HYPERBARIC OXYGEN THERAPY

THE POWER OF AN INTEGRATIVE APPROACH

Dr. Scott D. Sherr, MD
Director of Integrative Hyperbaric Medicine & Health Optimization
Hyperbaric Medical Solutions
www.integrativehbot.com

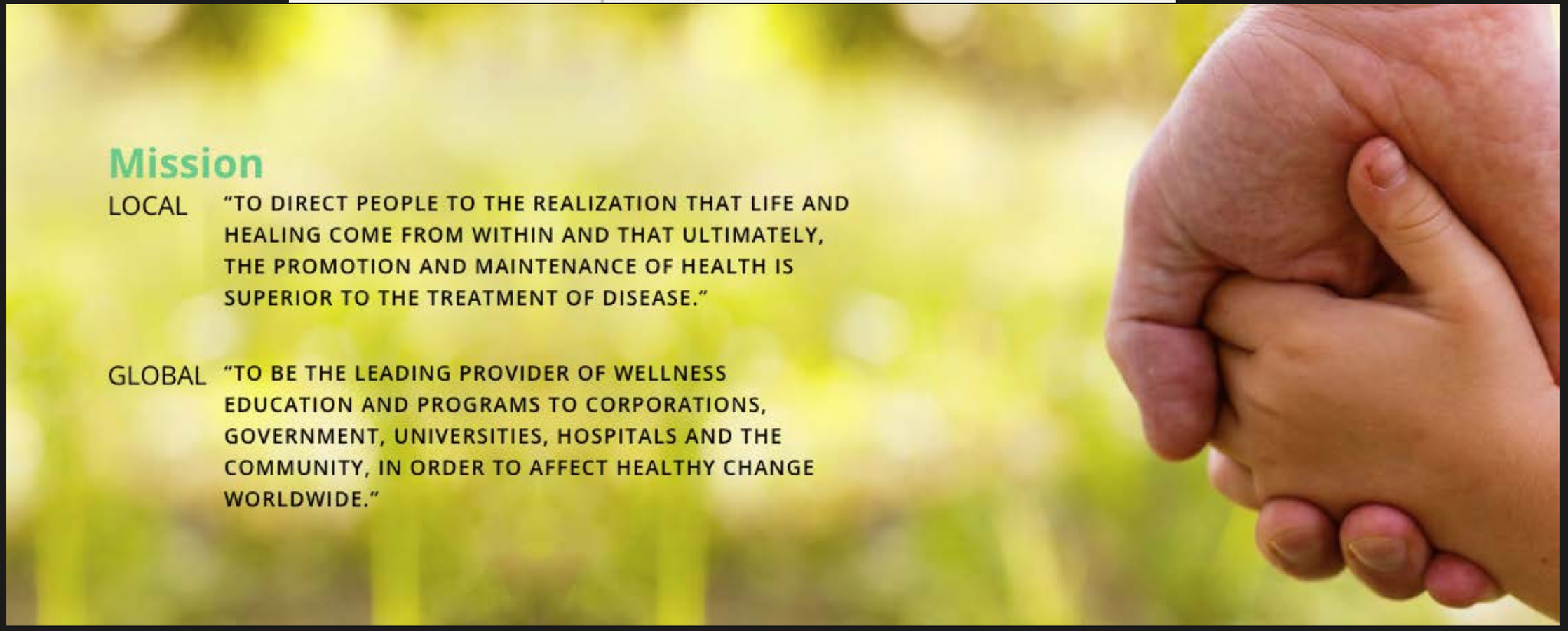
Alan P. Sherr, D.C.

