly to wounds for as long as 15 minutes. This resulted in damage to both bacterial cells and human tissue. Other sanitizing techniques, such as irrigation with [antiseptics](https://en.m.wikipedia.org/wiki/Antiseptics), were found preferable.[[25]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Distillations-25)[[26]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-Stoker-26)

In April 2016, the [FDA](https://en.m.wikipedia.org/wiki/FDA) prohibited the medical use of ozone, "In any medical condition for which there is no proof of safety and effectiveness", stating "Ozone is a toxic gas with no known useful medical application in specific, adjunctive, or preventive therapy. In order for ozone to be effective as a germicide, it must be present in a concentration far greater than that which can be safely tolerated by man and animals."[[27]](https://en.m.wikipedia.org/wiki/Ozone_therapy#cite_note-27)