The American Institute of Stress

COMBAT STRESS

BRINGING YOU ALL THE WAY HOME

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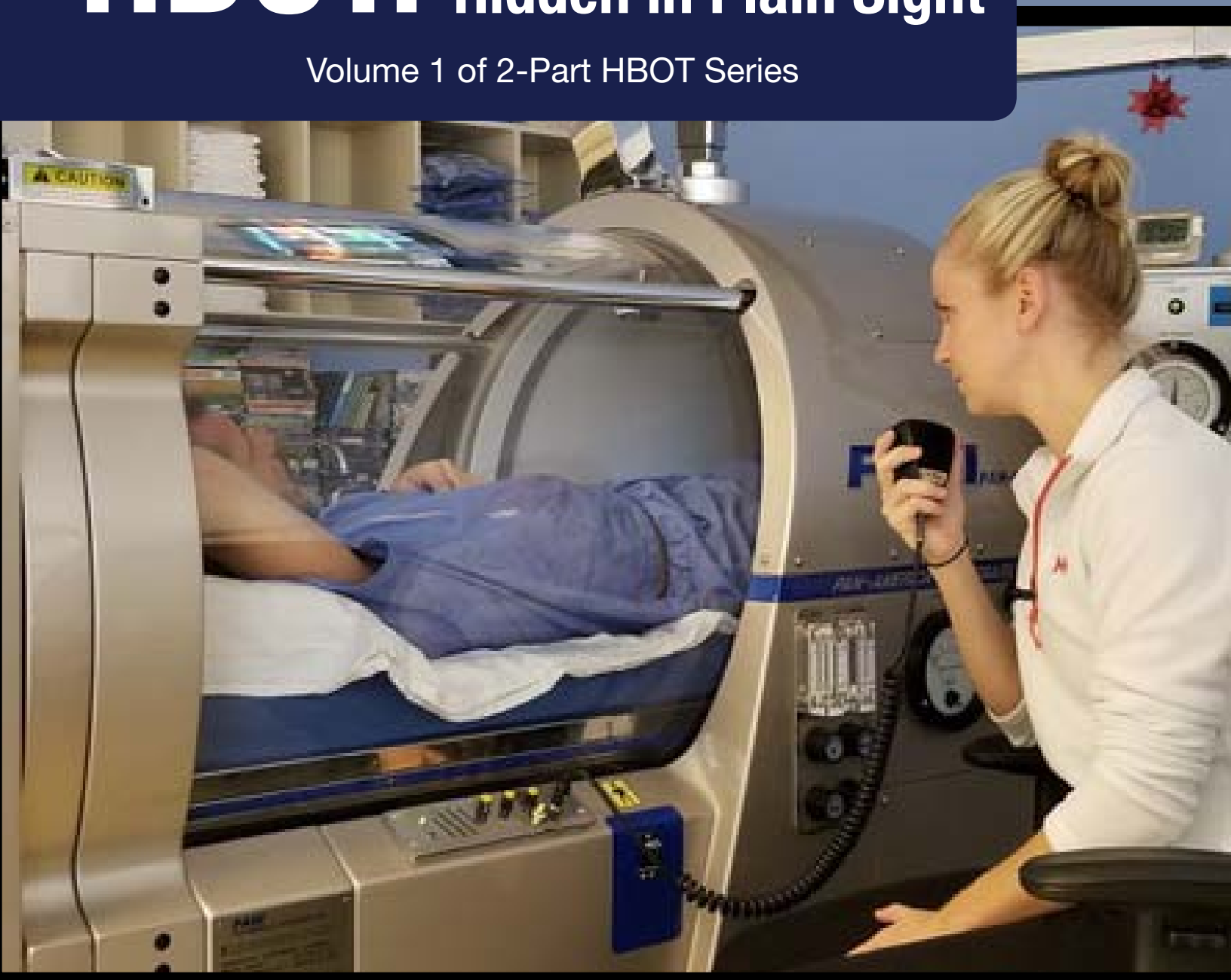
HBOT: Brain Healing Hidden in Plain Sight

Volume 1 of 2-Part HBOT Series



The mission of AIS is to improve the health of the community and the world by setting the standard of excellence of stress management in education, research, clinical care and the workplace. Diverse and inclusive, The American Institute of Stress educates medical practitioners, scientists, health care professionals and the public; conducts research; and provides information, training and techniques to prevent human illness related to stress.

AIS provides a diverse and inclusive environment that fosters intellectual discovery, creates and transmits innovative knowledge, improves human health, and provides leadership to the world on stress related topics.

Your source for science-based stress management information

COMBAT STRESS

We value opinions of our readers.

Please feel free to contact us with any comments, suggestions or inquiries.

Email: editor@stress.org

Combat Stress is a quarterly magazine published in February, May, August and November with news and advertising designed with Service Members, Veterans and their families in mind. It appeals to all those interested in the myriad and complex interrelationships between combat stress because technical jargon is avoided and it is easy to understand. Combat Stress is archived online at stress.org. Information in this publication is carefully compiled to ensure accuracy.

AIS Combat Stress Board

Chaired by Colonel Platoni, the role of this board is to develop initiatives and communications to serve the stress management needs of Service Members and Veterans.

Cover Photo Credit:John Davidson, B.S., Clinic Director, Bethesda Hyperbaric Oxygen Therapy

Martin Hoffman Legacy

In Memoriam, Martin R. Hoffmann, Army Secretary, 1975- 1977

Martin Richard Hoffmann, former Secretary of the Army, a tireless Veterans advocate, died on Monday, July 14, 2014, at the age of 82. Among many other accomplishments, he was a core member of the Coalition seeking to use HBOT to get immediate help to the hundreds of thousands of service members and civilians suffering from brain injuries and the invisible wounds of war: Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorder (PTSD).

A guiding principle throughout Marty's career was continual improvement in all aspects of the experience and well-being of our soldiers. From training to equipment, from health care to emotional & financial support for families, whether during active service or after discharge, Marty sought to honor their commitment to our country by securing the best for them.

Following the events of 9/11 and the beginning of the Afghan war, Marty helped to form and develop the Defense Resources Support Office-Afghanistan. It was in-country that he personally witnessed the devastating effects of IEDs and the debilitating results of TBI and PTSD. After seeing Hyperbaric Oxygen save a close friend and colleague from the ravages of both TBI and PTSD, he recognized the potential of this treatment to help hundreds of thousands of soldiers and Veterans. Working with expert physicians worldwide, members of the US Congress, and the Armed Sercies, state officials across the country and other dedicated patriots, Marty was instrumental in helping raise awareness and promoting the effective use of, and continued research about, Hyperbaric Oxygen Treatment for TBI. Never was his passion for the well-being, care, and treatment of our soldiers and their families more intense than during his work on this campaign.

Overview of this 2-Volume Series: Perspective for the Curious

Robert L. Beckman, PhD
Executive Director, TreatNOW.org

"The truth goes through three stages: first, it is ridiculed, then it is violently opposed, and then, it is accepted as self-evident." - Arthur Schopenhauer

"First they ignore you, then they laugh at you, then they fight you, then you win." - Mahatma Gandhi

Both these quotes share two traits: neither was stated this way, but each is generally true. They lead this introduction because we who are working to heal broken brains and stop the suicide epidemic are closer to winning than when we started. There are no guarantees, however, that all our successes will overcome medical resistance to accepting the obvious: what 'they' are doing does not work to heal brain wounds, and what 'we' are doing works and we have the research to back it up. Yet those of us trying to get urgent help to brain wounded Service Members see victory on the near horizon for the varieties of truths told in the following essays, notes, videos and references in this 2-volume series. As with many movements, an anecdote helps elucidate the main point: changing minds and medicine, even with science, data and facts, is not an easy task by any means.

Two renegade Australian physicians, Barry Marshall and J. Robin Warren, in 1981 knew there was a simple treatment for gastritis and peptic ulcers: an antibiotic to kill Heliobacter pylori bacteria. Now, Helicobacter pylori may be the most successful pathogen in human history. While not as deadly as the bacteria that cause tuberculosis, cholera, and the plague, it infects more people than all the others combined. Yet conventional medicine already knew that ulcers were caused by stress. An entire set of industries grew up around 'healing' stress and its aftermath: antacids, stomach surgery for bleeding ulcers, gastritis, stomach cancer, and depression. "To gastroenterologists, the concept of a germ causing ulcers was like saying that the earth is flat."[1] To them, the cause of all the illness and death was psychosomatic, "all in the head." Marshall went so far to prove his point that he gave himself ulcers by drinking a broth of Heliobacter pylori and curing himself. Still there was no recognition. Cut to the chase. For their relentless persistence and science on Heliobacter pylori, Marshall and Warren shared the 2005 Nobel Prize. Today the standard of care for an ulcer is treatment with an antibiotic. And stomach cancer, once one of the most common forms of human malignancy, was almost eradicated from the Western world

24 years ago, from goats to Nobel laureates. Along the way, these men were ridiculed and denounced by learned councils around the world. Then the truth set the world on fire.

As you read these pages of the first volume of our HBOT series, we expect that you will be whipsawed by the truths exposed, as authors and readers wonder about the answer to the obvious question: ***If this works, why are they opposed to it?*** As you will see, the authors do not have the entire answer, but they do have evidence, the Army's own research data, overwhelming scientific evidence, decades of clinical experience, and thousands of successes. It is self-evident to more than 2,700 patients who have been given their lives back. Here are some reasons why.

In a general essay, ***Dr. Robert Beckman, PhD***, crystallizes a decade of experience at the federal, state and local levels working to stop the Service Member suicide epidemic. The threads include the discovery of a worldwide network of practitioners, researchers and volunteers proving daily the safety, efficacy and efficiencies of using Hyperbaric Oxygen Therapy (HBOT) to treat and help heal brain wounds - those basically ignored by military and conventional medicine. ***John Davidson*** makes it plain how HBOT works and what patients can expect from HBOT treatment.

Tom Fox reveals the results of recent work with Israeli scientists related to blast injuries and the mechanisms of action to repair the damages of air emboli. ***Maryellen Ammons*** blends her work as a new-world health visionary integrating old world wisdom. Through her decades-long journey of medical hit-and-miss to health, she established Infinity Healing. She provides cold therapy, photobio-modulation, breathing and mindset/meditation (float rooms, sound and light healing). ***Drs. Carol L. Henricks, MD and Timothy M. Marshall, PhD*** go even further into the scientific underpinnings of brain healing and recovery through neuroregeneration. They are utilizing HBOT to reduce inflammation and carefully crafted nutritional doses of magnesium, lithium, and zinc. Their clinical successes demonstrate the neuro-protective effects of HBOT, while promoting vital healing processes in the brain and nervous system in both the acute and chronic phases of healing the brain.

Daniel L. Kirsch, PhD, DAAPM, FAIS is an internationally renowned authority on electromedicine. His piece relates the use of cranial electrotherapy stimulation (CES) to functionally stabilize the traumatized brain and return it toward a condition of pre-injury homeostatic functioning. Low level current is proving a significantly beneficial adjunct to other forms of physical, and psychological therapies for this heavily-medicated population.

Throughout this e-journal series, you will find multi-media presentations of the trauma, despair, elation, healing and success stories using HBOT and

other therapies during the course of the last decade. In addition to the work of Dr. Paul Harch, MD, few researchers are more qualified than ***Dr. Xavier Figueroa, PhD*** to comment on the 'sacred duty' levied on military medicine. His 'call to action' in the name of former Secretary of the Army, Martin R. Hoffmann, to whom this issue is dedicated, rings true to those of us laboring to slay the dragon of conventional drug-dispensing medicine. Xavier's incisive blogs, from which this article is drawn, demonstrate that both military and civilian-sponsored studies have demonstrated significant improvements in symptoms, neurocognitive measures, regional cerebral blood flow normalization and repair of fiber tracts in wounded brains. His summations speak for all the authors represented in this edition of ***Combat Stress.***

In May, we will present the second half of this series. Leading off with ***MAJ Ben Richards*** recounting his continuing journey toward his old normal, not the 'new normal' of degraded, welfare-dependent living that he was told would be his fate. His saga and many of videos in both Volumes of this HBOT edition, highlights the myriad of failed interventions by the palliative, drug-dispensing culture. His journey demonstrates the ripple effects of untreated brain wounds, with the attending negative effects on self, family and society. ***Dr. Beckman***, using the ground-breaking work of ***Dr. Daphne Denham***, reveals how practitioners are treating and healing acute concussions, while mitigating the symptoms that too many suffer for far too long. ***Drs. John Hughes, D.O. and James Lyons-Weiler PhD*** discuss TBI Therapy's standard of care protocols for TBI. These include intranasal and IV infusions, as well as other healing modalities such as cranial osteopathic treatment, IV nutrition and hydration, and other adjunctive therapies to aid in neuro-regeneration.

Dr. William Duncan, PhD employs HBOT and multiple modalities in the Patriot Clinics. He is the pioneer in state-sponsored legislation to provide HBOT to Veterans with brain injuries. Their grass-roots movement has provided largely free treatments to more than 500 brain-injured Veterans, in addition to firefighter/EMS/paramedic personnel, police, first-responder and public service civilians.

They represent a compelling argument for the rethinking of how we can treat and heal wounds to the brain: ***TreatNOW***.

References

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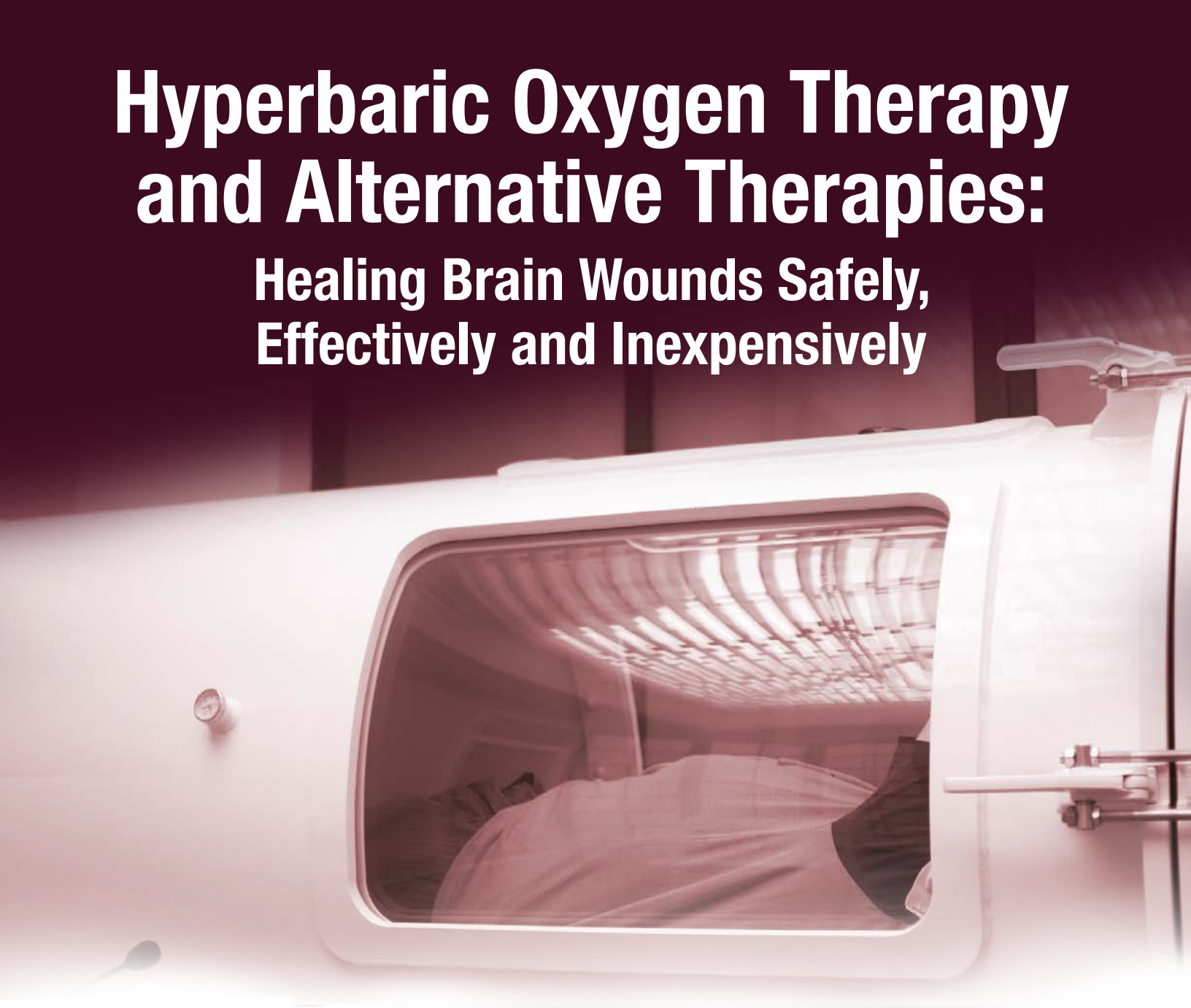
Hyperbaric Oxygen Therapy and Alternative Therapies:

Healing Brain Wounds Safely, Effectively and Inexpensively



Robert L. Beckman, PhD
Executive Director, TreatNOW.org

As the distinguished Nobel Laureate and physicist, Max Planck once said: "*A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.*"[1]

Hyperbaric Oxygen Therapy (HBOT)

Hyperbaric Oxygen Therapy (HBOT)[2] is an FDA approved medical treatment which enhances the body's natural healing process by inhalation of 100 percent oxygen in a chamber where the atmospheric pressure is increased above ambient pressure and controlled by the attending technician. HBOT has been employed

for decades to treat a variety of conditions. It is particularly useful and effective in the fields of neurology and wound care. The treatment process is safe, painless and comfortable, with very few side effects. HBOT has been used 'off-label' to help treat and heal brain wounds for decades. The suicide epidemic and the spotlight on concussions has brought HBOT to the fore as an already-fielded complementary treatment for the invisible wounds of war. As you will read below, Brain Injuries can very readily cause symptoms which overwhelm the wounded with desperation and despair, leading them too frequently to take their own lives. HBOT clinical medicine shows daily that hyperbaric medicine has the potential to interrupt that suicide cycle.[3]

Traumatic Brain Injury (TBI) is one of the leading causes of death and disability in the United States and in many cases, the underpinning of permanent mental health issues. The Department of Defense (DOD) has reported that mental illness ranks as the leading cause of hospitalization for active-duty troops.[4]

Insiders worry that the epidemic of brain injuries and mental health will continue to accelerate for many years to come. Today, this Veteran population faces a suicide rate of approximately 20 souls per day, with another 44 failed attempts daily.[5] Service Members suffer hundreds of thousands of diagnosed and undiagnosed cases of Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorder (PTSD). The Institute of Medicine recently issued a report that highlights the plethora of ineffective off-label treatments being used across the military, and their negative utility. The report and a summary notes: "The Defense and Veterans Affairs Departments spent $9.3 billion to treat Post-Traumatic Stress Disorder from 2010 through 2012, but neither knows whether this staggering sum resulted in effective or adequate care."[6]

As he retired, then head of US Special Operations Command, Admiral William McRaven warned that commandos were committing suicide at a record pace. He stated that: "The last two years have been the highest rate of suicides we have had in the special operations community and this year, I am afraid we are on the path to break that…. Clearly, readiness is imperiled along with lives."[7]

Kraig Dorner is a retired SEAL Chief Petty Officer (SOC), formerly Naval Special Warfare Group One (NSWG-1) Training Detachment (TRADET). His family clinic is part of a nationwide effort involving dozens of civilian clinics to provide treatment and healing to Veterans and others suffering from TBI/PTSD. Jennifer Dorner, RN and CEO, has been treating Navy SEALS, professional athletes and civilians with TBI and numerous other neurologic afflictions for more than a decade, and with tremendous success. As far as she is concerned, HBOT for TBI is safe, effective and

should be insured as a routine standard of care. Her opinion is shared by numerous state legislators. Groups like the Semper Fi Foundation, the Independence Fund, Mercy Medical Airlift and many other civilian sponsors have helped provide HBOT treatment on a pro bono basis.

Former Marine and Oklahoma legislator, John Bennett served in the Marines in Afghanistan from 2005 through 2006. Like hundreds of thousands of Service Members suffering from TBI, he was told that there was little he could expect by way of treatment and that he would have to get used to his 'new normal' and to learn to live with a reduced quality of life, effectively as a welfare recipient for the rest of his days. This Marine Veteran then fell upon a stroke of luck. The State of Oklahoma was part of a national study regarding the effects of HBOT on TBI. After wildly successful HBOT treatment, Bennett vowed to ensure that his wounded brethren would find similar help. He knew that untreated brain injuries result in increased health care costs, disability, unemployment, substance abuse, incarceration, family disintegration and suicide. Bennett spearheaded passage of the Oklahoma Veterans Traumatic Brain Injury Treatment and Recovery Act of 2014, which guarantees HBOT treatment to any Oklahoma Veteran.[8] More than a dozen other states are emulating the Oklahoma template, based not only on the ethics and science of restoring lost lives, but on simple economics.

