

# The Pressure Point

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## Research: Hyperbarics on many levels

A Look at International Hyperbaric Research

*This issue is dedicated to hyperbaric work around the globe. In addition to already known indications for hyperbaric medicine, research on new indications is a continuing process.*

*Many of these indications draw knowledge from established indications, such as wound healing, hypoxia, bacterial infection, and inflammatory diseases in order to test similar mechanisms in the human healing process.*



## Cancer Research: HBOT inhibits Breast Cancer Growth

How hyperbaric oxygenation affects mammary cell proliferation

Anticancer Res. 2005 Nov-Dec;25(6B):3833-42.

Hyperbaric oxygen inhibits benign and malignant human mammary epithelial cell proliferation.

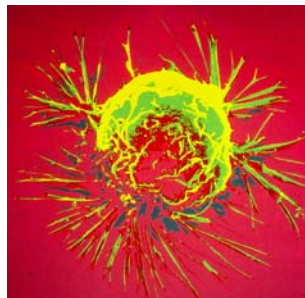
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**BACKGROUND:** Hyperbaric oxygenation (HBO) therapy is the administration of 100%-inhaled oxygen to patients at increased atmospheric pressure.

**MATERIALS AND METHODS:** We used an in vitro model to examine the effects of HBO on mammary cell proliferation.



Pictured is a breast cancer cell, photographed by a scanning electron microscope, which produces a 3-dimensional images. This picture shows the overall shape of the cell's surface at a very high magnification.

Normal mammary epithelia, primary tumor and metastatic tumor cells derived from the same patient and immortalized by transfection with the human papilloma virus E6 oncogene, as well as the MCF7 human mammary adenocarcinoma cell line, were studied.

**RESULTS:** HBO (97.9% O<sub>2</sub>, 2.1% CO<sub>2</sub>, 2.4 atmospheres absolute) inhibited the proliferation of all 4 cell types as measured by light microscopy, [3H]thymidine uptake, a tetrazolium-based colorimetric assay and a clonogenicity assay. The anti-proliferative effect of HBO was time-dependent (p < 0.01 for all 4 cell types).

Hyperoxia alone (95% O<sub>2</sub>, 5% CO<sub>2</sub>, 1 atmosphere

Humor Me  
Corner



## Sensoneural Hearing Loss: Adjunctive HBOT and steroids

A Look at the results of 12 patients

Pol Merkuriusz Lek. 2005 Sep;19(111):348-50.

[Evaluation of effectiveness of pharmacological treatment combined with the hyperbaric oxygen in the treatment of sensorineural hearing loss following acute acoustic trauma. Preliminary report]

[Article in Polish]

Winiarski M, Kantor I, Smereka J, Jurkiewicz D.

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**OBJECTIVE:** Exposure to loud sounds can cause acute acoustic trauma and permanent sensorineural hearing loss. The aim of the study was to evaluate effectiveness of pharmacological treatment combined with the hyperbaric oxygen (HBO) in the treatment of sensorineural hearing loss following acute acoustic trauma for patients treated in the Department of Otolaryngology of Military Institute of Health Service and Warsaw Center for Hyperbaric Therapy and Wounds Treatment.

**MATERIAL AND METHODS:** Group of 12 patients (22 damaged ears) with acute acoustic trauma (10 men and 2 women), 16-67 years of age, mean age 28 years, was involved in our study. Patients with tinnitus and sensorineural hearing loss of minimum 15 dB at 0.25-8 kHz

were included in the treatment group. Hearing gain of minimum 10 dB at 0.25-8 kHz and decrease in the intensity of tinnitus was considered as an improvement.

