REVERSE AGING, REGENERATIVE MEDICINE, AND OPTIMAL PERFORMANCE

The Future of Hyperbaric Medicine

Scott Sherr, MD
AFFILIATIONS

• Hyperbaric Medical Solutions, New York
• Hyperbaric Medical Services, San Francisco
• Hyperbaric Oxygen Treatment Center for Southern Oregon
• Virtual HBOT at IntegrativeHBOT.com
HBOT HEALS WOUNDS

NO MATTER WHERE THEY ARE
REVERSES HYPOXIA
DECREASES INFLAMMATION
FIGHTS INFECTION
EXPONENTIAL STEM CELL RELEASE
REGENERATING AND REVITALIZING TISSUE

Wound Healing is Anti (Reverse) Aging!
V.I.T.A.M.I.N. D.
OBJECTIVES

• Reverse Aging
• Regenerative Medicine
• Optimal Performance
• An Integrative Approach to Hyperbaric Therapy
The Future of Hyperbaric Medicine

REVERSE AGING: TEL AVIV, ISRAEL
REVERSE AGING

- Diseases of Aging
  - Atherosclerosis
  - Cancer
  - Type 2 diabetes
  - Alzheimer’s Dementia

Wound Healing is Anti (Reverse) Aging!
V.I.T.A.M.I.N. D.
The Future of Hyperbaric Medicine

REVERSE AGING: Atherosclerosis

• Cerebrovascular Disease
  • CVA
  • Vascular Dementia / MCI

• Coronary Artery Disease
  • MI
  • Angina

• Peripheral Vascular Disease
  • Erectile Dysfunction
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REVERSE AGING:
ATHEROSCLEROSIS-CVA

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

Shai Efrati1,2,3*, Gregori Fishlev1, Yair Bechor1, Olga Volkov3,4, Jacob Bergan1, Kostantin Kliakhandler5, Izhak Kamliager3,4, Nachum Gal1, Mony Friedman1, Eshel Ben-Jacob2,5,7, Haim Golan3,4

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

Abstract

Background: Recovery after stroke correlates with non-active (stunned) brain regions, which may persist for years. The current study aimed to evaluate whether increasing the level of dissolved oxygen by Hyperbaric Oxygen Therapy (HBOT) could activate neuroplasticity in patients with chronic neurologic deficiencies due to stroke.

Methods and Findings: A prospective, randomized, controlled trial including 74 patients (15 were excluded). All participants suffered a stroke 6-36 months prior to inclusion and had at least one motor dysfunction. After inclusion, patients were randomly assigned to “treated” or “control” groups. Brain activity was assessed by SPECT imaging; neurologic functions were evaluated by NIHSS, ADL, and life quality. Patients in the treated group were evaluated twice: at baseline and after 40 HBOT sessions. Patients in the cross group were evaluated three times: at baseline, after a 2-month control period of no treatment, and after subsequent 2-months of 40 HBOT sessions. HBOT protocol: Two months of 40 sessions (5 days/week), 90 minutes each, 100% oxygen at 2 ATA. We found that the neurological functions and life quality of all patients in both groups were significantly improved following the HBOT sessions while no improvement was found during the control period of the patients in the cross group. Results of SPECT imaging were well correlated with clinical improvement. Elevated brain activity was detected mostly in regions of live cells (as confirmed by CT) with low activity (based on SPECT) - regions of noticeable discrepancy between anatomy and physiology.

Conclusions: The results indicate that HBOT can lead to significant neurological improvements in post stroke patients even at chronic late stages. The observed clinical improvements imply that neuroplasticity can still be activated long after damage onset in regions where there is a brain SPECT/CT (anatomy/physiology) mismatch.

