Nathaniel Altman

THE OXYGEN PRESCRIPTION

The Miracle of Oxidative Therapies

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Foreword

I am glad that Nathaniel asked me to write a few words for his new book: he has been a pioneer in writing about oxygen and ozone therapy. In this third edition of *Oxygen Healing Therapies*, he includes all the available information without overemphasizing either results or practical implications.

He has proved to be a very precise journalist, retrieving and reporting a great number of studies, some of them unknown to me. It was a pleasure to read this latest edition, particularly those chapters dealing with nutrition and the powerful influence of our mind on our body.

Nathaniel has reported all the results of the laboratory and clinical studies that have been done on oxygen therapies, even though some data seem too good to be true. I know too well that owners of private clinics often want to sell gold for copper because of their personal interest. Both Nathaniel and I are convinced that boosting untruthful results is wrong, and we hope that the reader will discern “the wheat from the chaff,” because we do not want desperate patients to believe that ozone is a miraculous drug able to “cure” the very worst illnesses.

Biological and clinical experience acquired in the last fifteen years has taught me that, up to now, the pathology where ozonated autohemotherapy has a unique advantage is the dry-form of age-related macular degeneration. Even though distinguished ophthalmologists do not admit this, I can assure them that about two-thirds of patients (except those advanced cases whose photoreceptors are already dead) will notice an improvement of their visual acuity, enough to become self-sufficient and improve their overall quality of life. Orthodox ophthalmologists have no therapy, except the administration of antioxidants like lutein, which neither harm nor help the macular ischemia.

Other diseases such as vascular ischemias (limb and heart) improve markedly with autohemotherapy, particularly when used in conjunction with, when necessary, topical therapy with ozonated water and ozonated oil. In my experience, these treatments yield better results than the orthodox prostanoid infusions usually prescribed, without adverse side effects. A preparation of ozonated oil, which is the only way to “stabilize” ozone as a triozonide, displays marvelous disinfectant and stimulatory activities in chronic, purulent ulcers, bedsores, and other skin problems. When the benefits of ozonated oil become more widely known and accepted by the medical community, this treatment will become a valuable resource for millions of patients. However, in vascular pathologies (such as atherosclerosis, high blood pressure, and angina), I advise patients to also take advantage of the idoneous drugs (such as statins, antihypertensive, and anticoagulant drugs) provided by the medical establishment.

I would like to take the opportunity to remark upon the very intense and foolish antagonism between orthodox and complementary medicine over whether there is only one medicine or form of treatment that is able to restore a patient’s health. To claim that treatments such as ozone therapy, homeopathy, or acupuncture are better than conventional medicine because they are less toxic (but not necessarily cheaper) is incorrect and naive; common sense and experience tell us that it is better to select and take advantage of the most available and effective treatments. Physicians must be acquainted with all useful options and cannot behave like religious sectarians.

There are certainly other relevant pathologies, such as chronic bacterial, fungal, and viral infections, that can be treated proficiently and cured when we use an appropriate combination of ozone therapy along with antibiotics and/or antivirals. We have learned the hard way that attacking serious diseases with a combination of approaches is the winning strategy, because these diseases are always sustained by a variety of causes.

Do ozone therapy and oxidative therapy have some limits? They certainly have, and the patient must be better informed about them because they are not trivial. Owing to the chemical instability of ozone, selftreatment is not recommended. Patients should always go to a hospital or medical clinic for treatment. There is often the need for venipuncture and, particularly in women, venous access tends to deteriorate over time.

Moreover, after a first therapeutic cycle, ozone therapy must be continued practically for life, even though a less frequent schedule is required.

Unfortunately, recent clinical papers claiming the superiority of ozone therapy in patients with a diabetic foot condition neither mention the need for follow-up treatments nor discuss the absolute need for continuing treatments for years. The papers only mentioned that the treatments were performed over three weeks with about fifteen rectal insufflations of gas versus antibiotic therapy.

My experience has taught me that ozone therapy does not improve diabetes in three weeks. In addition, rectal insufflation of gas, although safe, simple, and economical, is an imprecise and only modestly effective method. If a patient were to acquire an ozone generator, he or she might be able to perform the therapy at home under a physician's supervision, but this rarely happens because of the expense and limited availability of the necessary equipment. I have mentioned these drawbacks because we are hoping to soon find new, valid options that will overcome these limitations.

The beauty of ozone is that when this molecule, almost as old as primordial life, is applied in small and precise doses, it is able to simultaneously trigger or reactivate many functional activities that have gone astray during a chronic disease. Among complementary medical approaches, ozone therapy is the only one where the chemistry, the mechanisms of action, and the biological effects (hence the therapeutic effects) have been delineated well enough to be considered a scientifically based discipline. From a neurophysiological point of view, acupuncture has also reached a similar stage of scientifically documented effectiveness. By contrast, homeopathy remains undefined, perhaps because we do not yet have the appropriate technology to demonstrate the pharmacological effect, if any, transmitted by water.

I am still fighting with some chemists who state that ozone is always toxic and should not be used in medicine. Their opinion is based on a lack of understanding about biology and medicine. In addition, they prefer to ignore that any drug, including crucial molecules (O_2, NO, CO, H_2S) or a compound like glucose, depending upon its concentration and the time-period of action, can be either toxic or physiologically valid. There is no doubt that continuous exposure to tropospheric ozone is noxious. But those who make the generalization that ozone therapy is also toxic show that they do not understand anything about these two completely different situations.

I hope that, by continuing to explain in detail this profound difference, we will eventually win the battle and stop others from comparing apples with oranges.

Nathaniel's book offers a very responsible, balanced, and broad view of how we should live and care about our health and the valuable uses of oxidative therapies in treating health concerns. I am sure that the material he has gathered here will be very useful for years to come.

VELIO Bocci, M.D.

Velio Bocci, M.D., is a specialist in respiratory diseases and clinical hematology. He is emeritus professor of physiology at the University of Siena, Italy, and the author of *Oxygen-Ozone Therapy*: *A Critical Evaluation* and *Ozone*: *A New Medical Drug*.

Introduction

My personal interest in oxidative therapies is the result of having been the primary caregiver for a friend with very advanced AIDS who was sent home from the hospital to die.

During the final weeks of my friend's life, I administered daily infusions of diluted 35 percent food-grade hydrogen peroxide under a physician's supervision. To my surprise, it was one of the only therapies that seemed to help. Although my friend did not survive, we were impressed at how the infusions gave him energy, inner peace, and optimism. He experienced far less discomfort than he had before the infusions began and was able to sleep better. He also applied undiluted hydrogen peroxide directly to a Karposi's sarcoma lesion on his foot, and it shrank by half within three weeks.

Having been interested in complementary and natural therapies for over twenty years, I became intrigued with the healing potential of hydrogen peroxide. If it could make such a difference in the quality of life of a person dying from AIDS-related diseases, how could it help people who were not at death's door?

Ozone—another oxidative therapy—has been used extensively in Europe for over fifty years to treat a wide variety of medical conditions, including heart disease, cancer, and AIDS. However, medical doctors in the United States and Canada who use oxidative therapies have often been persecuted by state medical authorities and medical societies. Some have even had their practices closed down.

Ozone and hydrogen peroxide are two chemical substances that could have a major impact on one's health and are inexpensive, relatively safe, and easy to administer. Thousands of practitioners have used them in Europe on millions of patients, but they have been legal to use (as an experimental therapy) in only a handful of states and Canadian provinces.

In fact, hundreds of people leave the United States and Canada every year to receive these therapies—especially ozone therapy—elsewhere. They pay for care out of their own pockets, since health insurance does not cover experimental treatments. At the same time, the mainstream press largely ignores oxidative therapies, with the exception of sensational stories of unqualified quack physicians offering oxygen therapies to desperate patients with promises of miracle cures for cancer or AIDS, often at a cost of tens of thousands of dollars.

I soon began reading what I could about hydrogen peroxide and ozone. I attended an International Bio-Oxidative Medicine Foundation conference and several conferences of the International Ozone Association, where I participated in workshops, attended presentations, and reviewed the medical literature offered by dozens of physicians, chemists, and other researchers.

Although I had been writing about holistic and alternative healing for over twenty years, I had not come across any information about oxidative therapies until the late stages of my friend's illness. Several self-published books were available and a number of people like Ed McCabe, Gary Null, and Walter Grotz had been struggling to educate the public for years, but many others (including myself) had never heard about these therapies.

I was also surprised to find that a tremendous volume of scientific and medical literature on the medical use of ozone and hydrogen peroxide had been published since the 1920s. Although a few articles were published in well-known journals like *Science*, *The Lancet*, *Cancer*, and *The Journal of the American Medical Association*, most were published in obscure scientific journals that are rarely read by the general public. For a medical writer, this represented a treasure trove of information. I soon realized that there was much more to learn about ozone and hydrogen peroxide, especially in their possible application in preventive health care. I learned that some of the most exciting work in the field of medical ozone therapy is being done in Cuba and Russia, but that little information was known outside those countries.

In 1993, I decided that an objective, scientifically documented, yet readable book was needed for both practicing physicians and the general public. I have always believed that information is vital to enabling us to make intelligent decisions about our health, and I wanted to assemble the latest and most reliable information about oxidative therapies—what they are, how they work, and what they can do to promote the healing process. I

also wanted to introduce these therapies as part of a holistic approach to health, in which body cleansing, diet, and exercise could enhance the therapeutic qualities of hydrogen peroxide and ozone.