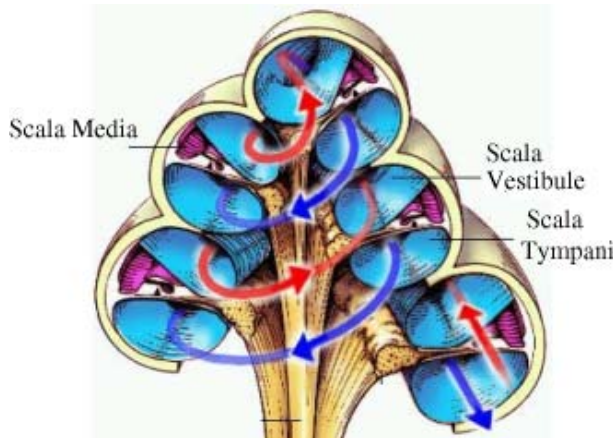
4 days was the mean time interval between acoustic trauma and starting the pharmacological treatment, 7 days was the mean time interval for the hyperbaric oxygen therapy commencement.

**RESULTS:** Statistically significant difference in Pure Tone Audiometry results obtained before and after the

treatment was noted in 4 kHz when considering all damaging factors that caused acoustic trauma and in 6 kHz only for damage resulting from shooting.

Statistically significant difference was noted in 6 kHz if the HBO therapy was continued over 10 days ( $p < 0.00001$ ). Statistically significant difference was noted in 4, 6, 8 kHz when treatment was started within 5 days since the acoustic trauma ( $p < 0.000001$ ).

**CONCLUSIONS:** Hyperbaric oxygen therapy is the unique method of increasing concentration of oxygen in the inner ear fluids, thus facilitating the regeneration process. Hyperbaric oxygen therapy combined with steroids is an effective method of sensorineural hearing loss treatment following acute acoustic trauma.

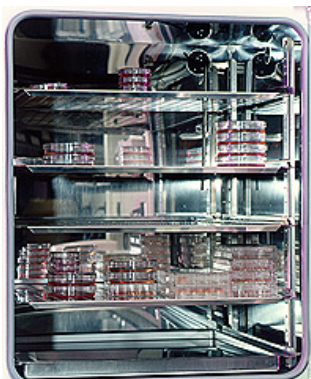


Cross-section of the cochlea showing the fluid set into motion when sound is transmitted to the stapes.

## Cancer Research: HBOT inhibits Breast Cancer Growth

How hyperbaric oxygenation affects mammary cell proliferation

(Continued from page 1)



Breast tissue specimens in traditional sample dishes

absolute) and increased atmospheric pressure alone (8.75% O<sub>2</sub>, 2.1% CO<sub>2</sub>, 2.4 atmospheres absolute) also inhibited proliferation, but their effects were not as profound as HBO ( $p < 0.01$  when either hyperoxia or increased pressure was compared to HBO for all 4 cell types).

HBO enhanced the anti-proliferative effects of melphalan ( $p < 0.05$ ), gemcitabine ( $p < 0.001$ ) and paclitaxel ( $p < 0.001$ ). The clonogenicity assay dem-

onstrated that the effects of HBO were still evident 2 weeks after the exposure ( $p < 0.01$  for all 4 cell types).

Experiments using Hoechst-propidium iodide or annexin V-propidium iodide staining showed no HBO-induced increases in necrosis or apoptosis.

**CONCLUSION:** HBO inhibits benign and malignant mammary epithelial cell proliferation, but does not enhance cell death.

## Archives: ALS Clinical Trial and HBOT

*Editor's note: While the final note is not to recommend hyperbarics (from a Medicare and insurance reimbursement standpoint), readers are asked to note the improvements in this group.*

Amyotroph Lateral Scler Other Motor Neu-  
ron Disord. 2004 Dec;5(4):250-4.

### A Phase I safety study of hyperbaric oxygen therapy for amyotrophic lateral sclerosis.

Steele J, Matos LA, Lopez EA, Perez-Pinzon MA, Prado R, Busto R, Arheart KL, Bradley WG.

Department of Neurology, University of Miami School of Medicine, Miami, FL 33136, USA.

**BACKGROUND:** Vascular endothelial growth factor and mitochondrial abnormalities have been described in ALS and its animal models.

We have reported that hyperbaric oxygen (HBO) treatment delayed the onset of weakness in the wobbler mouse.

