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Celeste McGovern investigates the oxygen–ozone injection therapy that is putting an end to thousands of people's joint and back pain and may radically change medicine

THE OZONE REVOLUTION

Dean Johnson first ran into trouble with his shoulders when he was 14 years old. He played rugby, and every other game or so, at least one shoulder would painfully jostle out of its socket because of his tendency to be hyperflexible. At 17, doctors drilled a hole through his collar bone, threaded a sinew grafted from his left leg through the hole, and attached it to his first rib and sternum in an attempt to stabilize his shoulder.

Three more surgeries followed over the next 15 years to remove and replace the surgical screws and staples that had chipped his shoulder bone. Not surprisingly, none of this did anything to alleviate Johnson's chronic pain. His job as an IT manager in Bedford, England, sitting at a computer all day, hardly helped matters.

"The pain stopped me from running," he says. "I couldn't play soccer. I couldn't do anything for any prolonged period of time." He developed tennis elbow that he thought was stemming from the pain in his shoulder. Physical therapy didn't help. His doctor offered more surgery and painkillers—nonsteroidal anti-inflammatory drugs (NSAIDs) like naproxen, diclofenac and a mixture of various opiates. "None of that worked," Johnson says. "It just gave me a bad stomach and didn't really help at all."

After turning to the internet for alternatives, Johnson came across Oliver Eaton, an osteopath and co-director of the ProHealth Clinic, with three locations in England, who offered oxygen–ozone gas injections as part of his

MULTIPLE STUDIES HAVE CONCLUDED THAT OZONE SHOULD BE A FIRST-LINE TREATMENT FOR SPINAL PAIN AND ALSO FOR OSTEOARTHRITIS

pain and regenerative medicine practice. Johnson started the first round of injections of a mixture of oxygen and ozone gas in his shoulders and elbow in March this year. Procaine, an anesthetic, is added to the injection to ease the pain of the procedure.

The next day he began to notice that he was more mobile and less painful in the areas that had been injected. Two more rounds of injections followed a few weeks apart, and he was astonished at the continued improvement.

Now, the 41-year-old wants others who are "living on painkillers" to know about the treatment. "Not only did it fix my shoulders, it also fixed my tennis elbow, which wouldn't heal due to problems in my shoulder," he says. "At this moment, I am feeling better than I have in years. I'm finally able to start playing sports again due to increased strength in my arms and lack of pain in my back. If I do overexert myself, it repairs quickly, whereas before it would just stay with me."

Miracle therapy or toxic gas?

A chronic debilitating pain that goes away with a few inexpensive treatments that take minutes to administer sounds too good to be true. Ozone injections for joint and back pain (and ozone therapy in general) are dismissed as dangerous quack medicine by conventional doctors in the US and UK, and the practice is relatively unheard of by the general public.

Since 1974, the US Food and Drug Administration has called ozone a "toxic gas with no known useful medical application." Yet hundreds of patients like Dean Johnson testify to ozone injections transforming their lives, melting away years of pain and disability in degenerated knees and hips, herniated discs, frozen shoulders, injured feet and more. They cancel surgery, ditch their canes and throw away their prescription painkillers.

More than 26,000 physicians use ozone in 31 countries, including Germany, Italy, Russia, Spain, Cuba and China, and a growing number in North America are adopting the practice. Many of them cite an expanding body of peer-reviewed medical papers describing tens of thousands of patients who received the treatment, with an astonishing 70–80 percent success rate and negligible side-effects.

Studies often include before and after MRI images—bulging hernias disappear, and cartilage appears to

What is ozone?

When oxygen gas (O_2) is exposed to UV radiation or electricity, such as from lightning, the jolt of energy causes it to form ozone (O_3)—the gas that gives the air its characteristic fresh smell after a lightning storm. Carrying an extra oxygen atom, ozone gas is much more reactive than the regular oxygen we breathe in air. It breaks down rapidly, which is why you can't buy it bottled or have it shipped to you.

When scientists learned how to generate ozone in the laboratory in the 1840s, they recognized its antimicrobial properties. It was first used to disinfect hospitals in 1856, and it was employed as a germicide before antibiotics. In World War I, German doctors used it to treat soldiers with gangrene.