The first edition of this book was published in 1995, and it was very well received. Medical doctors who were involved with oxidative therapies often recommended the book to their patients as an educational tool. The book went through several printings and was followed by a second edition, expanded and updated, three years later. It's now time for a third edition that not only is updated and enlarged but highlights several major discoveries made in the last few years that will change the face of oxidative therapies forever. At the same time, this new edition places more emphasis on the need for physician education and patient safety.

Writing this book over the years has been an incredible experience. My research has taken me to Germany, France, Cuba, and all over the United States. I've been privileged to meet and correspond with scientists and physicians from Italy, Russia, France, Cuba, Canada, and throughout the United States, including Charles H. Farr, Velio Bocci, Frank Shallenberger, Horst Kief, Den Rasplicka, and Lyle Hassel, many of whom have contributed material to this book. I have read hundreds of articles and have spoken to many patients who have received oxidative therapies.

As I complete this third edition, I continue to be astonished, although not surprised, at the continued opposition of the United States' medical establishment and government toward researching these therapies, let alone allowing their use under medical supervision. While not always a "miracle cure," the proven safety, effectiveness, and varied medical applications of hydrogen peroxide and ozone warrant far more attention.

The fact that ozone and hydrogen peroxide cannot be patented, are inexpensive, and are useful in treating dozens of diseases plays a primary role in this situation. Unlike expensive pharmaceuticals, surgery, and other advanced medical modalities, these simple therapies are not going to line the pockets of physicians, drug companies, medical equipment manufacturers, insurance companies, and hospitals. Since those interests influence—primarily through professional, trade, and political action organizations—the direction of health care policy in this country (along with media outlets that receive their abundant advertising dollars), research in oxidative therapies will probably never be initiated by them.

The future of alternative and complementary therapies like ozone and hydrogen peroxide is in the hands of the health care consumer. About 50 percent of us consulted nontraditional practitioners in the past five years. We support the health care industry through taxes and by purchasing its products and services. We should demand to have the freedom to choose the healing modalities that we want for ourselves and our families without having such personal decisions made by others. At the same time, we should insist on receiving the highest quality care by certified oxidative practitioners who are recognized experts in their field.

I didn’t write this book in order to persuade anyone to use ozone or hydrogen peroxide. I am not affiliated with any clinic, physician, or company that manufactures hydrogen peroxide- or ozone-related equipment, supplies, or nutritional supplements. Except for the modest royalties I earn from sales of this book, I do not make any commissions from physicians, clinics, or manufacturers. This financial independence allows me not only to be a more objective writer but also to offer constructive criticism without fear of financial hardship.

I believe that the field of oxidative therapies is worth learning about. My primary goal is to present the facts about these therapies, highlight new scientific findings, and show how they are being used in hospitals and clinics around the world. I hope that this book will stimulate discussion and even controversy. Eventually, perhaps, it can lead both the public and the medical and scientific communities to take a more serious look at the therapeutic potential of hydrogen peroxide and ozone. As a result, consumers can make more educated and intelligent decisions regarding our health care options.

PART ONE
Foundations

In an age of increasing medical specialization, complex and sometimes questionable medical procedures, and expensive, often inef fective medications, many health care consumers are interested in getting back to basics. They are looking for safe and effective medical therapies that will naturally enhance their body's innate healing powers. They are looking for therapies that cause a minimum of negative side effects and will not bring about their financial ruin.

Most of us feel that such therapies don't exist. However, there are two simple, natural substances whose clinical use has been well documented in medical literature. Health care pratitioners who have used these substances in this country have been threatened, harassed, and persecuted by state medical associations and the federal government, despite the fact that the substances have proved safe and effective in treating some of our most common serious health problems, including heart disease, cancer, diabetes, and HIV. Overlooked by the mainstream medical and dental professions, ignored by the government, and feared by the pharmaceutical industry, the substances are now being used by a rapidly growing underground of health care consumers. A small number of physicians who are tired of the expensive, dangerous, invasive, and often useless medical procedures used to treat these and other diseases are also turning to these substances, known as hydrogen peroxide and ozone, using them in a health-enhancing context known variously as bio-oxidative therapies, oxidative therapies, or simply oxygen therapies. Oxygen therapies have been used for over 120 years. They first appeared in mainstream medical journals in 1888. Since that time, they have been studied in many major medical research centers throughout the world.

Hydrogen peroxide is involved in all of life's vital processes and must be present for the immune system to function properly. The cells in the body that fight infection (known as *granulocytes*) produce hydrogen peroxide as a first line of defense against invading organisms like parasites, bacteria, viruses, and fungi. It is also required for the metabolism of protein, carbohydrates, fats, vitamins, and minerals. As a hormone regulator, hydrogen peroxide is necessary for the body's production of estrogen, progesterone, and thyroxin. It also helps the body regulate blood sugar and the production of energy in cells. Hydrogen peroxide has long been known medically as a disinfectant, antiseptic, and oxidizer. Clinically, it has been used to successfully treat a wide variety of human diseases—including circulatory disorders, pulmonary diseases, parasitic infections and immune-related disorders—with few harmful side effects.

Ozone is one of three forms, called *allotropes*, of the element oxygen. Electrical sparks and ultraviolet light can cause ordinary oxygen to form ozone, which is probably why many people call ozone an energized form of oxygen. Ozone was first used therapeutically to disinfect wounds during World War I. It was later found that ozone can "blast" holes through the

membranes of viruses, yeast, bacteria, and abnormal tissue cells before killing them. Ozone was the focus of considerable research during the 1930s in Germany, where it was successfully used to treat patients suffering from inflammatory bowel disorders, ulcerative colitis, Crohn's disease, and chronic bacterial diarrhea. As we will see later on in this book, there is evidence that ozone can destroy many viruses and abnormal tissue cells, including those related to hepatitis, Epstein-Barr, cancer, herpes, cytomegalovirus, and HIV.

Hydrogen peroxide and ozone hold great promise in helping to treat some of the most devastating diseases confronting humanity today. Together, they form the cutting edge of a new healing paradigm involving, safe, effective, natural, and inexpensive forms of medical therapy. In the following section, I will introduce oxidative therapies and examine their theoretical basis.

1
Foundations of Oxidative Therapies

Oxygen is essential for life. Over 62 percent of the Earth's crust (by mass) is made up of oxygen. Compounds containing oxygen form a major part of oceans, rocks, and all other living things. Oxygen also is found in 65 percent of the elements of our body, including blood, organs, tissues, and skin.[1]

Like all matter, oxygen comprises atoms. A substance that is made up of only one type of atom is known as an *element* (of which there are 108); a substance that is made up of more than one element is called a *compound*. Scientists have discovered literally millions of compounds, and new ones are being discovered and produced in laboratories every year.

Oxygen is a clear, odorless gas that can easily be dissolved in water. Each *molecule* (the smallest amount of a chemical substance that can exist by itself without changing or breaking apart) of oxygen is composed of two atoms of oxygen, and is known by the chemical formula O_2.

We require a continual supply of oxygen in order to survive. The average person needs some 200 milliliters (about one cup) of oxygen per minute while resting, and nearly 8 liters (approximately 2 gallons) per minute during periods of strenuous activity. The brain—which makes up about 2 percent of our total body mass—requires over 20 percent of the oxygen taken in by the body. While we can go without food for several months and survive without water for a couple of days, we cannot live without oxygen for more than a few minutes.

Oxygen makes up approximately 21 percent of the air we normally breathe.[a] Smokers or people who live in heavily polluted environments are likely to consume an even smaller percentage of oxygen.

The oxygen in the air we breathe reacts with sugars in our systems (from the food we eat and from the breakdown of fats and starch in the body) to

produce carbon dioxide, water, and energy. The energy from this process, a form of combustion, is stored in a compound called ATP (adenosine triphosphate). ATP is essentially the fuel we need to live, think, and move. According to Sheldon Saul Hendler, M.D., in his book *The Oxygen Breakthrough*, oxygen is the most vital component of ATP within our cells: "ATP is the basic currency of life. Without it, we are literally dead. Imbalance or interruption in the production and flow of this substance results in fatigue, disease and disorder, including immune imbalance, cancer, heart disease and all of the degenerative processes we associate with aging."[2]

The lungs, heart, and circulatory system deliver sufficient amounts of oxygen to the entire body. This oxygen creates the energy we need to survive and thrive. At the same time, the lungs take carbon dioxide (CO2), a waste product, from the blood and discharge it back into the air. It is estimated that we breathe in 2,500 gallons of air each day. Trees take in carbon dioxide and convert it into oxygen through the process of photosynthesis, sending it back into the atmosphere for us to enjoy once more.

We all know how tired and sluggish we feel when we are in a closed room full of people. Although the room is filled with air, that air is high in carbon dioxide and deficient in oxygen. A number of studies have linked the high CO2 level in the cabins of commercial jet aircraft (which is almost double the minimum comfort standard for indoor air) to a variety of temporary health problems, including headaches, exhaustion, and eye, nose, and throat discomfort.[3] When passengers arrive at their destination, leave the aircraft, and oxygen consumption returns to normal, symptoms often disappear within a couple of hours.

Oxygen is absolutely essential for healthy cells, as it acts against foreign toxins in the body. Many such toxins, like viruses and bacteria, are mostly *anaerobic*, meaning that they thrive in a low-oxygen environment. Cancer viruses are among those that are anaerobic. In 1966 Nobel Prize winner Dr. Otto Warburg confirmed that the key precondition for the development of cancer is a near lack of oxygen on the cellular level.[4]

HOW DO HUMANS BECOME OXYGEN DEFICIENT?

In a perfect world, we would easily get enough pure oxygen for our body's needs. However, in modern society, there are several major factors that make this difficult.

