Ozone and oxidation therapies as a solution to the emerging crisis in infectious disease management: a review of current knowledge and experience

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Abstract

Medicine faces crisis with emerging “super bugs,” lethal viruses (Ebola), and stealth pathogens such as tick-borne infections. Thousands are dying worldwide of once easily treatable diseases. Ozone therapy, extensively studied, may be a valuable adjunctive or stand-alone therapy. Ebola again ravages Africa with over 2000 already dead, carrying a 65% mortality rate. The world desperately needs safe, inexpensive and effective anti-infective therapy to which microbes will not develop resistance. Oxidation therapies have shown an extremely high safety profile, lacking credible reports of significant injury beyond vein irritation. Ozone therapy, the most studied and least expensive to perform, is in itself a germicide, not an antibiotic, and improves several physiological parameters essential for infection defense. Recent reports indicate very favorable responses to both bacterial and viral disease, inclusive of Ebola. Despite lack of commercial profitability (not patentable), medicine would do well to revisit its pre-antibiotic era oxidation therapy roots, especially ozone in the current crisis.

Key words: ozone therapy; Ebola; infection therapy; antiviral; antimicrobial; antibiotic; germicide; immune modulation; biofilm; Lyme disease

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INTRODUCTION

The world faces a crisis with failures of the very drugs that ushered in the modern medical era. Common bacteria have responded to man’s use/abuse of antibiotics with stunning resistance and emergence of “superbugs.” We face growing morbidity from traditionally treatable diseases, such as Lyme and Mycobacterium avium. We have no reliably effective treatment for aggressive viral diseases, such as Ebola or viral pneumonia. Research is showing that use of antibiotics in any sector (agriculture, medicine, etc.) will cross contaminate the sensitivity of bacteria in all sectors. Antibiotic resistant genes are shared and transmitted across species. Differing microorganisms are further responding by aggregating in mutually supportive bunker-like collectives called biofilms, where they assist and support each other. These are extremely difficult to treat. A new study has shown a simple but key mechanism of how bacteria armor themselves against antibiotics by membrane charge.1,2,4,5

Alarms have sounded for development of new pharmacetical antimicrobials, but every time one is released, resistance slowly or rapidly appears. “Superbugs” have emerged; thousands worldwide are dying from “untreatable” infections, and/or suffering the aftereffects of drug treatment such as Clostridium difficile or actual drug toxicity (such as fluoroquinolone). Politically, hospitals have escalated the crisis further by permitting only (U.S. Food and Drug Administration (FDA)) approved therapies out of policy. State “right to try” laws are trumped by FDA approval restrictions.2 Yet we are ignoring utilizing the very germicides and immune enhancers provided by Nature, both external and internally generated by the body. Physicians have used germicides for generations, but in a very limited venue, generally externally or on wounds or surgeries, not systemically.

Oxidation therapies are not new, they long antedate the modern antibiotic era, but are largely ignored or forgotten. The therapies include ozone therapy (OT), ultraviolet blood irradiation therapy (UBI), IV hydrogen peroxide therapy, and high dose intravenous ascorbate. These therapies are not patentable. It is unlikely that we will ever see industry funded studies for therapies relatively inexpensive to do, and which will not generate commercial profit. Corporate Medicine and Pharma are naturally profit driven. And, oxidation suffers further (tomato effect), because many of its achievements are regarded as impossible to believe.6

Bacteria have had billions of years to develop resistance to oxidants/germicides in nature, such as ultraviolet light and ozone, but have not succeeded. Otherwise, we would not be here. Our immune system acutely responds to infection with immune cells generating strong oxidants, crippling invaders. Neutrophils undergo a “respiratory burst” consuming 50 or more times the amount of oxygen than at rest. Products of this burst include germicides: hydrogen peroxide, sodium hypochlorite (bleach), other oxidative species, and even ozone, a remarkable discovery.7

This review concentrates on OT as a unique and novel treatment for infection. Databases used include PubMed, Google Scholar, the referenced books by Veilo Bocci and Silvia Menendez (see references), and a bound volume of original...
published references from the now defunct Foundation for Blood Irradiation). Finally, my extensive personal experience and knowledge of the field assisted in locating references which might not appear on any database due to dated material. Keywords for search: 1) Regarding ozone therapy: ozone therapy, Ebola, virus inactivation, antimicrobial, ozone physiology. 2) Regarding vitamin C, intravenous ascorbate. 3) Regarding ultraviolet blood irradiation, most of the world literature is older and not readily available. The author personally did a hand medical search in a university medical library to retrieve hard copies of several dozen original articles. 4) Regarding intravenous hydrogen peroxide: intravenous hydrogen peroxide, influenza pneumonia.