Ozone also revolutionized public health. The first ozone water treatment facility was built in Monaco in 1860, and in 1901, in the wake of a cholera epidemic that claimed 30,000 lives in the city of Hamburg, ozone water treatment plants also began to appear in Germany. There are still thousands of ozone water treatment plants in operation around the world.[1]

Because of its well-known antibacterial and antifungal effects, alternative practitioners use ozone gas that they synthesize on site to treat a range of conditions they suspect to have an underlying infectious cause, from autoimmune disease to fibromyalgia, chronic fatigue syndrome and even cancer.

Ozone needs to be made from pure medical-grade oxygen, and since it is so reactive, it must also be made using inert (non-reactive) materials. The gas also can't be shipped or stored for long periods of time.

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regenerate in ways conventional orthopedic surgeons say is impossible.

Multiple studies have concluded that ozone should be a first-line treatment for spinal pain among the half-million Americans lined up for surgery for low back problems, and also for osteoarthritis, which afflicts 30 million people in the United States alone, costing the healthcare system a staggering $16.5 billion annually—more than 4 percent of all the money spent on hospitalizations in this country.[1]

While back pain and arthritis are the most prevalent conditions shown to improve with ozone, they are certainly not the only ones. Recent studies show ozonated water and olive oil are capable of killing bacteria on teeth subjected to root canals, for example.[2] A study published this year shows photographs of animal and human eye infections dramatically healed by ozone after standard treatments failed.[3]

It's even been shown to be an effective treatment for liver abscesses[4] and to improve the survival rate of patients with severe hepatitis.[5]

Ozone modulates the immune system, and this feature is thought to be the reason why it's effective for treating asthma,[5] reducing brain damage after strokes,[7] and lowering the risk of a repeat heart attack or the development of arrhythmias after a first heart attack.[8]

Orthopedic revolution

In the 1970s, Dr Alexander Balkanyi of Zurich, Switzerland, used ozone injections to treat muscle and tendon pain, and soon afterwards others began injecting it into damaged joints. Dr Frank Shallenberger was one of the first to introduce the therapy to the United States. A former emergency doctor turned alternative and homeopathic physician who runs the Nevada Center of Alternative and Anti-Aging Medicine in Carson, Nevada, Shallenberger told *WDDTY* he learned about ozone on a trip to Germany in the early '80s. "When I got back, I found myself surrounded by all these patients in pain with arthritic and degenerative joints and just started injecting, and they got better. It was astonishing."

Now he sits on the International Scientific Committee on Ozone, and he's formed the American Academy of Ozonotherapy to promote and standardize medical use of the gas. More than a dozen studies on the injection of ozone into joints bear out Shallenberger's experience, and in 2017 the first randomized, double-blind, placebo-controlled clinical trial of ozone in knee arthritis was published.

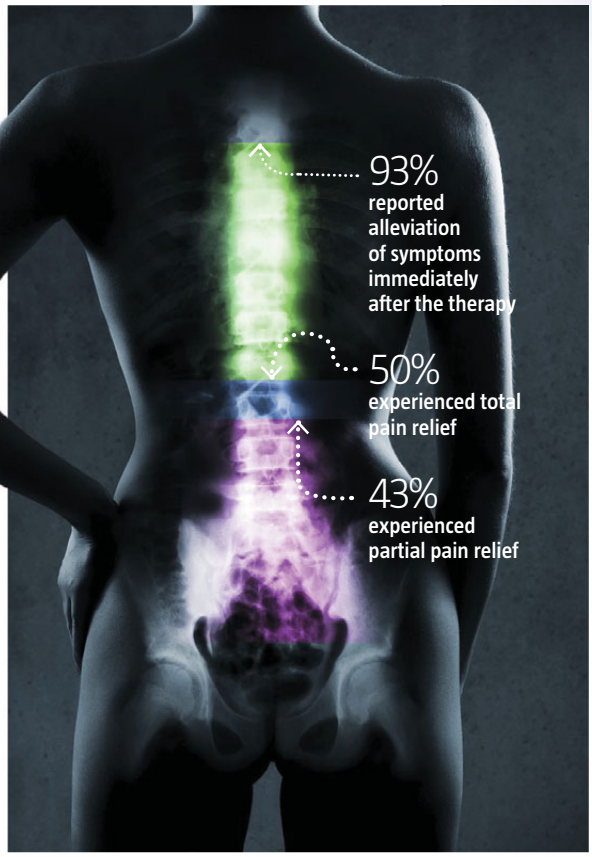
The researchers, from Paulista School of Medicine at Sao Paulo Federal University in Brazil, separated 98 patients with painful osteoarthritis into two groups. Every week for eight weeks, 63 patients received a 10-mL injection of an ozone gas mixture into their more painful and restricted knee, and 35 patients were injected with a placebo shot of air into their more troublesome knee. Neither the patients nor the doctors knew who was getting what.