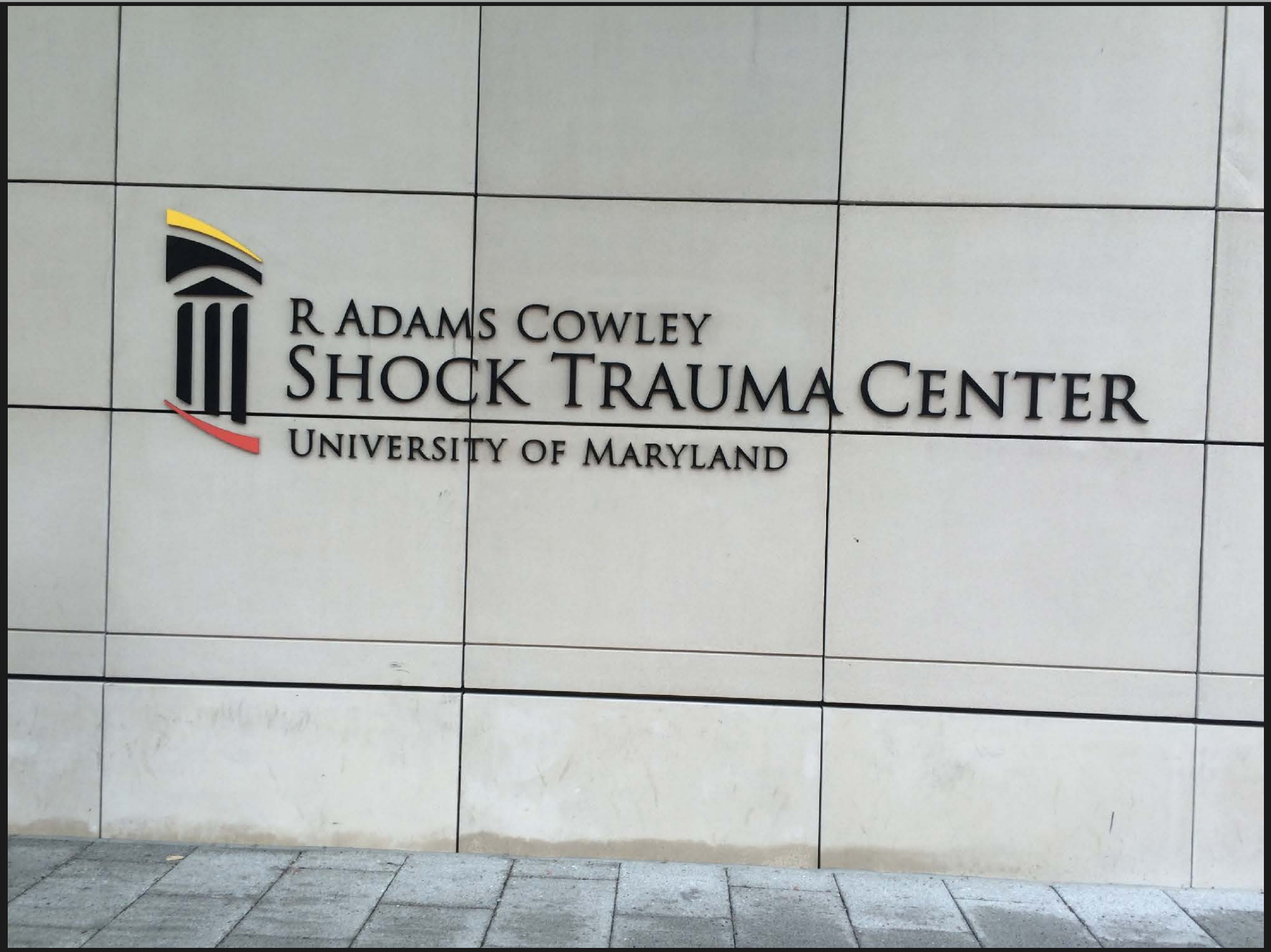
Chiropractor / Director

Biography

An established chiropractor since 1980, Dr. Alan P. Sherr founded the Northport Wellness Center in 1995 as a holistic health care practice that takes a vitalistic approach to health care and encourages individuals to take responsibility for their own physical, mental, emotional and spiritual health. The mission of the Northport Wellness Center is to "direct people to the realization that life and healing come from within and that, ultimately, the promotion and maintenance of health is superior to the treatment of disease."

Dr. Sherr truly enjoys assisting others along their path to optimal health. A champion of the philosophy of chiropractic, which emphasizes the uniqueness of each individual and views health as a dynamic process involving the body, mind and heart rather than merely an absence of disease symptoms, Dr. Sherr embraces each of his patient's journey toward optimal health and well being as a personal one.




R Adams Cowley
Shock Trauma Center
University of Maryland

HBOT HEALS WOUNDS

NO MATTER WHERE THEY ARE

REVERSING HYPOXIA

DECREASING INFLAMMATION

FIGHTING INFECTION

EXPONENTIAL STEM CELL RELEASE

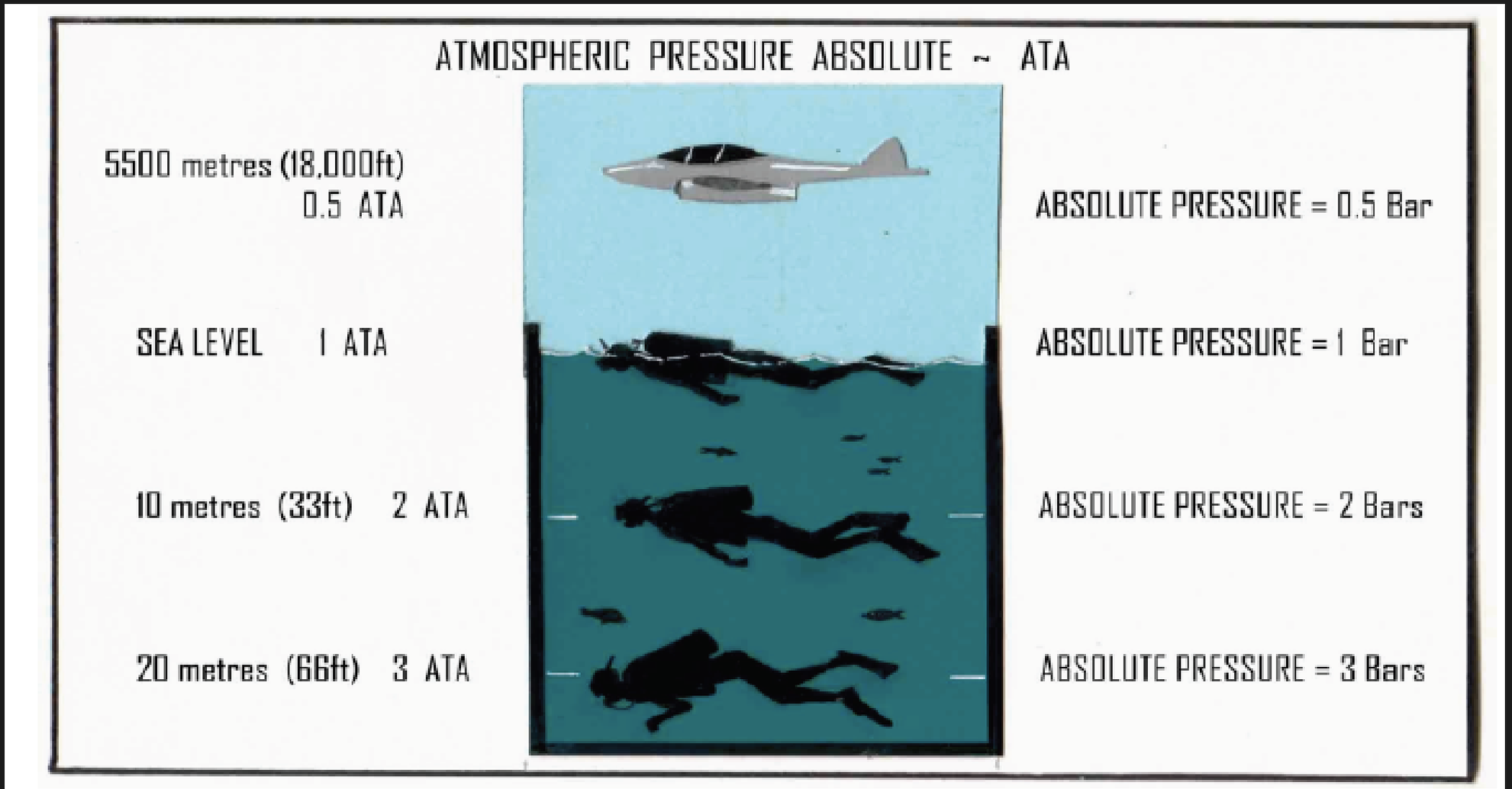
REGENERATING AND REVITALIZING TISSUE

OBJECTIVES

- HBOT Definitions and History
- HBOT Infusion mechanism
- HBOT Power
- HBOT Indications: Integrated & Optimized
- HBOT Precautions and Contraindications

HBOT DEFINITION

- The intermittent administration of 100% oxygen at increased atmospheric pressure.



NO SLEEP ’TIL!