How does HBOT work? The patient spends about one hour per session in a hyperbaric chamber, breathing oxygen under pressure, which saturates the body's tissues with 10-20 times more oxygen than tissue can hold at sea level. Oxygen now reaches damaged areas that may have lacked blood supply and can be dormant. The first dose restarts the body's cellular energy supply, causing cells to demand oxygen. Repeated doses cause blood supply and neural pathway recovery and doubles brain metabolism. Most patients experience rapid recovery of normal sleep patterns, relief from photophobia and headaches, and restored cognitive and neurological functioning without surgery or drugs. Most Service Members can reduce their prescribed drug intake to nearly zero after 40 treatments.[9]

The Navy 'wrote the book' on hyperbaric oxygen. For more than 77 years, oxygen has been used to repair decompression sickness (the 'bends') and injury caused by a lack of oxygen. O2 is utilized by the body in more than 5,769 cellular processes: HBOT activates 8,101 genes, resulting in down-regulation of inflammatory processes, up-regulating growth and repair, and restarting processes for stunned (idling) cellular metabolism. Research around the world demonstrates that HBOT activates stem cells to 8 times normal levels, heals wounds that have not healed, and repairs neural pathways. HBOT is already approved for 13 indications, three of which involve non-healing wounds

and three of which are indicated for various types of acute and chronic brain injuries. In addition to the bends, these include carbon monoxide poisoning, arterial gas embolism to the brain, and acute blindness from central retinal artery occlusion. Rebuilding a brain with HBOT is straightforward and fairly easy. Recovery is typically noticeable within the first 10 treatments. HBOT can be delivered within a 5-day period and approximately 50 percent of young war Veterans and active duty Service Members have been able to return to duty, work or school after 40 treatments. The success rate, however, has climbed as high as 80 percent over the course of 80 treatments. It is possible to help 'rebuild' a brain in 150 days with 80 1.5 atmospheres absolute (ATA) (7.35 psi) HBOT treatments.[10]

USMC Commandant, James Conway, in a 2009 hearing before House Armed Services Committee, commented: "I have seen none out there that I am more encouraged by... than hyperbaric treatment… (we must) speed the process... to rapidly bring this to treatment level... it can't hurt, it can only help... we think we're onto something here."[11] In the same hearing, CNO ADM Gary Roughead intoned: "If it can help, if it MAY help, I'm in."[12] Congress continues to fund research into HBOT for TBI/PTSD but does not go to the next step to employ what worldwide research conclusively shows to be a safe and effective, evidence-based treatment for symptoms of TBI/PTSD. In Israel, Scotland, Canada, China and across the US, thousands of brain-injured Veterans and civilians have been shown, with scientific assurance, to achieve positive results, with a return to a quality of life far beyond what is available under current standards of care.

Does it work to help heal brain injury? Drs. Eddie Zant and COL (RET) James Wright, USAF Special Operations Command, have treated more than 25 concussed (TBI) military patients for lingering concussion symptoms, including a US Army Brigadier General concussed in Afghanistan in an IED explosion (https://youtu.be/FmGqRLSKzWg). All these Service Members were months or years post-concussion and still experiencing severe post-concussion symptoms. None of these patients had life threatening head injuries. All had normal CT Scans/MRI's. Symptoms in these patients included cognitive impairments, loss of memory, headaches, depression, fatigue, anger and irritability, sleep disturbances, loss of multitasking and executive functions, and hypervigilance. These patients had successful results from HBOT therapy and either returned to full military duty, continued in school, or returned to full civilian employment. All those patients were previously treated by different agencies with medication, which provided them little or no relief from their disabling concussion symptoms. More than 2,700 patients have been treated with few complications, none of them long-lasting or involving major adverse reactions, yet resistance by DOD/VA/Army to the use of HBOT remains a constant.[13]

Those of us working to end the suicide epidemic among Veterans and others know too well, the forces aligned against using alternative therapies to help treat and heal brain injuries. Yet time and again, we treat Veterans and active duty Service Members who have attempted or thought about suicide to end the pain and suffering caused by their TBIs. In a startling revelation, Army commanders were astonished, not to say alarmed, when they learned that traumatic brain injuries were so prevalent in post-9/11 wars.[14] Dr. David Hovda's work finally demonstrated that blast injuries, concussions and traumatic brain injuries were so prevalent, though[15] the US Army's own researchers investigated blast injuries.[16] In what is being called a breakthrough study, Dr. Daniel P. Perl and his team at the Uniformed Services University of the Health Sciences in Bethesda, MD, found evidence of tissue damage caused by blasts alone, not by concussions or other injuries. As researcher, Tom Fox explains elsewhere in this publication, blasts cause nefarious damage to the entire body, but particularly to the brain due to concussive sound waves and other effects from explosives. The New York Times calls it the medical explanation underlying shell shock, battle fatigue, or what is now commonly known as combat stress: preliminary proof of what medicine has been saying without proof for nearly 100 years – ***blasts cause physical damage, and this physical damage leads to psychological problems, i.e., PTSD.***[17] The importance of this admission cannot be overstated. This is a DOD discovery with documented evidence that blast injury (IEDs, breaching – using explosives to gain entry – whether in training or combat, enemy and/or friendly fire) can lead directly to physical brain damage and its accompanying effects, many of which have been heretofore diagnosed as 'only PTSD.'

The bean counters are still arguing about definitions and statistics. 20 or 22 suicides a day? 320,000 traumatic brain injuries or almost 800,000? Deaths among Service Members from overdoses of prescribed drugs: 1,300 or 13,000? Wherever the numbers are these days, few argue that we are facing more and more psychological injuries among brain-wounded Service Members and Veterans and their families than the current VA healthcare system can manage or treat. The Veterans Administration is casting about for innovative approaches, but is mired in inaction and internal fights waged with researchers paid large sums of money to abide by the status quo. Research regarding 'What is PTSD and TBI?' has rewards of hundreds of millions of dollars.[18] The majority of wounded Service Members who come to TreatNOW Coalition clinics for help have been through – or are in – the VA system complain that the standard course of treatment for TBI and PTSD is drugs, counseling and various palliative interventions. (See ***Obstructions***, following.)

Well-meaning citizens like Arnold Fisher and others are building and donating facilities to the government to assist in providing mental health interventions.[19] According to reports, "The Intrepid Spirit Centers are playing a significant role in making sure that every resource and method of treatment is available to service members throughout the country, enabling them to work towards recovery." Sadly, hyperbaric oxygen therapy is neither available nor discussed in these centers.

More than 60,000 Veteran Service Organizations have been incorporated since 9-11. It is virtually impossible to find any that even mention wounds to the brain, let alone the work being undertaken to treat and heal 'the invisible wounds of war.' It is the rare Veteran or active duty warrior who is ever informed that there is treatment available for their brain injuries that is safe, effective and a small price to pay other than a life spent with unhealed wounds. In fact, there is an unspoken agreement among some researchers paid by military medicine that they are required 'to put the final nail in the coffin' for treatments that fail. If the treatment is unsuccessful, then the value of doing more research on it is nil. This is characteristic of that pre-disposed negative culture that alternative therapies have no value and must continuously be put to the test to prove their value.

14 on-label indications for HBOT are already approved and insured

1. Air or Gas Embolism**++
2. Carbon Monoxide Poisoning** Complicated By Cyanide Poisoning
3. Crush Injury, Compartment Syndrome and Other Acute Traumatic Ischemias**
4. Decompression Sickness**
5. Arterial Insufficiencies: Central Retinal Artery Occlusion** Enhancement of Healing In Selected Problem Wounds
6. Clostridial Myositis and Myonecrosis (Gas Gangrene)
7. Severe Anemia
8. Intracranial Abscess
9. Necrotizing Soft Tissue Infections
10. Osteomyelitis (Refractory)
11. Delayed Radiation Injury (Soft Tissue and Bony Necrosis)
12. Compromised Grafts and Flaps
13. Acute Thermal Burn Injury
14. Idiopathic Sudden Sensorineural Hearing Loss (Approved on October 8, 2011 by the UHMS Board of Directors)

** These indications are similar to conditions found in brain injury

++ This indication is reputedly the root cause of primary effects of "blast" injury; An argument can be made that HBOT-for-Blast is already an "approved" indication.

Obstructions

DOD/VA/Army medicine continue to insist that there is no effective treatment for brain-wounded TBI/PTSD Service Members, even as they spend billions of dollars on unproven, unscientific, undocumented, off-label and even dangerous interventions with drugs, devices, processes and providers. Meanwhile, the suicide epidemic across the force and within DOD, to include Special Forces, Reserve Component Forces and the National Guard, continues unabated. The Call Center at TreatNOW (www.treatnow.org) is beset with calls, typically from spouses of the brain wounded, asking for help for loved ones with TBI or 'PTSD only' diagnoses who are on the verge of suicide.

The Institute of Medicine's report highlights the plethora of ineffective off-label 'treatments' being used across the military and their negative utility.[20] (NOTE: the overwhelming number of Veterans treated for brain injuries in TreatNOW Coalition HBOT clinics with diagnoses of 'only PTSD' have been shown to have undiagnosed TBI. The amount spent on TBI and the off-label treatments that they fund – track closely with those noted by the IOM for PTSD.)

The TreatNOW Coalition, a group of largely Veterans nationwide working together to stop the suicide epidemic, has been tracking the types of treatment that Veterans receive in military and VA treatment facilities. These have been reported to us by Veterans treated later with HBOT by the Coalition. In no case has the intervention referred to 'wound healing.'

The Interventions/Treatments for PTSD/TBI/Concussion at Warrior Transition Units, Intrepid Centers, Defense Veterans Brain Injury Centers, Walter Reed National Military Medical Center and throughout DOD/VA/military medical treatment facilities include:

- Pharmacological treatment options, including black-box labeled drugs (warn of risk of suicide), starting with Selective Serotonin Reuptake Inhibitors (SSRIs) such as Sertraline (Zoloft), Paroxetine (Paxil), Fluoxetine (Prozac), and Venlafaxine (Effexor)
- More than 114 medications, all prescribed off-label for TBI (including now LSD, Methamphetamine and Psilocybin). Coincidentally, a Service Member or DOD civilian caught using marijuana without a prescription is subject to possible prosecution that can lead to other than honorable military discharges.
- MDMA (3,4-methylenedioxy-methamphetamine) – Assisted Therapy
- Botox injections
- Stellate Ganglion Block (SGB)
- Neurosteroid replacement
- Psychotherapy by many names and in many guises:
    - Psychopharmacology
    - Neuroplasticity coaching
    - Cognitive psychotherapy
    - Cognitive therapy
    - Cognitive rehabilitation
    - Neurocognitive therapy
    - Cognitive Control Training/

Therapy (CCT)
    - Cognitive Behavioral Therapy (CBT)
    - Cognitive Processing Therapy (CPT)
    - Brainwave optimization biofeedback
    - Psychoanalysis
    - Affective neuroscience
    - Psychophysiology
    - Psycho-educational computer-based treatment
- Affect Labeling Treatment (ALT)
- Brief eclectic psychotherapy
- Energy psychology /Emotional Freedom Techniques (EFT)
- Narrative therapy
- Heart rate variability feedback training
- Biofeedback
- Intervention prevention
- Exposure-based therapies (Includes in-vivo, imaginal/guided imagery, or narrative (oral and/or written) exposures to traumatic memories, situations, or stimuli. These therapies also generally include elements of cognitive restructuring (e.g., evaluating the accuracy of beliefs about danger, as well as relaxation techniques)
- Trauma-focused cognitive behavioral therapy
- Intensive trauma therapy (a blend of hypnosis, art therapy, and video technology treatment)
- Imagery rehearsal therapy
- Group interventions for trauma-related psycho-education and social support
- Psychotherapies, including exposure to traumatic memories, stimuli or situations
- Occupational and behavioral therapies
- Speech and language therapy
- Physical therapy
- Outdoor sports therapy
- Group therapy
- Life coaching
- Immersion therapy
- Craniosacral massage
- Transcranial magnetic stimulation
- Transcranial Direct-Current Stimulation of (TDCS)
- Repetitive Transcranial Magnetic Stimulation (TCMS or rTMS)
- Magnetoencephalography (MEG)
- Cranial Electrotherapy Stimulation (CES)
- Near-infrared Therapy (NIR)
- Bright-light therapy
- Polychromatic Light Therapy (PLT)
- Magnetic Resonance Therapy (MRT)
- Pulsed Electromagnetic Fields (PEMF) therapy
- Off Vertical Axis Rotational Device (OVARD)
- Eye Movement Desensitization and Reprocessing therapy (EMDR)
- Accelerated Resolution Therapy (ART)
- Prolonged Exposure Therapy (PET)
- Repetitive Peripheral Somatosensory Stimulation (RPSS)
- Transcutaneous Electrical Nerve Stimulation (TENS)
- Percutaneous Electrical Nerve Stimulation (PENS)
- Fear extinction therapy
- Chiropractic treatment
- Massage therapy
- Resiliency training
- Stress reduction techniques
- Interactive metronome
- Stress inoculation training (emphasizes breathing retraining and muscle relaxation)
- Relaxation/Self-monitoring techniques (e.g., “body scan”)
- Family and couples therapy
- Complementary and Alternative Medicine (CAM) approaches such as acupuncture, mind-body medicine, body manipulation and movement techniques, energy techniques, mindfulness
- Medicinal oils
- Vitamins and supplements
- Blueberry extract

- Detoxification
- Tai-chi, Pilates and Yoga
- Qigong
- Meditation
- Hypnosis
- Canine therapy/Emotional support dogs
- Horseback riding
- Equine-assisted psychotherapy
- Dance/drama/music/art therapy
- Transcendental meditation
- Battle Tap
- Scuba diving and aqua therapy
- Hiking and various outdoor exercise
- Native American healing
- Mobile applications by the dozens, including Provider Resilience, BioZen, Virtual Hope Box, Cognitive Behavioral Therapy for Insomnia (CBT-i Coach), Stay Quit Coach, etc.

The myriad of interventions used by DOD/VA/military medicine can be summarized succinctly: *they do not treat the physical wound to the brain*. Not one of the 80 plus therapies, processes, procedures, devices, countless computer applications, nor 114 plus prescribed drugs, have been approved by the FDA for treatment of TBI, nor do they 'treat' wounds. All are used off-label. All are controversial at some level. Many of them are brand new and have not yet been reviewed in the scientific literature. No risk analyses have been performed with respect to long-term impact or efficacy, and no longitudinal tracking has been undertaken. Yet neither the DOD or the VA provide Hyperbaric Oxygen Therapy used off-label to treat and heal brain injury, the one therapy proved by multiple clinical trials inside DOD/VA and around the world to treat and help heal wounds to the brain, safely and effectively.

Testing Hyperbaric Oxygen: the "SHAM" and Other Challenges

In a foot-dragging nod to mild Congressional pressure, the DOD/VA/Army has conducted a decade of research on, spending more than $125 million, an 'obscene amount of money' according to a senior manager at the US Army Medical Department (AMEDD) at Fort Dietrich, MD.[21] A few of them have categorically decided that HBOT does not work, despite their own data, based largely on jaundiced statistics. It is imperative for ethical, scientific, political and economic reasons that their bogus conclusions be repeatedly exposed. The crux of their errors rests on a lie at the center of their "sham" resistance.

Two definitions of "sham" interests us in this discussion:

1. *Sham (n): something that is not what it purports to be; a spurious imitation; fraud or hoax.* In the case of DOD/VA/Army medicine, arguments and conclusions by the government about the use of HBOT for TBI/PTSD/Concussion are a sham: a scientific error that has been exposed over and over, year after year. Their research ***DATA*** and ***DISCUSSION***, however, state categorically that HBOT is safe and effective. Army Medicine has run trials investigating the use of

Hyperbaric Oxygen to treat and help heal Traumatic Brain Injury. They have shown that HBOT is both safe and effective: ***"Randomization to the chamber... offered statistical and in some measures scores for (both) groups revealed significant improvement over the course of the study for both the sham-control group... and the HBO2 group***..." Expert outside consultants to DOD declared that ***"HBOT is a healing environment."***[22]

A recent USAF paper reanalyzing the data in the cornerstone DOD/VA/Army study concludes: "This pilot study demonstrated no obvious harm (and) both groups showed improvement in scores and thus a benefit. Subgroup analysis of cognitive changes and PCL-M (PTSD Checklist for the military) results regarding PTSD demonstrated a relative risk of improvement. ***At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm...*** (emphasis added). Hyperbaric oxygen therapy for mild traumatic brain injury and PTSD should be considered a legitimate adjunct therapy.[23]

2. "***Sham" as part of a clinical trial.*** In a sham treatment, the researcher goes through the external motions to counterfeit an actual treatment without actually performing the treatment. The intent is to have an ***inert or medically inactive procedure or substance*** used to compare results with active substances.

A placebo is often used in a drug trial to demonstrate whether the drug being studied is more effective than an inactive 'sugar pill.' Some of the people in the drug trial receive the active drug, while others receive the inactive placebo. The results of each group are compared. (NOTE: current Randomized Controlled Trials were designed for drugs. Oxygen is a drug and HBOT has been declared both a drug and a device. As such, it is extremely difficult to construct a sham for HBOT given both the natures of oxygen and pressure and the physical changes experienced by a subject during pressurization and depressurization.)

When a subject taking the inactive substance, or has received sham treatment reports that symptoms have improved, this improvement is called the placebo effect. This is probably a result of the brain releasing 'feel-good' hormones such as endorphins in response to treatment. Active drugs and therapies can also have a placebo effect. It can be difficult for researchers or doctors to determine if the reason a drug works is because of its active ingredient or because of the placebo effect.

Understanding Blast Injury and Other Insults to the Brain

In June of 2016, DOD/VA/Army medicine confirmed, with solid science and objective physical evidence, that blast injuries cause physical wounds to the brain. Formerly "invisible wounds" have been revealed, through post-mortem autopsies, to be demonstrate visible Traumatic Brain Injuries (TBI), as well as probable cause for secondary symptoms of PTSD and other debilitating, life-altering behavior. The implication of these findings is that those wounds should be and can be healed through application of 'wound-healing' protocols that have scientific rigor. The stunning reality is that HBOT has been proven and approved by the FDA as an effective form of treatment for wound healing.

Consider that we now know that blast injury is a physical wound to a body organ, the brain. Blast waves to the body, with or without unconsciousness, result in an immediate and significant metabolic crisis for the now wounded brain. Studies are underway to better link the acute pathobiology of blast injury with potential mechanisms of chronic cell death, dysfunction and neurodegeneration. Current findings about blast injury point to disruptions in cellular processes that may underlie long term impairments. In a phrase, blast injuries and concussion are physical wounds which can't yet be 'seen' in life but are accompanied by symptoms which can be observed. Physiological damage – ripping, tearing, shearing, bleeding, bruising and swelling lead to 'chaos' in the head and link directly to clinical characteristics of concussion: balance problems, migraine symptoms, cognitive impairment and numerous other observable and measurable dysfunction, with considerable vulnerability to repeat brain injuries. Treatments of the physical injury that can interrupt this damaging cascade of degeneration should be implemented immediately.

Medicine has well-known explanations of the nature of wounds and the phases in wound healing. The so-called 'concussion cascade' that follows the wound to the head creates conditions that impede healing in the closed, heretofore, unseen environment inside the skull. A blast or jolt to the head begins a series of negative consequences. These can include: inflammation, interrupted blood flow, oxygen starvation/hypoxia, tissue and nerve fiber ripping and tearing, cell stunning/inactivation and/or cell death. This insidious biological set of degenerative processes may or may not lead to permanent damage. This acute inflammation phase is the body's natural response to injury. After initial wounding, the blood vessels in the wound bed contract and a clot is formed. Blood vessels then dilate to allow essential cells, antibodies, white blood cells, growth factors, enzymes and nutrients to reach the wounded area. Unlike a wound that can be seen, there is solid evidence that this brain

inflammation can continue and linger for an extended period, impeding healing and increasing the likelihood that more physical damage is more likely to occur. It has been common knowledge that most blast injuries and concussions heal themselves. That is far too simplistic. What may be true is that symptoms abate, yet damage that can lead to mental and physical degeneration may lead to lingering symptoms and chronic degeneration.

The use of Hyperbaric Oxygen Therapy (HBOT) directly addresses this negative cascade of damage and degeneration, both in the acute phase of wound stabilization and in the acute and chronic phases of wound healing. The validity of using HBOT for healing the wound to the brain is validated in the most recent research. Unsurprisingly, delivering oxygen under pressure safely and economically leads to effective wound healing. Numerous other interventions for comorbid maladies have a much better chance of effectiveness when the concussion cascade is interrupted and reversed.

Concussion or Mild Traumatic Brain Injury (mTBI)

If you are reading this, you or someone you know has probably experienced a concussion and not fully recovered. Hyperbaric Oxygen Therapy (HBOT) promotes brain healing through mechanisms of suppressing inflammation, increasing by 20 times the amount of oxygen available to injured brain cells, promoting growth of blood vessels and new neurons, promoting stem cell mobilization and direct cellular healing through increased oxygen delivery. Simply put, HBOT increases a wide variety of beneficial brain-healing processes and interrupts destructive processes in the destructive 'Neurometabolic Cascade of Concussion,' such as inflammation and cell death.

Coincidentally, in April 2011, Army Secretary John McHugh made it official that Soldiers qualified for the Purple Heart Medal for traumatic brain injuries. Hundreds of thousands of Service Members with 'invisible wounds' were finally recognized as having suffered physical damage to their brains, in addition to the psychological consequences of their physically wounded brain. What did not follow in either the Army, the NFL or medicine in general was the answer to the obvious question: *What are we doing to heal those wounded brains?* After awards were received, nothing followed.