Polluted Air

Perhaps the most important contributor to oxygen deficiency is air pollution. The oxygen content of the air for those who smoke or are unfortunate enough to breathe in secondhand smoke is even lower. Automobile exhaust, factory emissions, and burning garbage are the three greatest causes of lowered oxygen content in the air we breathe.

Devitalized Foods

As we will see later, fresh fruits and vegetables contain an abundance of oxygen that is dissolved in water. When we eat generous amounts of fresh, raw vegetables and fruits, we benefit from increased oxygen intake as well as from the valuable vitamins and minerals these foods contain.

However, foods that have been heavily processed, cooked, and preserved through canning tend to be very low in oxygen. High-fat foods like meat, eggs, and dairy products tend to be lower in oxygen as well. The Standard American Diet (known appropriately as S.A.D.) tends to be very low in oxygen content. It should be no surprise that this type of diet has been linked to a wide variety of degenerative diseases like arteriosclerosis, cancer, and diabetes.

Poor Breathing

Healthy breathing involves deep, rhythmic breaths that fill the lungs with air and then exhale that air fully back into the atmosphere. Due to pollution, stress, or simply habit, most people do not breathe fully. For example, many of us were taught to breathe relying only on the muscles of the upper chest, which tends to ventilate just the upper part of the lungs. By using the diaphragm as well as the upper chest to breathe, we are able to take fuller breaths and incorporate more of the available oxygen in the lungs. We'll examine the subject of breathing later on.

OXIDATION

The primary effect that breathing has on the body is *oxidation*. Oxidation is simply a natural process that involves oxygen combining with another substance resulting in changes in the chemical composition of both substances. Technically speaking, oxidation includes any reactions in which electrons (tiny particles smaller than an atom that have an electrical charge) are transferred. Most oxidation produces large amounts of energy in the form of light, heat, or electricity. The products of oxidation include corrosion, decay, burning, or respiration.[5] By exposing certain metals to oxygen, for example, the metal is oxidized, producing rust. When butter is left out in the open air for long periods of time, the process of oxidation turns the butter rancid.

Oxidation is also a primary component of combustion. When we light a fire in the fireplace, we are causing the wood to be oxidized. When we start our car engine in the morning, gasoline combines with oxygen and is oxidized to water and carbon dioxide.

Oxidation occurs as combustion within the body when oxygen turns sugar into energy. Our body uses oxidation as its first line of defense against harmful bacteria, viruses, yeast, and parasites. Oxidation breaks down the toxic cells into carbon dioxide and water, and they are removed from the body through its normal processes of elimination.

OXYGENATION

After oxidation, the most important effect of breathing is *oxygenation*. Oxygenation involves saturation with oxygen, as in the aeration of blood in the lungs. Breathing in oxygen is a major source of oxygenation. Although hydrogen peroxide and ozone are best known as oxidizers, they are also powerful oxygenators.

If the oxygenation process within the body is weak or deficient, the body cannot eliminate poisons adequately and a toxic reaction can occur. In minor cases, a toxic buildup can lead to fatigue, dullness, and sluggishness. However, when poor oxygenation is chronic, our overall immune response to germs and viruses is weakened, making us vulnerable to a wide range of diseases.

OXIDATION AND FREE-RADICAL PRODUCTION

One of the medical establishment's chief reservations about the use of oxidants like ozone and hydrogen peroxide in medicine is the production of *free radicals*. A free radical has been defined as "any molecule that possesses an unpaired electron, an electrically-charged particle spinning in lonely orbit and searching for another electron to counterbalance it."[6]

Stable molecules have electrons in pairs. To become stable, a free radical will steal an electron from a stable molecule, which then becomes a free radical itself. Free radical formation follows a chain reaction, with one free radical causing important structural changes in many other molecules. Cell damage, including mutations, often results.

Yet free radicals are not necessarily "bad." In fact, many are essential to life. Physiological amounts of some free radicals (including superoxide and hydroxyl radicals) are produced by the body to deliver energy to the body's cells. In addition, free radicals have a crucial role in killing bacteria, fungi, and viruses—without them, we could not survive on Earth. For example, when exposed to a flu virus, the body creates free radicals to destroy it. Free radicals also play an important role in regulating the chemicals the body needs for its survival, such as hormones.

Free radicals are manufactured by the body (they are produced in extra-high amounts during vigorous exercise, but people who are in good physical shape are easily able to detoxify them) and are formed by certain medications. Free radicals are also produced in the environment. Air pollution (including ozone-laden smog, motor vehicle exhaust, and cigarette smoke), toxic waste, certain food additives, pesticide residues, and radiation (such as radiation from X-rays and airplane travel) all produce free radicals that can affect us in different ways.

When we have too many free radicals in our bodies, cell damage can occur. In his book *Free Radicals and Disease Prevention*, David Lin lists how excess free radicals can cause harmful effects to cells. They can

- Break off the membrane proteins, destroying a cell's identity
- Fuse together membrane lipids (fats) and membrane proteins, hardening the cell membrane and making it brittle
- Puncture the cell membrane, allowing bacteria and viruses easy entry
- Disrupt the nuclear membrane, opening up the nucleus and exposing genetic material

- Mutate and destroy genetic material, rewriting and destroying genetic information
- Burden the immune system with the above havoc and threaten the immune system itself by undermining immune cells with similar damage[7]

As a result, free radical damage has been linked to a number of degenerative diseases, including atherosclerosis, cancer, cataracts, diabetes, allergies, mental disorders, and arthritis. Excess free radicals also play a role in the aging process and decreased immune response, opening the door to a variety of immune disorders, including the onset of AIDS.[8]

SEEKING BALANCE: THE BODY'S "ANTIOXIDANT" SYSTEM

The human body is more than a machine, it is a highly complex living organism that is constantly striving to achieve a dynamic state of self-healing. Healing involves the constant interaction among the myriad aspects of the immune system. One of the most complex and yet powerful components of body healing is the so-called "antioxidant" system. Antioxidants are enzymes (such as catalase, superoxide dismutase, and glutathione peroxidase) that protect cells from free radicals by chemically changing them into harmless compounds like oxygen and water.

In their book *Antioxidant Adaptation*, Stephen A. Levine, Ph.D., and Parris M. Kidd, Ph.D., write about the ability of the body's antioxidant defense system to fight off free radical attacks by providing greater tolerance to oxidative stress to selected tissues:

> The system is flexible: individual antioxidant factors can interact to donate electrons on to another, thereby facilitating the regeneration of optimally active (fully-reduced) forces. The system is also versatile and can respond adaptively to abnormal oxidative challenges subject to source and site availability of required factors.… The adaptability of the antioxidant defense system appears to be rather remarkable.[9]

Nutritional Antioxidants

Because excess free radical activity can seriously deplete our body's antioxidant reserves, nutritionists recommend that we augment those supplies with foods rich in antioxidants. Three common vitamins— beta-

carotene (vitamin A), vitamin C, and vitamin E—are important dietary antioxidants, as are minerals like zinc and selenium. According to Natalie Angier, writing in *The New York Times Magazine:*

> Vitamin E and beta-carotene both are used in the fatty membranes of the cell, sponging up free radicals before the vagrants can poke holes in the cellular sheath. Vitamin C, a water-soluble compound, works in the aqueous innards of the cell, coupling with radicals and allowing them to be flushed away in the urine.[10]

These natural antioxidants can help inhibit or control excessive oxidation. They help protect proteins, fats, and other substances in the body from oxidative damage. They can help stabilize cell membranes. Antioxidants have also been found to influence chemical "messengers" both within and between body cells.

Many of the foods we eat—green and yellow vegetables, fruits, nuts, and seeds—contain antioxidant vitamins and minerals in abundance and are recommended as a major part of all healthy diets. Many people take nutritional supplements rich in antioxidants for additional protection. We'll discuss the role of nutrition as an adjunct to oxidative therapies later on.

A Problem of Language

Though still widely used in scientific and medical literature like the sources quoted above, some practitioners feel that the word *antioxidant* is really a misnomer. Why? They claim that because oxidation is essential for both life and for healing it should not be seen as a negative process. They correctly point out that our minds often think in terms of "good" and "bad," with oxidation viewed as bad and antioxidant as good. Yet neither is bad nor good; instead, together they are essential for healing. For this reason, some physicians feel that the term *reduction* is a more appropriate term. We'll see how this amazing process works in the following chapter.

2
What Are Oxidative Therapies?

A major aspect of free radical activity involves oxidizing the pathogenic by-products of modern living: environmental pollution, dietary toxins, stress, and radiation. This is part of the body's normal healing process and is essential for our survival and well-being. However, a growing number of physicians believe that if the body's antioxidant/reduction requirements are met, adding certain oxidative substances to the body is safe as long as these substances are of the right kind and are introduced in the proper manner.

Utilizing the principles of oxidation to bring about improvements in the body is known as *bio-oxidative* therapy. This term was first introduced in 1986 by Charles H. Farr, M.D., Ph.D., in his monograph *The Therapeutic Use of Intravenous Hydrogen Peroxide*. Although some practitioners still use Dr. Farr's term, these therapies are also popularly known as *oxidative therapies* or simply *oxygen therapies*.

While aerobic-type exercises; deep, rhythmic breathing; and highoxygen foods (like fresh fruits and vegetables) promote the normal oxidation process in the body, two natural elements—ozone and hydrogen peroxide—are among the most powerful oxidizers available to humanity and form the essence of oxidative therapy today.

OXIDATIVE STRESS FOR HEALTH?