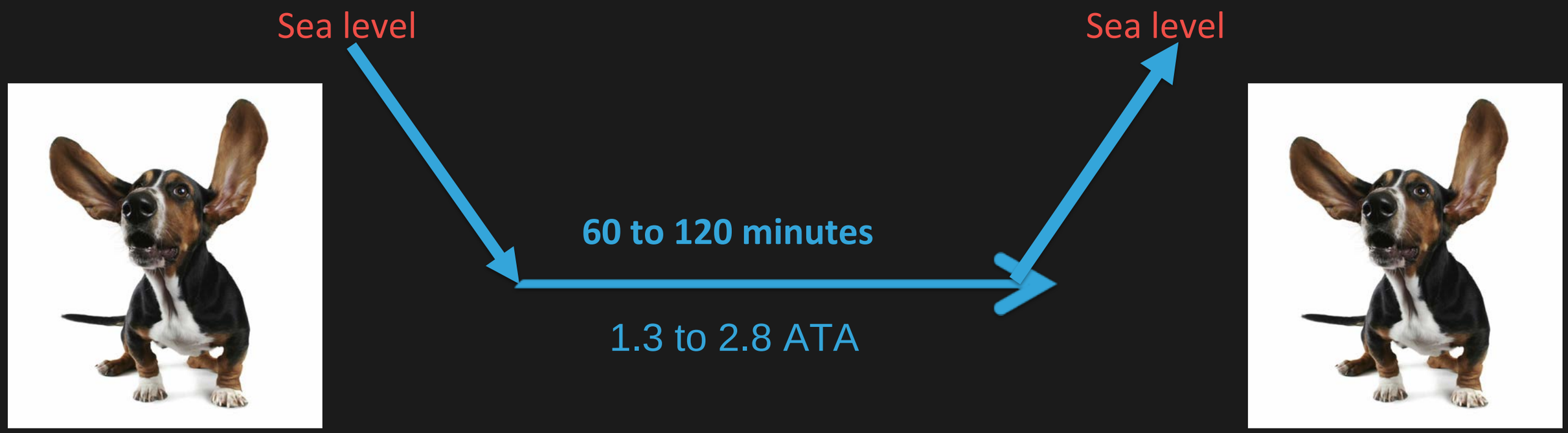
MULTIPLACE CHAMBER

MONOPLACE CHAMBER

SOFT CHAMBERS

HBOT EXPERIENCE

- Chambers: Monoplace vs. Multiplace
- Oxygen: Ambient vs. Facemask / Hood
- Air Breaks



OBJECTIVES

- HBOT Definitions and History
- HBOT Infusion mechanism
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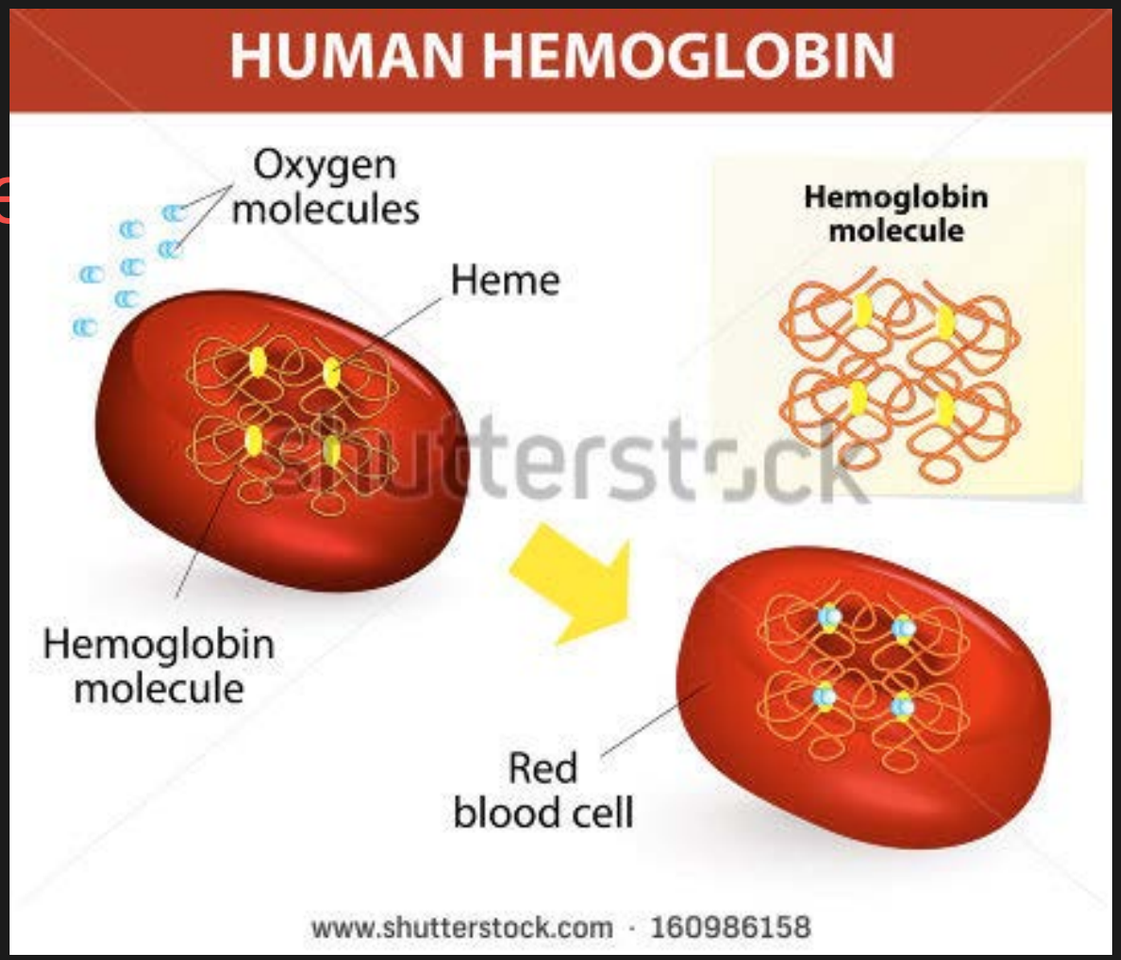
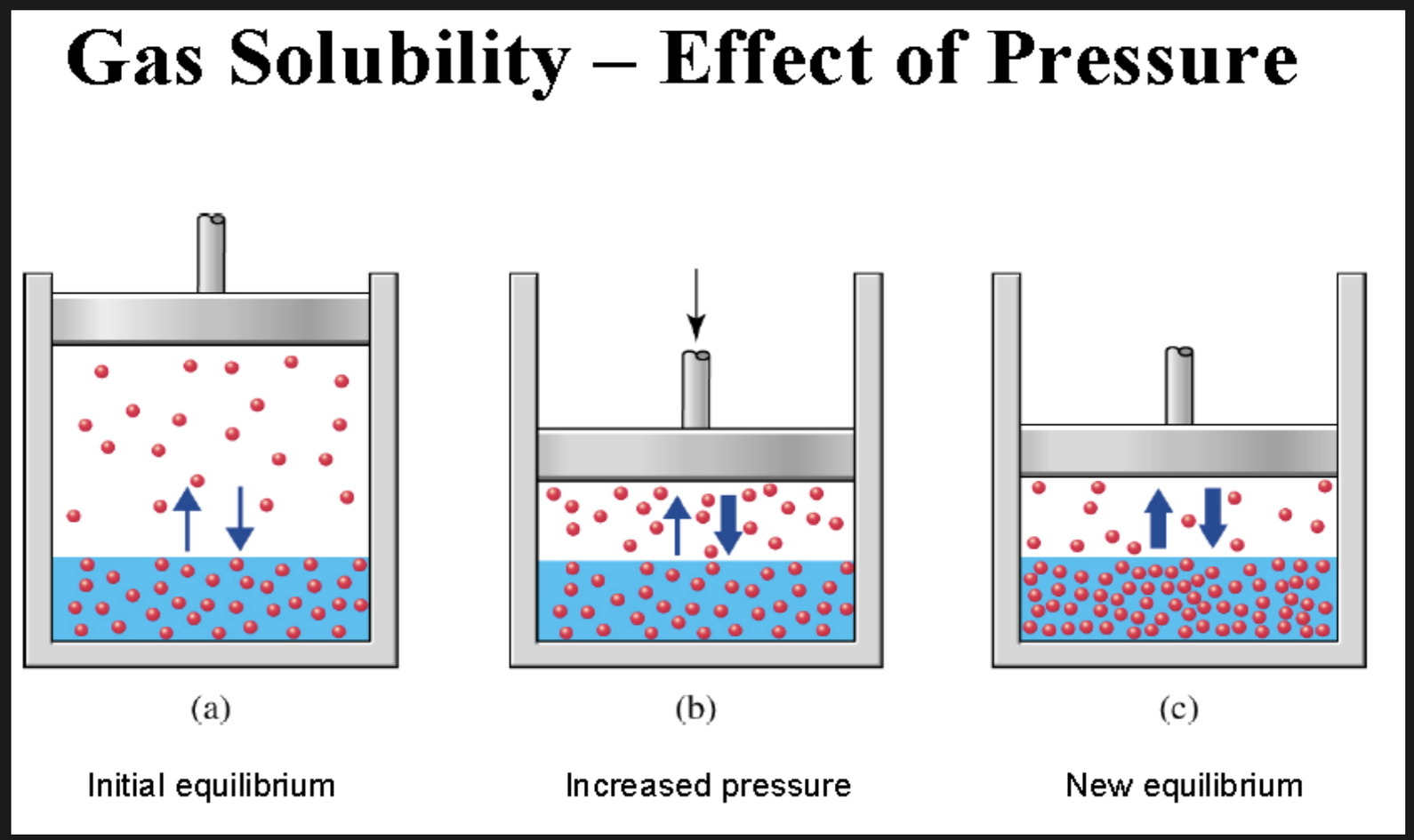
HBOT: IT'S NOT ABOUT THE RBC