Trial Registration: ClinicalTrials.gov NCT00715897
REVERSE AGING: Atherosclerosis-CVA

Clinical Study
Effects of Repetitive Hyperbaric Oxygen Treatment in Patients with Acute Cerebral Infarction: A Pilot Study

Cheng-Hsin Chen,1 Shao-Yuan Chen,2,4,5 Vinchi Wang,2,4,5 Chao-Ching Chen,2,5 Kwai-Chen Wang,1 Chih-Hao Chen,2 Yi-Chien Liu,2 Kuo-Cheng Lai,1,2 Ping-Kuang Yip,2,5 Wen-Yu Ma,1,3 and Chuan-Chieh Liu1,5

1 Department of Internal Medicine, Cardinal Tien Hospital, New Taipei City, Taiwan
2 Department of Neurology, Cardinal Tien Hospital, New Taipei City, Taiwan
3 Department of Hyperbaric Medicine, Cardinal Tien Hospital, New Taipei City, Taiwan
4 Department of Medical Research, Cardinal Tien Hospital, New Taipei City, Taiwan
5 School of Medicine, Fu Jen Catholic University, New Taipei City, Taiwan

Correspondence should be addressed to Chuan-Chieh Liu, chuanchiehlia@gmail.com

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Academic Editors: G. Chen and R. Kirchmair

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The role of hyperbaric oxygen therapy (HBOT) in the treatment of acute ischemic stroke is controversial. This prospective study assessed the efficacy and safety of HBOT as adjuvant treatment on 46 acute ischemic stroke in patients who did not receive thrombolytic therapy. The HBOT group (n = 16) received conventional medical treatment with 10 sessions of adjunctive HBOT within 3-5 days after stroke onset, while the control group (n = 30) received the same treatment but without HBOT. Early (second two weeks after onset) and late (one month after onset) outcomes (National Institutes of Health Stroke Scale, NIHSS scores) and efficacy (changes of NIHSS scores) of HBOT were evaluated. The baseline clinical characteristics were similar in both groups. Both early and late outcomes of the HBOT group showed significant differences (P < 0.001). In the control group, there was only significant difference in early outcomes (P = 0.004). For efficacy, there was no difference when comparing changes of NIHSS scores between the two groups (P = 0.140) but there was statistically significant difference when comparing changes of NIHSS scores at one month (P ≤ 0.001). The HBOT used in this study may be effective for patients with acute ischemic stroke and is a safe and harmless adjunctive treatment.
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REVERSE AGING: Atherosclerosis-CVA

Hyperbaric Oxygen Post Established Stroke (HOPES)
ClinicalTrials.gov Identifier: NCT02582502

Hyperbaric Oxygen and Manipulative Therapies to Regain Function Post Stroke (HBOT/OMT)
ClinicalTrials.gov Identifier: NCT03352232

Effects of Repetitive Hyperbaric Oxygen Therapy in Patients With Acute Ischaemic Stroke
ClinicalTrials.gov Identifier: NCT03431402
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REVERSE AGING:
ATHEROSCLEROSIS-VASCULAR DEMENTIA & MCI

The Aging Brain

Originally, doctors thought this degeneration was an unimportant part of aging. But then research showed it is associated with cognitive decline and dementia.

What is the **CAUSE** of this white matter disease?

So...

We recruited 5 adults who had white matter disease in their brains and we scanned their brains every week for 16 weeks to look for tiny, asymptomatic strokes.
The Future of Hyperbaric Medicine

REVERSE AGING: ATHEROSCLEROSIS-VASCULAR DEMENTIA & MCI

Clinical Effect of Free Radical Scavenger Combined with Hyperbaric Oxygen Therapy on Vascular Cognitive Impairment

Objective: To evaluate the clinical effect of free radical scavenger (FRS) combined with hyperbaric oxygen (HBO) therapy on vascular cognitive impairment (VCI).

Methods: A total of 164 patients with VCI were randomly divided into three treatment groups, i.e., HBO group, FRS group, and HBO/FRS combination group, and a control group. The clinical effects were evaluated based on the scores of mini-mental state examination (MMSE) and activity of daily living (ADL) scale before and after treatment.