OZONE HISTORY

Ozone was discovered first by electrolysis of oxygen, by its peculiar odor. As triatomic oxygen, it is the strongest naturally occurring oxidant, produced in nature by lightning and solar ultraviolet radiation. Ozone was found to rapidly destroy bacteria, and employed in water purification in the late 1800s (to the present). Nikola Tesla patented the first American ozone generator. Charles Kenworthy, MD, president of the Florida State Medical Association, published “Ozone” in 1885. Pediatrician Robert Mayer brought the therapy to his Florida practice having learned of it from German prisoners of war on Ellis Island during World War II. He successfully treated thousands of children for various conditions, including intrathecal use for meningitis. Germans further evolved OT. The development of ozone resistant materials propelled reliable generator production. The use of ozone has exploded worldwide though still relatively unknown in conventional drug-based medicine. It is produced by passing medical grade oxygen over a corona discharge, creating medical “ozone” from 1–5% O3 and 95–99% O2, or 5–70 μg/mL ozone concentration.

OZONE CHEMICAL AND PHYSICAL CHARACTERISTICS

As a triatomic oxygen molecule, ozone is a most powerful oxidant. Once created medically, it is metastable, with a half-life of about 30 minutes at room temperature (72°F (~22.2°C)) and sea level before dismuting back to O2. Two research teams in Europe for decades with no record of injury and reports of enhanced oxygen availability. Thousands of direct intravenous oxygen gas administrations have been accomplished in Europe for decades with no record of injury and reports of improvement in circulation, rheologic properties of blood, prostacyclin/thrombixane ratio improvement, and enhancement of eosinophil generated 15-lipo-oxygenase-1, which is an immune modulator. Schmidt considered intravenous oxygen to be superior to hyperbaric oxygen (HBO) in improving circulatory status of blood. (OT has been reported to be superior to HBO in reducing blood viscosity.) HBO is well accepted as a treatment for osteomyelitis, and its utility demonstrates the crucial role of enhanced oxygen availability. Thousands of direct intravenous oxygen gas administrations have been accomplished in Europe for decades with no record of injury and reports of improvement in circulation, rheologic properties of blood, prostacyclin/thrombixane ratio improvement, and enhancement of eosinophil generated 15-lipo-oxygenase-1, which is an immune modulator. Commonly accepted delivery method is major autohemo-
therapy (MAH). An aliquot of blood, 50–200 mL is withdrawn in glass (preferable) or plastic container. An equal volume of ozone gas is added with mixing the two phases, and reinfused under gravity.

An apparently superior method is using a glass bottle, and adding the gas to blood under pressure (up to 2 atmospheres absolute), mixing and reinfusing the blood (not gas). It is termed hyperbaric ozone therapy (HBO₃). The method creates better admixing of the phases, and, also solubilizes oxygen gas into the blood by Henry’s law, and is a much faster treatment than MAH. Depending upon concentration used, it provides up to 14.4 mg of ozone in a single 200 mL blood treatment. HBO₃ appears to provide more rapid and greater observed clinical benefits, supporting Regelsberger’s intravenous oxygen concepts. HBO₃ requires a more sophisticated and expensive apparatus. Any group performing HBO₃ therapy must have a much more protracted administration of treatment as compared to MAH.