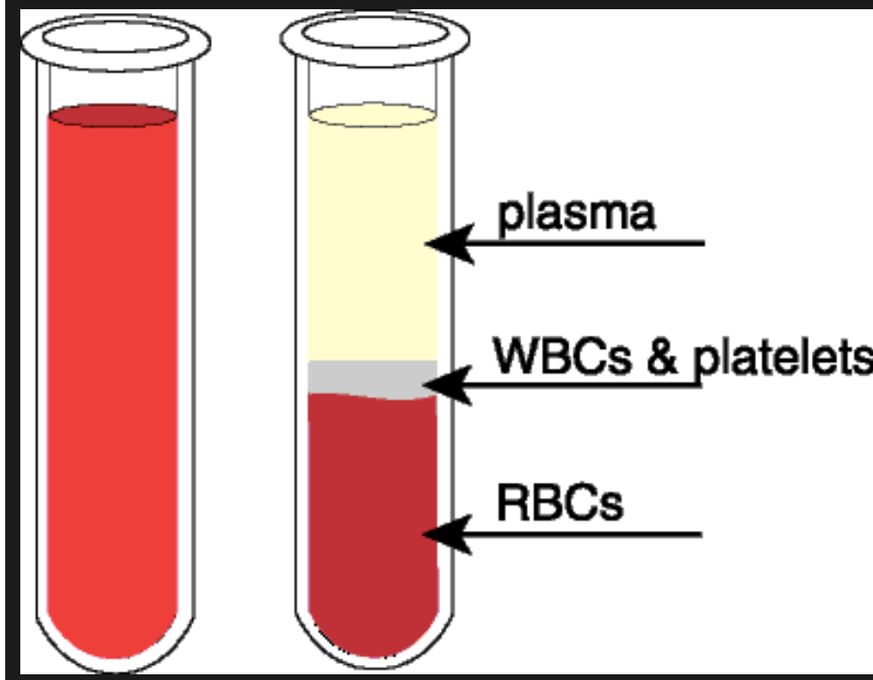
- Hemoglobin is already 97% saturated with oxygen at sea leve
- Sea Level Air: 21% Oxygen



HBOT: PRESSURE IS KEY

- Effect of HBOT is due to its ability to super-saturate the blood **plasma** with oxygen via Henry's Law.