Results: The HBO group, FRS group, and HBO/FRS combination group all showed significantly increased MMSE and ADL scores after treatment, better than the control group on the two measures. In addition, the above scores in the HBO/FRS combination group were higher than those in each of HBO group and FRS group. Conclusions: FRS combined HBO therapy can improve MMSE and ADL scores significantly in patients with VCI, showing better clinical effects and holds promise for clinical application.

Hyperbaric Oxygen Therapy for Cognition in Diabetic Elderly at High Dementia Risk

ClinicalTrials.gov Identifier: NCT03036254
Hyperbaric oxygen preconditioning improves myocardial function, reduces length of intensive care stay, and limits complications post coronary artery bypass graft surgery.

Jeysen Zivan Yogaratnam, Gerard Laden, Levant Guvendik, Mike Cowen, Alex Cale, Steve Griffin

Department of Cardiothoracic Surgery, Castle Hill Hospital, Castle Road, HU16 5Q Cottingham, United Kingdom
North of England Hyperbaric and Medical Services, Classic Hospital, Lovel Field Road, Anlaby, East Yorkshire, HU10 7AZ, United Kingdom

Received 31 December 2008; received in revised form 16 March 2009; accepted 17 March 2009

Hyperbaric oxygen therapy for acute coronary syndrome

Michael H Bennett, Jan P Lehm, Nigel Jepson

Department of Anaesthesia, Prince of Wales Clinical School, University of NSW, Sydney, Australia. Department of Diving and Hyperbaric Medicine, Prince of Wales Hospital, Randwick, Australia. Prince of Wales Hospital, Randwick, Australia

Contact address: Michael H Bennett, Department of Anaesthesia, Prince of Wales Clinical School, University of NSW, Sydney, NSW, Australia. m.bennett@unsw.edu.au, s9400356@unsw.edu.au

Editorial group: Cochrane Heart Group. Publication status and date: New search for studies and content updated (no change to conclusions), published in Issue 7, 2015.
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REVERSE AGING: Atherosclerosis-Erectile Dysfunction

HBOT reverses the basic common pathophysiology, atherosclerosis and decreased penile perfusion, responsible for most cases of ED.
REVERSE AGING: CANCER

- Delayed Radiation Injury
- Chemotherapy Sensitization
- Radiation Sensitization
- HBOT + Ketogenic Diet
- Surgical Recovery
- Cancer Prevention?
REVERSE AGING: TYPE 2 DIABETES

Repetitive hyperbaric oxygen treatment increases insulin sensitivity in diabetes patients with acute intracerebral hemorrhage

Hyperbaric Oxygen Therapy Improves Glucose Homeostasis in Type 2 Diabetes Patients: A Likely Involvement of the Carotid Bodies

Hyperbaric oxygen therapy increases insulin sensitivity in overweight men with and without type 2 diabetes.
REVERSE AGING: ALZHEIMER’S DEMENTIA

Hyperbaric Oxygen and Ginkgo Biloba Extract Ameliorate Cognitive and Memory Impairment via Nuclear Factor Kappa-B Pathway in Rat Model of Alzheimer’s Disease

Li-Da Zhang, Li Ma, Li Zhang, Jian-Guo Dai, Li-Gong Chang, Pei-Lin Huang, Xiao-Qiang Tian
1Department of Hyperbaric Oxygen, Affiliated ZhongDa Hospital of Southeast University, Nanjing, Jiangsu 210009, China
2Department of Neurology, Brain Hospital Affiliated of Nanjing Medical University, Nanjing, Jiangsu 210029, China
3Department of Pathology, Nanjing University of Traditional Chinese Medicine, Nanjing, Jiangsu 210023, China
4Department of Pathology, Medicine School of Southeast University, Nanjing, Jiangsu 210009, China
5Medical Oncology, The Second Hospital of Nanjing, Affiliated to Medical School of Southeast University, Nanjing, Jiangsu 210003, China

Li-Da Zhang and Li Ma contributed equally to this work.