Current Practice

Medicine struggles with treating physical injury to the brain, these 'invisible wounds.' Medicine is slow to change and for decades the common myth about concussions is that there is no treatment and that most concussions heal on their own. Sadly, the standard protocol for concussions and TBI is 'watchful waiting.'

It is now also common knowledge that if one has suffered a loss of consciousness, they have had at least suffered a mild concussion. But even a transient change in awareness or a feeling of 'having your bell rung' signals some type of mild brain injury. One does not need to lose consciousness to sustain a concussion. The new message is that an accumulation of those mild brain injuries initiates a process that can lead to short, medium and long-term damage, up to and including dementia. An estimated 15 percent of people who suffer a mild to moderate concussion do not return to their baseline level of functioning within a year.

Wound Healing

The use of Hyperbaric Oxygen directly addresses this negative cascade of damage and degeneration, both in the acute phase of wound stabilization and in the acute and chronic phases of wound healing. Consider the known benefits of using HBOT for wound healing:

- Decreasing levels of inflammatory biochemicals
- Increased oxygenation to functioning mitochondria
- Increases in blood flow independent of new blood vessel formation
- Angiogenesis from the addition of oxygen (growth of new blood vessels in the acute and chronic phases)
- Up-regulation of key antioxidant enzymes and decreasing oxidative stress
- Increased production of new mitochondria (the energy factories of the cells)
- Neurogenesis (growth of new neuronal tissue and remyelination during and after the treatments are completed)
- Bypassing functionally impaired hemoglobin molecules, the result of abnormal porphyrin production, thereby allowing increased delivery of oxygen directly to cells
- Improvement in immune and autoimmune system disorders
- Direct production of stem cells in the brain
- Increases in the production of stem cells in the bone marrow with transfer to the Central Nervous System, making them available for brain wound healing and growth of new brain cells, neuronic tissue and myelination[24]

The Obvious Question: Why Does the DOD/VA/Army Deny HBOT to the Injured?

The DOD/VA/Army continue to deny the effectiveness of Hyperbaric Oxygen Therapy (HBOT) in treating and healing traumatic brain injuries. Contractors being paid millions of dollars to research 'new' drugs and therapies are also on record as saying that anyone using HBOT to treat and help heal brain injuries is practicing bad medicine and harming patients by offering them 'false hope.'[25] Insurance companies indicate that the science is uncertain and hence, they will not reimburse for the use of HBOT for TBI/PTSD/Concussion.[26] We disagree. Here are responses to the major arguments put forward by those who resist the science and evidence.

Dueling DATA. Army medicine has run four major and two other trials investigating the use of Hyperbaric Oxygen for Traumatic Brain Injury. The lead administrator commented that the DOD "has spent an ***obscene*** amount of money, over $100M on HBOT research and the evidence is inconclusive." Their discussion and **DATA**, however, as opposed to their editorial conclusions, demonstrate that HBOT is both safe and effective: ***"Randomization to the chamber... offered statistical and in some measures clinically significant improvement over local routine TBI care.*** Also: ***"...total scores for (both) groups revealed significant improvement over the course of the study for both the sham-control group... and the HBO2 group..."*** Expert outside consultants to DOD declared that ***"(HBOT) is a healing environment."*** The lead researcher and a USAF team, reanalyzed the data in the cornerstone DOD/VA/Army study and concluded "This pilot study demonstrated no obvious harm (and) both groups showed improvement in scores and thus a benefit. To reiterate, a subgroup analysis of cognitive changes and PCL-M results regarding PTSD demonstrated a relative risk of improvement. There is a potential gain and no potential loss. The VA/Clinical Practice Guidelines define a 'B evidence rating' as "a recommendation that clinicians provide (the service) to eligible patients. ***At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm.*** A team of non-government researchers evaluating HBOT science and DATA concluded that **"There is sufficient evidence for the safety and preliminary efficacy data from clinical studies to support the use of HBOT in mild traumatic brain injury/persistent post-concussive syndrome (mTBI/PPCS)".** The reported positive outcomes and the durability of those outcomes has been demonstrated at 6 months post-HBOT treatment.[27] Given the current policy by Tricare and the VA to allow physicians to prescribe drugs or therapies in an off-label manner for mTBI/PPCS management and reimburse for the treatment, it is past time that HBOT be given the same opportunity. This is now an issue of policy modification and reimbursement, not an issue of scientific proof or preliminary clinical efficacy. And a soon-to-be-released study by a DOD contractor also concludes that an analysis of their data demonstrates that HBOT is safe and effective for PTSD. (NOTE: PTSD has recently been shown by Army researchers to be, in a majority of cases, probably the *result* of blast injury and, thus, a physical wound to the brain with psychological sequelae.)[28]

Finances: Why admit there's a treatment when the brain-injured are on active duty? The Army would have to pay for it. We have heard: "Get them over to the VA and let the VA deal

with it. Save money and meet downsizing requirements." Such a stance ignores the obvious: costs deferred increase the long-term costs. This no longer remains the Army's problem when Service Members are told there is no treatment or, worse, are given palliatives that mask symptoms with drugs. Neither do ethics appear to be a concern; apparently the Warrior Ethos "I will never leave a fallen comrade" stops at the hospital door.

Furthermore, the Army and VA continue to quote alarmist numbers about the cost of HBOT. They insist that each treatment will cost tens of thousands of dollars. The real truth is that a typical protocol of forty dives will cost less than ten thousand dollars. Economies of scale and multiplace chambers will drive those prices down to more than half that amount. And the current analysis of neglected brain injured Veterans is that each patient costs state tax payers $60,000 each year. States are paying billions of dollars every year for failing to treat wounds to the brain and those patients are sustained on drugs, which in many cases, are accompanied by warnings about the risks of suicide.

Pharma: They make it so easy to just palliate the problem rather than heal it. It is always easier to write a prescription for drugs, many of them warning of the risks of suicide, than to admit they are stymied. Accountability about results is hard to come by. (This practice is not unique to military medicine, but at a minimum, the Army should follow best practices with respect to tracking what medicines the brain-injured are prescribed and the contraindications for each. They do not.) Prescription drug overdoses have increased exponentially. A 2010 Army study found that one-third of its Soldiers were on prescription medications.[29] Nearly half of those, 76,500 Soldiers, were taking powerful and addictive opiate painkillers. The number of patients treated by VA has increased by 29 percent, but narcotics prescriptions have increased by 259 percent. While the actual numbers are proving difficult to obtain, among all Veterans receiving VA services nationally in the year, 2005, a VA researcher calculated that 1,013 had died of accidental drug overdoses, double the rate of the civilian population, when accounting for age and gender. More current data from the CDC reports that the accidental drug overdose in the Army is 33 percent higher than in the civilian sector.

The Research Trough: President Eisenhower warned about the military-industrial complex. Today, he would call it the military, industrial, academic, research, contractor, pharma, insurance / health care complex. This issue has ballooned to epic proportions, with billions of research dollars sloshing around to feed the cycle. There is no patent on oxygen and no profit in fixing the problem. We just keep nursing it. Sound familiar? Alternative medicine practitioners have

to step outside the problem to be able to really treat patients and get them healthy, but they cannot do it with the controls and formularies mandated by the DOD/VA/Army and insurance regulations to which they are beholden. One telling example: One of the authors of Army research that perpetuates a fundamental flaw in research design and execution, is a researcher leading a $62.2 million federally funded effort involving multiple universities, military installations and VA hospitals to better understand how to prevent, diagnose and treat concussions.[30] Millions of dollars will pass through the contract to other institutions, but most of it will remain at home. Comically, the researcher crowed at the time: "This isn't just about throwing money at a problem. This is the military and the (Department of Veterans Affairs) and President Obama realizing that this is a huge problem, concussions, and we need to get to the bottom of this. **It is probably not as bad a long-term problem, as people are yelling and screaming,** but if there is something there, we need to understand it."[31] His compatriot, a fellow researcher, also compromised by a perpetual conflict of interest, spelled out the formula: **"There's nothing that compares to the federal government in terms of sustainability. The federal government is how you sustain your research, year in and year out, even when times are bad."**[32] Notice there is not a word about the suicide epidemic or the need for urgency, let alone compassion or the hair-on-fire need to prevent the damages across hundreds of thousands of lives, families and communities. Together, with too many members of Congress, they would rather talk about the problem and get paid for long-term studies/research than go to work solving the problem. We need to treat now, utilizing the private sector's installed capability that can go to work immediately, for fractions of the current hospital-based costs. Over 1,000 private chambers are available for use. Over seventy TreatNOW Coalition clinics could today begin treating 1,000 additional brain wounded Service Members if funding was made available. Underutilized government HBOT chambers scattered across the US could triple that number when their multi-place chambers at places like Travis AFB, Wright-Patterson AFB, US Naval Diving and Salvage Center and Wilford Hall Medical Center in Texas were made available.

Closely allied to the above is the explosion of Veteran Service Organizations (VSO): More than 50,000 Veteran help organizations have been started since 9-11. Many of them mean well, but do little more than plan events. Fraud, greed and lack of accountability are part of the process. Certain organizations have been exposed for skimming unconscionable amounts out of every dollar for salaries and pensions, marketing, advertising, travel, merchandise, and office space.[33] The public is lulled into thinking that they are helping Veterans

to recover, when what they are really accomplishing is giving them a temporary fix, handing them t-shirts and meals, but sustaining them as permanently disabled, on welfare, and assured that there is no treatment for their brain injury other than coping with their 'new normal.' Many VSOs do good work, but they do not typically fund medical support to treat the underlying wounds to the brain.[34]

Recruiting: DOD and the VA recruit more and more from foreign ranks and younger psychiatrists and psychologists. Most have never seen combat and all are constrained by current protocols and evidence-based practices. Virtually none have studied alternative therapies. Nutrition is seldom discussed. A language barrier with health care professionals is often at play. The common and frequently reported protocol is this: "There's not much we can do for you. This is complex. We need to see where your new normal is going to be. Be resilient. Let's monitor your drugs. Next."

Recent Successes

2017 saw unprecedented progress with respect to enlisting the DOD/VA/Army and general medicine moving forward in recognizing that Hyperbaric Oxygen Therapy (HBOT) is safe, dramatically more effective, and much less expensive than all other interventions when treating and helping heal brain wounds caused by TBI/PTSD/Concussion.

Consider the following:

1. The Center of Compassionate Innovation in the US Department of Veterans Affairs (VA) announced that it will offer Hyperbaric Oxygen Therapy (HBOT) as a treatment option for a small number of Veterans with persistent Post-Traumatic Stress Disorder (PTSD) symptoms resistant to standard treatment options. Pilot sites are Tulsa Wound Care and Hyperbaric Center at Oklahoma State Medical Center in Tulsa, OK and the David Grant Medical Center on Travis AFB, CA.[35]
2. COL Rachel LeFebrvre (USAF), Brooke Army Medical Center, reports that 'miraculous' results are achieved with hyperbaric treatment in San Antonio, TX. The Brooke facility deals primarily with approved uses of HBOT – burns, infections and non-healing wounds. COL LeFebrvre said in the interview: "In terms in the actual healing process, it's absolutely phenomenal."[36]
3. VA and DOD facilities in six states (FL, GA, MD, NJ, TX, OK) began paying for and/or treating TBI and/or PTSD using HBOT "because it is the right thing to do," according to a neurologist in one Florida VAMC. In addition to the legislation already passed in OK, TX and IN, legislators in more than a dozen states are crafting legislation to make HBOT available for treating brain-wounded Veterans using HBOT (FL, AL, LA, AR, AZ, NV, ND, IA, CO, ID, OH, KY, NY, VA).[37]

4. Nineteen US Congressional Legislators from eleven states (NJ, TX, CO, NC, FL, CA, OH, AL, MI, VA and IN) signed letters encouraging DOD and the VA to urgently use HBOT for PTSD/TBI/Concussion.
5. Dr. Daphne Denham, the nation's premier expert on HBOT treatment of acute concussion in sports, showed years of evidence-based clinical results.[38] (http://bit.ly/2jwdUwl) Facing a crisis of more than three million concussions in the US every year, Dr. Denham has been working with athletes to treat acute concussions within 10 days to 'get in front' of the concussion cascade. This downward cycle of cell death and cellular and neuronal disruption can be treated instead of merely managed according to the 'watchful waiting' Concussion Protocol. 98 percent of her patients (51 out of 52) with acute concussion (ten days or fewer from brain trauma events) completely resolved her/his symptoms with less than five treatments (average of 2.4 treatments per concussion).[39] Unsurprisingly, most sports medicine doctors, trainers and neurologists recommended against the treatment, despite growing evidence of success.[40]
6. At the recently concluded International Conference HBOT2017, researchers showed evidence that further validated the safety and efficacy of HBOT for TBI/PTSD/Concussion.[41] The consensus was that "Scientific literature strongly supports the use of HBOT at 1.5 ATA (Sea level pressure is 1.0 ATA. 1.5 ATA is the equivalent pressure you would experience at about 15 feet underwater) for acute severe traumatic brain injury." Other researchers at the conference explained Mechanisms of Action at work with the use of HBOT. (Mechanisms of Action refer to physiological effects on the patient as a direct result of HBOT, e.g., anti-inflammation; growth of new blood vessels; proliferation of stem cells, etc.) While billions of dollars have been and continue to be spent on diagnosing and managing symptoms of TBI/Concussion/PTSD, precious few dollars are devoted to treating and healing. (http://bit.ly/2fq1y4T) It is well known to those who study brain physiology following brain trauma that a myriad of negative effects can occur: fractures, brain contusion, bleeding, sheering, stretching, compression, tearing, inflammation, edema, reduced blood flow, reduced oxygen/hypoxia, excitatory amino acids, free radical damage, lipid peroxidation, vasospasm, hyperglycemia, and cell death. Expecting that all this damage will abate with rest and 'the tincture of time' is a fantasy. True, symptoms may abate within days or weeks. It is often said that all the symptoms stemming from such damage to a main body organ will resolve themselves in 80 to 90 percent of the injuries, yet nothing has been done using the Concussion Protocol and various interventions by DOD/VA/Army medicine to address the wound to the brain.[42]

7. Continuing the accumulation of positive data, Dr. George Wolf, the US government's premier HBOT expert, reported recently that "(HBOT) for mild (TBI) and PTSD should be considered a legitimate adjunct therapy," despite continuing DOD/VA/Army efforts to delegitimize this form of therapy. The Agency for Healthcare Research and Quality (AHRQ) discerns that "The case against HBOT is based on the reasoning that, because HBOT may be harmful, it must be held to the highest standard of proof." Wolf and AHRQ agree that, "The standard of proof of HBOT efficacy should be lowered." HBOT is both safe and effective in use for TBI and PTSD. HBOT has perhaps the best safety record in the history of FDA-approved devices.[43]

Common Symptoms of TBI

COGNITIVE	PHYSICAL	PSYCHOLOGICAL
• Memory decline and loss	• Headache	• Irritability
• Slow Reaction time	• Fatigue	• Easy frustration
• Inability to pay attention	• Sleep disorders	• Tension
• Executive dysfunction	• Vertigo or dizziness	• Anxiety
• Slow learning	• Tinnitus or hyperacusis	• Affective lability
• Interrupted speech	• Photosensitivity	• Personality changes
• Difficulty understanding	• Anomia	• Disinhibition
• Inability to concentrate	• Reduced tolerance to psychotropic medications	• Apathy
• Confusion	• Disorientation	• Suspiciousness
• Difficulty communicating thoughts	• Loss of mobility	• Suicidality
• Inability to plan, reason, problem-solve	• Seizures	• Depression
	• Loss of smell	• PTSD

8. Dr. Lindell Weaver, recently concluded the Brain Injury and Mechanisms of Action of HBOT for Persistent Post-Concussive Symptoms After Mild Traumatic Brain Injury (BIMA) Protocol with 71 patients. His conclusions: "By 13 weeks, HBOT improved post-concussive and PTSD symptoms, cognitive processing speed, sleep quality, and vestibular symptoms, most dramatically in those with PTSD."[44]
9. Dr. Gary Steinberg of Stanford University and team are 'stunned' and 'shocked' at the progress made using stem cells on stroke patients. (http://wbur.fm/2BT1qof) An Israeli research study utilizing HBOT for strokes indicated that HBOT increases the production of stem cells in the bone marrow with transfer to the Central Nervous System, making them available for brain wound healing and growth of new brain cells, neuronic tissue, and repair of white and grey matter. [45]
10. Dr. Paul Harch and team published results showing 30 subjects undergoing HBOT for brain injuries experienced a significant reduction in suicidal ideation and anxiety. At the same time, they were able to discontinue or decrease the dosage of their psychoactive medications. 52 percent of these patients no longer met the criteria for PTSD after HBOT.[46]
11. Israeli researchers published results showing the mechanisms by which HBOT induces brain neuroplasticity using highly sensitive MRI techniques of dynamic susceptibility weighted dynamic susceptibility MRI (DSC-MRI) and diffusion tensor imaging (DTI). HBOT can induce cerebral angiogenesis and improve both white and gray microstructures indicating regeneration of nerve fibers. The micro structural changes correlate with the neurocognitive improvements.[47]
12. Drs. Harch and Fogarty published a case study involving HBOT in near-drowning. Short duration normobaric oxygen and hyperbaric oxygen therapy in the subacute phase of drowning recovery resulted in video-documented near-complete resolution of severe neurological deficits and near-complete reversal of gray and white matter atrophy on MRI. Hyperoxic and hyperbaric gene signaling-induced growth of both gray and white matter is the most likely explanation.[48]
13. By the end of 2017, more than 2,700 brain-wounded Veterans, citizens, active duty Service Members, and athletes had experienced significant medical improvement since 2010 in TreatNOW Coalition Clinics using HBOT and other alternative therapies. (https://youtu.be/N-CkR5shqEM) The professional athlete community of users continues to grow. (http://www.hypertc.com/athletes.cfm)

14. Doctors Wright and Figueroa summarized the current body of knowledge: ***"There is sufficient evidence for the safety and preliminary efficacy data from clinical studies to support the use of HBOT in mild traumatic brain injury/persistent post-concussive syndrome (mTBI/PPCS). The reported positive outcomes and the durability of those outcomes has been demonstrated at 6 months post-HBOT treatment. Given the current policy by Tricare and the VA to allow physicians to prescribe drugs or therapies in an off-label manner for mTBI/PPCS management and to reimburse for this treatment, it is long past due time that HBOT be given the same opportunity. This is now an issue of policy modification and reimbursement, not an issue of scientific proof or preliminary clinical efficacy."*** (http://bit.ly/2xEZSz9)

What is TreatNOW?

We are Veterans and civilians working largely on a pro bono basis to stop the suicide epidemic and restore the brain injured to a quality of life denied them by conventional approaches to concussions and brain injuries.

The TreatNOW Coalition sprang from the work of former Secretary of the Army, Martin R. Hoffmann. The Coalition is supported by numerous clinics and physicians worldwide. The Coalition has built a collaborative network among civilian Hyperbaric Oxygen Therapy (HBOT)-capable clinics, which have, also on a largely pro bono basis, successfully treated over 2,700 TBI/PTSD Veteran and civilian casualties. Using HBOT and a variety of safe and effective, alternative therapies, clinicians are actively treating and helping to heal underlying brain damage that is ignored with current, passive 'watchful waiting' and drug-based concussion protocols. Patients are also able to discontinue taking most of their medications prescribed by the VA for conditions as varied as sleeplessness, pain, headaches, depression and mood disorders, among many others. It is common for patients to start sleeping again, to experience dramatic changes in headaches, confusion, balance, memory and pain.

TreatNOW has had dramatic, life-altering success returning each of the fully-treated patients to a quality of life far beyond what they could receive from traditional or DOD medicine. A significant number were returned to active military duty. Under TreatNOW, this scientific work will continue to give hope to the hundreds of thousands of brain-injured patients with TBI/Concussion and/or PTSD. Neither Soldiers or athletes or citizens need to settle for a 'new normal,' along with a life of addictive dependence on prescribed drugs that come with warnings against suicidal risk. This

is not the quality of life they deserve nor what safe and effective evidence-based medicine can provide for them.

The TreatNOW civilian research and treatment effort to this point has been largely self-funded. It has concluded an observational study of over 30 patients, the National Brain Injury Rescue and Rehabilitation study (NBIRR).[49] All patients underwent significant medical improvement. This soon-to-be published scientific evidence demonstrates, once again the role of hyperbaric oxygen in active treatment of wounds to the brain, restoring function and brain health to wounded who were told they would have to settle for seriously degraded quality of life.

The TreatNOW Mission is to immediately and urgently identify and treat Veterans and others suffering from Concussion/TBI/PTSD, and to alleviate pain and withdrawal symptoms for substance abusers. The TreatNOW Goal is to ensure that more than 800,000 Iraq and Afghanistan brain injured war Veterans and active duty Service Members, along with all citizens, receive insured access to Hyperbaric Oxygen Therapy and other proven alternative medical treatments for their invisible wounds. Immediate compassionate care is needed now for the most at-risk wounded Veterans. Currently, these steps forward will likely come only from the private sector. With funding, the Coalition's assistance could lead to treatment of Reserve and National Guard Servicemen and women in states that have started their own treatment programs, beginning now.