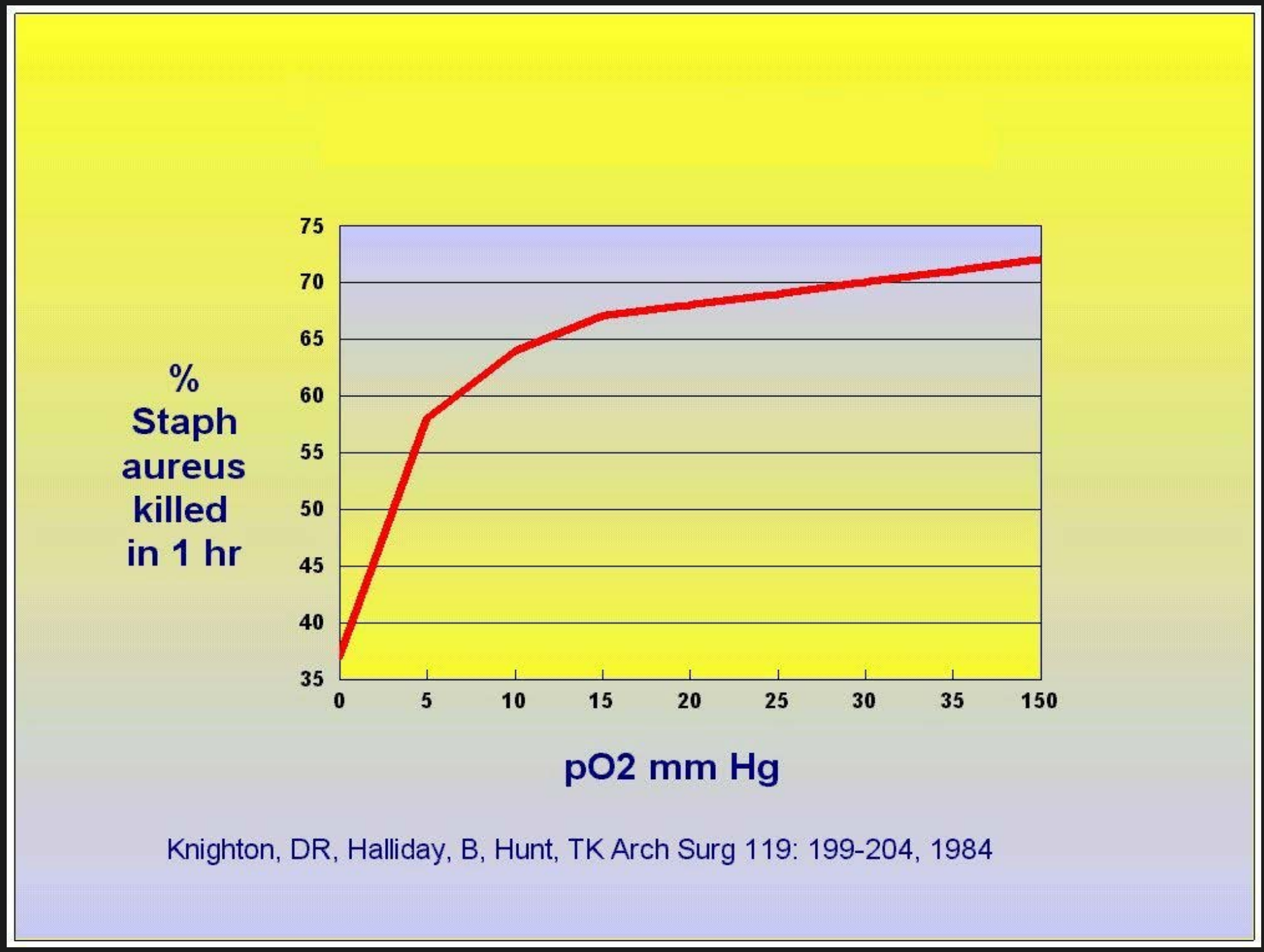




HBOT 02 SATURATION

- When breathing sea level air (21% 02 @ 1ATA)
  - Pa02 = 100mmHg
  - Normal tissue oxygen tension = 55mmHg
- When breathing 100% Oxygen at 3 ATA (66 fsw)
  - Pa02 = 2000mmHg
  - Tissue oxygen tension = 500mmHg
  - Life without blood @ 3ATA

TISSUE O2 TENSION



Knighton, DR, Halliday, B, Hunt, TK Arch Surg 119: 199-204, 1984

OBJECTIVES

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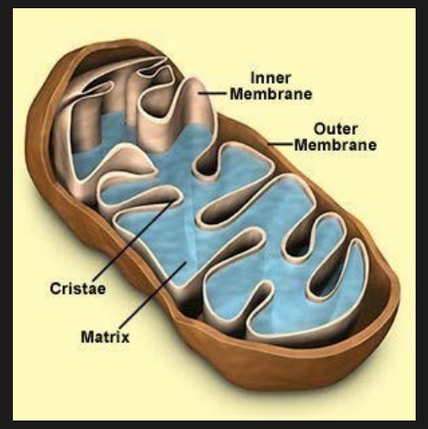
HYPERBARIC TREATMENT—IMMEDIATE EFFECTS

- Vasoconstriction
- Mitigates tissue damage and reperfusion injury
- Decreases inflammation & pain
- Exponential stem cell release & activation (CNS and bone marrow)
- Increases neutrophil & macrophage activation/efficiency
- Kills anaerobic and facultative anaerobic bacteria & fungi
- Potentiates antibiotics

HBOT TREATMENT PROTOCOL



- Optimize all stages of wound healing:
  - Fibroblast, Chondrocyte, Osteoblast, Osteoclast proliferation
- Stem cell release, activation, and migration to injury
- Decrease inflammation (IL 1, 6,8 & TNF Alpha)
- Apoptosis inhibition
- Angiogenesis (HIF-1, VEGF)
- Antioxidant response (superoxide dismutase, NRF2, Glutathione)

HBOT PROTOCOLS

- Acute conditions: Less treatment
- Chronic conditions: More treatment
- Neurologic Conditions: 1.3 to 2.0 ATA
- Non-CNS Conditions: 1.75 to 3.0 ATA
- Chronic inflammatory conditions: Maintenance treatment
- Time at depth: 60 to 120 minutes
- Treatment regimens
  - 3 to 120 sessions
  - Done in succession, Daily to BID

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FUNCTIONAL MEDICINE + HBOT = MASSIVE OUTCOME ACCELERATOR

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REGENERATING AND REVITALIZING TISSUE

FDA APPROVED FOR HBOT

- Delayed Radiation Injury
- Diabetic Foot Ulcers
- Refractory Osteomyelitis
- Sudden Sensorineural Hearing loss
- Crush Injury, Compartment Syndrome and other Acute Traumatic Ischemias
- Air or Gas Embolism
- CO Poisoning
- Gas Gangrene
- Decompression Illness
- Necrotizing soft tissue infections
- Severe Anemia
- Thermal Burns
- Central Retinal Artery Occlusion

INVESTIGATIONAL HBOT

- Post Stroke
- Cancer Synergy
- Pre/Post Surgery
- RSD / CPRPS
- Inflammatory Bowel Disease
- Chronic Fatigue Syndrome
- Traumatic Brain Injury
- Dementia & MCI
- Cerebral Palsy
- Lyme disease
- Autoimmune conditions
- SIBO
- Regenerative Medicine/ Anti-Aging
- Optimal Performance
- Opioid Withdrawal
- many more…

AN INTEGRATIVE APPROACH

- Functional Medicine
- Expert Referral
- Adjunctive Technologies
- oh yeah, & HBOT too :)
  - But NOT always! (Or at least, not right away)