We mentioned earlier that air pollution and other environmental contaminants, food toxins, smoking, lack of exercise, poor diet, and psychological stress can, over time, overwhelm the body's oxidation/reduction system. The result is commonly known as chronic *oxidative stress*, which has been linked to a wide range of degenerative diseases including diabetes, cancer, heart disease, yeast problems, and

infections. Medical research has also connected chronic oxidative stress to premature aging.

Mainstream physicians tend to believe that oxidative stress is always harmful to health. They cannot understand how a powerful oxidizer like ozone or hydrogen peroxide could possibly be safe, let alone promote healing for a wide variety of health problems including cancer, eye problems, diabetes, wound healing, heart disease, and circulatory problems. Though an apparent contradiction, the medical potential for oxygen therapies like hydrogen peroxide and ozone is based on both transient and long-term biochemical reactions that take place when introduced to the body.

Velio Bocci, M.D., emeritus professor of physiology at the University of Siena in Italy and author of two groundbreaking medical texts on ozone therapy, believes that transient oxidative stress is the reason why oxygen therapies work. In *Ozone—A New Medical Drug*, he wrote: "*Blood exposed to ozone undergoes a transitory oxidative stress* necessary to activate biological functions without detrimental effects. The stress must be adequate (not subliminal) to activate physiological mechanisms, *but not excessive* [enough] to overwhelm the intracellular antioxidant system and cause damage."[1]

So how does this work? Ozone is a form of superactive oxygen. When it comes in contact with blood inside an ozone-resistant glass bottle *ex vivo* (that is the preparative phase of autohemotherapy), it *immediately reacts* with blood plasma and other body fluids, such as those found in the skin and the mucous membranes, thus generating a number of chemical "messengers" like antioxidants and polyunsaturated fatty acids.

This reaction yields two results: the production of hydrogen peroxide (along with other chemicals collectively known in scientific literature as *reactive oxygen species* or ROS) and *lipid oxidation products* (called LOPs). The ROS are believed to be responsible for immediate negative biological effects, such as free radical production. However, within a few seconds the oxidized antioxidants are recycled back in reduced form, leading to more positive biological effects. Over the longer term, the ROS target the erythrocytes (red blood cells containing hemoglobin with the main job of transporting oxygen), resulting in improved oxygen delivery to the body; the leukocytes (blood cells whose main job is to engulf and digest bacteria and fungi), thus stimulating immune system activation; and the

blood platelets, which stimulate the release of growth factors, substances made by the body that regulate cell division and cell survival.

The biological effects of their “partner” LOPs are both positive and more long-term. Through the continual circulation of blood, LOPs can reach virtually any organ of the body and stimulate important biological functions like the generation of cells with improved biochemical characteristics (“supergifted erythrocytes” with the ability to deliver more oxygen to ischemic tissues) and the upregulation of antioxidant enzymes in the blood. Antioxidant enzymes have been found to neutralize oxidative stress, perhaps explaining some of the extraordinary clinical results of ozone therapy. Dr. Bocci also believes that LOPs can mobilize endogenous stem cells (stem cells already inside the body), which can promote regeneration of ischemic heart tissue (tissues of the body damaged by heart disease) and other tissues.[2]

Through both transient oxidative stress and the biochemical reactions that take place within the body over time, therapeutic ozone and hydrogen peroxide stimulate the body’s immune system. Because they are not designed to treat specific symptoms, these modalities enjoy numerous and varied clinical applications, often with unexpected beneficial side effects. For example, a person undergoing ozone therapy for Lyme disease may discover that their chronic asthma symptoms have improved as well.

As we’ll see in laboratory and clinical studies later on, ozone and hydrogen peroxide therapy can help achieve a multitude of therapeutic outcomes that would be unthinkable with a single drug or mainstream medical procedure. Simply put, oxidative therapies can help accelerate oxygen metabolism and stimulate the release of oxygen atoms from the bloodstream to the cells. When levels of oxygen increase, the potential for disease decreases. Germs, parasites, fungi, bacteria, and viruses are killed along with diseased and deficient tissue cells. At the same time, healthy cells not only survive but are better able to multiply. The result is a stronger immune system and improved overall immune response.

Although ozone and hydrogen peroxide are highly toxic in their purified state, they are safe and effective when diluted to therapeutic levels for medical use. When administered in prescribed amounts by a qualified and experienced medical practitioner, the chances of experiencing adverse reactions to oxidative therapies are extremely small. For example, a German study evaluating the adverse side effects of over five million

medically administered ozone treatments found that the rate of adverse side effects was only 0.0007 per application. This figure is far lower than any other type of medical therapy.[3]

However, this figure can be deceiving. Outside of Germany, many practitioners—particularly in the Americas, with Cuba being the exception—have received only minimal education and hands-on training in the correct use of oxidative therapies. In addition, there is presently no single medical, scientific, or government organization that provides standards of training, certification, or oversight. Finally, some patients opt to treat themselves, whether out of necessity, for convenience, or because they believe that ozone and hydrogen peroxide can be administered by anyone, regardless of training. As a result, both the safety factor and effectiveness of oxidative therapies can be severely compromised.

LONG HISTORY

Although few of us have ever heard of them, oxidative therapies have been around for a long time. They have been used clinically by European physicians for over a century, and were first reported by Dr. I. N. Love in *The Journal of the American Medical Association* in 1888.[4] Since that time, they have been studied in many major medical research centers throughout the world, including Baylor University, Yale University, the University of California at Los Angeles, and Harvard University in the United States, as well as in medical schools and laboratories in Great Britain, Italy, Germany, Russia, Canada, Japan, Cuba, Mexico, and Brazil. Today, between fifty and one hundred scientific articles about the chemical and biological effects of ozone and hydrogen peroxide are published each month.

HOW ARE OXIDATIVE THERAPIES USED?

Tiny amounts of ozone or hydrogen peroxide, added to a base of oxygen or water, are used to introduce active forms of oxygen into the body by intravenous, oral, intradermal, or rectal means. Once in the body, the ozone or hydrogen peroxide breaks down into various oxygen subspecies that contact anaerobic viruses, bacteria, fungi, microbes, and diseased and deficient tissue cells. Through oxidation and the other chemical reactions

described earlier, these disease microorganisms and deficient cells are killed and eliminated from the body.

It has been estimated that over twelve million people (primarily in Germany, Russia, and Cuba) have been given oxidative therapies over the past ninety years to treat more than fifty different diseases, including heart and blood vessel diseases, diseases of the lungs, infectious diseases, and immune-related disorders. In some cases, oxidative therapies are administered alone; in others, they are used in addition to traditional medical procedures (such as surgery or chemotherapy) or as adjuncts to alternative health practices like megavitamin therapy, acupuncture, chelation, ultraviolet light therapy, or herbal medicine. According to the International Bio-Oxidative Medical Foundation, the following conditions or diseases have been treated with ozone and hydrogen peroxide with varying degrees of success:

Heart and Blood Vessel Diseases

Cardiac arrhythmias (irregular heartbeat)
Cardioconversion (heart stopped)
Cardiovascular disease (heart disease)
Cerebral vascular disease (stroke and memory loss)
Coronary spasm (angina)
Gangrene (of fingers and toes)
Peripheral vascular disease (poor circulation)
Raynaud's disease ("white finger")
Temporal arteritis (inflammation of the temporal artery)
Vascular and cluster headaches

Pulmonary Diseases

Asthma
Bronchiectasis (dilatation of bronchus or bronchi)
Chronic bronchitis
Chronic obstructive pulmonary disease
Emphysema
Pneumocystis carinii (PCP or AIDS-related pneumonia)

Infectious Diseases

Acute and chronic viral infections

Chronic unresponsive bacterial infections
Epstein-Barr virus (chronic fatigue syndrome)
Herpes simplex (fever blister)
Herpes zoster (shingles)
HIV-related infections
Influenza
Parasitic infections
Systemic chronic candidiasis (candida)

Immune Disorders

Diabetes mellitus Type II
Hypersensitive reactions (environmental and universal reactors)
Multiple sclerosis
Rheumatoid arthritis

Other Diseases

Alzheimer's disease
Cancers of the blood and lymph nodes[5]
Chronic pain syndromes (due to multiple causes)
Migraine headaches
Pain of metastatic carcinoma
Parkinson's disease

HOW DO THESE THERAPIES WORK?

According to Frank Shallenberger, M.D., H.M.D., one of America's most respected oxidative practitioners, ozone and hydrogen peroxide therapies have been found to have the following effects on the human body:

1. They stimulate the production of white blood cells, which are necessary to fight infection.
2. Ozone and hydrogen peroxide are virucidal.
3. They increase oxygen and hemoglobin disassociation, thus increasing the delivery of oxygen from the blood to the cells.
4. Ozone and hydrogen peroxide are anti-neoplastic, which means that they inhibit the growth of new tissues like tumors.
5. They oxidize petrochemicals.

6. They increase red blood cell membrane distensibility, thus enhancing their flexibility and effectiveness.
7. They increase the production of interferon and tumor necrosis factor, which the body uses to fight infections and cancers.
8. They increase the efficiency of the antioxidant enzyme system, which scavenges excess free radicals in the body.
9. They accelerate the citric acid cycle, which is the main cycle for the liberation of energy from sugars. It also breaks down proteins, carbohydrates, and fats to be used as energy.
10. Oxidative therapies increase tissue oxygenation, thus bringing about patient improvement.[6]

In the following section, we'll focus in detail on the many health effects of ozone and hydrogen peroxide therapies under a wide variety of conditions and clinical applications.