Influence of hyperbaric oxygen on serum estrogen level in patients with Alzheimer’s disease

WANG Huilin1, TANG Jianmei2 (1.Department of Neurology, the Second People’s Hospital Huaihua General Hospital, Hu‘nan Province, Huaihua 418000, China; 2. Department of Hyperbaric Oxygen, the Second People’s Hospital Huaihua General Hospital, Hu‘nan Province, Huaihua 418000, China)

Clinical Effect of Maixuekang Capsules Combined Hyperbaric Oxygen in the Treatment of Alzheimer's Disease

LIU Ya-feng, LI Jiang-ping, WANG Jian (Department of Geriatrics, the Central Hospital of Toutunhe District of Urumqi, Xinjiang, Urumqi 830023, CHINA)
The Future of Hyperbaric Medicine

OBJECTIVES

• Reverse Aging

• Regenerative Medicine

• Optimal Performance

• An Integrative Approach to Hyperbaric Therapy
REGENERATIVE MEDICINE

- Stem Cells
- PRP
  - Blood
  - Joint
  - Intranasal
- Tissue Engineering and Biomaterials
The Future of Hyperbaric Medicine

REGENERATIVE MEDICINE: STEM CELLS

The effect of bone marrow concentrate and hyperbaric oxygen therapy on bone repair

Authors

Hyperbaric oxygen improves engraftment of ex-vivo expanded and gene transduced human CD34(+) cells in a murine model of umbilical cord blood transplantation

Use of Hyperbaric Oxygen Therapy to Improve Umbilical Cord Blood Stem Cell Homing and Subsequent Engraftment

ClinicalTrials.gov Identifier: NCT02099266
Human Amniotic Fluid Mesenchymal Stem Cells in Combination with Hyperbaric Oxygen Augment Peripheral Nerve Regeneration

Authors
Hung-Chuan Pan, Chun-Shih Chin, Dar-Yu Yang, Shu-Peng Ho, Chung-Jung Chen, Shiaw-Min Hwang, Ming-Hong Chang, Fu-Chou Cheng

ORIGINAL PAPER
First Online: 17 January 2009

242 Downloads 34 Citations
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REGENERATIVE MEDICINE: PRP


**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. BOTHÄ¹, Y.COOPPO¹, M.K. BOTHÄ², R. COLLINS³, E. LYNCH¹ and R.L. VAN NIEKERK⁴

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**Experimental research**

Effects of hyperbaric oxygen therapy combined with platelet-rich plasma on diabetic wounds: an experimental rat model
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REGENERATIVE MEDICINE:
DR. JOHN HUGHES

- Improves brain ATP production
- Decreases CSF cortisol
- Improves neuronal viability in the hippocampus
- Increases the expression of anti-inflammatory microglia
- Reduces beta-amyloid and tau protein deposition
- Autologous plasma contains growth factors and cytokines to aid the injured brain

INTRANASAL PRP/INSULIN
The Future of Hyperbaric Medicine

REGENERATIVE MEDICINE: TISSUE ENGINEERING AND BIOMATERIALS

Tissue Engineering Part A, Vol. 20, No. 9-10 | Original Articles

Hyperbaric Oxygen Treatment of Tissue-Engineered Mucosa Enhances Secretion of Angiogenic Factors In Vitro

Tra Wendy Maria Wilhelmina, Spiegelberg Linda, Tuk Bastiaan, Hovius Steven Eric Ruden, and Perez-Adhio Soledad

Published Online: 2 Apr 2014 | https://doi.org/10.1089/ten.tea.2012.0629

The Effect of Hyperbaric Oxygen and Air on Cartilage Tissue Engineering

Juin-Hong Cherng; Shun-Cheng Chang; Shyi-Gen Chen; Ming-Lun Hsu; Po-Da Hong; Shou-Chen Teng; Yi-Hsin Chan; Chih-Hsin Wang; Tim-Mo Chen; Niann-Tzuy Dai
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OBJECTIVES

• Reverse Aging

• Regenerative Medicine

• **Optimal Performance**

• An Integrative Approach to Hyperbaric Therapy
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OPTIMAL COGNITIVE PERFORMANCE