CONDITIONS AND CASES

HBOT & STROKE RECOVERY

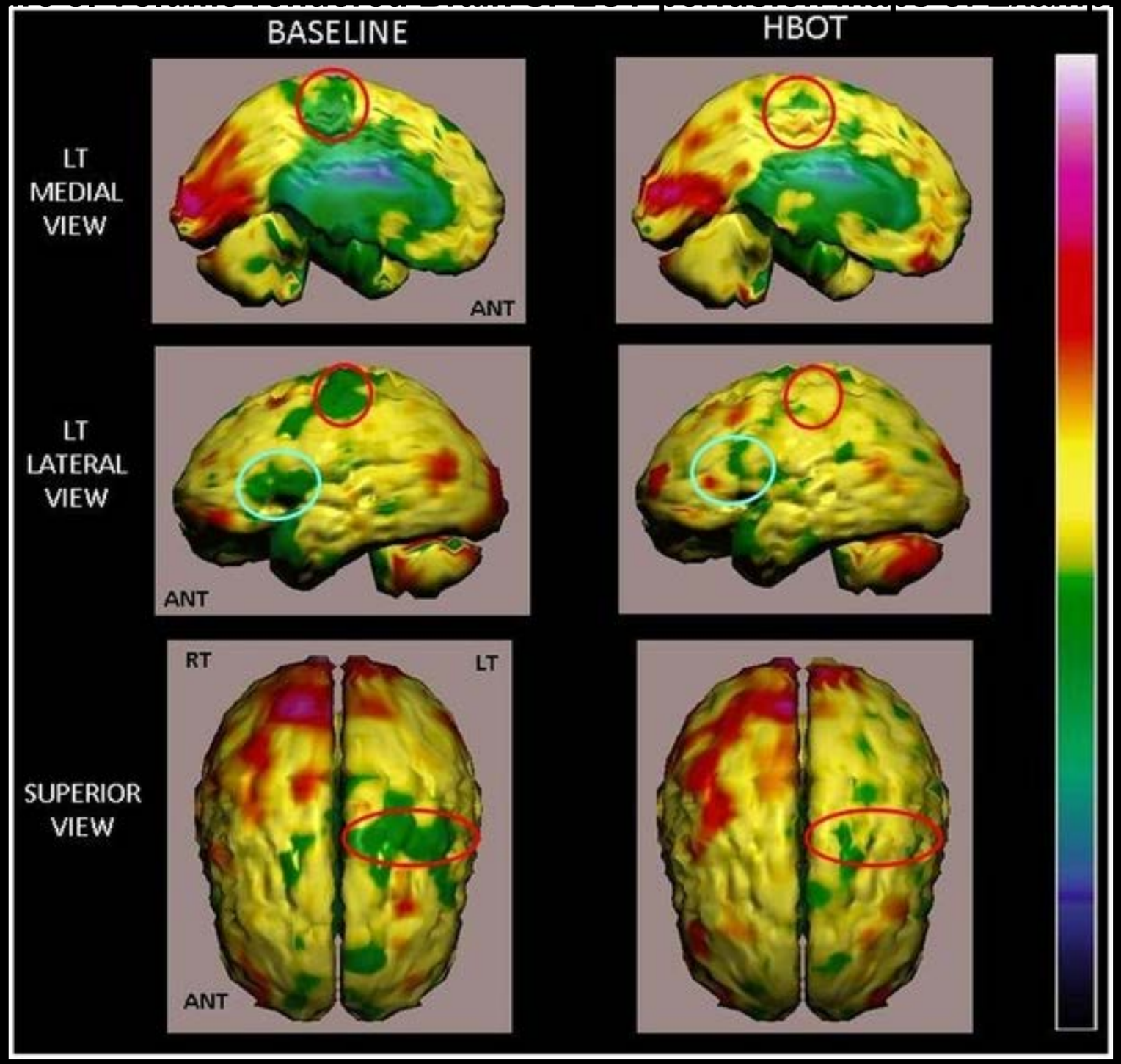
OPEN ACCESS Freely available online

PLOS ONE

Hyperbaric Oxygen Induces Late Neuroplasticity in Post Stroke Patients - Randomized, Prospective Trial

Shai Efrati[1,2,3]*, Gregori Fishlev[1], Yair Bechor[1], Olga Volkov[3,4], Jacob Bergan[1], Kostantin Kliakhandler[5], Izhak Kamiager[3,6], Nachum Gal[1], Mony Friedman[1], Eshel Ben-Jacob[2,5,7], Haim Golan[3,4]

1 The Institute of Hyperbaric Medicine, Assaf Harofeh Medical Center, Zerifin, Israel, **2** Research and Development Unit, Assaf Harofeh Medical Center, Zerifin, Israel, **3** Sackler School of Medicine, Tel-Aviv University, Tel-Aviv, Israel, **4** Nuclear Medicine Institute, Assaf Harofeh Medical Center, Zerifin, Israel, **5** School of Physics and Astronomy, The Raymond and Beverly Sackler Faculty of Exact Sciences, Tel-Aviv University, Tel-Aviv, Israel, **6** Neurology Department, Assaf Harofeh Medical Center, Zerifin, Israel, **7** Center for Theoretical Biological Physics, Rice University, Houston, Texas, United States of America



EFRATI S, FISHLEV G, BECHOR Y, VOLKOV O, BERGAN J, ET AL. (2013) HYPERBARIC OXYGEN INDUCES LATE NEUROPLASTICITY IN POST STROKE PATIENTS - RANDOMIZED, PROSPECTIVE TRIAL. PLOS ONE 8(1): E53716. HTTPS://DOI.ORG/10.1371/JOURNAL.PONE.0053716

HBOT & NEUROLOGIC CONDITIONS (INTEGRATED)

- Functional Medicine
- Referral
  - PT, OT, ST, CBT & other conventional therapies
  - Exogenous Stem Cell & intranasal PRP
  - Structural therapies: D.C. & D.O, other movement therapies
- HBOT
- Tech:
  - LLLT, Neurofeedback, PEMF

The Journal of International Medical Research
2004; 32: 258 – 262

Effectiveness of Hyperbaric Oxygen Therapy in the Treatment of Complex Regional Pain Syndrome

MZ KIRALP[1], Ş YILDIZ[2], D VURAL[1], I KESKIN[1], H AY[2] AND H DURSUN[1]

[1]Department of Physical Therapy and Rehabilitation and [2]Department of Underwater and Hyperbaric Medicine, Gülhane Military Medical Academy, Haydarpaşa Training Hospital, Istanbul, Turkey

HBOT & RSD/CPRS

- 71 patients
- 2.4 ATA X 90 minutes X 15 sessions vs. sham
- Lower pain scores in treatment group
- Lower wrist circumference and increased ROM in treatment group
- And INTEGRATE!
  - Functional Medicine
  - Expert Referral
  - Adjunctive Tech

CANCER & H

Targ Oncol (2012) 7:233–242
DOI 10.1007/s11523-012-0233-x

REVIEW

Hyperbaric oxygen therapy and cancer—a review

Ingrid Moen · Linda E. B. Stuhr

Received: 14 May 2012 / Accepted: 20 September 2012 / Published online: 2 October 2012