HBO₃ requires a more sophisticated and expensive oxygen generator. Austrian physician Johann Lahodny, MD, has pioneered “high-dose” OT by repeating the 200 mL of treated blood volume 10 times for total delivery of 144 mg ozone. He presented extraordinarily fast resolutions of wounds and clinical resolution of illness. HBO₃ therapy (MAH) appears to provide more rapid and greater observed clinical benefits, supporting Regelsberger’s intravenous oxygen concepts. HBO₃ requires a more sophisticated and expensive oxygen generator. Austrian physician Johann Lahodny, MD, has pioneered “high-dose” OT by repeating the 200 mL of treated blood volume 10 times for total delivery of 144 mg ozone. He presented extraordinarily fast resolutions of wounds and clinical resolution of illness. HBO₃ therapy (MAH) appears to provide more rapid and greater observed clinical benefits, supporting Regelsberger’s intravenous oxygen concepts. HBO₃ requires a more sophisticated and expensive apparatus. Any group performing HBO₃ therapy must have a much more protracted administration of treatment as compared to MAH.

Ozone is very commonly injected into body cavities, soft tissues and joints (prolozone or proloozone therapy). Local injections may have additional benefits. Ozone gas is directly germicidal and can cut through biofilm. Ozone is also capable of delivering up to 80 mL of plasma dissolved oxygen gas by Henry’s Law, likely adding to efficacy. Ozone is very commonly injected into body cavities, soft tissues and joints (prolozone or proloozone therapy). Local injections may have additional benefits. Ozone gas is directly germicidal and can cut through biofilm. Ozone is also capable of delivering up to 80 mL of plasma dissolved oxygen gas by Henry’s Law, likely adding to efficacy. Ozone is very commonly injected into body cavities, soft tissues and joints (prolozone or proloozone therapy). Local injections may have additional benefits. Ozone gas is directly germicidal and can cut through biofilm. Ozone is also capable of delivering up to 80 mL of plasma dissolved oxygen gas by Henry’s Law, likely adding to efficacy.

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tion with oral antibiotic (the first reported non-surgical/non-parenteral intravenous cure of a septic prosthetic joint). The latter utilized local joint injection which may cut through septic biofilm, along with the high-dose HBO mode of blood treatment.

The tick bite cellulitis case was a male previously treated years before with OT only for Lyme with apparent full remission. He consequently refused antibiotics for his new tick bite condition. His cellulitis fully resolved within 72 hours of a single high-dose HBO treatment.

A male with a highly aggressive and totally uncontrolled (4 drugs including 120 mg prednisone) dermatomyositis with CK exceeding 9000 U/L arising from occult dental infection resolved totally with removal of infected jaw pathology and DIV/HBO ozone therapy.

Private office unreported cases of interest: A current case of Mycobacterium avium with pulmonary cavitation and debility has had an essentially full clinical recovery over 18 months with no antibiotics, using only HBO, and UBI. She had been given only a 30% chance of improvement by her specialists who offered antibiotics. Symptoms of measles in a person returning to the USA from abroad remitted in a few days with DIV OT.

**DISCUSSION**

Oxygen is indisputably the most important factor in all healing and tissue repair. Oxidation therapies have been shown to improve oxygen metabolism and/or the intermediates involved with oxygenation. Ozone, in particular, has been the most researched, with proven modulation of cytokines, interferons, including the induction of gamma interferon. It modulates inflammation, especially crucial in infection where the inflammatory process itself may take down the organism, as with Ebola. The redox properties of ozone may provide enough oxidant power to inactivate viruses, via membrane oxidation of sulfhydryl groups. Ozone is known to kill bacteria on contact. The germicide ozone, ultraviolet, bleach, hydrogen peroxide, etc. have been in medical use for well over 100 years and there has been no development of resistance. Our leukocytes make oxidant germicides to counter pathogens.

Since ozone reacts with blood components in microseconds, it is not likely that ozone itself is acting as a direct germicide (unless administered in gas form to local infection). However, its favorable effects on oxygen delivery, immune modulation, redox balance, induction of superoxide dismutase and, glutathione, and ozone pro-oxidant byproducts, such as peroxides, might contribute synergistically to anti-infective effects. Regarding Ebola, we surmised that as lethal as the virus is, that its redox status is its Achilles heel, which can easily and safely be exploited with OT.