On every scale of pain and mobility that was measured, the outcomes were dramatically better in the treatment group, prompting the research team to conclude that ozone "reduced osteoarthritis-associated pain, improved joint function, and enhanced quality of life of patients with knee osteoarthritis."[9]

Sylvia Jenson of Warrington, England, was immobile and couldn't put any pressure on her left leg before having ozone injections in her knees. "I had to have a walking stick even to get out of bed," she says. She was prescribed NSAID painkillers that kept her awake at

> OZONE MODULATES THE IMMUNE SYSTEM, AND THIS FEATURE IS THOUGHT TO UNDERLIE ITS EFFECTIVENESS FOR TREATING ASTHMA, REDUCING BRAIN DAMAGE AFTER STROKES AND LOWERING THE RISK OF A REPEAT HEART ATTACK

Back in action
In patients with low back pain, ozone relieved pain and dramatically improved slipped discs on CT scans.



night "with all the troubles with my stomach," and her doctor advised knee surgery. Her physical therapist told her not to walk or stand for more than 10 minutes in the meantime.

After three rounds of injections at Eaton's clinic, Jenson got rid of her cane and quit her painkillers. "In fact, the other week I went for a walk for a mile and had no pain at all afterwards," she says.

Back pain

A similar success rate is being reported for painful disc herniations or 'slipped discs.' A 2016 study reported the results of 84 Italian patients with low back pain, all of whom had followed standard medical drug treatment for at least two years and declined surgery. Among the 84 people included in the study, 77 (93 percent) reported alleviation of symptoms immediately after the therapy: 42 (50 percent) experienced total pain relief and 35 (43 percent) experienced partial pain relief. None of them had any detectable side-effects.

The numbers are striking, but the images included in the study are even more so. A CT scan of a 66-year-old woman shows disc herniation between lumbar discs 4 and 5, which never changed over three years of medical treatment. A scan taken one month after oxygen–ozone therapy shows the herniation had completely disappeared.[1]

HUNDREDS OF PATIENTS TESTIFY TO OZONE INJECTIONS MELTING AWAY YEARS OF PAIN AND DISABILITY IN DEGENERATED KNEES AND HIPS, HERNIATED DISCS, FROZEN SHOULDERS, INJURED FEET AND MORE

Safety profile: ozone vs surgery

Anytime you break the skin with a needle, there is risk—a risk of infection, a risk of injury and a risk of provoking the immune system to respond unpredictably.

Considering how extensively oxygen–ozone gas injections have been used in Europe (see main story), with 70 to 80 percent of patients benefiting from the therapy, there are very few reported adverse events, which suggests it is a very low-risk procedure.

For example, a 2017 study on the intradiscal injection of ozone—the most technically demanding ozone-injection procedure for back pain—reports that the risk of complications is 0.1 percent, equivalent to one in 1,000 patients.[1]

University of Siena physiology professor Velio Bocci, author of *Ozone: A New Drug* (Springer, 2014), published a review of the therapy for spinal treatment that describes the importance of precisely calculated ozone concentration in the syringe. Below 18–20 μg/mL, it won't work. Higher than 20 μg/mL, the treatment becomes too painful and may cause dizziness or fainting.[2]

Ozone is toxic to lung tissue, and when inhaled, it can cause chest pain, coughing, shortness of breath and lung irritation, but no cases of this have been reported in relation to medical therapy, in which the ozone is injected at the site of pain and the lungs are never exposed.