Abstract Hypoxia is a critical hallmark of solid tumors and involves enhanced cell survival, angiogenesis, glycolytic metabolism, and metastasis. Hyperbaric oxygen (HBO) treatment has for centuries been used to improve or cure disorders involving hypoxia and ischemia, by enhancing the amount of dissolved oxygen in the plasma and thereby increasing O_2 delivery to the tissue. Studies on HBO and cancer have up to recently focused on whether enhanced oxygen acts as a cancer promoter or not. As oxygen is believed to be required for all the major processes of wound healing, one feared that the effects of HBO would be applicable to cancer tissue as well and promote cancer growth. Furthermore, one also feared that exposing patients who had been treated for cancer, to HBO, would lead to recurrence. Nevertheless, two systematic reviews on HBO and cancer have concluded that the use of HBO in patients with malignancies is considered safe. To supplement the previous reviews, we have summarized the work performed on HBO and cancer in the period 2004–2012. Based on the present as well as previous reviews, there is no evidence indicating that HBO neither acts as a stimulator of tumor growth nor as an enhancer of recurrence. On the other hand, there is evidence that implies that HBO might have tumor-inhibitory effects in certain cancer subtypes, and we thus strongly believe that we need to expand our knowledge on the effect and the mechanisms behind tumor oxygenation. 2012, using the MeSH search terms ("hyperbaric oxygenation" and/or "hyperoxia" and "neoplasms"). A total of 28 articles were found relevant, directly involving the use of HBO as a stand-alone or as adjuvant treatment on different cancer types. We focused on growth, cell survival, angiogenesis, and metastasis observed in HBO-treated cancers the last 9 years, both as stand-alone and adjuvant treatment, and compared them to older publications involving the selected topic.

Background

Cancer and hypoxia

Solid tumors often contain areas subjected to acute or chronic hypoxia [1], though with variable severity in patients both within and among different tumor types [2]. Although severe or prolonged hypoxia is deleterious, adaptation to the hypoxic microenvironment has allowed cancer cells to survive and proliferate in this hostile milieu [3]. Tumor hypoxia develops due to the structural and functional abnormalities of the tumor vasculature since cancer growth often overrides the ability of the cancer vasculature to adapt to the increasing oxygen demand.

CANCER & HBOT (SYNERGY)

- Chronic Radiation Injury (FDA approved)
- Chemo & Radiation Sensitization
- HBOT + Ketogenic Diet
- Surgical Recovery
- Cancer Prevention?

PLOS | ONE

RESEARCH ARTICLE

Non-Toxic Metabolic Management of Metastatic Cancer in VM Mice: Novel Combination of Ketogenic Diet, Ketone Supplementation, and Hyperbaric Oxygen Therapy

A. M. Poff[1]*, N. Ward[1], T. N. Seyfried[2], P. Arnold[3], D. P. D'Agostino[1]

1 Department of Molecular Pharmacology and Physiology, Morsani College of Medicine, Hyperbaric Biomedical Research Laboratory, University of South Florida, Tampa, Florida, United States of America, **2** Department of Biology, Boston College, Chestnut Hill, Massachusetts, United States of America, **3** Savind, Inc. Seymour, Illinois, United States of America

* abennett@health.usf.edu

HBOT & CANCER (INTEGRATED)

- Functional Medicine
- Press / Pulse
  - Ketogenic diet + HBOT + Antioxidant overdrive
- Referral
  - Physician Advocates
  - Integrative Oncology
- Tech
  - Infrared sauna, cold thermogenesis, meditative practices

UHM 2013, VOL. 40, NO. 2 – HYPERBARIC OXYGEN AND CHRONIC FATIGUE SYNDROME

The efficacy of hyperbaric oxygen therapy in the management of chronic fatigue syndrome

Selim Akarsu M.D. [1], *Levent Tekin M.D.* [1], *Hakan Ay* [2], *Alparslan Bayram Çarlı M.D.* [1], *Fatih Tok M.D.* [3] *Kemal Şimşek* [4], *Mehmet Zeki Kıralp M.D.* [1]

[1] Gülhane Military Medical Academy Haydarpasa Training Hospital, Department of Physical Medicine and Rehabilitation, İstanbul, Turkey

[2] Gülhane Military Medical Academy Haydarpasa Training Hospital, Department of Underwater and Hyperbaric Medicine, İstanbul, Turkey

[3] İskenderun Military Hospital, Physical Medicine and Rehabilitation Service, İskenderun, Turkey

[4] Gülhane Military Medical Academy, Department of Underwater and Hyperbaric Medicine Ankara, Turkey

CORRESPONDING AUTHOR: Dr. Selim Akarsu – *selimakarsu@yahoo.com.tr*

Int J Clin Exp Pathol 2015;8(2):1752-1759
www.ijcep.com /ISSN:1936-2625/IJCEP0003403

Original Article

Hyperbaric oxygenation promotes neural stem cell proliferation and protects the learning and memory ability in neonatal hypoxic-ischemic brain damage

Lixia Wei[1,2], Jinshen Wang[2], Yuntao Cao[3], Qing Ren[2], Lili Zhao[2], Xingang Li[4], Jiwen Wang[5]

[1]Department of Neurology, Children's Medical Center, Qilu Hospital of Shandong University, Jinan 250012, China; [2]Department of Pediatrics, Liaocheng People's Hospital, Liaocheng 252000, China; [3]Department of Neonatal, Affiliated Hospital of Zunyi Medical College, Zunyi 563003, China; [4]Brain Science Research Institute, Shandong University, Jinan 250012, China; [5]Department of Neurology, Children's Medical Center, Qilu Hospital of Shandong University, Brain Science Research Institute, Shandong University, Jinan 250012, China

Published in final edited form as:
Stem Cell Res. 2014 May ; 12(3): 638–645. doi:10.1016/j.scr.2014.02.005.

CD34+/CD45-dim stem cell mobilization by hyperbaric oxygen – changes with oxygen dosage

Marvin Heyboer III[1], Tatyana N. Milovanova[2], Susan Wojcik[1], William Grant[1], Mary Chin[2], Kevin R. Hardy[2], David S. Lambert[2], Christopher Logue[2], and **Stephen R. Thom[2,3]**

[1]Department of Emergency Medicine, State University of New York Upstate Medical University, Syracuse, NY

[2]Institute for Environmental Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA 19104

African Journal for Physical, Health Education, Recreation and Dance (AJPHERD) November 2015 (Supplement 1), pp. 29-39.