Ozone is extensively used in dentistry for a wide variety of pathologies, including infection, biofilm treatment, accelerated healing, and more. Ozone appears to be safe in latter pregnancy, actually improving placental function. CDC reports at least 300,000 new yearly cases of difficult-to-diagnose-and-treat Lyme disease. Antibiotic treatment failure is very high, and there is high long-term morbidity. My office has seen less than 20% failure of treatment (HBO and/or UBI) to significantly (and long term) restore clinical normalcy to patients suffering tick bore disease symptoms over many years of use, and without any use of chemical antibiotics. “Brain fog” often clears in the office on the first treatment, which the author believes represents rapid modulation of neurological inflammation.

**Issues in the use of ozone**

1. Oxygen is currently regarded by the FDA as a toxic gas with no medical uses despite the presence of a plethora of publications to the contrary, which apparently, the agency has ignored. It is toxic to lungs, but its reported toxicity ends there. (Liquid water is also toxic to lungs). The worldwide medical paradigm revolves around patented profitable synthetic pharmaceuticals, which ushered in the antibiotic and modern medical era. Ozone cannot be patented for profit. Hence, financing for full study to obtain “approval” is highly unlikely. There is no financial gain. Any study funding would have to come from fully altruistic sources.

2. OT suffers from regulatory board challenges. Not being pharmaceutical “standard of care” physicians have been investigated over their use of OT. The current medical paradigm of only using “approved” therapies handcuffs ozone’s integration into medicine.

3. “Condemned to Die with No Right to Try.” Hospitals (and most conventional physicians) will not even consider non-approved (FDA) therapies. In 2018, despite providing several original published reports contained in this review’s references, the author was refused permission to use ozone to treat a terminally ill infected (superbug) airplane pilot, already given up to die, by a Texas hospital after the distraught family so requested, and providing liability waiver to protect the hospital. The hospitalist cited “policy” to me. The man died shortly afterwards.

4. DIV has clear advantages in cost, ease of administration, and medical waste, but can sclerosis veins, and cause temporary chest tightness. It may be most suitable in third world countries and for patients who do not have the larger veins required for MAH or HBO.

5. With the critical/emergency need for answers to “superbugs,” and “stealth” pathogens like Borrelia, and after effects of antibiotic therapy, medicine might do well to return to the therapies utilized before we became addicted to antibiotics for infection. This is particularly true in poverty-stricken countries, and especially with the frightening new Africa Ebola epidemic. DIV ozone cost is that of a butterfly needle and syringe beyond the ozone generator and compressed oxygen. It can be employed remotely, powered off a car battery. This makes ozone a two-edged sword. It appears to be the therapy the world urgently needs, but will be obstructed by powerful interests vested in patented pharmaceuticals.

6. Hospitals seeking to reduce their infectious disease mortality rate could lead the way, and quite ethically, since untreatable infections will otherwise lead to death. The “placebo” would be conventional antibiotic therapy alone, with the “experimental” group receiving concurrent OT. A hospital observational
study would be inexpensive and could be overseen by the hospital’s IRB, a research luxury those in clinical practice do not have. Lack of IRB greatly hampers the type of study demanded to make the industry take notice (A “Catch-22”).

Conclusion

Medicine desperately needs alternatives to antibiotics, which are failing and carry significant adverse effects. OT has the necessary biochemical requisites to offer a powerful stand alone or adjunctive therapy to assist an infected patient. Ebola is again ravaging Africa and a treatment for symptomatic cases is critically needed. Published case reports strongly support ozone utility for infectious disease management.

Ozone (and other oxidation) therapy carries virtually no known adverse or toxic effects when performed properly (other than sporadic vein issues, as can other intravenous therapies). OT can easily be carried out in medical offices, from general practice to infectious diseases.

Progress in this field is hampered by unwillingness of physicians to look/consider “outside the box” of conventional drug-based medicine, along with possible unjustifiable medicolegal concerns. Far from being a “tomato,” ozone is widely used around the world with well researched and defined benefits. Office physicians, hospitals and field clinics may do well to consider revisiting oxidation therapy on behalf of infected patients. This will require a shift in the current paradigm of use of “approved” therapies only, to include a “Right to Try.”

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