An extensive annotated bibliography can be found on the TreatNOW.org web site at: https://bit.ly/2oG3o8Q

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20. Ibid. The National Intrepid Center of Excellence (NICoE) at the Walter Reed National Military Medical Center in Bethesda MD delivers a broad range of patient- and family-centered assessments and clinical offerings, encompassing traditional medicine, advanced diagnostic techniques, and integrative medicine. Nowhere do they talk about treating the wound to the brain, and none of their offerings of drugs, devices or Interventions are approved by the FDA for use with TBI. http://bit.ly/1P7u3ig. See also IOM Report: "Treatment for Posttraumatic Stress Disorder in Military and Veteran Populations: Final Assessment." June 2014.
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About the Author

Robert L. Beckman, PhD, is the Executive Director for **TreatNOW.org** and Chief Knowledge Officer, Foundation for the Study of Inflammatory Disease. He is part of a nationwide Coalition focused on ending the Service Member suicide epidemic through clinical research and healing TBI and PTSD in brain-injured Wounded Warriors. He is responsible for sustaining a national network of hyperbaric clinics as well as architecting the technology platform for data collection and analysis. Dr. Beckman has been building knowledge management systems most of his professional career, primarily in the Intelligence Community and DOD. He has participated in and led revolutionary efforts in strategic planning, organizational and management reengineering, knowledge-based targeting and decision support, competitive intelligence, war room development, targeting and thwarting foreign targeting of US assets, fraud detection, counter-drug, counter-terror, money laundering and organized crime investigations. He was a senior member of an elite data integration effort for the counter-intelligence (CI) and counter-terrorism (CT) communities, and has built an 'insider threat' prototype for law enforcement entities engaged in CI, CT and homeland security. He had an extensive academic and publishing career. In a former life he taught at the US Naval Academy and was a co-owner of consulting and software companies. His PhD is in International Relations and he is an expert on nuclear non-proliferation and knowledge management. He is a former USAF KC-135 pilot and a Vietnam Veteran. He lives in Arlington, VA, is married and has three sons.

What is Hyperbaric Oxygen Therapy?

By John Davidson, B.S., Clinic Director, Bethesda Hyperbaric Oxygen Therapy

Quite simply, hyperbaric oxygen therapy (HBOT) means breathing pure oxygen in an environment that is pressurized above the normal atmospheric pressure at sea level (one atmosphere absolute, or 1 ATA).[1]

Under normal atmospheric conditions, we are subjected to approximately 14.7 pounds per square inch of pressure and the air we breathe is composed of 21 percent oxygen and 79 percent nitrogen. During HBOT, the pressure can be increased up to three times normal atmospheric pressure (3 ATA) creating a higher partial pressure of oxygen. This results in oxygen saturating the blood plasma through the lungs and diffusing throughout all the tissues of the body, even to areas where blood supply may be limited by injury or illness.[2]

HBOT is not a new idea. In the late 1600s, the first attempts were made to treat illness by increasing the pressure of normal room air (hyperbaric air). In the early 1900s, pressure chambers were used to treat divers suffering from decompression illness (the 'bends'). Breathing pure oxygen at increased pressure during surgery and to treat infection was introduced in the 1950s.[3]

What Does HBOT Do?

Oxygen is critical to producing the cellular energy for almost all living processes, from growing and healing, to thinking. When the intricate molecular engines that keep us alive are starved of oxygen by injury or disease and our health suffers. In the worst case, cells die.[4] But very often, the damage and disruption are reversible.[5] HBOT delivers high levels of oxygen to all tissues of the body, regardless of blood supply, which:

- Increases tissue oxygen levels up to 2,000 percent providing immediate help to cells that are compromised by poor blood flow
- Reduces inflammation and stimulates the body's immune system to help clear infection
- Reduces edema and swelling by constricting the small vessels in the body, especially in injured tissues which is important in treating burns, crush injuries and injured tissues in general
- Restarts cellular metabolism
- Enhances killing of bacteria, which is critical in curing deep-seated, resistant infections
- Stimulates stem cell production - after 20 treatments, circulating Cd34+ stem cells increase up to eightfold (800 percent)[6]

- Reduces pain by decreasing lactate accumulation in ischemic tissue, which greatly aids healing
- Stimulates nerve growth
- Triggers development of new capillary networks and collateral blood flow, critical to the repair of injured tissues. Collateral blood vessels are produced by increased fibroblasts leading to new collagen production
- Increases growth factor production
- Potentiates and synergizes with antibiotics that require oxygen for transport across cell membranes[7]

What is a Treatment Like?

There are two main types of HBOT chambers: a *monoplace* or single person chamber; and a *multiplace* for many patients [typically accompanied by a medical technician]. Once a patient is in the chamber and the door is closed, the oxygen begins to circulate gradually while increasing pressure. (This is called a 'dive,' harking back to the use of hyperbaric oxygen for diving medicine.) The only sensation of the compression is pressure on the ear drums, similar to what one experiences while diving under water or descending in an airplane. Patients are taught how to 'clear' their ears by equalizing this pressure by yawning, moving the jaw or squeezing the nose closed and blowing out against it. Once at the prescribed pressure ('depth'), there is no sensation of the pressure or any discomfort. During depressurization, some ear popping naturally occurs as the ears equalize to the lower pressure.[8] The length and frequency of treatments will be individualized for each patient and their condition(s), such as the use of HBOT for wound healing, near-drowning, gas poisoning or brain injury. For most conditions, patients are treated once a day for five days a week. Each treatment may last one to one and a half hours. Some emergency conditions will require only one or two treatments; others require more pressure (major burns, for example). In most cases of wound healing or the healing of brain injuries, the effects are gradual, requiring 20 to 40 treatments.[9]

Typical single-person chambers today are designed with clear Plexiglas around or above the patient, which allows for viewing TV or DVD monitors above the chamber, and easy observation by the technician. The patient changes into cotton scrubs and removes all jewelry, watches, electronic devices and the like. The technician rolls the patient into the 'tube' and secures the air-tight door. (NOTE: A hyperbaric chamber is one of the safest medical devices in the world. While there are certain difficulties that may arise during a session – inability to clear ears, claustrophobia/anxiety – most conditions are easily resolved quickly.) Two-way communication is also built into all chambers, so the patient can always be in conversation with the technician. For most patients, HBOT treatment becomes a comfortable daily routine, during which they can watch TV, a movie, meditate or take a well-deserved nap.[10]

What Does HBOT Cost?

A typical one-hour session in a hospital setting is anywhere between $1,500 to $3,000. But since hospitals normally won't treat non-insured brain injuries, victims of TBI/PTSD/Concussion seeking help turn to independent, free-standing HBOT clinics. The average retail price of a one-hour session in these hundreds of clinics around the US is $250 per dive. The normal course of treatment of a brain injury is 40 dives; acute concussions normally take less time. Thus, the 'cost' for treating TBI/PTSD/Concussion is $10,000 or less at retail. Veterans treated in TreatNOW Coalition Clinics (see accompanying listing or visit www.treatnow.org) receive more favorable rates.

It is calculated that an untreated service-connected traumatic brain injury costs taxpayer close to $60,000 per year, every year.[11] In this age of cost consciousness, let alone from an ethical perspective, there is this reality: ***For a fraction of the costs, HBOT practitioners can treat and help in the healing of hundreds of thousands of the wounded and injured with a safe therapy that thus far has enabled approximately 85% of those treated to return to work, school or duty.***[12]

The Need for Informed Consent

HBOT has been shown to be a safe and effective healing therapy across a broad range of injuries and medical conditions worldwide.[13] There is abundant clinical evidence and research that has established its benefits in treating TBI/PTSD. While this is considered an 'off-label' use of HBOT in the US, it should be noted that the great majority of pharmaceutical and other therapeutic modalities that are being provided to Veterans also are 'off-label' and are unsupported by clinical trials that establish their safety or efficacy against TBI/PTSD. At the very least, comprehensive 'informed consent' regarding treatment options demands that every Service Member, Veteran and civilian be made aware of the existence of HBOT and its potential value in their care.

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TreatNOW Coalition Clinics Across the U.S. Veterans can receive help, typically for discounted rates.

Integrated Pain Management of Alabama	Mobile	AL
NorthStar Hyperbarics	Tucson	AZ
HYPERBARIC OXYGEN THERAPY OF ARIZONA L.L.C.	Phoenix	AZ
San Diego Center for Hyperbaric Therapy	San Diego	CA
Pacific Hyperbarics	Chula Vista/San Diego	CA
Nirvana Hyperbaric Institute	Solvang	CA
Advanced Hyperbarics Operations	Stanton	CA
Advanced Hyperbarics Operations	Brea	CA
Advanced Hyperbarics Operations	Upland	CA
Bay Area Hyperbarics	San Jose / Los Gatos	CA
Bay Area Hyperbarics	Los Altos, CA	CA
Hyperbaric Oxygen Clinic of Santa Monica	Santa Monica	CA
The Hyperbaric Oxygen Clinic of San Francisco	San Francisco	CA
Hyperbaric Oxygen Medical Clinic of Sacramento	Sacramento	CA
Beverly Hills Center for Hyperbaric Medicine	Los Angeles	CA
Center for New Medicine	Irvine	CA
Hyperbaric Oxygen Inst at Longevity Orthopedic Ctr	Mission Viejo	CA
Rocky Mountain Hyperbaric Institute	Boulder	CO
Colorado Center for Hyperbaric Medicine	Basalt	CO
Breiner Whole-Body Health Center	Fairfield	CT
South Florida Center for H.O.P.E.	Deerfield Beach	FL
Hyperbaric Medicine Inc.	Ft Walton Beach	FL
Hyperbaric Medicine Inc.	Destin	FL
Hyperbaric Services of the Palm Beaches, LLC	Delray Beach	FL
Oxygen Rescue Care Centers of America ORCCA	Delray Beach	FL
HyperbaricsRx	Lauderhill	FL
Brevard Regional Hyperbaric Center	Melbourne	FL
Orlando Hyperbarics	Orlando	FL
Neurological Solutions	Palm Harbor / Tampa	FL
Hyperbaric Centers of Excellence (PC Beach)	Panama City Beach	FL
Hyperbaric Centers of Southwest Florida	Sarasota	FL
HyperbaRXs at Kennestone	Marietta	GA
HyperbaRXs at Northside Forsyth	Cumming	GA
HyperbaRXs at Saint Joseph's	Atlanta	GA
Idaho Hyperbarics Inc. AKA Idaho Doctors Hospital Healing Center	Pocatello	ID

Healing Center and Hyperbaric Oxygen Therapy, Bingham Memorial Hospital	Pocatello	ID
Hyperbarics of Sun Valley	Hailey	ID
Chicago Hyperbarics	Northbrook	IL
Harch Hyperbarics, Inc.	Marrero	LA
HYPERBARIC OXYGEN TREATMENT CENTERS	Randolph	MA
Bethesda Hyperbarics	Bethesda	MD
Hyperheal Hyperbarics	Cockeysville	MD
Hyperheal Hyperbarics	Glen Burnie	MD
Hyperheal Hyperbarics	Rosedale	MD
Hyperbaric Healing Institute	Kansas City	MO
Fayetteville Hyperbarics, LLC	Fayetteville	NC
Hyperbaric Institute of Nevada	Las Vegas/Henderson	NV
ANDI Hyperbaric Wellness & Research Center	Freeport	NY
Hyperbaric Medical Solutions	Manhattan	NY
Hyperbaric Medical Solutions	Medford	NY
Northport Wellness Center	Northport/Long Island	NY
Center for Integrative & Innovative Therapies – CIIT Center	Plainview	NY
Hyperbaric Medical Solutions	Woodbury	NY
The Patriot Clinics OKC	Oklahoma City	OK
OSU Center for Aerospace & Hyperbaric Medicine	Tulsa	OK
R.M.Lombard Hyperbaric Oxygenation Medical Center Inc.	Columbia	PA
Oxygen Oasis Hyperbaric Wellness Center, LLC	Langhorne	PA
Island Hyperbaric Center	Pincourt, Quebec Canada	QC
Hyperbaric Therapy of the Low Country	Hilton Head Island	SC
New Life Medical Group	Jackson	TN
ATX Hyperbarics	Austin	TX
Hyperbaric Healing Centers of Texas	Plano	TX
Hyperbaric Centers of Texas	Richardson	TX
Hyperbaric Oxygen Therapy of Northern Virginia	Reston	VA
Hampton Roads Hyperbaric Therapy	Norfolk	VA
Washington Hyperbaric Therapy Center, LLC	Redmond	WA
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Hyperbaric Oxygen Therapy: Effective Treatment of the Silent (Signature) Injuries of Combat

Thomas M. Fox MAS, MS, CHT

For more than one hundred years, the wounding pattern derived from exposure to changes in **ambient pressure** in combatants subjected to explosions and detonations has perplexed medical professionals. Explosive blast cause complex injuries. It is a specific group of wounded brought about solely by changes in pressure that are unique and different, for in most cases this wounding pattern has nothing that is immediately apparent on external examination. The initial symptoms are hidden and may not be fully appreciated for weeks to years after the blast exposure.[1] Care-providers at the initial presentation may be challenged by other wounds that are more pressing. For this reason, the care of these 'invisible wounds' is often subordinated to the care of these other wounds that may be more evident and life threatening. These invisible injuries are no less real. They go unrecognized and untreated as one moves away from the blast event, leaving a significant population of Veterans whose lives are forever changed.

The unique nature of these wounds was recognized early in the 'War on Terror' by Dr. P. Steven Macedo, a neurologist and former doctor at the Veterans Administration. In an article appearing in Washington Post, Dr. Macedo recounted, "TBIs from Iraq are different." "Concussions from motorcycle accidents injure the brain by stretching or tearing it," he noted. But in Iraq, something else is going on. "When the sound wave moves through the brain, it seems to cause little gas bubbles to form," he said. "When they pop, it leaves a cavity. So, you are littering people's brains with these little holes."[2]

On the modern battlefield, the detonation of improvised explosive devices has become the major source of wounds affecting more 60% of those wounded. Blast injuries occur as a result of exposure to these explosions or detonations. The injuries created can be divided into five categories based on a specific mechanism of injury. Primary blast injuries result strictly from the exposure to changes in ambient pressure. Secondary blast

injuries occur as a result of missiles and debris that are propelled by the blast wind. The mechanism of injury in tertiary blast injuries is inertia as individuals are injured as they are driven into other objects. Quaternary blast injuries occur as a result of exposure to the heat from the pressure wave. The quinary injuries include the illnesses or injuries caused by chemical, biological, and radiological substances. For the purposes of this paper, we are limiting the discussion only to primary blast injury – those injuries resulting from an application of significant pressure.

The neuropathology of the primary blast-induced injury can be divided into two categories; immediate and long term. The immediate injuries cause functional impairments such as cognitive deficits, increased blood brain barrier permeability, diffusion and perfusion deficits, Impaired information processing due to diffuse axonal damage is evident as well as the failure of energy metabolism immediately following exposure to blasts.[3]

The long-term consequences from primary blast can be categorized as morphological impairments. These impairments evolve in the days, weeks and months following the blast event in response to cavitation emboli or microemboli formed.[4]

The emboli/microemboli creates an area of localized ischemia. The physiological response to the significant pressure exposure from the explosive blast includes the initiation of a cascade of biological pathways that lead to both necrotic and apoptotic cell death in the brain. The damaged tissue in the brain undergoes liquefactive necrosis creating an extracellular fluid that is neurotoxic. This is an unique characteristic of ischemic injuries to the brain that we suggest last for weeks following blast event. This is an evolving injury, a stage of infarct resolution that may last for weeks or months although the exact length is currently unknown. A key component in the repair process involves reactive astrocytes and microglia forming a glial scar. Recent studies out of the University of Arizona report that "although the glial scars are robust physical and endocytic barriers, they are nevertheless permeable." "There is atrophy, cytotoxic edema and neuron loss in regions adjacent to the glial scar for weeks following the ischemic event in response to exposure to the neurotoxic extracellular fluid that has leaked through the permeable glial scar."[5]

We suggest that the current observation period of approximately 72 hours and follow-up of the pressure change from the blast event is inadequate and does not capture changes seen in this evolving injury. Moving away from the blast event, long term neurological deficits such as memory

loss, motor dysfunction and neuroendocrine deficiencies become evident. Neurogenic inflammation and the formation of multiple scars throughout the brain may be associated with the long-term effects of blast exposure.[6]

It is the creation of injuries through acoustically-mediated cavitation nuclei (microbubbles) formed by substantial changes in pressure that creates subtle injuries in the absence of visible wounding. This condition has been identified by and associated with different labels over the years (Soldier's heart, shell shock, combat fatigue, battle fatigue, combat stress, mild traumatic brain injury or post-traumatic stress disorder, to name a few) but the symptomatology or the constellation of signs and symptoms accompanying these labels is surprisingly consistent. Those affected, display cognitive and behavioral impairment, memory lapses, short attention spans, muddled reasoning, headaches, sleep disturbances, pain, depression, anxiety, irritability, apathy and aggression. Untreated, it has been associated with suicidal ideation.

We would suggest that these silent or signature injuries are essentially unrecognized decompression illness brought about by the pressure generated from the blast. Vann et al concludes "Decompression illness occurs in a small population but is an international problem that few physicians are trained to recognize or manage. Although its manifestations are often mild, the potential for permanent injury exists in severe cases, especially if undetected or inadequately treated. Emergency medical personnel should be aware of manifestations of decompression illness in patients with a history of recent diving or other exposure to substantial pressure change."[7]

Previously it was thought that decompression sickness could only be associated with exceeding a point of critical super saturation of inert gas. Krasovitski et al (2011) demonstrated the formation of submicron-sized cavitation nuclei within the cellular membrane due to the motion of lipid leaflets in response to the pressure.[8] These micro-nuclei were created by very slight changes in pressure equivalent to what a diver would experience in diving one quarter of a foot in sea water (.74 kilopascals). The formation of these microbubbles did not require the pre-existence of air voids in the tissue. The creation of these microbubbles in bilipid structures impairs the function of the cellular membranes through the impairment of mechanosensitive channels. The mechanism of injury is pressure-duration related. The more significant the magnitude of the pressure exposure, the less important the duration component becomes, until the point where the measure of time becomes irrelevant.

Recognition and early treatment of these wounds is directly related to complete resolution for these

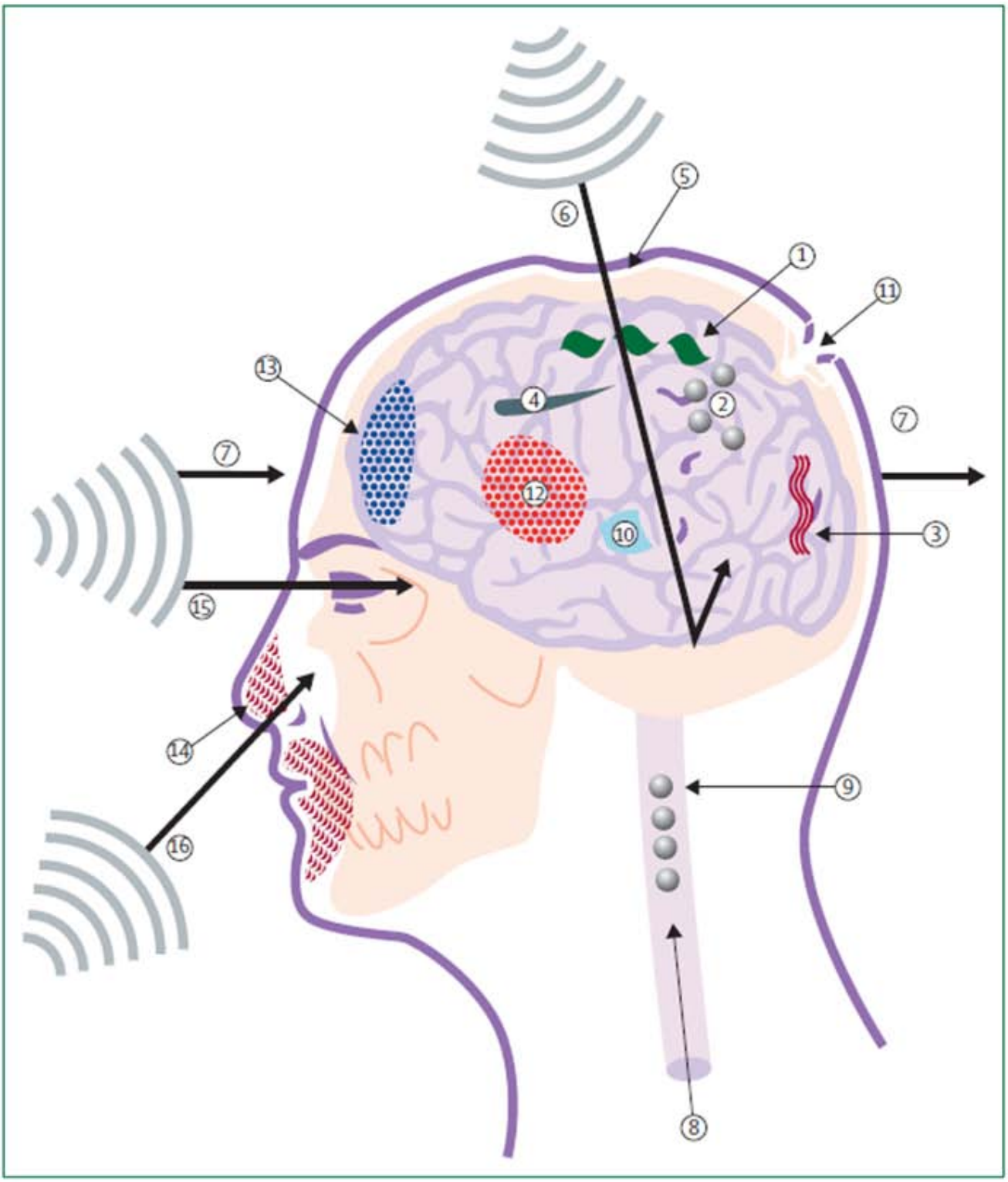

***Figure 1*: Schematic diagram of the mechanisms of blast-related traumatic brain injury**

Figure shows local effects (1–7) and systemic effects (8, 9) of primary blast injury, secondary blast injury (10–12), tertiary blast injury (13), quaternary blast injury (14), and portals for blast wave transmission to the brain (15, 16). (1) Acoustic impedance mismatch causes spallation. (2) Shock-bubble interaction. (3) Shear stress causing diffuse axonal injury. (4) Cavitation. (5) Skull deformation with elastic rebound. (6) Reflection of the blast wave within the skull. (7) Bobblehead effect of acceleration–deceleration. (8) Blood surge from the torso damages the microvasculature. (9) Air embolism from blast lung injury.(10) Penetrating fragments. (11) Compound fractured skull. (12) Intracerebral haemorrhage. (13) Contrecoup contusion. (14) Burns. (15) Blast wave transmitted through the orbits. (16) Blast wave transmitted through the nasal sinuses.

individuals, although the potential for significant improvements has been demonstrated following extended delays in treatment.