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

Ronghao Yu¹, Bin Wang¹, Shumei Li, Junjie 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 Vadas¹, Leonid Kalichman², Amir Hadanny³,⁴,⁵ and Shai Efrati³,⁴,⁶
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OPTIMAL PHYSICAL PERFORMANCE

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

Carlos Burgos, Carlos Henríquez-Olgue, David Cristóbal Andrade, Rodrigo Ramírez-Campillo, Oscar P. Araneda, Allan White, and Hugo Cerda-Kohler

-effects-Researchers from the University of Santiago, Chile, investigated the effects of exercise training under hyperbaric oxygen on oxidative stress markers and endurance performance in young soccer players. The study aimed to assess the potential benefits of hyperbaric oxygen therapy in enhancing athletic performance.

DOI: 10.1519/JSC.0000000000000809, PMID: 25785701
Issn Print: 1064-8011
Publication Date: 2015/06/01

Effects of Hyperbaric Oxygen on Muscle Fatigue After Maximal Intermittent Plantar Flexion Exercise

Manabu Shimoda; Mitsuhiro Enomoto; Masaki Horie; Shumpel Miyakawa; Kazuyoshi Yagishita

-effects-Another study explored the effects of hyperbaric oxygen on muscle fatigue during intermittent plantar flexion exercises. The researchers found that hyperbaric oxygen therapy significantly reduced muscle fatigue, suggesting potential applications in sports and rehabilitation.

-effects-
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OBJECTIVES

• Reverse Aging
• Regenerative Medicine
• Optimal Performance
• An Integrative Approach to Hyperbaric Therapy
  • Integrative HBOT
  • Diagnostics
  • Therapeutics
  • Allied Practitioners
  • Examples: Cancer and Neurological Indications for HBOT
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Acute vs. Chronic
INTEGRATIVE HBOT-DR. SCOTT’S APPROACH

- Health Optimization Medicine and Practice (HOMe/HOPe)
- Functional Medicine
- Diagnostics
- Therapeutics
- Expert Referral
- HBOT
  - Not always
  - At least not always right away.
HEALTH OPTIMIZATION MEDICINE AND PRACTICE

- Pioneered by Dr. Ted Achacoso
- Certifying doctors and health care practitioners
- HOMe simply detects and corrects imbalances applying the sciences of:
  - Clinical Metabolomics, Epigenetics, Bioenergetics, Gut Immune System, Exposomics, Chronobiology, and Evolutionary Medicine
  - Measuring at level of the metabolome and balancing using network-wide range shifting
- www.healthoptimizationmedicine.org
# The Future of Hyperbaric Medicine

## HOME/HOPe: Metabolomic testing

<table>
<thead>
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<th>Normal</th>
<th>Borderline</th>
<th>High Need</th>
<th>Supplementation for High Need</th>
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<td><strong>Antioxidants</strong></td>
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<td>Thiamin - B1 - Dose = 50 mg</td>
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<td>Biotin - B7</td>
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<td>Folic Acid - B9</td>
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<td>Cobalamin - B12</td>
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<td><strong>Minerals</strong></td>
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<td><strong>Vitamin D</strong></td>
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<td>Vitamin D - Dose = 4,000 IU</td>
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INTEGRATIVE HBOT-
DR. SCOTT’S APPROACH

- Health Optimization Medicine and Practice (HOMe/HOPe)
- Functional Medicine
- Diagnostics
- Therapeutics
- Expert Referral
- HBOT
  - Not always
  - At least not always right away.
OBJECTIVES

• Reverse Aging

• Regenerative Medicine

• Optimal Performance

• An Integrative Approach to Hyperbaric Therapy
  • Integrative HBOT
  • Diagnostics
  • Therapeutics
  • Allied Practitioners
  • Examples: Cancer and Neurological Indications for HBOT

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INTEGRATIVE HBOT: DIAGNOSTICS

• Cytokine testing
• V02 max testing
• Functional Imaging
• Neuropsychological testing
• Advanced Glycation End Product Assessment
• Mitochondrial P02 assessment
INTEGRATIVE DIAGNOSTICS: CYTOKINE TESTING