One case study describes an infectious abscess resulting from spinal injection of ozone and cites only two other documented cases of infection following ozone injection—all of these patients were successfully cured.[3]

On the other hand, about one in 25 people will develop an infection following spinal surgery. The British Association of Spine Surgeons (BASS) estimates that about one in every 350 people who have surgery to treat spinal stenosis will die from complications of the surgery, as will about one in every 700 people who have surgery to correct a slipped disc.

There is also the risk of nerve injury: about one in 300 people who undergo back surgery are left paralyzed. There's a 2 to 17 percent chance of having the dura—the protective covering surrounding the spine—torn, leaving the nerves exposed. There are also the risks of cerebrospinal fluid leakage and of developing dangerous blood clots.

Patients are additionally warned that symptoms may recur or worsen due to the surgery weakening the spine, causing another slipped disc, or from scarring, which can cause symptoms similar to nerve compression. Roughly one in 20 to one in 100 patients will develop new numbness or weakness in one or both legs as a result of the operation.[4]

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No steroids necessary

Mainstream medical treatment for arthritis involves injecting steroids into the joints of patients with pain. Although many patients experience short-term pain reduction, a 2015 Cochrane Collaboration review of the research calls the benefits of the procedure "unclear" and notes there is no evidence to suggest any benefit at all six months after treatment.[1]

In fact, other research has found that steroids are associated with significant damage to cartilage and toxicity to the cells (chondrocytes) that build cartilage, especially at high doses or over long periods of treatment.[2]

In a 2013 study, Chinese researchers compared the effects of injecting the standard ozone–oxygen mixture into the spines of people with low back pain to those of injecting ozone and oxygen along with a steroid. At check-ups six and 12 months after the procedure, the researchers found that the patients who received the steroid in addition to the ozone mixture fared no better than those treated with ozone alone.[3]

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63,000 cases in Italy alone

A 2015 review paper examining the ozone treatment used for spinal pain describes the "rapid dissipation of pain" from a single ozone injection. Researchers led by Velio Bocci at the University of Siena report that about 63,000 patients have been treated in Italy with intradiscal ozone injections, or injections directly into the fluid in their spinal discs, with an overall 80 percent success rate at cutting pain, making it a "method of choice" for spinal disc herniation.

It also describes treatment with a "technically simple" series of up to four injections that go in between the discs near the area of pain—the method employed by Shallenberger and Eaton. These injections are usually given up to twice a week for five or six weeks. "It has been defined as 'chemical acupuncture' because both the needle and gas injection have a role in eliciting a complex series of chemical and neurological reactions leading to the disappearance of pain in the majority (positive responses in 70–80 percent of cases) of patients with low spinal pain."[ii]

Lasting effects

Patients may improve for a month, but does ozone really make lasting changes? A study published in the *International Journal of Spine Surgery* in 2014 claims to be the first to look at how patients are doing long-term after ozone spinal injections—five and 10 years later. Based on MRI scans, 79 percent of patients had a reduction in herniation volume, and the average reduction was 56 percent.

Among the 108 patients who underwent ozone treatment included in the study, 89 did not have any subsequent back surgery, and in this group, 82 percent had improvement at five years, and 88 percent had improvement at 10 years after receiving the ozone injections. Since the ozone injections were also very safe, the researchers concluded that "the risk reward profile for this treatment is favorable."[iv]

More than joints

Besides the joints, preliminary research shows that ozone has longer-lasting effects than injected steroids for plantar fasciitis, a painful foot condition caused by inflammation of the connective tissue that connects the heel to the toes.[v] And a pilot study published in 2017 found that ozone was "very effective" for treating 10 patients with adhesive capsulitis or 'frozen shoulder,' a painful, chronic condition of the shoulder that can immobilize the entire arm and disrupt sleep.[vi]

David Brownstein, a holistic family doctor in Bloomfield, Michigan, and author of *Ozone: the Miracle Therapy* (2017 Medical Alternatives Press), uses the gas to help frozen shoulder, arthritis, sprains and strains, as well as ligament and tendon tears, and claims an 80 to 90 percent success rate in reducing pain.

As Robert Rowen, MD, of Santa Rosa, California, puts it, "I use it for anything that hurts." Rowen's YouTube channel features videos of hundreds of his patients, walking more easily after injections, raising arms they couldn't raise before, smiling about months or years of dissipating pain. Alix Mayer injured her shoulder five years ago when her dog yanked on his leash. A year later when her "frozen shoulder" was still bothering her, she went to see Rowen for an injection of prolozone (see box, page 37). One round of shots fixed her permanently, she says, and she hasn't needed to return for more treatment. "It's been amazing for me," she says.