UNKNOWN, IGNORED, AND FORGOTTEN

Although ozone and hydrogen peroxide therapy have been proven in both clinical trials and regular clinical practice to be safe and effective in Germany, Cuba, Mexico, Russia, Italy, France, and Australia, very few people have heard about oxidative therapies in the United States and Canada. Even though an estimated fifteen thousand European practitioners legally use oxidative therapies in their practices, the number of physicians using these therapies in North America is small, due in part to the fact that information about ozone and hydrogen peroxide is not provided in medical schools, which are largely funded by pharmaceutical companies. In addition, the medical establishment does not advocate the use of oxidative therapies and often discourages or prevents licensed physicians from using them in their medical practice. In the United States, medical doctors have been threatened with having their licenses revoked if they administer hydrogen peroxide or ozone. Clinics have been closed down and practitioners have been threatened with jail.

Perhaps the best-known victim of government persecution was the late Robert Atkins, M.D., the developer of the Atkins Diet and author of *Dr. Atkins' Diet Revolution* and other books. As director of the Atkins Center for Complementary Medicine in New York City, Dr. Atkins' medical

license was revoked because he was treating patients with ozone. After regaining his license in court, Dr. Atkins' 1993 lawsuit against the state of New York helped bring about the passage of a law permitting physicians to use ozone and other modalities not approved by the U.S. Food and Drug Administration (FDA).

Yet even before the government attempted to take away Dr. Atkins' license, the FDA harassed him through his supplier of ozone equipment. During an interview with Geoffrey Rogers in the award-winning film *Ozone and the Politics of Medicine*, Dr. Atkins said:

> Well, I had an ozone generator, and we used it on all our AIDS patients, [on] just about all our cancer patients, and we used it on the yeast patients, which was really the largest group. Generally, we gave it intravenously, [via] autohemotherapy, where we pull the blood out, mix the blood with ozone, and in a few minutes gave ozonated blood back to the patient.
>
> We found that our cancer protocol, which includes ozone, was effective and was keeping people alive, and without ever having to require pain medicine, without losing weight, without any sign of deterioration. And then when we lost our ozone machine, the patients began to go downhill. The FDA saw to it that our manufacturer had to take away the business end of the machine, so we no longer had an effective ozone-generating machine. That's where we are right now currently. I'm right now trying to figure out how to get around that, because I believe that my patients need ozone.[7]

A major reason for this lack of interest in oxidative therapies is that ozone and hydrogen peroxide are *nonpatentable* substances that are very inexpensive to manufacture and use. There is simply no financial incentive to incorporate them into traditional medical practice.

In addition, these substances are being used to treat a broad spectrum of health problems at a low cost. And when compared to chemotherapy or surgery, medical ozone and hydrogen peroxide are extremely cheap. Typically, oxidative therapies properly administered in a medical setting cost up to 50 percent less than traditional therapies, especially for chronic and degenerative diseases. As we will see later on, there are successful case histories involving patient-administered treatments under proper medical supervision that can cost far less. For these reasons, ozone and hydrogen peroxide pose a threat to the continued dominance of the medical establishment, which includes the pharmaceutical industry, medical centers, and physicians who are accustomed to providing expensive drugs, complex medical procedures, and long hospital stays.

Because U.S. government agencies like the FDA and the National Institutes of Health (NIH) are influenced by the pharmaceutical industry

and the medical lobby, objective investigation and development of effective protocols for oxidative therapies have been difficult to undertake. According to the late Michael T. F. Carpendale, M.D., a pioneer ozone researcher and professor of orthopedic surgery at the University of California School of Medicine:

> In the FDA, the drug companies have representatives on nearly all the committees. If there's something which may be very effective but may undersell the average drug company, of course they are not going to be very pleased if it gets developed. It might be very difficult for them to compete with that. And ozone is obviously inexpensive to produce; it is very potent [and] if it works half as well as the Germans claim it does, everyone should be using it.[8]

Dr. Horst Kief, one of the first physicians in the world to successfully treat HIV-infected patients with ozone, commented on why so little government-sponsored and drug company research is taking place regarding ozone therapy: "Nobody in the pharmaceutical industry can sell ozone. That's the main reason. When we can find a way to sell ozone, I am sure that ozone [will be] the most important drug in the world."[9]

WHERE PATIENTS COME FIRST?

Now that pharmaceutical companies can legally promote their products in newspapers, in magazines, on television, on highway billboards, on the radio, and over the Internet, we are literally saturated by drug advertising. Industry propaganda is constantly provided to radio and television stations as either news reports or public service announcements to highlight what appear to be positive outcomes of drugs and surgical procedures (long-term follow-up results, often with negative outcomes, are rarely announced to the public). In addition, the pharmaceutical industry hires physicians as spokespeople to promote their products using the media and gives them free drug samples to distribute to patients in their medical offices.

Through such carefully crafted publicity campaigns, the pharmaceutical industry has tried to cultivate the image of a benign, humanitarian organization whose primary goal is to serve humanity, cure disease, and end human suffering. This image has been tarnished over the past few years with the multibillion-dollar lawsuits surrounding the deaths of patients taking COX-2 inhibitor drugs like Vioxx, Bextra, and Celebrex, which are commonly used to treat arthritis symptoms, as well as other scandals where

concerns about drug company profits have far outweighed those about public safety.

On June 10, 2005, the *New York Times* published a front-page story about the drug Propulsid, manufactured by Johnson & Johnson to treat heartburn. In July 1998, after more than a hundred patient deaths and injuries, Johnson & Johnson issued a new warning label, but the label did not contain all the warnings and qualifications originally sought by the FDA (because pharmaceutical companies are not required by law to change their warning labels, they often can negotiate changes with the FDA). According to the article:

> Propulsid's history has striking parallels with the painkillers now at the center of controversy. Dozens of studies sponsored by Johnson & Johnson that might have warned doctors away were never published, just as the pharmaceutical manufacturer Pfizer failed to publish an early study of Celebrex that indicated a heart risk. And Johnson & Johnson was able to delay and soften some proposed label changes, just as Merck later did with Vioxx.[10]

Looking After the Bottom Line

Although many scientists employed by the pharmaceutical industry are true humanitarians who are seriously committed to fighting disease and relieving human suffering, we should never forget that the main goal— the bottom line—of the drug companies is to *make as much money as possible*. By 2006, the drug industry in the United States was estimated to be a $245.3 billion business, with annual sales expected to reach $288.23 billion by the year 2010. With an average net profit margin of 18.1 percent, the American pharmaceutical industry is one of the most profitable sectors of all industry groups.[11]

As an extremely powerful economic and political force in the United States and around the world, these giant multinational corporations play a major role in determining government policy and influencing medical schools through educational grants, which often disguise efforts to further marketing aims. According to the U.S. Senate Finance Committee, twenty-three drug makers spent a total of $1.47 billion on such grants in 2004, or an average of $64 million per company.[12]

Physicians are also influenced by heavy advertising in medical journals: the December 21, 2005, edition of *The Journal of the American Medical Association*, which is published weekly, contained no less than twenty full pages of drug advertisements.[13] Drug companies also advertise heavily in

mainstream consumer health magazines (the December 2005 issue of *Health* contained thirty-three and one-third pages of drug advertising),[14] leading editors to avoid running objective articles that may educate readers about alternative modalities like oxygen therapies.

Given the tremendous influence and power of the drug companies, it is amazing that oxidative therapies are practiced to even the modest extent that they are today. As these inexpensive, nonpatentable, and multidisease therapies become better known, we can be certain that the pharmaceutical industry will strengthen its resolve to make medical ozone and hydrogen peroxide unavailable to the general public and will continue to lobby to prevent research and clinical application.

The eight biggest drug companies trading on the New York Stock Exchange reported 2006 sales and profits and 2008–2010 estimates as seen in table 2.1 on page 26.

LEGAL STATUS (2007)

In many European countries, oxidative therapies can be legally administered by a licensed health care professional, although each country has regulations governing the licensure of practitioners and limitations, if any, of specific therapeutic procedures. At the time of this writing, eleven U.S. states (known as “health freedom states”) have laws that protect patient access to alternative therapies (such as oxidative therapies) if they are administered by a licensed physician: Alaska, Colorado, Georgia, Massachusetts, New York, North Carolina, Ohio, Oklahoma, Oregon, Texas, and Washington. The state of Florida has a law that protects patient access to alternative therapies from *all* licensed health care professionals, while Louisiana, Nevada, and Texas have *regulations* that protect patient access to alternative therapies by licensed physicians. For updates, visit the Web site of the Foundation for the Advancement of Innovative Medicine: www.faim.org/states.htm.

Table 2.1. Annual Estimated Sales and Profits of the Largest Publicly Traded Pharmaceutical Companies

Company	Sales (billion dollars)		Net Profit (billion dollars)		Net Profit Margin (percent)
	2006	2008–10	2006	2008–10	
Bristol-Myers Squibb	19.10	19.35	2.23	2.71	12.7
GlaxoSmith-Kline	40.80	43.25	8.60	9.66	22.3
Eli Lilly	15.79	20.50	3.425	4.65	22.7
Merck	22.05	21.40	5.28	5.395	25.2
Novartis	33.80	31.60	5.94	5.70	18.0
Pfizer	55.35	58.60	15.93	19.35	33.0
Schering-Plough	9.60	10.90	.83	1.68	11.0
Wyeth	20.20	26.00	4.10	5.53	21.3

Source: The Value Line Investment Survey, July 22, 2005, 1243–87.

A VIABLE ALTERNATIVE?

In an age of increasing medical specialization, complex and sometimes questionable medical procedures, and expensive, often ineffectual medications, people want to get back to basics. Interest is high in medical therapies for both major and minor health problems that are safe and effective and that can naturally enhance our innate healing powers. We are looking for therapies that will cause a minimum of side effects and that will not bring about financial ruin.