In preparing to deploy to combat zones and in the wartime theater, members of combat forces are exposed to substantial changes of pressure through exposure to explosions i.e., IED's, detonations, breeching operations, firing of crew-served weapons such as the Karl Gustav Recoilless Rifle MAAWS/RAWS weapons system and sustained firing of the individual combat weapon as in firefights. Dr. Charles W. Hoge was the first to highlight the positive correlation between 'PTSD' or signature wounding and firefights in an article published in the *New England Journal of Medicine*.[9]

Modifications in barrel length of the individual combat weapon were made to adapt to an urban environment. The consequences of this modification were significant because the multiple impulses created in sustained firing of the US individual combat weapon produces an impulse pressure equivalent of 2.4 times the atmospheric pressure in a matter of milli-seconds (170 decibels or 242.862 kilopascals) for each round fired. The threshold for pain is 160 decibels. An impulse of 170 decibels is equivalent to that produced by the detonation of a single stun (flash-bang) grenade. The effects of this explosion are powerful enough to confuse and disorient. Repetitive or sustained firing of individual combat weapons, as is typical in firefights, produces multiple pressure impulses, the optimal environment for growth of microbubbles in bi-lipid structures throughout the body and the brain. The impairment created by this exposure is also acknowledged by Dr. Hoge, as he makes the following observation: "The exposure of Service Members to 1 to 2 firefights doubles the occurrence of 'PTSD,' from what has been observed in individuals who have not been exposed to firefights. This increase continues, even with limited subsequent exposures. With exposure to 5 firefights, the incidence rises to 19.3 percent, without an indication that it would plateau at this point.

The presence of microbubbles in individuals exposed to blast waves, brought about by explosions and detonations, is documented by numerous sources. In a study entitled, Blast- related traumatic brain injury[10] Dr. Rosenfeld acknowledges, "The blast wave induces sudden changes in intracranial pressure that result in bubble formation, particularly at interfaces between CSF (cerebral spinal fluid) and the brain, resulting in penetration and cavitation of brain tissue, disruption of axonal pathways and damage to capillaries."

The supersonic pressure wave has a special form that is separate and unique to the type of explosive detonated. A common trait that is produced by all explosions/detonations is a very

rapid increase in pressure. Variations in duration of the higher pressure exposure varies with explosive types. These longer duration explosions use substantial pressure as a mechanism of injury. The slow reversal to negative pressures in the brain, occurs over a period of hundreds of milliseconds. The reflective surfaces of the interior of the skull changes the direction of the pressure pulse modifying the net pressure amplitude within the focal zone of impulse. The proximity of reflective surfaces, individual body armor and Kevlar helmets may serve to redirect pressure impulses, amplifying their affects. These unique characteristics to which our Veterans have been exposed and the resulting diagnoses classified as invisible, silent or signature wounds could be affecting as many as 800,000.[11]

Once an explosion occurs, the management of the neurological abnormalities in the blast casualty should follow a comprehensive multidisciplinary treatment plan. One such plan appears in the Textbook of Military Medicine. It identifieshyperbaric oxygen as a definitive treatment.[12]

When asked about hyperbaric oxygen, most physicians are quick to recognize that it is effective in treating decompression sickness, more commonly recognized as the bends; a condition caused by bubbles within the tissues of the body. One of the most critical forms of Decompression Sickness (Neurological DCS) affects the central nervous system- brain and spinal cord. Treatment of this condition is considered definitive. Improvements are seen even after extended delays in treatment.

To date, attempts to identify an effective therapeutic approach to address signature wounding have failed to provide significant sustainable benefits to the Veterans affected.

One of the therapeutic approaches to these silent wounds is the use of hyperbaric oxygen. It has been studied repeatedly. Significant improvements from baseline evaluations are reproducible and have been documented in each of the 4 DOD/VA studies conducted to date.

In an invited commentary of the largest hyperbaric study by the US military,[13] these significant improvements are documented. Drs. Hoge and Jonas acknowledged “significant improvements in post concussive symptoms and secondary outcomes, including PTSD (which most participant had) depression, sleep quality, satisfaction with life, and physical, cognitive and mental health functioning.”[14] To date Hyperbaric Oxygen is the only therapeutic approach that is able to produce consistent and reproducible improvements in individuals with neurological injuries. These findings have been independently verified by studies out of Israel.[15]

Treatment with hyperbaric oxygen is a safe and effective therapeutic option that is capable of providing significant improvements in Veterans experiencing post-deployment issues that have been identified as signature wounds. In the words of the principle investigator of the US DOD's largest study of Hyperbaric Oxygen, in an article appearing on the VA website dated 21 January 2015 entitled DoD, VA research again finds hyperbaric oxygen ineffective at treating concussion-related injuries, COL Scott Miller, stated that "People did get better and we can't ignore those results."[16] The time is now that we heed these words acknowledging the powerful impact of Hyperbaric Oxygen as a key therapeutic approach in addressing the silent signature wounds of combat brought about by the exposure to significant pressure changes or neurological decompression illness.

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Special Interests:
The effects of pressure on the human body. The role of blast overpressure from blasts or explosions in the silent wounding of veterans.

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The Next Generation in Brain Recovery and Neuroregeneration

By Timothy M. Marshall, PhD and Carol L. Henricks, MD

Abstract

For several decades traditional medicine has perpetuated the notion that, unlike other tissues in the human body, the brain and nervous system, once injured, lack the capacity to repair and heal themselves. In fact, clinical and scientific evidence show that the nervous system has significant healing ability.

Millions of Americans are affected by both acute and chronic traumatic brain injury (TBI), but there is no standard-of-care recovery therapy. Medications used in TBI patients are mostly off-label and treat symptoms but do not promote healing. Even worse, without healing, neurodegenerative processes begin.

Methods of reducing inflammation and promoting neural recovery include hyperbaric oxygenation therapy (HBOT) and nutritional doses of magnesium, lithium, and zinc.

Traumatic Brain Injury (TBI)

According to U.S. Centers for Disease Control and Prevention statistics, approximately 1.7 million people in the U.S. suffer a traumatic brain injury (TBI) each year.[1] Nearly 75% of TBIs that occur each year are concussions or other forms of mild traumatic brain injury (mTBI).[2] In 2010, direct and indirect medical costs of TBI totaled an estimated $76.5 billion in the U.S.[3] In the U.S. alone, more than 5.3 million people live with disabilities caused by TBI.[3,4] The traditional approach to recovery is observation and supportive care. Supportive care often includes medications to treat the various symptoms and consequences of TBI such as depression, anxiety, night terrors, chronic headaches, poor balance, difficulties concentrating, and sleep disturbances. Current medications do little more than treat symptoms. They do not promote healing, do not inhibit cell death or any neurodegenerative process, and are often associated with negative side effects.

Basic Pathophysiology of Traumatic Brain Injury

The first stages of cerebral injury after TBI are characterized by tissue damage, axonal shearing, contusions, and impaired regulation of cerebral blow flow (CBF) and metabolism. During the first 10 days succeeding a TBI, known as the acute phase, the following excitotoxic events occur: terminal membrane depolarization along with excessive release of excitatory neurotransmitters (i.e. glutamate, aspartate) leading to overactivation of N-methyl-D-aspartate (NMDA), α-amino-3-hydroxy-5-

methyl-4-isoxazolpropionate (AMPA), and voltage-dependent Ca^{2+} and Na^{+} channels. Subsequent Ca^{2+} and Na^{+} influx leads to an increase in catabolic intracellular processes and a high level of oxidative stress.[5]

The next stage, known as the subacute phase (more than 10 days, less than a year post-injury) is defined by tissue damage, and if healing is not progressing, Wallerian degeneration begins. A potentially reversible phase of intra-axonal damage proceeds to further axon fragmentation and demyelination of intact axons. Repair might still be possible, but if the process is unchecked, cell death is likely.[6]

The chronic phase of post-concussion is persistent and ongoing. Depending on the severity of the trauma (or repeated traumas), symptoms such as long-lasting cognitive impairment, depression, anxiety, sleep disturbances, and progressive neurodegeneration and decline may occur years after the injury.[7,8] Cell death has occurred, and processing speed is invariably compromised.

Biochemical Restoration

The past few decades have seen great advances in our knowledge of nutritional biochemistry and nutrient-based therapeutics, and a new treatment model known as "biochemical restoration" has emerged. In biochemical restoration, the goal is to correct underlying nutrient and hormone deficiencies and toxic burdens (e.g. mercury and other heavy metals as well as persistent organic pollutants) that drive inflammation and mitochondrial disease and dysfunction. Mitochondria are responsible for creating more than 90% of the energy the body needs to sustain life, and all healing and growth processes require healthy mitochondrial function. These vital organelles require a multitude of nutrients (e.g. Mg, Li, Se, Zn, Cu, Mn, Mo, B-vitamins, essential fatty acids, cholesterol, hormones, and oxygen) for optimal function and ATP production.

Biochemical restoration can activate or reactivate healing processes.

Magnesium, Lithium, and Zinc: Essential for Neuronal Repair

Like magnesium and zinc, lithium is an essential mineral required for a number of biochemical and regulatory functions in the body. All three minerals are needed for neuronal healing processes (e.g. neurogenesis, neuroregeneration, reducing neuroinflammation), and modulation of the body's excitatory NMDA receptor.[9-17] Magnesium and zinc are cofactors in more than 600 chemical reactions in the human body, while lithium has a wide range of nutritional effects that are intercorrelated with the functions of several enzymes, hormones, and vitamins, as well as with growth and transforming factors.[18-19]

Low doses of lithium were found to increase brain-derived neurotrophic factor (BDNF) expression in cortical neurons (10% at 0.02mM) and hippocampal neurons (28% and 14% at 0.02 mM and 0.2 mM, respectively). Extracellular BDNF of cortical neurons increased 30% at 0.02 mM and 428% at 0.2 mM, and in hippocampal neurons, BDNF increased 44% at 0.02 mM.[20]

Small, nutritional doses of lithium from 5-40 mg/d have been used since the 1970s to treat depression, anxiety, headaches, migraines, chronic pain, alcoholism, drug addiction, stroke, and autism, to halt or slow progression in Alzheimer disease, Parkinson disease, and amyotrophic lateral sclerosis (ALS), and to prevent suicide.[18,19] Nutritional deficiencies result from poor diet or lithium antagonists such as caffeine or alcohol, which promote the loss of many water soluble nutrients (e.g. lithium, magnesium, zinc, B-vitamins, and ascorbic acid).

Brain magnesium levels fall rapidly following the acute phase of a TBI, and replenishing levels to their normal values has been shown to prevent and reverse neurological injury.[14,15] Magnesium has also been shown to promote sciatic nerve regeneration[16] and rapid recovery from major depression.[17]

Zinc is needed for healthy brain function, and has been shown to possess anxiolytic and antidepressive effects similar to those of magnesium and lithium.[21,22] Like magnesium and lithium deficiency, zinc deficiency increases oxidative stress and contributes to general inflammation,[23] while zinc supplementation can reverse this. Other symptoms of zinc deficiency include mental lethargy, learning difficulties, delayed wound healing, low testosterone, and neurosensory disorders.[21,23] Zinc deficiency has been shown to impair hippocampal neurogenesis, while decreasing neuronal survival.[24-27] Supplementing with zinc during the acute and subacute phases of TBI also decreases the damaging effects of oxidative stress and inflammation.[23-28]

Molecular mechanisms are being elucidated.[29] One of lithium's beneficial effects resides in its ability to modulate the NMDA receptor. A large part of its wide-ranging action lies in its inhibition of the phosphorylating enzyme glycogen synthase kinase-3 (GSK3),[30,31] thereby protecting brain cells from a wide range of assaults, including oxidative stress, DNA damage, impairment of mitochondrial function, and excitotoxicity.[32,33] GSK3 regulates the functions of more than 100 proteins, many of which are involved in neuronal resilience. GSK3 also regulates the actions of more than 25 different transcription factors, exerting a large effect on the levels of proteins in neurons. Lithium increases resistance to oxidative stress by reversing GSK3's inhibition of the antioxidant boosting, neuroprotective transcription factor Nrf2.[29,34]

Replenishing these nutrients is important in all phases of TBI, including the chronic phase, to prevent cell damage as well as to stimulate the healing process by increasing neural growth factors such as BDNF20 and stem-cell mobilization.[35,36]

Hyperbaric Oxygenation for Neurologic Recovery

Hyperbaric oxygenation therapy (HBOT) involves breathing pure oxygen (100 v/v%) in a pressurized chamber. It is a well-established and effective treatment for decompression sickness, serious infections, inflammation, and wound healing. Many recent reports provide evidence for its effectiveness in promoting repair of neurologic injuries, whether traumatic or anoxic.[37-47]

HBOT at 1.5 atmospheres absolute (ATA) is a commonly used treatment pressure in outpatient clinics in the U.S. and has been used internationally. A treatment pressure of 1.5 ATA with 100% oxygen tremendously enhances the oxygen carrying capacity of blood, promotes healing, and has an excellent safety record.[37-40]

The minimal elevated pressure a patient can sense (about 1.3 ATA, depending on the rate of change) can induce an elevation in tissue oxygenation of 50% or more when the patient is breathing room air. This is important to recognize because "sham" treatment under such conditions has been used as a "placebo" in experimental trials, when in fact it is a low-dose treatment.

It has been said that over-oxygenation at pressures at or above 2.0 ATA can inhibit healing or even have toxicity. If so, HBOT above 2.0 ATA may be less effective than 1.3 ATA, explaining the "unexpected" improvements in control groups when 1.3 ATA was used for the control.[48] There is controversy about the optimal pressure to use. Dr. Paul Harch at Louisiana State University Health Sciences Center is working with the LSU Neurology Department to develop protocols for a variety of neurological conditions.

Mechanism of Action of HBOT

HBOT creates oxygen radicals, which stimulate healing mechanisms including production of neurotrophic growth factors[49] and vascular endothelial growth factor,[50] neural stem cell proliferation and mobilization,[51-54] and modification of gene expression.[50]

In a 2014 study, researchers at M.D. Anderson Cancer Center found that "HBOT not only increased antioxidant enzyme expression, such as Cu/Zn-superoxide dismutase, catalase, and glutathione peroxidase, but also significantly decreased pro-oxidant enzyme levels…thereby decreasing net oxygen radical production by means of negative feedback."[55] Note that free radicals have a hormetic effect, i.e. a biphasic response in which low levels stimulate beneficial processes and high levels are damaging.

HBOT improves cerebral plasticity, allowing the repair of chronically impaired brain functions and improved quality of life in mTBI patients with prolonged post-concussion syndrome and in post-stroke patients, years after the brain insult.[43,56]

HBOT has also been shown to inhibit NO-induced apoptosis (programmed cell death) via enhanced expression of heat shock protein[58] and the up-regulation of the anti-apoptotic protein Bcl-2 (increasing the Bcl-2/Bax ratio) in degenerated human intervertebral disc cells.[59] Bcl-2 is localized to the outer membrane of mitochondria, where it plays an important role in promoting cellular survival and inhibiting the actions of pro-apoptotic proteins (e.g. Bax, Bak).

Summary

While there is currently no standard-of-care therapy that has been recognized to treat brain injury, which is too often considered hopeless, this could change with biochemical restoration therapy and hyperbaric oxygenation therapy (HBOT). These modalities have neuro-protective effects while promoting vital healing processes in the brain and nervous system in both acute and chronic phases.

Published research shows that these modalities have great potential. Much further research is needed to establish the most appropriate dosing and pressures.

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Disclosure: Dr. Marshall's company NeuroLith Nutraceuticals LLC has developed nutritional supplements designed to enhance brain healing, based on research cited here; patents pending.

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About the Authors

Dr. Carol Henricks graduated with a major in psychology from Washington and Jefferson College in 1981. She worked on a variety of research projects: Artificial Intelligence at the University of Pittsburgh Learning Research and Development Center; Memory Research at Yale University; and Brain recording from implanted electrodes in rats at Hahnemann University before she began medical training at Hahnemann University School of Medicine. Dr. Henricks graduated from Medical School in 1991 and completed Internship, Neurology Residency and Chief Residency at Hahnemann University Hospital. She then went on to do a 2-year Fellowship training program from July 1995-97 at the University of Michigan in Ann Arbor, Michigan in Clinical Neurophysiology which included training in EEG, Epilepsy, Sleep Disorders and intra – operative monitoring. Following that training she completed a second Fellowship at the University of Arizona from July 1997 – 98 in Behavioral Neurology and Memory Disorders.

In private practice since 1999, Dr. Henricks has developed expertise in Hyperbaric Oxygen Therapy and presented her work at the International Hyperbaric Medical Association meetings on 3 different occasions. She presented "Hyperbaric Oxygen Therapy in recovery from Spinal Cord Injury" in August 2008; "Ani: A case study" (Late recovery from multiple early childhood injuries using HBOT) in August 2010 and "Recovery from Chronic Traumatic Encephalopathy with HBOT as demonstrated by Brain MRI with DTI" in August 2012. Dr. Henricks focuses her practice on Traumatic Brain Injury (TBI) and complex neurological recovery programs with a comprehensive approach to patient care.

Dr. Tim Marshall is a neuropharmacologist and nutritional biochemist with a passion for natural healing practices and functional medicine. Dr. Marshall holds a doctorate in Neuropharmacology from the University of Arizona, College of Medicine, with his Bachelor's in Biochemistry and a Master's degree in Organic Chemistry from the same institution. Following graduate school, he entered the realm of drug discovery research as an analytical chemist for Pfizer Global Research and Development, working in their Pharmacokinetics, Dynamics, and Metabolism Group in La Jolla, CA and Aventis-Selectide Pharmaceuticals in Oro Valley, AZ. After a few years in Big Pharma, he returned to academia to teach (2002-2004) and complete his doctorate in Medical Pharmacology (2008) – specializing in Neuropharmacology, and minoring in Medicinal Chemistry and Toxicology.

For the past 10 years, Dr. Marshall has taught courses in general chemistry, organic chemistry, biochemistry, and pharmacology, while serving as the Lead Biofuels Chemist for a Department of Defense funded (NASA sponsored) clean-energy research team. Following a three-year stint in clean energy research, he returned to his lifelong passion in nutritional therapeutics and natural medicine – as a holistic neurospecialist – utilizing the tenets of functional medicine to address a wide-range of neurological conditions and disorders. Since 2012, he has been working closely with neurologist, Dr. Carol Henricks of NorthStar Neurology and Hyperbarics to tailor nutrient protocols that work in tandem and enhance the healing benefits of hyperbaric oxygen therapy (HBOT).

In addition to teaching, research, and medical consulting – he is a highly sought-after expert in the fields of nutritional biochemistry, formulation chemistry and optimization, and environmental toxicology – with recent contracts with Susquehanna International Group (SIG), and the award-winning herbal tea company, Garden to Cup Organics (Canada). He is a diversely published author with three books on Amazon/Kindle, including his newly released groundbreaking book "Lithium – An Essential Micronutrient," and "Think Smoking is Bad? Try Aspartame!" and has two recent publications in the *Journal of American Physicians and Surgeons* titled: "The Next Generation in Brain Recovery and Neuroregeneration," and "Lithium, as a Nutrient." Dr. Marshall's passion for root-cause healing solutions began as a child fueled by his quest to identify the root causes of his own health issues, and passion to understand health challenges at their most basic level has driven him throughout his life. It is the culmination of this passion, education and arduous research that lead to the creation of his next-generation supplements – MagLith+ and BrainFood7 – and has brought forth his own line of "Regenerative Therapeutics" that he feels confident will change the face of neurological medicine forever.

Old World Wisdom, New World Healing and Health

By Maryellen Ammons, CHC
Infinity Healing Wellness Center: "Healthy People Thriving Communities"

I'm Maryellen Ammons and I'm a new-world health visionary integrating old world wisdom. I was chronically ill for 15 years, with some symptoms even tracing back to my childhood. Every day I felt like I was hit by a mac truck and the doctors could not figure out what was wrong with me.

It turned out to be a very complex case of Lyme disease with some other infections thrown in. Just two years ago, I was looking at purchasing anti-fatigue wheelchairs. I owned two canes and I had just started researching going on medical disability.