The effect of hyperbaric oxygen and blood platelet injection therapy on the healing of hamstring injuries in rugby players: A Case series report

D.M. BOTHA[1], Y.COOPOO[1], M.K. BOTHA[2], R. COLLINS[3], E. LYNCH[1] AND R.L. VAN NIEKERK[4]

[1]*Department of Sport and Movement Science, University of Johannesburg, South Africa.*
E-mail: maddaniel@mweb.co.za
[2]*Milpark Hyperbaric Centre, Johannesburg, South Africa*
[3]*Section of Sports Medicine, University of Pretoria, South Africa*
[4]*Department of Human Movement Science, University of Fort Hare, Alice, South Africa*

Experimental research

Effects of hyperbaric oxygen therapy combined with platelet-rich plasma on diabetic wounds: an experimental rat model

Gündüz Yümün[1], Cüneyt Kahaman[2], Nail Kahaman[3], Ulviye Yalçınkaya[4], Aydin Akçılar[5], Engin Akgül[6], Ahmet Hakan Vural[6]

Inflammatory bowel disease

BMJ Open Gastroenterology

Hyperbaric oxygen therapy stimulates colonic stem cells and induces mucosal healing in patients with refractory ulcerative colitis: a prospective case series

Mohamed Bekheit,[1], [2] Nahed Baddour,[3] Khaled Katri,[2] Yousry Taher,[4] Khaled El Tobgy,[5] Essam Mousa,[2]

HBOT & PERFORMAN

- Sports Injury
- Cognitive Enhancement
- Cardiovascular Fitness
  - Endurance
  - Recovery

Hindawi Publishing Corporation
Journal of Nutrition and Metabolism
Volume 2016, Article ID 5647407, 8 pages
http://dx.doi.org/10.1155/2016/5647407

Hindawi

Research Article

Effects of Exercise Training under Hyperbaric Oxygen on Oxidative Stress Markers and Endurance Performance in Young Soccer Players: A Pilot Study

Carlos Burgos,[1] Carlos Henríquez-Olguín,[1] David Cristóbal Andrade,[1] Rodrigo Ramírez-Campillo,[1,2] Oscar F. Araneda,[3] Allan White,[4] and Hugo Cerda-Kohler[1,5]

[1] *Unidad de Fisiología Integrativa del Ejercicio, Laboratorio de Ciencias del Ejercicio, Clínica MEDS, Avenida Isabel La Católica 3740, 7550557 Santiago, Chile*
[2] *Departamento de Ciencias de la Actividad Física, Núcleo de Investigación en Salud, Actividad Física y Deporte, Universidad de Los Lagos, Avenida Fuchslocher 1035, 5290000 Osorno, Chile*
[3] *Laboratorio Integrativo de Biomecánica y Fisiología del Esfuerzo (LIBFE), Escuela de Kinesiología, Facultad de Medicina, Universidad de los Andes, Avenida Monseñor Álvaro del Portillo 12455, 7620001 Santiago, Chile*
[4] *Laboratorio Ciencias de la Actividad Física, Instituto de Ciencias Biomédicas, Facultad de Medicina, Universidad de Chile, Avenida Independencia 1027, 8380453 Santiago, Chile*
[5] *Escuela de Ciencias de la Actividad Física, el Deporte y la Salud, Facultad de Medicina, Universidad de Santiago, Avenida Libertador Bernardo O'Higgins 3363, 9170022 Santiago, Chile*

Cognitive enhancement of healthy young adults with hyperbaric oxygen: A preliminary resting-state fMRI study

Ronghao Yu[1], Bin Wang[1], Shumei Li, Junjing Wang, Feng Zhou, Shufang Chu, Xianyou He, Xue Wen, Xiaoxiao Ni, Liqing Liu, Qiuyou Xie, Ruiwang Huang
[1] Ronghao Yu and Bin Wang contributed equally to this work.

Hyperbaric Oxygen Environment Can Enhance Brain Activity and Multitasking Performance

Dor Vadas*[1]*, *Leonid Kalichman*[2], *Amir Hadanny*[3, 4, 5] *and Shai Efrati*[3, 4, 6]

[1] *The Israeli Rehabilitation Center for Stroke and Brain Injury, Rehovot, Israel,* [2] *Department of Physical Therapy, Faculty of Health Sciences, Recanati School for Community Health Professions, Ben-Gurion University of the Negev, BeerSheva, Israel,* [3] *Sagol Center for Hyperbaric Medicine and Research, Asaf Harofeh Medical Center, Zerifin, Israel,* [4] *Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel,* [5] *Galilee Faculty of Medicine, Bar Ilan University, Ramat Gan, Israel,* [6] *Sagol School of Neuroscience, Tel Aviv University, Tel Aviv, Israel*

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- HBOT Precautions and Contraindications

COMPREHENSIVE PHYSIOLOGY

Hyperbaric Environment: Oxygen and Cellular Damage versus Protection

Angela M. Poff,[1] Dawn Kernagis,[2] and Dominic P. D'Agostino[*1,2]*

ABSTRACT

The elevation of tissue pO_2 induced by hyperbaric oxygen (HBO) is a physiological stimulus that elicits a variety of cellular responses. These effects are largely mediated by, or in response to, an increase in the production of reactive oxygen and nitrogen species (RONS). The major consequences of elevated RONS include increased oxidative stress and enhanced antioxidant capacity, and modulation of redox-sensitive cell signaling pathways. Interestingly, these phenomena underlie both the therapeutic and potentially toxic effects of HBO. Emerging evidence indicates that supporting mitochondrial health is a potential method of enhancing the therapeutic efficacy of, and preventing oxygen toxicity during, HBO. This review will focus on the cellular consequences of HBO, and explore how these processes mediate a delicate balance of cellular protection versus damage. © 2017 American Physiological Society. *Compr Physiol* 7:213-234, 2017.

HBOT & OXIDATIVE STRESS

- Oxidative Stress and Redox Signaling mediates both Hyperbaric Oxygen Therapy Efficacy and Oxygen Toxicity
- HBO-induced DNA damage can be detected following the first HBO exposure but not following subsequent treatments, suggesting an antioxidant response capable of repairing and preventing oxidative damage
- Global gene expression analysis of human endothelial cells following HBO exposure demonstrated an upregulation of antioxidant genes that correlated with increased resistance to oxidative stress
  - Upregulation of Nrf2 transcription factor, a major regulator of antioxidant genes that is activated during inflammation to protect against oxidative stress
- BUT, in those with significant ongoing oxidative stress
  - Consider targeted antioxidant support.

HBOT SIDE EFFECTS

- Middle ear trauma
- Sinus pain
- Myopia
- CNS Toxicity: rare, no LT effects
- Pulmonary Toxicity

HBOT CONTRAINDICATIONS

- Untreated Pneumothorax (absolute)
- 02 dependent COPD
- Bullous Lung Disease
- Severe Asthma
- Uncontrolled Seizure d/o
- High fevers
- EF <35% or unstable CAD

HBOT HEALS WOUNDS

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FIGHTING INFECTION

EXPONENTIAL STEM CELL RELEASE

REGENERATING AND REVITALIZING TISSUE

HBOT: THE GREAT SYNERGIZER!

- Think about HBOT anytime there is:
  - Inflammation
  - Hypoxia
    - A wound
    - An anaerobic or facultative anaerobic infection
    - Cancer
- Functional Medicine + HBOT = Massive outcome accelerator

Imagination is more important than knowledge

—Albert Einstein

Curiosity is more important than imagination

—Dr. Ted Achacoso

But without oxygen, NEITHER is possible!!

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