The use of oxygen therapies—particularly ozone and hydrogen peroxide—holds great promise in treating both minor health problems and some of the most devastating diseases confronting humanity today, including cardiovascular disease, cancer, and HIV, the virus believed to cause AIDS. Together, they form the cutting edge of a new healing paradigm involving safe, effective, natural, and less costly forms of medical therapy. In the

following chapters, we will examine ozone and hydrogen peroxide in greater detail.

3
Ozone: Properties and Uses

Ozone is an elemental form of oxygen occurring naturally in the Earth's atmosphere. It is created in nature when ultraviolet energy causes oxygen atoms, (which are normally found in pairs, forming oxygen molecules) to temporarily recombine in groups of three. Ozone is also formed by the action of electrical discharges on oxygen, so it is often created by thunder and lightning. After a thunderstorm, the air seems to smell like freshly mown hay because of the small quantities of ozone generated by the storm. Ozone is also produced commercially in ozone generators, which involve sending an electrical discharge through a specially built condenser containing oxygen. Figure 3.1 shows the principle behind ozone generation. Because it is made up of three atoms of oxygen, ozone is known chemically as O_3. The newly formed molecule is quick to react with other substances.

Ozone surrounds the Earth at an altitude of between 50,000 and 100,000 feet in the form of a pale blue gas that condenses to a deep blue liquid at very low temperatures.[1] When it occurs in the upper atmosphere, ozone forms a protective layer that absorbs much of the sun's ultraviolet radiation. If it were not for the ozone layer, the survival of animal and plant life on this planet would be impossible. The depletion of the ozone layer caused by the use of chlorofluorocarbons (CFCs)— released into the atmosphere by refrigerators, air conditioners, and aerosol containers—has become a grave concern to scientists and physicians the world over. The dangerous ultraviolet light that is ordinarily blocked by the ozone layer has been linked to a wide variety of human health problems, including skin cancer and immunosuppression. Ultraviolet radiation has also been a factor in poor

crop growth found in certain species of grains. After many years of study and much procrastination on the part of industry and government, efforts are finally being made to phase out the use of CFCs completely.

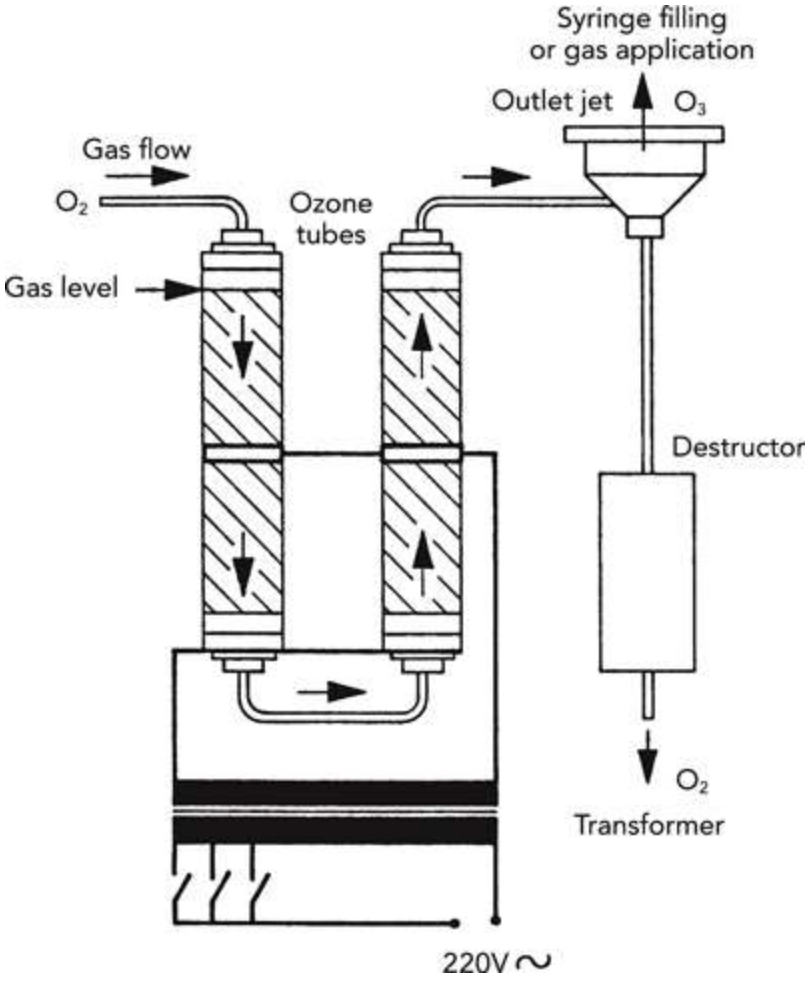

Figure 3.1. Principle of ozone generation. (From Siegfried Rilling and Renate Viebahn, *The Use of Ozone in Medicine*, Heidelberg: Haug Publishers, 1987. Reprinted courtesy of Dr. Siegfried Rilling and Haug Publishers.)

In the lower atmosphere, ozone combines with hydrocarbons (like carbon dioxide) and nitrogen oxide in vehicular exhaust and other sources to create photochemical smog. As a result, new and often highly corrosive pollutants are formed. The number of possible chemical reactions that can occur when ozone is combined with these oxides can reach into the hundreds. Ozone-laden smog has been linked to acid rain; a variety of lung, eye, and nose-related diseases; and the oxidation of buildings and monuments, especially in smoggy cities like Mexico City, Los Angeles, and Sao Paulo.

Many people feel that ozone is toxic because it is associated with these reactions. Yet the ozone index published in the newspapers and announced during the evening weather report is only an assay to estimate the amount of toxic nitrous oxide and hydrocarbons present in the atmosphere. As a powerful oxidizer, ozone actually helps clean the atmosphere of hydrogen monoxide, nitrous oxide, sulfur dioxide, and dozens of other dangerous compounds. Rather than warn only of the dangers of breathing ozone (and even breathing pure ozone can be harmful), weather reporters should focus more on the effects of breathing these other (and far more dangerous) elements of smog, formed primarily by vehicle exhaust and factory emissions.

Scientific and medical studies have emphasized the negative consequences ozone has on breathing, while ignoring the benefits of a transitory, precisely calculated medical application of a tiny amount of ozone that is never inhaled by the patient. This may be the main reason why physicians and others feel that ozone is not only medically useless but also a dangerous substance to take into the body under any circumstances, despite recent scientific findings at the Scripps Research Institute in La Jolla, California, that the human body can produce its own ozone for healing.[2]

HISTORY

Ozone's distinctive odor was first reported by Van Mauren in 1785, but the gas was not actually "discovered" by German chemist Christian Frederick Schonbein at the University of Basel in Switzerland until 1840. Schonbein decided to name the gas *ozone* (from the Greek word for "smell") because of its pungent odor. In 1860, the Swiss chemist Jacques-Louis Soret concluded that the ozone molecule was made up of three atoms of oxygen. However, it was the Irish chemist Thomas Andrews, a member of the Royal Society of London, who first demonstrated many of ozone's oxidating and disinfecting properties for the first time in a laboratory.

In 1856, ozone gas was used for the first time to disinfect operating rooms, and in 1860, the first water treatment plant to use ozone to purify municipal water supplies was built in Monaco. After a severe cholera epidemic in Hamburg killed thirty thousand people, the first waterworks to use ozone in Germany was constructed by chemist and inventor Werner von

Siemens (the company he founded has evolved into the huge German conglomerate that bears his name) in Wiesbaden in 1901, followed by one in the Westphalian city of Paderborn a year later.[3]

Since the early part of this century, many advances have been made in ozone technology. Sophisticated ozone generators and related technologies that incorporate ozone in a wide range of industrial and scientific applications have been developed. Over the last few years, a number of ozone-resistant materials have been developed for use with ozone generators. In addition to custom-blown glass components, modern substances like Teflon, a form of plastic known as PVDF or Kynar, a rubberlike substance called Viton, and silicone for flexible tubing are becoming increasingly available.

MUNICIPAL WATER TREATMENT

Ozone is a powerful oxidizer that can kill a wide variety of viruses, bacteria, and other toxins. It also oxidizes phenolics (poisonous compounds of methanol and benzene), pesticides, detergents, chemical manufacturing wastes, and aromatic (smelly) compounds more rapidly and effectively than chlorine without chlorine's harmful residues.[4] For this reason, ozone has become the element of choice for disinfecting and purifying drinking water and wastewater through a wide variety of applications.