ABOUT 63,000 PATIENTS WITH SLIPPED DISCS HAVE BEEN TREATED IN ITALY BY INJECTIONS DIRECTLY INTO THE FLUID IN THEIR SPINAL DISCS, WITH AN OVERALL 80% SUCCESS RATE AT CUTTING PAIN

A pain fix, and more

Degenerating cartilage is a stubborn problem in current conventional medicine. Most orthopedic specialists would say that joint wear and tear is an irreversible process that only goes downhill, and there is no universally accepted treatment to prevent or stop it.

However, the before and after images and corresponding pain scores of patients reported in new ozone research don't fit with this theory, and it is going to be increasingly difficult for the medical establishment to disregard a tool if it works for such a huge number of afflicted people.

AN EXPANDING BODY OF MEDICAL PAPERS DESCRIBES TENS OF THOUSANDS OF PATIENTS WHO RECEIVED THE TREATMENT, WITH AN ASTONISHING 70–80% SUCCESS RATE AND NEGLIGIBLE SIDE-EFFECTS

Many of the mechanisms of ozone's anti-inflammatory capabilities have now been described in the medical literature. And researchers have finally begun to elucidate the mechanisms behind its capacity to regenerate cartilage and repair damaged tissue.[15]

When Shallenberger first began using ozone injections more than 30 years ago, he started to wonder about the processes underlying pain, given the oxygen–ozone miracles he was seeing. "I knew oxygen had something to do with it," he says. "Decreased oxygen utilization is at the root of all chronic disease," and it's "fundamental to chronic pain and tissue degeneration."

When ankle and knee injuries won't heal, for example, he says it is because low oxygen metabolism leads to free radicals, which damage tissue and increase inflammation and swelling, and go on to perpetuate the injury and lead to even lower oxygen. Ozone, he says, breaks the vicious cycle "so cells and tissues can begin to do what they usually do so well—heal themselves."

Although about 10 to 15 percent of patients don't respond to ozone treatment, he can't think of another therapy with so many benefits, so many potential applications, and such a favorable safety profile. "This is not just another drug," he says. "This really is an entirely new principal with the potential to radically change medicine."

Ozone is among the fastest growing alternative health therapies, and Shallenberger suspects that it will be "commonplace" in a decade or so because of the satisfaction it generates. "In all of medicine, as a doctor, there is nothing as much fun as taking pain away from an individual, especially if that pain is life-destroying. It's the most fun any doctor could have."

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Ozone, prolozone, prolotherapy or PRP?

Prolotherapy is the process of adding an irritant to the joint capsule, which seems to rev up the metabolism and kick pain-relieving mechanisms into gear. The sugar dextrose is the most common irritant used in prolotherapy, and a number of studies have shown that it helps. Hyaluronic acid, which has been linked to joint repair, has been tested recently. One study compared the injection of a mixture of oxygen and ozone gas against hyaluronic acid injection in arthritic knees and found that both had lasting benefits to patients.[1]

Injecting platelet-rich plasma (PRP) is another new therapy. A 2018 randomized, double-blind study divided 42 patients with knee osteoarthritis into two groups receiving either the usual prolotherapy (dextrose) injections or PRP and found that six months later, the PRP patients had experienced a significantly greater improvement in function.[2]

Joint injections can be quite painful for a few minutes, especially if the area is already inflamed. When holistic doctor Frank Shallenberger of the Nevada Center of Alternative and Anti-Aging Medicine started injecting oxygen–ozone gas into joints three decades ago, one of his patients asked why he couldn't put a little painkiller in the injection. He thought it was a good idea, especially when he learned that the local anesthetic procaine actually has the ability to restore membrane potential to cells.

After adding procaine and finding that patients responded even better, Shallenberger christened his new mixture 'Prolozone.' Over time, he has also added vitamins and minerals that assist healing, along with anti-inflammatories and a small amount of the dextrose used in prolotherapy.

Although most scientific studies have focused on injected ozone alone, Shallenberger maintains that, "When you add these other things in, you really see results."

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