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INTEGRATIVE MEDICINE

BLOOD - SERUM

INTEGRATIVE MEDICINE

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INTEGRATIVE DIAGNOSTICS: V02 MAX TESTING
INTEGRATIVE DIAGNOSTICS: FUNCTIONAL IMAGING

The Future of Hyperbaric Medicine
INTEGRATIVE DIAGNOSTICS: NEUROPSYCH TESTING

- Standard Neuropsych Battery
- EEG Technology
- Many, Many More…
INTEGRATIVE DIAGNOSTICS: AGE READER

Advanced Glycation Endproducts

AGEs play a pivotal role in the development of chronic age-related diseases such as diabetes, renal failure and cardiovascular disease.
INTEGRATIVE DIAGNOSTICS: MITO PO2

Oxygen in tissue cells
The Future of Hyperbaric Medicine

OBJECTIVES

- Reverse Aging
- Regenerative Medicine
- Optimal Performance
- An Integrative Approach to Hyperbaric Therapy
  - Integrative HBOT
  - Diagnostics
  - Therapeutics
  - Allied Practitioners
  - Examples: Cancer and Neurological Indications for HBOT
INTEGRATIVE THERAPEUTICS

- Diet
- Drugs & Supplements
- Cutting Edge Technologies
INTEGRATIVE THERAPEUTICS: DIET

• Ketogenic
• Fasting
• 500 + more…
The Future of Hyperbaric Medicine

INTEGRATIVE THERAPEUTICS: DRUGS AND SUPPLEMENTS

- NAC
- MCT Oil / Coconut Oil
- Ketone Esters and Salts
- CBD
- Targeted Supplementation (HOMe/HOPe)
INTEGRATIVE THERAPEUTICS: CUTTING EDGE TECH

- Low Level Light Therapy
- Pulsed Electromagnetic Field Technology
- Cryotherapy and Cold Thermogenesis
- Infrared Sauna
- Flotation Tanks
- Neurofeedback
OBJECTIVES

- Reverse Aging
- Regenerative Medicine
- Optimal Performance

An Integrative Approach to Hyperbaric Therapy
- Integrative HBOT
- Diagnostics
- Therapeutics
- Allied Practitioners
- Examples: Cancer and Neurological Indications for HBOT
INTEGRATIVE HBOT: ALLIED PRACTITIONERS

- Chiropractors
- Osteopathic Physicians
- Naturopaths
- Neurofeedback Specialists
- Cannabis Experts
- PT/OT/Speech Experts
- Psychologists
- Interventional Pain Management
- Stem Cells Experts
- Health Coaches
- Massage Therapists
- More…
OBJECTIVES

• Reverse Aging

• Regenerative Medicine

• Optimal Performance

• An Integrative Approach to Hyperbaric Therapy
  • Integrative HBOT
  • Diagnostics
  • Therapeutics
  • Allied Practitioners
  • Examples: HBOT for Cancer and Neurological Conditions
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INTEGRATIVE HBOT: CANCER

• HOMe/HOPe & Functional Medicine

• Diagnostics

• Therapeutics:
  • Press/Pulse: Ketogenic Diet + Antioxidant Overdrive
  • Infrared Sauna, Cold Thermogenesis, Meditation, Breath Work

• Allied Practitioners
  • Integrative Oncology (Dr. Dawn Lemanne)
  • Physician Advocates

• HBOT
INTEGRATIVE HBOT: NEUROLOGIC CONDITIONS

- **HOME & Functional Medicine-Dale Bredesen Protocol.**
- **Diagnostics**
- **Therapeutics**
  - Supplements: Ketones, MCT, CBD, etc.
  - Tech: LLLT, PEMF, Neurofeedback
  - Exogenous and intranasal Stem Cells, PRP
- **Allied Practitioners**
  - PT/OT/Speech and additional conventional therapies
  - Structural Therapies: DC / DO / Craniosacral
- **HBOT**
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INTEGRATIVE HBOT:
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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