More than a hundred different viruses that are excreted in human feces can be found in contaminated drinking water. Viruses such as those associated with hepatitis infect thousands of people a year and can survive for a long period of time in potable water. As a potent virucide, ozone is seen as an effective alternative to chlorine, which (in addition to its undesirable taste and odor) may yield chloroform and other compounds that are potentially carcinogenic.[5] According to *The Encyclopedia of Chemical Technology:* "Chlorination as it is practiced in potable-water treatment plants cannot adequately remove viruses to an acceptable level. The complete control of viruses by ozone at low dosage levels is well documented."[6]

As a potent oxidizer, ozone kills bacteria by rupturing the cell wall. Among the harmful microorganisms that ozone can oxidize are *Escherichia coli (E. coli), Streptococcus fecalis, Mycobacterium tuberculosum, Bacillus megatherium* (spores), *Cryptosporidium parvum,* and *Endamoeba*

histolytica. *The Encyclopedia of Chemical Technology* reports, "Ozone displays an all-or-nothing effect in terms of destroying bacteria. This effect can be attributed to the high oxidation potential of ozone. Ozone is such a strong germicide that only a few micrograms per liter are required to measure germicidal action."[7]

The process of purifying water with ozone is a simple one: a small amount of ozone is added to oxygen and mixed with the drinking water. Not only does it kill viruses and bacteria, but it also removes the microorganisms that cause bad taste and odor in the water. Today, over 2,500 municipalities around the world use ozone to purify their drinking supplies, including Moscow, Montreal, Los Angeles, Kiev, Helsinki, Brussels, Florence, Turin, Marseilles, Manchester, Amsterdam, and Singapore.[8] The technique seems to be most popular in Western Europe, including France, with over 700 units, and Switzerland, with over 100.[9]

An advice column in a weekend supplement to the *Los Angeles Times* spoke highly of using ozone in swimming pools, adding that ozone purifiers are easy to install and use in residential pools. Speaking of the advantages of ozone over chlorine, the author wrote:

> Activated oxygen, ozone, is one of the best and safest swimming pool and spa purifiers. An ozone purifier can cut chemical usage by 80% and eliminate burning eyes, faded and bleached bathing suits, dry skin, etc. Many major cities use ozone to purify their drinking water.… A very low concentration of ozone gas in water is not harmful to people or pets, but it destroys bacteria, viruses and tiny particles. Within several minutes, ozone converts back to pure oxygen. Ozone gas breaks down bacteria and virus cell-walls in seconds and kills them. Chlorine takes hours to slowly penetrate these cells. Chlorine can react with common compounds in the pool to create cancercausing chemicals.[10]

Ozone has also been used to purify the water in public swimming pools since 1950. During the Olympic Games held in Los Angeles during the summer of 1984, the European teams insisted that the water in the swimming pools be treated with ozone, not chlorine, or they would not participate in the events.

OZONE IN INDUSTRY

Ozone is used by the bottling industry to disinfect the inside of soda and beer bottles. The ozone later disappears as it decomposes to oxygen. Brewers use ozone to remove any residual bad taste and odor from the

water used in beer production. Ozone is also employed by the pharmaceutical industry as a disinfectant and in the manufacture of electrical components to oxidize surface impurities. Ozone concentrations of one to three parts per million are used to inhibit the growth of molds and bacteria in stored foods like eggs, meat, vegetables, and fruits.[11]

WASTEWATER POLLUTION CONTROL

Ozone can break down industrial wastes like phenol and cyanide so that they become biodegradable. It is often utilized to oxidize mining wastes, wastes from the photographic industry, and harmful compounds like heavy metals, ethanol, and acetic acid.[12]

Ozone is also used to disinfect municipal wastewater and to clean up lakes and streams that have become polluted by sewage and other pollutants. Unlike chlorine, ozone can clean up a lake or stream without killing the resident animal life or leaving potentially harmful chemical residues in the ecosystem.

AIR AND ODOR TREATMENT

In the United States, over one hundred ozone generators are used by both municipalities and private companies to remove noxious odors from treated sewage. Sewage contains high amounts of foul-smelling chemicals like sulfides, amines, and olefins. Ozone gas does not mask their odors; instead, it oxidizes these compounds and leaves them odor-free.

Ozone is also used to reduce odors in rendering plants, paper mills, compost operations, underground railways, tunnels, and mines. The food industry uses minute amounts of ozone to treat odors in dairies, fish processing plants, and slaughterhouses.[13]

FOOD SANITATION

In addition to controlling odors, the potential use of ozone in insuring food sanitation, eliminating pesticide residues, and killing harmful fungi is now being recognized by food technologists, with industry leaders like Ozone Safe Food Inc. (see resources—appendix 2) developing sophisticated

ozonation equipment for use in farms, slaughterhouses, dairies, fish processing plants and fruit and vegetable processing facilities.

During the past few years, increasing attention has been focused on the importance of food safety, not only related to food growing in the field but also in food processing and storage. Cases of food-borne diseases have increased over recent years, and spoilage in the fruit and vegetable industry has been estimated to be as high as 30 percent.[14]

The most popular sanitizing agent has been water, either used alone or with added chemicals like chlorine. However, not only has chlorine been found to have limitations as an effective sanitizer, but it also forms by-products like trihalomethanes (THMs), dioxins, and other harmful chemical residues formed in wastewater. When returned to the environment, these by-products lead to water pollution and other ecological damage.

However, ozone is being increasingly regarded as a safe and effective alternative to chlorine, especially in the washing, sanitizing, and storing of produce. It can also destroy pesticides and chemical residues, as well as kill bacteria like *E. coli*, *Listeria*, *Cryptosporidium*, *Giardia*, and other pathogens far more efficiently than chlorine. Ozone leaves no chemical residues: it completely decomposes within minutes into simple oxygen. And best of all, ozonated wastewater can be easily recycled without causing environmental damage of any kind.[15]

Other studies have found that ozone, whether applied as gas or ozonated water, reduces spoilage of fresh fruits and vegetables, including foods like blackberries, which are very prone to fungal decay.[16] Ozone has also been found to be a cheap and effective method of decontaminating food-processing equipment, storage rooms, food containers, foodcontact surfaces, and rooms where food is processed.[17]

Ozone has especially been found effective in controlling aflatoxin, a naturally occurring cancer-causing chemical that is a by-product from the fungus *Aspergillus flavus*. Found primarily in corn, cottonseed, and peanuts, aflatoxin can find its way into the products of animals that feed on corn (such as meat and dairy products) and foods made from corn and cornmeal (such as corn chips, muffins, and breakfast cereal). A study published in the *Journal of Food Science* found that ozone reduced aflatoxin levels by 92 percent, with no reversion to the parent compound observed.[18]

OZONE, ANTHRAX, AND HOMELAND SECURITY

In addition to aflatoxin, ozone can also kill *Erwinia*, a pathogen found in potatoes and other vegetables that causes rot after harvesting. After the bioterrorist attacks with anthrax on U.S. Postal Service facilities in 2001, scientists at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL)—who had tested ozone on potato crops—discovered that ozone can also kill anthrax spores. Ken Watts, a manager of the National Security Division of INEEL, reported that ozone "basically oxidizes the anthrax into a carbon dioxide compound. But the actual kill mechanism of the spore itself, no one knows for sure."[19]

In addition to being safer than chlorine dioxide and electron beam irradiation—which can destroy computer memory, photographic film, some medicines, and seeds—ozone is also much less expensive than electron beam irradiation. The price of a radiation machine is in the neighborhood of $5 million, while a comparable ozone generator costs about $120,000. Scientists like Watts believe that ozone can play an important role in national security, but more research needs to be carried out to see how best to proceed.[20]

"GENERALLY REGARDED AS SAFE"

On June 23, 2001, the FDA officially granted GRAS (generally regarded as safe) status to ozone for use in food contact applications. Whether working to limit food-borne illness or to address concerns over food contamination (either by accident or as a result of terrorist activity), ozone offers exciting possibilities for enhancing the safety of our food supply.

4
Ozone in Medicine

Toward the beginning of the twentieth century, interest began to focus on the uses of ozone in medical therapy. In September 1896, Nikola Tesla, the electronics genius and inventor of the radio, patented his first ozone generator, and in 1910 he formed the Tesla Ozone Company with a capital of $400,000. He hoped to apply his invention to a number of commercial uses, including refrigeration. It is said that Tesla sold his machines to doctors for medical use, and he is believed to have been the first person to manufacture ozonated olive oil to be sold to naturopathic physicians.

A recent discovery at the historical collection of the College of Physicians and Surgeons in Philadelphia shows that ozone was first used therapeutically by surgeon Samuel R. Beckwith, M.D., a member of the American Institute of Homeopathy and the Medical Society of Ohio. His book, *A New Therapeutics for the Cure of Disease by Sending Ozone, Oxygen and Medicine into Diseased Tissues*, was published in New York City in 1899.[1]

In Germany, physician Albert Wolff first utilized ozone to treat skin diseases in 1915, and the German army used ozone extensively during World War I to treat a wide variety of battle wounds and other anaerobic infections.

However, it was not until 1932 that ozone was seriously studied by the scientific community, when ozonated water was used as a disinfectant by Dr. E. A. Fisch, a German dentist. One of his patients was surgeon Erwin Payr, who immediately saw the therapeutic possibilities of ozone in medical therapy. Dr. Payr, along with French physician P. Aubourg, was the first medical doctor to apply ozone gas through rectal insufflation to treat mucous colitis and fistulae. In 1945, Payr pioneered the method of injecting ozone intravenously for the treatment of circulatory disturbances.

Other German pioneers in medical ozone include physician Hans Wolff (1924–1980), who wrote *Medical Ozone (Das medizinische Ozon)* and collaborated with physicist Joaquim Hansler (1908–1981) to establish the Medical Ozone Society (now the Medical Society for Ozone Application in

Prevention and Therapy) in 1972.[2] Hansler designed and built the first medical ozone generator (the "OZONOSAN") that could make accurate dosages of oxygen and ozone. The company he founded bears his name and is one of the largest and most trusted manufacturers of medical ozone generators in the world. A picture of a modern medical ozone generator is reproduced in figure 5.1 on page 45.

World War II brought about major setbacks for German research into medical ozone, because many clinics and laboratories were destroyed in Allied air raids. It was not until the 1950s that clinics reopened and research was begun once more.