Today I am fully recovered. I traveled the country looking for treatments. I researched and tried many traditional, holistic and ancient therapies. With Infinity Healing, I am bringing the most effective therapies to you here, locally, so you have easier access than I did. I stand here today to give you hope. No matter what you are dealing with, you can live a vibrant, healthy life. I am.

"You have to lower your stress," my doctor of 12 years told me. This was after over a decade of extreme, persistent chronic Lyme disease symptoms and a myriad of treatments, both traditional and alternative. Over a 15-year period, I traveled all over the country and spent over $300,000 trying to get well. I was a functioning, bedridden person, working every day with flu-like symptoms to afford my therapies and my supplements, with no idea when it was going to end.

"You are pouring very expensive seeds on very poor soil," my doctor told me. I paused and said. "I can't lower my stress. I am not being chased by lions and tigers, I have enough to eat, and I have not had significant trauma in my life." This, of course, was said in my head.

"I have to lower my stress response."

"Yes!" said my doctor. "Okay, well how do I do that? What treatments are available?"

"I don't know," said the best doctor ever. The search began…

I started with my friend Google, of course. That led me to understand that the stress response is largely impacted by the vagus nerve, the main nerve (starts around the back of your neck) that controls the autonomic nervous system. Some clinics were implanting pace makers to help regulate its activity, which was pretty much a non-starter for me. I already had about 5 surgeries in my lifetime and was not interested in an invasive option.

There are many things that positively affect the vagus nerve, but the two that caught my attention were meditation and cold therapy. Before I go on, here's what you can do at home for little to no cost:

- Cold ice packs on the back of your neck
- Hot/cold showers, ending in cold
- iTunes has a ton of guided meditations, I searched and just downloaded the ones I liked
- Heart rate variability apps - there are many out there, pick one with a guided breathing meditation
- Binaural beats on iTunes or other music alternatives (pick alpha, theta, delta or gamma tones)
- Wim Hof has an app on iTunes or Google Play to practice breathing techniques

All of these work.

After I cleared my infections one more time, I decided to go to the experts in meditation. I invested time and money to learn from some of the best. I attended a week-long Alpha One session with Biocybernaut in Sedona. Through that experience, I reduced many of the supplements I needed to support my body's ability

to handle stress. The basic premise was forgiveness and trauma release with a ton of data every day to assess how well I was clearing these internal stressors. I saw my brain-waves changing as I was working.

It turned out that, not unlike many people with chronic illness, I was carrying a lot of baggage and suppressing my reactions to people. People with chronic illness tend to create happy shells around us all the time, all the while feeling stressed out and emotional on the inside. Through the neurofeedback I did, I started to be more honest with myself as to how I was feeling and it helped to change the functioning of my vagus nerve.

I continued working on it in my daily life, finding my emotions and expressing them honestly with a great deal of compassion.

After about a year of daily working on opening up to the world, I found The Four Winds Society and started to research the energy fields around us. I have now come to understand through my own life experiences and work with my clients that the best, most efficient way to change the stress response is to clear the heavy energy that resides in our fields.

Some of the more high-tech ways to do this are to increase your body's oxygen levels (HBOT, Photobiomodulation, the advanced Wim Hof Method-a system of optimizing health through cold therapy, breathing and mindset/meditation), cold therapy like cryotherapy, and to release the energy with mediation (float rooms, sound and light healing). Combine these with ancient techniques of healers/shamans around the world and that's where the magic happens.

About the Author

Maryellen Ammons, CHC, supported the Navy as a civilian for 23 years. She is a former Procuring Contracting Officer and program manager for the Naval Air Systems Command, supporting multiple major weapons systems in both capacities (Triton, F-18, H-60, EA-6B, T-45/TH-57/T-34/44, P-3, Corporate Ops, and Aircrew Systems).

She is a fully recovered Lyme disease patient, a Certified Health Coach through the Institute of Integrative Nutrition, and a recent graduate of The Four Winds Energy Medicine program. She owns and operates a recently opened health and wellness center, Infinity Healing, located in Lusby, Maryland. Her life's work is to give back by helping people recover from chronic disease, to help athletes train and recover in a healthy way, and to help create thriving communities throughout the country.

The Use of Cranial Electrotherapy Stimulation in Traumatic Brain Injuries

By Daniel L. Kirsch, PhD, DAAPM, FAIS

Mild traumatic brain injury (mTBI) along with post-traumatic stress disorder are the signature injuries of the current wars in Iraq and Afghanistan. This article reviews the promising available information on cranial electrotherapy stimulation (CES) for mTBI in the civilian sector. Based on the consistently robust results seen throughout this preliminary data, the use of this safe and effective electromedical modality as an adjunct to medical and psychological interventions for mTBI patients should be considered in both civilian and military rehabilitation settings.

Cranial electrotherapy stimulation (CES) is the generic term for a medical treatment that entered the USA from the USSR and Europe in the 1960s as "electrosleep." It involves the passage of small levels of microcurrent stimulation in a specific waveform through the brain to normalize and bring back into homeostatic balance the brain's electrochemistry which can be thrown into disarray by physical or psychological trauma. Once back into a prestress homeostasis, the brain can function normally again, carrying out its myriad systemic regulation duties.

CES treatment is generally administered for 20 minutes to one hour per day, at least once a week, but as often as daily in severe cases. Most symptoms improve significantly during a customary initial three-week evaluation period, although patients are often provided a CES unit to have at home to use from time to time in order to prevent symptoms from returning.

This article reviews the promising available information on cranial electrotherapy stimulation (CES) for mild traumatic brain injury (mTBI) in the civilian sector but it is equally applicable to the military rehabilitation setting since mild traumatic brain injury (mTBI) is one of the signature injuries of the current wars in Iraq and Afghanistan.

Electroconvulsive Therapy, Electroanesthesia, and CES

CES was advanced in Europe under the assumption that if the strong current used in electroconvulsive therapy (ECT) were turned down sufficiently, electroanesthesia could be produced so that surgery could be performed on an unconscious patient without the danger of concomitant seizure activity. Once electroanesthesia devices were available, physicians who had an interest in sleep therapy or who merely wanted to provide a non-drug way of assisting insomniacs, had the electroanesthesia current turned down another substantial notch to microcurrent levels and obtained a treatment originally called electro-sleep, the forerunner of CES. The idea was to induce sleep, then turn off the CES device to allow the patient to complete a good night's rest.

Much research was done in American, Russian, and European medical schools and other research centers in the 1960s and early 1970s to learn what parameters – waveform, frequencies, current levels, etc. – were necessary to reliably induce sleep in their patients. These researchers were never able to find a set of electrical stimulation parameters that reliably induced sleep.[1-5]

A serendipitous discovery, however, was that the patients who were given even one treatment with CES reported general feelings of relaxation and a substantial reduction of anxiety.[6-10] When treated daily over a few weeks to a month, even severe cases of anxiety and depression resolved.[11-13]

CES Research in the US: Stress, Rehabilitation, Cognitive Improvements

A major reorientation of CES studies and clinical use followed. Controlled scientific studies began on the substance abstinence syndrome – with its major symptoms of anxiety, insomnia and depression – of patients withdrawing from illicit drugs and/or pharmaceuticals, alcohol or nicotine.[14-19] Other studies looked at the stress of graduate students in a business management training program,[20] incarcerated prisoners on a prison psychiatric ward,[21] and of psychiatric patients in general.[22-24]

Because of its ability to treat stress under such a wide assortment of patient populations, CES soon became a major component of rehabilitation medicine. Patients in rehabilitation programs are well known to suffer from extreme stress, including anxiety and depression as they and their therapists work to get their lives back to a semblance of normality.[25,26] It found use in treating the stress-related symptoms in para- and quadriplegic patients and, in doing so, it was found to significantly reduce their muscle spasticity.[27] CES also proved beneficial for cerebral palsy patients in gaining control of primitive reflexes and brought many of their other neuro-muscular symptoms under control.[28-30]

Another serendipitous finding was that in every case where patients experienced an improvement in their

stress level, they also experienced a dramatic improvement in cognitive functions, with an average gain of 12 to 18 points on standardized IQ tests administered just previous to and following three weeks of daily CES treatment. It was in this manner that researchers found that so-called permanent brain damage in drug and alcohol addicts was no permanent. While the cognitive abilities of most such patients would approach normal following two years of total abstinence, it could return to normal with just three weeks of CES treatment.[31-35]

Research attention was then turned to patients with mild traumatic brain injuries (mTBI) incurred in various ways such as motor vehicle accidents or falls from high elevations on construction projects. That group drew special attention because the majority of them were know seizure patients and little was known of the effects of CES on seizure patients.

"...in every case where patients experienced an improvement in their stress level, they also experienced a dramatic improvement in cognitive function, with an average gain of 12 to 18 points on standardized IQ tests administered just previous to and following three weeks of daily CES treatment."

Case Summaries

Case 1: 'Rancho Level IV' Patients
Confused and agitated TBI (or post-anoxic or post-stroke) patients may be classified as 'Rancho Level IV' from the Rancho Los Amigo I-VIII Scale and would be described as follows:

"The patient is in a heightened state of activity with severely decreased ability to process information. He is detached from the present and responds primarily to his own internal confusion. Behavior is frequently bizarre and non-purposeful relative to his immediate environment. He may cry out or scream out of proportion to stimulus even after removal. He may show aggressive behavior and attempt to remove restraints or tubes."

A 33-year-old male Rancho IV patient was given droperidol PRN, along with CES. The patient developed meningitis at age 14 which left him with a generalized tonic-clonic seizure disorder. Seizures were controlled until two years later when he suffered a significant concussion playing high school football. At that time, he experienced up to seven generalized tonic-clonic seizures a day, uncontrollable by medication. In 1989, he underwent a right temporal lobectomy which resulted in a disappearance of the seizures for two years. In 1991, he experienced the acute onset of status

epilepticus followed by a prolonged coma. He was diagnosed with viral encephalitis. On awakening, his behavior deteriorated into confusion, sexual inappropriateness, and dangerous aggression. MRI showed left temporal ishemia and atrophy with enlargement of the left temporal horn and atrium of the left temporal ventricle. Topographical EEG showed increased right temporal and frontal slowing. Brain stem auditory, middle latency, and 40 Hz evoked potentials were all abnormal. Haldol, Norpramin, Verapamil, lithium, sodium amytal, and lorazepam were all ineffective.

In the first seven months of his inpatient stay, he was physically aggressive 247 times, made 58 verbal threats, engaged in door rattling 1,983 times, refused tasks 453 times, and attempted to elope 200 times. On introduction of droperidol PRN, the assaultive episodes decreased from an average of 8 to 4 per week, with substantially diminished duration.

Five weeks after beginning droperidol, 30 minutes twice daily, CES was added. There was a lessening of tension in the first three weeks of treatment, and the violent assaults ceased. In addition to extinguishing the physical aggression, the droperidol PRN/ CES treatment was successful in decreasing the other four behaviors: door rattling was down 76%, verbal threats were down 100% (to zero), task refusal was down 29%, and elopement attempts were down 33%. Because of these dramatic changes in behavior, the patient no longer required continuous 1:1 supervision, and PRN injections for explosive behavior became infrequent, then completely unnecessary. Although the patient was still confused and required a closed treatment setting, he was no longer aggressive, which clearly had been his most problematic and dangerous behavior.[34]

Case 2: Aggressive Behavior

A 57-year-old unmarried Caucasian woman was admitted to the maximum-security unit of North Texas State Hospital at Vernon, after having been found to be Manifestly Dangerous at another State hospital where she had carried out 17 assaults on peers and staff over a two-month period. In spite of numerous medication changes, 1:1 – and even 2:1 – staff coverage and other specialized interventions, she continued to attack, throw furniture, kick walls and doors, and required frequent restraints. She would fall down up to eight times a day, accuse staff of shoving her, and make false reports to the Department of Regulatory Services. She was floridly paranoid, developed grudge lists, and would follow peers and staff around yelling at them to get away from her. At other times, she would target peers for assault when they were taking staff's time and attention, which she was demanding. She sometimes expressed remorse over her actions, but did not change her behavior.

The patient's history of psychiatric hospitalizations began nearly 40 years prior, having first been hospitalized at age 15. Since 1991, she was in Texas State hospitals 11 times and was in prison for two years for stealing a car with a baby in the back seat. For the past 13 years, she was homeless when not incarcerated. Throughout the years, antipsychotic medication, including clozapine, would produce a certain level of improvement in the schizoaffective disorder, in that her hallucinations would become quiescent, but she was never able to be maintained in halfway houses or nursing homes because of her violent behavior. Her last such placement ended when she broke an attendant's arm. She was thought to be of borderline intelligence, but had obtained a General Educational Development (or GED) test while in prison. The patient had grown up in a sexually and physically abusive home, had started using alcohol and street drugs at age 12, and by 21 she described herself as an alcoholic like her father.

In the first three months at NTSH-V, she was treated with maximum doses of quetiapine and ziprazidone along with a large dose of oxcarbazepine and escitalopram. She had 12 episodes of physical assault in this pre-CES period, requiring 12 restraints and 66 PRN medication administrations. In spite of the large doses of medicine, she was sleepless many nights, ate irregularly, and was deeply paranoid and withdrawn between aggressive outbursts.

CES was started at 0.5 Hz, one hour twice daily and 15 to 45 minutes, up to three times daily, for her frequent agitated episodes. Compliance with CES improved after two weeks and she began sleeping and eating better. Oxcarbazine and ziprazidone were discontinued and a small dose of clozapine (200mg/day) was added. Two weeks later, the quetiapine dose was cut in half and she continued the escitalopram. In the first month of CES, she had only five aggressive episodes, requiring four restraints and PRN's dropped to 19.

After six weeks of CES, her personality changed dramatically. She became outgoing, was no longer accusatory, and her grooming and hygiene became exceptional. Her assaultive behavior stopped altogether, as did the necessity for PRN's and other interventions. At the end of three months of CES, she passed the Dangerousness Review Board and was returned to the referring hospital. There was no recurrence of her illness on discontinuation of the CES treatments. Observers familiar with the patient from her years at both hospitals commented on what a different person she had become.[35]

Double Blind Pilot Study of CES for TBI

A double-blind pilot study was conducted on 21 closed TBI patients who were living in a supervised care home. Their time since injury ranged from six months to 32 years and their ages ranged from early teenagers to those in their 40s and 50s (average age of 30 years).

The subjects were randomly assigned to CES treatment (N=10), sham CES treatment (N=5), or "wait in line" controls (N=6). The therapists, patients, and the statistician all remained blind to treatment conditions.

CES or sham CES was administered below sensation threshold Monday through Thursday for three weeks for a total of 12 one-hour sessions. It was found that anxiety and depression scores improved significantly in the treatment group, but not in the placebo (sham treated) group, or the wait in line control group. Their fatigue scores also improved significantly, as did their cognitive function scores and their Total Mood Disturbance score on the Profile of Mood States psychometric test as shown in Table 1.

During the study, one of the subjects who had brain cancer had a seizure and was immediately removed from the study by the principal investigator.

Profile of Mood States Subscale	CES treatment pre to post N = 10	Sham treatment pre to post N = 5	Control pre to post N = 6
Tension Anxiety	12.33 ± 7.36 to 8.78 ± 5.09	13.00 ± 6.21 to 14.36 ± 8.25	12.33 ± 8.07 to 12.50 ± 5.87
Depression Dejection	17.11 ± 12.35 to 12.06 ± 8.71	20.91 ± 17.79 to 18.18 ± 12.47	20.00 ± 14.45 to 16.17 ± 9.48
Anger Hostility	13.67 ± 11.20 to 10.39 ± 7.49	16.73 ± 8.27 to 17.55 ± 12.22	14.83 ± 11.50 to 14.83 ± 6.18
Fatigue Inertia	7.44 ± 6.75 to 5.33 ± 3.96	9.46 ± 7.83 to 8.09 ± 6.63	8.17 ± 7.41 to 6.50 ± 5.82
Confusion Bewilderment	8.50 ± 6.75 to 6.22 ± 3.96	10.55 ± 5.87 to 10.27 ± 5.10	9.67 ± 6.15 to 10.50 ± 5.01
Total Mood Disturbance	45.11 ± 41.95 to 31.89 ± 23.84	52.73 ± 41.95 to 52.33 ± 36.64	47.83 ± 43.25 to 45.67 ± 24.16

TABLE 1. *Profile of Mood States pre- and post-scores from CES, sham CES, and wait in line controls in a double-blind pilot study on traumatic brain injuries.*

Following the study, the 11 patients in the two control groups were given CES for three weeks. It had been learned that the patient who had the seizure during the double-blind phase of the study was receiving sham CES treatment. Upon the insistence of his parents, he also received actual CES treatment for three weeks following the study. Neither he nor any of the other subjects in the study experienced a seizure while receiving actual CES treatment and, according to house attendants, their seizure experience in the weeks following the study was unremarkable.[36]

CES Mechanisms and EEG Studies

Possible mechanisms of CES have been studied. Researchers at the University of Wisconsin found that even though the current applied was small (in the microamperage range), 42% to 46% of the current applied externally actually went through the entire brain, but canalized especially along the limbic system and its centers of emotional experience and expression.[37]

Scientists at the University of Tennessee Medical Center completed a series of five studies that used various drugs to deliberately cause Parkinson-like symptoms in canine subjects. They found that once brain homeostasis was thrown into dramatic disarray, the application of CES could bring it back into apparent neurochemical homeostasis within 3 to 7 hours. Left to their normal care—but without CES—the dogs required 4 to 7 days to return to normal behavior once the drugs had been removed.[38]

Over the years, a number of EEG studies have been done pre- and post-CES treatments. Kennerly did the best EEG study to date revealing significant increases in alpha activity denoting more relaxation and significant decreases in delta activity that accounts for the increased alertness typically seen following CES.[39] Cox did a crossover study on a female depressed patient and found that following CES, but not sham CES, she became sleepy and drowsy for the first time in months, exhibiting a well-developed alpha rhythm in the occipital cortex.[40] Empson studied student volunteers in a sleep lab and found that CES treatment was accompanied by an EEG state suggesting an alteration in the mood of tense, anxious students to one of relaxation.[1]

Heffernan completed two studies of the EEG spectrum in chronic pain patients in which he completed fast fourier transformation and chaos correlation dimension analyses and found CES to bring the EEG back into a coherent, pre-stress pattern.[41,42] Itil used a computerized frequency analyzer to study the EEG's of ten male volunteers in a crossover design. He found that the effect of CES on the EEG depended on whether the subjects were resting or involved in reaction measurements. Those who began with an EEG suggesting a relaxed state became even more

relaxed, while those who began in an alert state remained in the alert state. During reaction time measurements, there was an increase in 5-10 Hz activity and a decrease in fast alpha and beta activity following CES.[4]

McKenzie completed an EEG study with eight psychiatric patients suffering chronic anxiety with depression and insomnia and compared them with four normal staff controls. Following one CES treatment a day for five days, the patients showed increased quality and quantity of alpha with increased amplitude in the occipital-parietal leads.[43] Magora studied 20 hospitalized patients suffering from longlasting insomnia with anxiety, obsessive and compulsive reactions, morphine and barbiturate addiction, and involutional depression. They were given two to four CES treatments weekly for two to three hours a day for a total ranging from 10 to 20 treatments. A majority (75%) of the patients were labeled as responders to the treatment with a return to a normal sleep pattern as measured by their EEG. Parallel with the return to a normal sleep pattern, all the other psychiatric signs (e.g., anxiety, depression, agitation, delusions, abstinence syndrome) improved significantly so that all were able to be discharged from the hospital. There was no relapse on an 8 to 12 month follow up in any of these patients.[44]

There were other EEG studies, but as can be seen, the findings in the above studies varied depending on the subject population, EEG testing parameters and so on, yet in every case there was a robust normalizing trend found in the EEG following CES treatment, whether the subject population were addicts, patients undergoing treatment in a psychiatric hospital, patients in a sleep laboratory, or simply students in a graduate school experimental EEG laboratory. There was no instance in which an EEG indicated adverse effects from CES treatment.

After several years of using CES alone, it was discovered that it potentiated biofeedback, including the speed of learning, length of retention, and ongoing patient improvement if given just before or along with biofeedback of various kinds.[45-47] It potentiated the hypnotherapy process, increasing the speed and depth of induction, and often permitted hypnosis resistant patients to be hypnotized.[48] Similarly, it was found that it potentiated the effects of psychoactive medications, 34 and also general anesthetics in surgery patients by approximately 37%, allowing the patient to remain anesthetized with less anesthesia as the surgery progressed, waking sooner following surgery, and experiencing less pain during recovery.[26,49,50]

Post-traumatic Amnesia

Childs reported on the effectiveness of CES in two cases of post-traumatic amnesia. The first was a 21-year-old male who sustained a TBI following a motorcycle accident but recovered

"Childs reported on the effectiveness of CES in two cases of post-traumatic amnesia. The first was a 21-year-old male who sustained a TBI following a motorcycle accident but recovered much of his tested memory recall functions following a series of CES treatments administered three and one-half years after the accident."

much of his tested memory recall functions following a series of CES treatments administered three and one-half years after the accident. Post-accident, computerized tomography (CT) revealed a right lateral basal ganglia hemorrhage and hemorrhages into both ventricles. He was totally unresponsive for ten days, semi-comatose for ten days, and in a state of coma vigil for 20 days. Three months after the accident he showed a dense left hemiparesis, and a Wechsler Memory Scale (WMS) score of 61, Full Scale IQ of 71. Six months after the accident his IQ improved to 80, but the WMS score was essentially unchanged at 63. He showed marked deficits in short-term retention of visual and verbal information. By eight months after the accident his WMS was 83, but acquisition of new learning was significantly impaired. This patient was treated with CES 40 minutes daily for three weeks. He averaged 29 correct responses immediately after CES, and 30 correct responses (delayed recall) 30 minutes later. At the end of three weeks of CES, immediate recall was in the 36-37 point range, while delayed recall increased to 40 (33% improvement). Ten days following discontinuation of treatment, he averaged 45 in immediate recall (55% improvement), and delayed recall improved to an average of 47 (56% increase over baseline).

The other report was of a 58-year-old orthopedic surgeon who sustained a closed head injury in a motor vehicle accident in 1984, with extensive lacerations and a broken leg. Initial CT scan revealed intraventricular hemorrhages within the occipital horns of both ventricles. An area that appeared consistent with an infarction of the left anterior thalamus was also noted. An EEG three weeks later showed slowing consistent with diffuse encephalopathic process. CT scans one month later showed clearing of the hemorrhages and progressive dilation of the ventricles. From the day of injury, the patient was extremely confused, disoriented, and demonstrated severe memory deficits. Twelve weeks after the injury he was transferred to a rehabilitation hospital where he exhibited disorientation, memory disturbance, and delusions of being dead. He had difficulty distinguishing between fantasy and reality, and experienced overwhelming anxiety during periods of disorientation. His problems were with new memory, exemplified by his successful completion of a state medical board

exam after which he was unable to find his way out of the building. He could not drive because he could not remember where he was going. He was diagnosed with diencephalic amnesia secondary to trauma. Baseline scores averaged 29 for immediate recall, and 23 for delayed recall. After one week of CES, immediate recall averaged 35 and delayed recall averaged 25. After three weeks of CES, immediate recall averaged 35 and delayed recall averaged 31. During three weeks following discontinuation of treatment, he was tested three times and averaged 37 on immediate recall (28% improvement), and 32 on delayed recall (39% improvement).

Subjective observations by staff indicated visible improvements in mood, spontaneity, and initiative in both patients, but deteriorated rapidly after the treatment was stopped. Nevertheless, the authors stated that the clinical improvement in these two patients cannot be ignored.[51]

Combined TBI and Global RSD

Another case was reported of a 60-yearold male treated with CES for an intracranial TBI coupled with full body reflex sympathetic dystrophy (global RSD). In spite of severe disabilities of his brain and body, WHH continued to serve his country in his position on the Executive Staff of the President's Committee on Employment of People with Disabilities. Daily 20-minute treatments of CES provided satisfactory pain relief for WHH to complete his tasks and enjoy a relatively higher quality of life than he was able to have with drugs alone.

Prior to CES, WHH has been prescribed numerous medications including Prozac 20mg q.i.d., Catapres Tab 20mg q.d., Effexor 100mg in AM and 50mg at bedtime, Levo-Dromoran 1mg b.i.d., Balofen 10mg split AM and PM, Risperdal 7.5mg at bedtime, Kolopin 0.5mg 1 tab t.i.d. to q.i.d. per day as needed, C-Dextromthrph 60mg t.i.d. and Fentanyl patches for four years. This regime did little to reduce his whole body chronic intense critical pain and burning. Nor did it relieve his difficulty sleeping. Transcutaneous electrical nerve stimulation did not help. WHH claims these treatments made him worse and expressed concerns about the short and long-term side effects the drugs had on his ability to function.

WHH was provided CES at George Washington University Medical Center prior to oral surgery. He exhibited marked relaxation from CES, with a reduced anxiety level and a significantly enhanced pain threshold. Based on these positive results he was prescribed 20-minute CES treatments daily via ear clip electrodes. WHH credits the CES treatment for allowing him to return to work, and for improving his family and social life. Prior to CES he claimed that "life was not worth living to the degree that suicide was an attractive option." He found this treatment provided

him a moderate improvement of 50-74% relief from his pain, anxiety, depression, headaches, and muscle tension, and a marked improvement of 75-99% in his insomnia.

A single CES treatment lasted 6 to 8 hours, allowing him to get through the day, then the pain gradually returned. In his own words, "The Alpha-Stim 100 [the CES unit used] has given me short term relief from my pain levels that medications have not been able to accomplish. While the relief periods may only be for 8 hours or so, these near pain-free hours allow my body to recycle itself, granting me an improved quality of life. Without this therapy, the constant 'level 10' debilitating pain levels leave me with no physical or emotional reserves to carry on daily life. The CES therapy has no side effects, whereas my medicines have profound, crippling and lasting side effects that have impaired my bowel and colon. These impairments cannot be reversed." On a zero (no pain) to 10 (maximum pain) scale, He says CES reduces his pain level from a 10 to a 3 which he describes as "the difference between standing on a busy street in New York at 5 PM and fly fishing on a tranquil creek." He added "CES provides me with a measure of pain relief that brings me back from the depth of despair and gives me a wedge of hope."

CES reduced his pain level to a point where he was able to perform his daily exercise routine. He was also able to rest better at night, which he credited as creating a "positive emotional and physical self-environment." He felt more rested in the morning. He was able to work 30 to 40 hours per week, up from a maximum of 15 hours prior to CES.

Following CES, his medication had been reduced to Prozac 10mg q.d., Catapres Tab 0.1mg b.i.d., Effexor 50mg AM and 25mg PM, Levo-Dromoran 1mg b.i.d., Restoril 7.5mg at bedtime, Kolopin PRN, and Neurontin 400mg PRN.[52]

Conclusion

Some researchers have said that the current mass pandemic of fibromyalgia patients may be due to brain dysfunction following whiplash injury or similar traumas to the brain.[53] That concept is still under discussion, but meanwhile two independent double-blind studies have shown CES to be a very effective treatment for pain and mood disorders in fibromyalgia patients.[54,55] CES has also shown to be effective in two double-blind studies of spinal cord injuries, an anatomically-related pathology.[56,57]

This preliminary evidence supports the hypothesized ability of CES to functionally stabilize the traumatized brain and return it toward a condition of pre-injury homeostatic functioning. Additional research will likely confirm these findings and definitively prove CES to be an effective treatment for patients with traumatic brain injury or, at the very least, a significantly beneficial adjunct to other forms of physical, and psychological therapies for this heavily-medicated population.

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Daniel L. Kirsch, PhD, DAAPM, FAIS is an internationally renowned authority on electromedicine with over three decades experience in the field who currently serves as the Electromedical Dept. Editor of Practical Pain Management and a Contributing Editor of the *Journal of Neurotherapy*. He was board-certified as a Diplomate of the American Academy of Pain Management in 1990 and was named a Fellow of the American Institute of Stress in 1997. He is a Member of the International Society of Neurofeedback and Research and a Member of Inter-Pain (an association of pain management specialists in Germany and Switzerland). He served as Clinical Director of The Center for Pain and Stress-Related Disorders at Columbia-Presbyterian Medical Center, New York City, and of The Sports Medicine Group, Santa Monica, California. Dr. Kirsch is the author of two books on CES titled, *The Science Behind Cranial Electrotherapy Stimulation, 2nd Ed.* published by Medical Scope Publishing Corporation, Edmonton, Alberta, Canada in 2002; and *Schmerzen lindern ohne Chemie CES, die Revolution in der Schmerztherapie, Internationale Ärztegesellschaft für Energiemedizin*, Austria 2000 (in German). Dr. Kirsch is a research consultant to the US Army, Navy and VA Medical Centers and spent much of his time giving lectures at national military conferences and grand rounds at Veterans Affairs Medical Centers and U.S. Army hospitals such as Brooke Army Medical Center, Walter Reed Army Medical Center and William Beaumont Army Medical Center. Best known for designing the Alpha-Stim line of medical devices, Dr. Kirsch is Chairman of Electromedical Products International, Inc. of Mineral Wells, Texas, USA with additional offices in Europe and Asia, and President of The American Institute of Stress.

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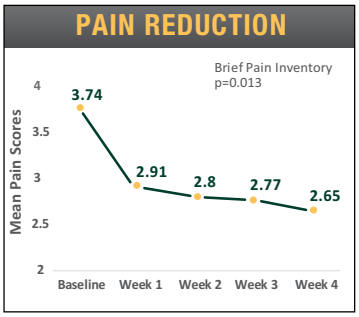

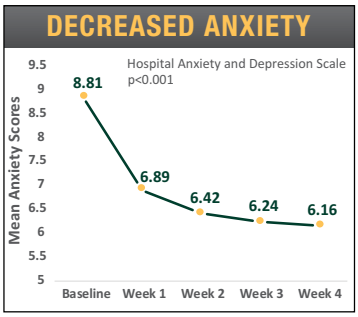

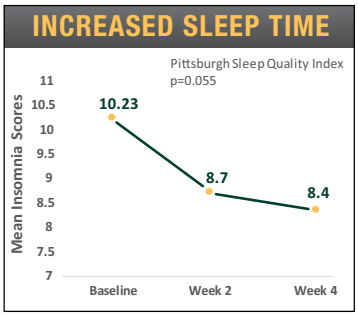

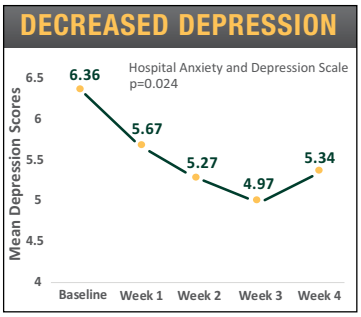

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TRAUMA

Filmed and Directed by Harry Sanna

Running Time: 88 Minutes. Color
Language: English
United States, Afghanistan

Synopsis:
On the battlefields of Afghanistan the pilots, medics and engineers of medevac save thousands of lives in deadly conditions. Their mission is sacred - get to them fast and bring them back alive.

Journalist and Director Harry Sanna was embedded with a Blackhawk medevac unit in Afghanistan. Living and flying with the unit, he captured unprecedented and unfiltered access to the rush and chaos of their mission. After the completion of their deployment, Sanna followed the team members home, recording their lives and thoughts in the years since their return with an access only afforded to a member of the unit. This is their story.

About Harry Sanna:
Harry Sanna is a documentary filmmaker, cinematographer and cross-media journalist. His work has taken him from Australia to India, Sri Lanka, Nepal, Pakistan, Haiti, Afghanistan, Jordan and the United States.

Between 2009 and 2011, Sanna was in Afghanistan working as an embedded journalist visiting bases in the East and South of the country. In early 2011, Harry was embedded with the C Company Dustoff, Mountain Division, 3-10 GSAB medevac unit at FOB Shank in Logar Province, Afghanistan.

Harry's work has been featured in publications including The New York Times, The National, The Sydney Morning Herald, GlobalPost, Motherland and the Huffington Post. His work from Afghanistan has also appeared on CBS and PBS.

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Director's Statement:
This film's story began when I was working as an embedded Australian journalist in Afghanistan in 2011 and met, documented and lived with the members of the helicopter medevac unit featured in the film. I have continued documenting their lives over the last six years, updating their stories as they returned home to locations all across America and periodically in the following years. All of the subjects of the film have been affected by what they (we) saw in Afghanistan.

For me, the purpose of the film was always to communicate the intensity of the medevac role and to breathe some human complexity back into our go-to concept of a veteran and the challenges that veterans face. The very different men and women from the medevac missions – from family types to fierce individuals, unwavering cynics, flippant jokers and staunch faithfuls – are now spread right across America from New York to Louisiana, Texas, Idaho, Washington, Alabama, and California. They're pretty much everywhere. Whether still on military bases or in civilian life, they've all forged lives beyond who they were on that helicopter. And yet, in some ways, they are all still there.

My hope, with Trauma is to simply highlight a very small but real aspect of that war, and what it is like now for those individuals.

– Harry Sanna

Click here to view the trailer

Links:
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Trailer: https://youtu.be/g5nKmWwvTYo

Documentary Review: Trauma

By Emily Chambers

In Harry Sanna's documentary *Trauma*, the viewer is brought face to face with a glimpse of an Army medevac platoon, devoid of the Hollywood glamour typically present in war movies. With the veneer stripped away, we see a more honest portrayal of the men both actively working in their combat roles in Afghanistan and then years later, in the aftermath of their military service upon returning home.

Sanna's interviews reveal starkly different personalities among the men on the crew. Some speak somberly, stoic expressions on their faces, while they talk about their jobs. In contrast, one of the medics delights in laughter and strums his guitar to Britney Spears while in the field. Another shakes his head, saying "I hate it and I like it at the same time. I don't know why I stay, to tell you the truth."

Despite the different demeanors, the common thread among the men is their reverence of the job itself, citing "a sense of purpose, a sense of worth," and calling it "highly addictive." In the field footage, we watch men who are good at their job, and know it; who embrace the rush of adrenaline they get while doing it. They are synchronized and efficient, saving lives and thriving on the thrill of escaping danger, all while forging a strong camaraderie. The Soldiers who seem to be faring the best in the post-war interviews are the same ones who mentioned; while overseas, their ability to detach from their work, to turn off the part of their brain that processes the trauma of the battlefield. One medic claimed, "The good thing about me is, I don't remember my dreams, and I'm really thankful I don't." The same medic who crooned Britney Spears had a similar skill for blocking out the imagery of war, saying, "I have that ability to forget really easily…let things go that I don't need to be carrying around with me."

The stress of serving on a medevac crew is undeniable, but the men are highly functional in their roles – their adrenaline fuels them; the camaraderie and sense of purpose buoys them; they do whatever they need to do to preserve lives, including their own. In short, the stress is vital because it provides the alertness they need to survive.

Combat stress becomes an issue when the men return home to civilian life and, in the newfound quiet, begin to pay attention to the gruesome thoughts that they so adeptly shut out while working overseas. Sleep becomes a struggle; the nightmares begin. The hypervigilance and "coiled spring mentality" that kept the men alive in Afghanistan doesn't go away once the danger is gone. It impedes their ability to let down their guard, to stop scanning for danger, to even sit with their back towards a door in a restaurant.

Also gone is the sense of purpose. Without the uniform, the men whose roles were once so definite and vital are now left with only a fuzzy notion of what exactly they are supposed to be doing with their days. They are no longer saving lives, but merely living their own – and it is incredibly confusing.

None of the men in *Trauma* are unscathed, though some fare better than the others. One finds solace in fishing; one embraces the tedium of a mundane job; one checks into a PTSD program. We hear how a daughter's bloody lip can transport a Soldier back into the battlefield, unable to ground himself in reality. We see wives and children resigned to husbands and fathers who are not the same versions of themselves as they were before they deployed.

Sanna juxtaposes the before and after interviews skillfully, nudging the audience to wonder whether the men who can shut out the reality of war are better able to transition back into the real world – while suggesting that the men who keep going back for more are prioritizing their next adrenaline fix over their families and lives at home. They seem to be riding the high, despite the danger, in avoidance of ever coming down from it.

Trauma is intentionally and expertly uncomfortable to watch, in that it opens the viewer's eyes to the fact that the danger these men face in the battlefield may be more tolerable than the horrors they endure upon returning home. Combat stress is a scar brought home from war, preventing Soldiers from ever fully purging it from their bodies and minds. When the credits roll, the viewer finds relief from the discomfort– but the story will play on for the men in Sanna's film, and countless others who have served.

About the Author

Emily Chambers is a writer and mental health advocate living just outside of Boston, Massachusetts. She has a Masters Degree in Public Policy and served in the Army National Guard.

To Veterans with Invisible Wounds

Since 2012, this video has been used by staff at VA National Center for PTSD, the Army's most deployed division, the VA's nationwide suicide prevention programs, and many other organizations. The message encourages troubled Veterans to seek help and can also be used as a tool for their families and friends. With approximately 20 daily Veteran suicides, I thank *Combat Stress Magazine* for sharing this.

Video Link: https://www.youtube.com/watch?v=nNV-hEsidXY

Roland Van Deusen, LMSW, CAC
Roland Van Deusen served ten years on active duty and reserve status with the US Navy, from 1962-1972. Because his vision twice led to his being turned down for River Patrol boats in Vietnam, he always felt he should have done more. Because the service and GI Bill helped lift him and so many others out of poverty, he felt the need to do something for his fellow Veterans. At age 73, Mr. Van Deusen has had a long and successful career as a counselor, now enjoying a secure retirement. Mike Haynie, Director of the Institute for Veterans and Military Families at his alma mater, Syracuse University, suggested a video would be the best way to reach today's Veterans.

By Xavier A. Figueroa, PhD
Director, Pre-Clinical Development

I had the pleasure of meeting Mr. Martin R. Hoffmann, former Secretary of the Army, in 2012. I was in Washington, D.C. for a conference and had the opportunity to talk and share a drink with him. A mutual friend had arranged this meeting, though at the time, I was only peripherally aware of who this incredible individual really was and what he had accomplished. He was unpretentious, sharp, energetic, jovial and a gentleman. Not once was I aware of how he had shaped one of the largest branches of the military into its modern state. I was, however, aware how he was trying to change Army policy as a civilian.

Mr. Hoffmann's story is one of dedication to his country and to public service. He enlisted in the Army after graduating from Princeton University in 1954. Prior to accepting his commission after Officer Candidate School as a 2nd Lieutenant, he had achieved the rank of Sergeant. He was released from active duty in 1958, with the rank of 1st Lieutenant and stayed on as member of the Army Reserves. He became a practicing lawyer in the interim and was selected as the general counsel for the Atomic Energy Commission in 1971, under the chairmanship of Arthur Schlesinger. President Ford nominated Mr. Hoffmann as Secretary

of the Army, which forced him to resign his commission as a Major in the Army Reserves.

Martin R. Hoffmann was appointed as Secretary of the Army from August 5, 1975 until February 13, 1977. He oversaw the transition of the Army into an all-volunteer force, as the Vietnam War was winding down. Not the easiest time to serve in this capacity, but he carried out his charge with aplomb. It was customary for the Secretary of the Army to have a chauffeur assigned for travel between residence and the Pentagon, which he thought unnecessary for himself. He preferred to drive himself or ride into work on his Harley-Davidson. A guiding principle throughout Mr. Hoffmann's career was continual improvement of the Service Member, from training to equipment, health care to emotional and financial support for families, whether during active service or after discharge, Mr. Hoffmann sought to honor their commitment to our country by securing the best for them.

Mr. Hoffman continued to practice law after his tenure as the Army's civilian head until he became an advisor to Defense Secretary, Donald Rumsfeld in 2001. He advised on multiple matters, including the Afghanistan Campaign. One matter that captured his attention until his death was the recognition of traumatic brain injuries (TBIs) in Service Members. The rate of injury of this type was becoming rampant and was not being addressed or recognized within military service. He actively lobbied for recognition of this injury and to speed up development of diagnostic technologies and treatments. He, along with many Veteran and civilian supporters, pushed for and obtained funding to begin trials on novel therapies to treat brain injuries. One of the therapies he pushed for recognition within the Army was hyperbaric oxygen therapy (HBOT).

Mr. Hoffmann was not working as a lobbyist when he began to push for recognition of TBIs as a recognized injury or to compel Army and DoD medicine to look at HBOT as an effective therapy. This was work he performed pro bono. He believed that the Army has a duty and responsibility to treat their injured and restore them to health, prior to releasing them or the Service Member separating or retiring from the military service. He saw that HBOT was an effective treatment for TBI and wanted to make the Army (and the Department of Defense, by extension) aware of this technology. This reminder of duty was coming from a former Secretary of the Army, a former Service Member (active and reserve) and not some starry-eyed idealist that was demanding change. Let it sink in... a former Secretary of the Army was REMINDING the civilian and uniformed leadership in the ARMY that they had a duty and a legal obligation to treat their brain injured. Not only that, the Department of the Army already had the therapy in-house

and it was approved in the Textbook of Military Medicine[1] as a treatment for neurological abnormalities of blast casualties.

Sitting at a bar in Georgetown, I began to recognize the scope and dimension of the problem as Mr. Hoffmann was outlining it to me. This was an issue that was deeply troubling to him and something that he knew the Army had to care about or be forced to identify. He told me that this was going to be larger than the Agent Orange scandal if the DoD did not do the right thing by beginning to address the epidemic of TBIs and to initiate treatment in-house. He believed that Army leadership would do the right thing after they reviewed the science and completed their clinical trials. We hope that his faith in the military brass is rewarded.

Seven years later (and 4 years after his death) the DoD and the VA still routinely dismiss HBOT as a tool to effectively treat brain injured Service Members. Mr. Hoffman was shocked when initial clinical trial results with HBOT were initially released and the authors categorically denied any effectiveness of HBOT as a therapy for TBI/PCS (in 2014). As we will outline below, the data clearly demonstrate a reparative effect.

The 'signature wound' from the Wars in Iraq and Afghanistan continue to go untreated in the US Armed Forces. Since 2010 there have been at least 7 studies, numerous conferences, round-table discussions and advocacy hearings that have laid out a rational, safe and efficacious approach to this heterogeneous neurological injury.