The first physician to treat cancer with ozone was Dr. W. Zable in the late 1950s, followed by Drs. P. G. Seeger, A. Varro, and H. Werkmeister. During the next twenty years, hundreds of German physicians began using ozone in their practice to treat a wide variety of diseases (both alone and as a complement to traditional medical therapy) through a number of applications. Horst Kief is believed to be the first physician to use ozone therapy to successfully treat patients infected with HIV. He also pioneered the development of autohomologous immunotherapy (AHIT) using ozone and other elements, which can be used to treat a wide variety of diseases that are resistant to traditional medical therapy.

Today some eight thousand licensed health practitioners (including medical doctors, homeopathic physicians, and naturopaths) in Germany use ozone in their practices, while some fifteen thousand practitioners use ozone on the European continent, either alone or as a complement to other therapies. It is estimated that over twelve million ozone treatments have been given to over one million patients in Germany alone over the last fifty years. Although medical uses of ozone are still considered experimental by North American scientists, they are well known and well established outside the United States.

PSEUDOSCIENCE?

Some critics of ozone therapy have condemned it as a "pseudoscience" that has no solid medical foundation. Although prejudice can be a factor, this view may in part be a reaction to proclamations from overenthusiastic supporters of oxidative therapies who have claimed that ozone and hydrogen peroxide are "miracle drugs" that can cure any disease known to humankind. In addition, many reports on cures have never been documented by objective medical and scientific sources. While personal case histories have value, a major challenge

among oxidative practitioners is the careful documentation of their clinical findings and collaboration with others to expand their research.

It's important to remember that while the clinical findings related to ozone and hydrogen peroxide are often impressive, oxidative therapies only *assist the body to heal itself*. Not every disease will respond to oxidative therapy, and many patients will find that these therapies will not relieve their health complaints. This is why we must focus not only on claims of miracle cures but also on documented clinical and laboratory findings that show why and how these therapies can work.

RESEARCH IN MEDICAL OZONE

Since the end of World War II, literally hundreds of laboratory and clinical studies in the medical uses of ozone have been done, primarily in Europe, and their findings have been published in a variety of scientific and medical journals. Many have been published in German, with the exception of those findings first reported at international medical conferences sponsored by the International Ozone Association, which were presented in English. At the present time, the bulk of scientific research in the medical uses of ozone is being undertaken in Cuba, Russia, Germany, and Italy, where researchers receive cooperation and support (in varying degrees) from the government and major universities. Research is going on to a far lesser extent in the United States, France, Mexico, and Canada.

However, one recent American study by scientists at the Scripps Research Institute in La Jolla, California, received worldwide attention. Published in the respected journal *Science* and other publications, it showed that in addition to hydrogen peroxide, ozone may be naturally produced in the human body to help kill bacteria, viruses, and other pathogens. These antibodies may not only kill pathogens directly but might also promote inflammatory and other immune responses.[3] Unfortunately, the article's authors emphasize the point that, particularly when ozone seems to be located in atherosclerotic plaques, ozone is always an unwelcome compound. Their report does not certainly explain how ozone works in the human body to both prevent and cure disease. Yet commenting on these surprising findings in another issue of *Science*, Dr. Carl Nathan, an immunologist at the Weill Cornell Medical Center in New York City, commented, "It will be hard to think of antibodies in the same way [as before]."[4]

More clear evidence that ozone works in this way is necessary. However, if true, this could be a significant discovery for several reasons. First, the fact that

ozone is naturally produced by the human body removes from it the stigma of being classified as a “foreign element” that is harmful under all circumstances. It can also answer the critics of ozone therapy by helping explain how ozone works naturally in the human body to both prevent and cure disease.

Another important North American study receiving wide publicity was published in the *Canadian Medical Association Journal* when fears of AIDS-related blood transfusions were at their height. It showed that ozone can kill HIV, the hepatitis and herpes viruses, and other agents in blood used for transfusion in vitro. The article’s author added: “The systemic use of ozone in the treatment of AIDS could not only reduce the virus load but also possibly revitalize the immune system.”[5]

Other research in ozone therapy is taking place in two unlikely countries: Russia and Cuba. In Russia, physicians, chemists, biologists, and other scientists have been working with the support of the Ministry of Public Health at major institutions like the Interregional Cardiovascular Center and the Central Scientific Laboratory at the Medical Institute in Nizhny Novgorod (Gorky), the Sechenov Medical Academy and the Central Scientific Research Institute of Dermatology and Venerology in Moscow, and the Institute of Photobiology in Minsk, Belarus. Ozone therapy is becoming part of the medical mainstream in Russia, and physicians from around the country come to Nizhny Novgorod for training.

Medical ozone research has been carried out since 1985 in Cuba under the auspices of the Ozone Research Center (formerly called the Department of Ozone), a branch of the prestigious National Academy for Scientific Research in Havana. In addition to investigations in medical ozone under the leadership of Dr. Silvia Menendez, director of research, the center is involved in the use of ozone for sanitation, wastewater treatment, and the design, construction, and installation of ozone generators. The Ozone Research Center also works closely with physicians throughout the country as part of the National Program for Ozone Therapy and offers training for physicians from Cuba as well as from other countries. The Ozone Research Center sponsors an International Symposium on Ozone Applications every few years, which is attended by physicians, researchers, and others from all over the world. Since 1985, over 600,000 patients have been treated with ozone at clinics and hospitals throughout the country, and many foreigners travel to Cuba for ozone therapy at the International Ozone Therapy Clinic and other institutions, mostly in Havana.

By 2007, the Ozone Research Center and a staff of more than fiftyfive chemists and laboratory technicians were located at a modern campus on the

outskirts of Havana. The facility includes two laboratories, two ozone clinics (one for Cubans and one for foreigners), and an administration building. A 180-bed four-star hotel for foreign patients and their families, complete with an ozonated swimming pool, is located across the street.

It is important to view ozone therapy in the context of the Cuban health care system. One of the primary goals of the Cuban Revolution of the 1950s was to provide free and universal health care to all Cuban citizens. Although subjected to a crippling economic blockade by the U.S. government since 1961, Cuba has nonetheless been able to position itself in the vanguard of medical research characteristic of many developed nations, including genetic engineering (the Center for Biotechnology and Genetic Engineering is the first in Latin America), organ transplant technology, the development of an artificial heart, vaccines for hepatitis B and meningococcal meningitis B, neural brain implants to treat Parkinson's disease, and epidermal growth factor to aid burn victims.[6]

In contrast to his devastating eyewitness account of the disintegration of Castro's Cuba in his book, *Castro's Final Hour*, Andres Oppenheimer had the following to say about the Cuban health care system:

> In fact, the revolution's greatest success had been in providing a firstclass health care system for free. Whatever health needs Cubans had, whether a pregnancy test or a heart-bypass operation, they could have it for the asking. And because health care was the revolution's greatest pride, the state's magnanimity was unlimited: even cosmetic surgery and orthodontic treatments were performed without charge.[7]

Despite severe ongoing problems with transportation, agriculture, and economic development, Cuba has consistently maintained one of the highest levels of health care in all of Latin America. The results of much of the Cuban research will be presented here in this book.

Why are the Cubans and Russians so interested in ozone? Citizens of both countries have enjoyed socialized medicine for decades, so private drug manufacturers and private hospitals and clinics have traditionally played a small or nonexistent role in determining the direction of the health care system. As mentioned before, ozone cannot be patented, it is extremely cheap to produce, and it can be used effectively in a wide range of therapeutic applications. In countries like the United States, where large drug companies provide funding for medical schools, are directly or indirectly involved in all medical research, and lobby to influence governmental policy, there is simply no interest in researching the possibilities of ozone therapy. And even when private funding is offered for scientific or clinical research, hospitals have been known to refuse it. Yet in countries where the profit motive has traditionally been absent from

health care, physicians, chemists, and other researchers enjoy government support and funding for their work.

The Bocci Breakthrough

One of the most tireless researchers in the therapeutic applications of ozone has been Velio Bocci, M.D., specialist in respiratory diseases and hematology and emeritus professor of physiology at the University of Siena in Italy. Since 1988, when Dr. Bocci first began to study ozone, he has collaborated with numerous researchers in Europe and has authored or coauthored more than fifty published articles on the subject. He is also the author of two respected scientific texts on ozone therapy: *Oxygen-Ozone Therapy: A Critical Evaluation* and *Ozone: A New Medical Drug*. Both books were primarily written for the scientific and medical communities, but the newer edition is more easily understood by the lay reader.

Although German researcher J. Washuttl and colleagues wrote about immunoactivation through ozone in the 1980s, Dr. Bocci was the first to scientifically explain how ozone actually works when added to blood removed from the body and reinfused into the patient. As described in chapter 2, rather than merely kill bacteria and viruses directly through oxidation, ozone induces a cascade of complex immunological reactions within the body that promote health and healing. According to Renate Viebahn-Haensler in the fourth English edition of *The Medical Use of Ozone*, these findings, first published in a 1990 edition of the medical journal *Haemalotogica*,[8] represent "a major milestone in ozone therapy."[9]

ONE GAS, MANY APPLICATIONS

Because ozone works primarily to stimulate the body's immune reactions through transient oxidative stress, and because blood is composed of a number of cells with different functions, the range of human health problems that can respond favorably to ozone therapy is quite broad. According to *The Use of Ozone in Medicine* (considered to be the basic reference book for physicians who work with ozone therapy), ozone has been used therapeutically in the areas of allergology, angiology (blood vessels), dermatology, gastroenterology, gerontology, gynecology, intensive care, neurology, odontology (dental medicine), oncology, orthopedics, proctology, radiology, rheumatology, surgery (including vascular surgery), and urology.[10] As the Canadian report cited earlier indicated, ozone has also been proven to effectively purify human blood supplies.