Hyperbaric medicine has gone through a contentious history,[2] with editorials characterizing hyperbaric medicine as "a therapy in search of diseases",[3] editorial opinions discounting biological effects of pressurized air[4,5] and studies that assume little-or-no biological activity of a pressurized air 'control'.[6-10]

Hyperbaric oxygen therapy (HBOT) has been largely ignored, dismissed, attacked and ridiculed. Yet, the published literature and the data in various clinics and clinical studies, show a clear and consistent effect in reversing the clinical symptoms and physical traumas of the central nervous system. The results of all the major (and minor) clinical trials have been unequivocal in the positive outcomes in terms of symptom reduction and structural restoration of the central nervous system, as will be outlined.

What has been clouding the acceptance of HBOT as a therapy for an acquired brain injury has been the use of a control comparison group: a pressurized air (21% Oxygen/ 79% Nitrogen, 1.2-1.4 ATA) (atmosphere absolute, ATA) group that is mislabeled as a sham. The use of a sham or a placebo is a normal and accepted part of clinical trials, but a sham is defined as a treatment or procedure

that is performed as a control and that is similar to but omits a key therapeutic element of the treatment or procedure under investigation. Since the active component of hyperbaric oxygen appears to be a mixture of pressure plus a threshold level of oxygen,[11] all studies that use a pressurized air group are best described as a variable dose study.[12,13] A pressure of less than 1.4 ATA and an oxygen fraction of 21 percent is assumed to be an inactive treatment. It is not.[11-14] Any study that uses a pressurized air group as a control must be scrutinized with great care.

Into the Breach

One of the first studies sponsored by the DoD and VA that looked at the effects of HBOT (and compared the outcomes to a pressurized air group) is the study by Wolf et al.[15] Both treatment arms produced changes (improvements) in symptoms measured in the PCL-M (Post-Traumatic Disorder Check List-Military) for these Service Members.

The sham increased oxygen concentration anywhere from 28 to 43 percent above normal (pressure in the sham were in the range of 1.3 ATA to 1.2 ATA). Any increase in dissolved oxygen in the body can produce (under pressure) a measurable biological response. Dosages of oxygen are as real as dosages of pills. Too much of a drug can harm you, too little will do nothing… just right will treat what is ailing you. Oxygen under pressure is no different than a pill.

The conclusions by Wolf et al. assume that they are comparing a treatment group to a non-treatment group, but:

"The current study in participants with postconcussive syndrome from chronic mTBI demonstrates no efficacy in symptom relief with HBO2 at an exposure pressure of 2.4 ATA for 90 min given once daily for 30 treatments; however, both groups improved more than would be expected greater than 6 months after mTBI… It is recommended that larger, multicenter, randomized, controlled (both sham-control and wait-list), double-blinded clinical trials be conducted at lower total oxygen doses as recommended by AHRQ."

A follow-on study sponsored by the US Army, called HOPPS (Hyperbaric Oxygen Therapy for Persistent Post-Concussion Syndrome After Mild Traumatic Brain Injury),[16] reaches a similar conclusion as Wolf et al.[15]

"Our results support the conclusion that supplemental administration of breathing 100% oxygen at 1.5 ATA (HBO procedure) or air at 1.2 ATA (sham procedure) for 60 minutes is well tolerated and improves symptoms and quality of life compared with local care management of PCS (post-concussion syndrome) without chamber intervention."

Both the HBOT and pressurized treatment were superior to a standard-of-care arm (no HBOT or pressurized

air applied). They acknowledge that fact that the 'sham procedure' is not a true sham, explicitly:

"It has been argued that the sham designs used in this trial and other Department of Defense studies are not inert and represent dose-ranging trials of pressurized air.[37] We recognize that a sham is not inert, and we cannot completely discount the physiological effects of minimal increases in nitrogen or oxygen from pressurized room air."

So, instead of acknowledging the real improvements, they compare the HBOT outcomes to the pressurized air group, which results in no significant differences in outcome:

"However, we observed no difference between HBO and sham. We postulate that improvement in the chamber intervention groups was due to placebo effects or the potential benefit of daily interactions with the study staff. Taken with results from other concurrent investigations, our study does not support phase 3 trials of HBO for the treatment of PCS at this time."

The statement above is the equivalent of saying the following:

We treated three patient populations with what we believe is a full therapy dose, a quarter therapy dose (which we believe is inert) and no therapy. The full and quarter therapy treatment groups both improved to a statistically measurable level when compared to the no therapy group. When we compared the full dosage group to the quarter dosage group, we saw no difference. We therefore conclude that the treatment has no effect and any improvement seen is not due to the applied therapy.

The results of the Miller et al. study[16] show significant and clinically relevant improvements, yet these studies are used to prop up the notion that HBOT is ineffective for TBI/PPCS (traumatic brain injury/persistent post-concussion syndrome) treatment.

Correcting the Record

Both the Wolf and Miller studies are not the only controlled studies that demonstrate an improvement in symptoms and neurocognitive function. Civilian sponsored studies have demonstrated significant improvements in symptoms, neurocognitive measures, regional cerebral blood flow normalization and repair of fiber tracts.

One of the first civilian studies to look at the effects of HBOT on blast-induced TBI in wounded Veterans was carried out by Harch et al.[17] This study measured the effects on symptoms, neurocognitive performance and regional cerebral blood flow. In all cases, the injured Service Members improved, including a reduction and near-elimination of their PTSD symptoms.

A follow on study by Harch et al, in 2017,[18] demonstrated similar results, with the added analysis demonstrating an improvement of regional cerebral blood flow to levels seen in non-TBI control cases in 75 percent of treated patients.

In support of the studies in the US, the Israeli group at Assaf Haroffeh Medical Center, led by Dr. Efrati, have shown nearly the same outcomes in their treatment population. In two separate studies[19,20] using HBOT as the main intervention, the team demonstrated significant improvement in memory, executive functions, information processing speed and global cognitive scores, as well as improvement in both white and gray microstructures indicating regeneration of nerve fibers.

In support of the findings in all studies using HBOT for TBI/PPCS treatment are the recent results of Dr. Wolf. In his study of 28 subjects with persistent cognitive impairment caused by mild to moderate TBI suffered during military deployment to Iraq or Afghanistan, hyperbaric oxygen therapy correlated with stem cell mobilization as well as increased cognitive performance.[21]

Keeping A Promise

Unfortunately, the stakes are very high for the military Service Members that live with mTBI/PCS or have a misdiagnosis of PTSD.[22] At a minimum, 20 plus Service Members commit suicide[23] per day, mental health issues presumably as the primary drivers of suicide (PTSD and TBI). The Institute of Medicine of the National Academy of Science concluded that the DoD and VA have spent $9.2 billion attempting to deal with PTSD,[24] but have been unable to stop the suicide epidemic (this study briefly mentions HBOT as a potential treatment option (p. 263) for TBI, but makes no conclusions or recommendations regarding its use for PTSD).

Currently, there are no phase III clinical trials that have tested the efficacy of TBI/PCS and PTSD treatments that are routinely prescribed by both the VA and DoD. Yet, the routine prescription of drugs and therapies occurs daily. So, if a doctor wants to try HBOT for his/her patients within the Armed Services, they must 'move heaven and earth' to get the treatment for their patients. This may include getting creative in how their patients get treatment, including begging civilian groups to sponsor treatment... but that is another story entirely.

The cardinal rule in medicine is "First, Do No Harm".

The second rule should be "Work to Restore Health".

If a treatment has few side effects (HBOT is safe and well tolerated[8,15,16,20,25-30]) and has good

preliminary evidence for its use, the physician has the right and obligation to prescribe it. Other unproven treatments (with far lesser evidence of improvement) are applied regularly and covered.

Dr. E. George Wolf, lead author of the first published work of the DoD/VA sponsored studies[15] noted the following on the results of HBOT trials at the time:

"Placebo effect in our previous reports has been considered as why there was no significant statistical difference in this study… However, both groups showed improvement in scores and thus a benefit. Given the studies demonstrating hydrostatic pressure effects and results of Boussi-Gross' crossover study, our design could be considered a treatment comparison vs. a true sham with a therapeutic effect from both increased oxygen partial pressure and hydrostatic pressure. A Type II statistical error cannot be ruled out... There is a potential gain and no potential loss. The VA/Clinical Practice Guidelines define a 'B evidence rating' as 'a recommendation that clinicians provide (the service) to eligible patients.' At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm."[31]

I think that Secretary Hoffmann would agree with that sentiment: **Treat. Now.**

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Dr. Figueroa is the principal scientist for Nativis, overseeing pre-clinical research and the application of Nativis technology in multiple disease areas. He has more than 20 years of experience in basic and neurological clinical research, including Alzheimer's research, neuron biology, cancer research, bioengineering and biophysics.

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Dr. Figueroa received his doctoral degree in Neurobiology and Behavior from the University of Washington in 2003. His doctoral training was followed by two post-doctoral fellowships within the University of Washington's Department of Bioengineering. He is currently an Affiliate Assistant Professor at the School of Medicine at the University of Washington.

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COMING HOME

By Alexis Artwohl, PhD

Post-deployment Issues for Combat Veterans

First, the authors of this article wish to thank you for your military service and hope that these words will be of assistance in navigating the way back home.

The purpose of this article is to outline some of the issues involved in returning home after a combat deployment. You may experience none, or all, of these issues. Every human is a complex combination of genetic predisposition and the sum total of their life experiences. Although you will share commonalities with many Veterans, each of you will have your own unique reactions and solutions.

We hope that friends, family, and colleagues will welcome you home with all the thanks and gratitude that you deserve. We encourage you to also take charge of your own homecoming and hope that you find some of these reminders and suggestions useful.

Leaving a combat zone and trying to integrate into the more casual and mundane world of peacetime America can be a wonderful, confusing and aggravating experience. Preparing warriors for war, then bringing them home again has always been a challenge, one that will not be fully solved in our lifetime. Sometimes returning Veterans can become frustrated by civilians and civilian life: the very peace they were fighting to protect. What a conundrum. For those who have been injured physically and/or psychologically, the adjustment can be particularly challenging.

Primal, Tribal Connections with your Comrades-in-Arms

During a combat deployment, you will be thrown into a life threatening and life changing, experience with

people whom you probably never met before military life began. This intense emotional crucible can quickly forge personal bonds that go deep and last a lifetime. Even with Veterans that you did not serve with, the mere mention of a mutual combat theater, or even simply having been in combat anywhere, can bring instant understanding. This is true with many other human experiences, but those with the intensity of combat are particularly compelling. When your deployment is over, the sudden loss of these tribal connections with your comrades in arms can be jarring. If this is an issue for you, there are a variety of ways of honoring those tribal connections that can ease the loss.

For many civilians, Memorial Day and Veterans Day are simply another day off work. For Veterans, they often hold a deeper meaning and can become part of a personal repertoire of remembrance rituals that honor the friends you left behind. Some of your comrades in arms may have died, some may have disappeared into civilian life, but the bonds you shared can still be honored and savored for what they added to your life.

Some Veterans may further these attachments by having personal reunions with their comrades in arms, and/or socializing with other combat Veterans. These can be attending formal events or informal gatherings where you can reminisce, catch up on one other's lives, and raise a glass to those who never came home. This can also be part of a path toward letting go of any survivor guilt you might be experiencing… that fate chose you instead of others to make it back.

Some chose to honor their tribal bonds by helping other Veterans. There are many volunteer organizations that help Veterans, and who better than another Veteran who can uniquely understand what they have been through, and/or will be facing.

Reintegrating with your Friends and Family

No one emerges from a combat zone the same person as they entered military service. In the past, even the recent past, warriors often went for months, even years, without any contact with their loved ones. In the internet age the disconnection is not as severe, but you are still the recipient of an intense experience that changes you, one not directly shared by those you left at home.

Your loved ones back home have not been locked in a static time warp while you have been gone and immersed in a life foreign to them and the country you left behind. They are having their own experiences that will change them as well. Children especially can be quite different than when you last saw them. While you have been gone, everyone has had to adapt to your absence. All the things that you used to take care of will now have to be taken of in some other manner, usually by the spouse left with all the responsibilities. Even small things like the rearrangement of household items can become annoyances.

Once the joy of the initial reunion is over, everyone will be faced with catching up to the logistical and

personal changes that have happened during separation. These can be small or large, but they are ignored at your own peril. Everyone must take personal responsibility for communicating the changes you have felt and/or observed in others. Negotiations over new household routines must be hammered out. It is best to acknowledge up front that an adjustment period will be needed, one that may take considerable time and one that may occasionally be quite frustrating.

One of the primary questions to sort out is how much of your deployment experience you will share with others. Everyone will have different preferences, both for the telling of their experiences, and the willingness of others to hear them. There is no correct answer. You may feel comfortable sharing all of it with other combat Vets, but leave out significant pieces when talking with friends, family, and co-workers. If you feel the need to talk about your experiences but lack an audience you feel comfortable sharing them with, this too is an issue requiring resolution for you.

Feeling Aggravated by Clueless Civilians

Warriors, including combat Vets and cops, face an ironic problem: They put themselves on the front line to shield and protect their family, their community, their country. They endure danger and hardship so other don't have to, but then they may find themselves annoyed by these same people they are protecting because "they don't get it – they have no idea what we go through to protect them." This is the whole point. The fact that the clueless civilians do not understand can certainly be an enormous negative, or you can view it as a badge of honor that shows just how good you are at protecting them. Yes, it would be nice if more people would at least say "thanks" even if they fail to fully understand what you have faced, but try to remember that most people are, in fact, appreciative, even if they never get around to verbalizing it. As for those who disrespect and even condemn those protect and serve here and abroad – they are not worth wasting any attention on, so do your best to ignore them. They deserve nothing more than that.

Once you have had life pared down to a struggle for survival, be it for a few minutes or a year or more, you quickly learn what really matters. This is not about having the latest big screen TV or the fastest and sharpest new vehicle, as wonderful as that may be. A gift you have earned is a true appreciation all the luxuries of modern life – a long hot shower, a bug free bed, or a quiet, air-conditioned or heated room, etc. It can be easy to get annoyed with 'spoiled civilians' who get upset over minor inconveniences and cannot comprehend or appreciate all the amazing things they have access to. You can feel contempt, or you can choose to take the complaining with a grain of salt and remind yourself that this could have been you too, had you not chosen to serve and protect others.

Finding Excitement and Challenge in Civilian Life

A Warrior's life is often characterized as being long stretches of boredom and discomfort, punctuated by moments of terror. Those moments of terror add an intensity to life that often cannot be matched in civilian life. For some Warriors, the challenge of testing yourself and prevailing during those moments of terror can become an addictive adrenaline rush that is missed. The need for excitement is one of many personality traits that vary from one person to the next. Some people have a strong need for change, risk, challenge, and variety in their life. This includes civilians who have never been in combat, but combat can certainly make some people or aware how gratifying that feels to them. If you're one of those people, you will be well served to find an outlet in civilian life. Some may choose first responder work that puts them on the front line in their community. Others may find personal outlets in sports, or tackling difficult personal challenges. Not everyone will understand the need to engage life at this intense level but you will be well-served finding a positive outlet for it.

Finding Meaning and Purpose

It has long been known that people who have meaning and purpose in their life fare better than those who do not. The survival of you and your comrades-in-arms during deployment provides meaning and purpose at its most basic and profound level. Back in civilian life, meaning and purpose may seem more nebulous and difficult to find. After deployment, meaning and purpose can be found in a variety of things like your family, spiritual values, service to your community or your career. If you find yourself at loose ends, wondering what is the meaning and purpose of your life, you need to fix that. There are innumerable paths, many of which can involve being of service to others in new ways, but it is critically important to make finding this a priority.

Reintegrating into your Civilian Job

The world has moved on while you were deployed, and this can include the job from which you took a leave of absence to serve. Whether the changes are large or small, tackling them proactively can help you integrate more quickly. If your employer and/or co-workers are not providing sufficient briefings to help you get caught up on changes that have happened in your absence, do not hesitate to ask questions and request whatever training you think you need to get back up to speed.

Post-Traumatic Stress Disorder (PTSD)

The good news is that most combat Veterans do not develop PTSD. The 2017 research based VA/DoD *Clinical Practice Guidelines for the Management of Posttraumatic Stress Disorder and Acute Stress Disorder* includes a review of the literature dating back to the Vietnam War era.

The incidence rates over multiple studies vary widely, from single digits to as high as 32 percent. Even using the highest numbers, most Veterans will not go on to develop PTSD. Although combat exposure increases the risk of developing PTSD, it is not known why some individuals are more susceptible than others. PTSD is never a personal weakness or failing. As with everything else, it is undoubtedly a complex mix of genetics and environmental factors.

For those who do develop PTSD, it is important to seek treatment. You do not have control over the genes you inherited, but you can choose to do something about the multiple challenges those genes might present to you during your lifetime. The VA/DoD Guidelines can provide you with a summary of the symptoms of PTSD, and the types of treatment that are available. Treatment can be provided at a VAMC or a Veterans Readjustment Counseling Center (Vet Centers are staffed by mental health professionals who are also Veterans), but there are many non-VA mental health professionals who are trained to conduct trauma-focused therapy for a wide variety of traumatic experiences.

Finding New Reality

Life is a series of changes and losses. Some are small and incremental, others can be dramatic and even traumatic. Dramatic/traumatic changes can take us far outside our comfort zone. Here we are, cruising along, minding our own business believing we have a solid handle on how our world works. Then fate comes along and delivers a blow that sends us reeling. Reality as we know it has been shattered. We are now adrift in the Twilight Zone, trying to get back to earth. We may yearn for life as we once knew it but that can never be. Our challenge will be to construct a new reality and a new self that takes into account the change/loss we have experienced. It is a personal journey we will make multiple times in our life. We may have to walk parts of it alone, other times we can share it with others who will help us through it. As a combat Veteran, you have proudly walked a path few others have trod and coped with a strange reality you may never have been able to fully imagine. Coming home is yet another new reality to tackle and you will surely figure this one out too. Welcome back.

About the Author

Dr. Artwohl is an internationally recognized behavioral science consultant to law enforcement as a trainer, researcher, and author. She has done extensive training in the USA as well as in Canada, Mexico, the United Kingdom, and Jordan. She is on the National Advisory Boards of the Force Science Institute and the International Law Enforcement Educators and Trainers Association. Dr. Artwohl is co-author of the book DEADLY FORCE ENCOUNTERS and other publications. During her 16 years as a private practice clinical and police psychologist, she provided consultation to multiple agencies throughout the Pacific Northwest as well as traumatic incident debriefings and psychotherapy to numerous public safety personnel and their family members.

AN EPIC ISSUE

Our March 2018 issue is just that – an issue of epic proportions and a gathering of this nation's and the entire world's leading experts in this revolutionary form of treatment that has so very sadly, been overlooked and dismissed by those charged with dispensing care to our Service Members and Veterans. For those of us who have ever worn the uniform and served in time of war, only to carry home the woundedness of all things horrific and unforgettable, we remain invisible to the Department of Defense, all branches of the Armed Forces, and the Veterans Administration. The unequivocal denial of one of the most effective and yet harmless forms of treatment available to those who continue to pay the cost for having raised their right hands to die for their country and for the enormous cost of freedom, perpetuates the assault on the souls of hundreds of thousands of suffering the lifelong effects of the trauma of war. HBOT is unquestionably one of the gold standards of treatment for traumatic brain/blast injuries, primary causes of death and disability, as sustained on the battlefield (as well as on the gridiron and for stroke patients) and the PTSD so frequently associated with these devastating injuries. And then there is the epidemic of military and Veteran suicides that are all too commonly, how the final chapter is written and the story ends.

We have assembled the best and the brightest to ignite an acute and enduring awareness of the massive costs of continuing to promote the early demise of our Veteran population with boluses of medications designed only to benefit Big Pharma and to ignore other FDA approved treatments that are not only tremendously effective, as hoards of research have demonstrated, but lifesaving across several dimensions. The sheer size, magnitude and critical importance of the research and scientific writings offered up to our banquet table of phenomenal contributors and most notable experts requires that we create a two-volume series for the HBOT subject. This will certainly provide our readers something special for which they can look forward to for our May HBOT issue.

Very sadly, but not so surprisingly, most Veterans and most healthcare providers have never even heard of HBOT. Per Dr. Rob Beckman, even if they are informed of this powerful state-of-the-art intervention, there is more often than not, no one to direct them to where this form of treatment is available… and even if Service Members and Veterans do happen to find themselves at the door of an HBOT program or clinic, this form of treatment is considered "off label" by the Department of the Army, the Department of Defense and the Veterans Administration. This is truly disgraceful, but this raw truth has given us the impetus to not only substantiate the extraordinary effectiveness of HBOT with scientific rigor, but to expose the truth of the matter regarding those very agencies that sent us to war and force us back onto the battlefield once we come home.

The concluding article in this issue, written by the internationally renowned police psychologist, Dr. Alexis Artwohl, who has artfully chronicled the terrible toll of war's aftermath. Her writing is a powerful testimonial to the camaraderie that sustains the soul in the face of the downward spiral that consumes so many returning Veterans. Like HBOT, this is among the most powerful of remedies and one also largely forgotten and overlooked.

We at *The American Institute of Stress* and the editorial staff of *Combat Stress* continue to be extremely proud to introduce our Guest Editor, Dr. Rob Beckman, who is a veteran of Vietnam and of 10-years of war in Washington to stop Service Member suicide and make HBOT and other safe and effective alternative therapies available and insured. That he willingly accepted this role and dedicated the last several months to this enormous undertaking is a gift to every one of our readers. Thank you, Dr. Rob, for being the creative force behind the March 2018 issue and providing a long overdue wakeup call to those charged with the immense responsibility for caring for our Service Members and our Veterans.

Your humble editor,
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