**OBJECTIVE:** To perform a Phase I safety study of HBO in patients with ALS.

**METHODS:** Five patients with ALS were treated for 60min with 100% oxygen at 2 atmospheres pressure daily for five days a week for four weeks. The patients reported any deterioration in their condition after each treatment, and their neurological condition was measured serially during the four weeks of the treat-



Maximum isometric voluntary contraction (MVIC) of all muscle groups except right hand grip improved significantly by up to 97%.

Maximum isometric voluntary contraction (MVIC) of all muscle groups except right hand grip improved significantly by up to 97%. Most improvement occurred during the four weeks after treatment.

It is possible that the improvement in muscle strength was a placebo or a learning effect, though no such effects have been detected in prior therapeutic trials in ALS using MVIC. No change was detected in other measures of neuromuscular function.

**CONCLUSIONS:** A longer duration, placebo controlled trial in a larger

ment, and for four further weeks.

**RESULTS:** Four patients reported decreased fatigue, while one patient dropped out at three weeks because of increased fatigue.

number of patients is needed to determine the safety and efficacy of HBO. Until that is completed, it is not recommended that ALS patients should be treated with Hyperbaric Oxygen.

## Archives: Malignancies and HBOT

Med Sci Monit. 2005Sep;11(9):  
RA279-89. Epub 2005 Aug 26.

### Hyperbaric oxygen and malignancies: a potential role in radiotherapy, chemotherapy, tumor surgery and phototherapy.

Al-Waili NS, Butler GJ, Beale J, Hamilton RW, Lee BY, Lucas P.

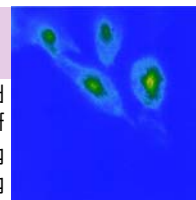
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Over the past 40 years, hyperbaric oxygen (HBO2) therapy has been recommended and used in a wide variety of medical conditions. In the 1950s, HBO2 was first used as a treatment, in addition to radiation,

for head and neck cancers and cervical cancer.

Many studies have been conducted to investigate possible therapeutic effects HBO2 as part of cancer management. Evidences showed that HBO2 improved tumor oxygenation, and treatment with HBO2 during irradiation has been shown to improve the radiation response of many solid tumors. It was used for delayed radiation injuries for soft tissue and bony injuries, for symptomatic radiation reactions of the urinary bladder and the bowel, for laryngeal radionecrosis, for radiation-induced optic neuropathy, for radiation-induced proctitis and for radiation-induced necrosis of the brain.

Time-gated  
florescent image of  
cells incorporating  
light activated drug



HBO2 also increases sensitivity to chemotherapy. A significant improvement in tumor response was obtained when photodynamic therapy (PDT) was delivered during hyperoxygenation.

These studies were extensively reviewed and rational scientific basis for further investigations was discussed. The possibility of combining HBO2, PDT and photosensitizers to overcome primary and secondary carcinoma deserve extensive laboratory and clinical research works.

HBO2 is a relatively benign with few contraindications, even for active cancer patients.

*"Mundo vitam dare"*



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*The International Hyperbarics Association, Inc., is a coalition of doctors, parents, patients, corporate chamber-industry professionals, hyperbaric center owners, and above all members who are committed to the cause of medical hyperbarics.*

*Our members come to us from all geographical areas with one common goal— to share their knowledge and information regarding the latest hyperbaric news. Our driving force is our members, who are committed to do all we can "to give life to the world."*

— "Mundo vitam dare"

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### Infertility Research: Varicolectomy with HBOT

A 96-patient study shows great promise

Zhonghua Nan Ke Xue. 2006  
Jan;12(1):46-9.

[Effect of varicolectomy with hyperbaric oxygenation in treating infertile patients with varicocele]

[Article in Chinese]

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OBJECTIVE: To explore the therapeutic effects of combination of varicolectomy with hyperbaric oxygenation (HBO)

in treating infertile patients with varicocele.

METHODS: Ninety-six patients were randomly divided into two groups: 40 patients in group A treated by varicolectomy with HBO, and 56 in group B treated by solitary varicolectomy.

RESULTS: The sperm density, sperm motility, sperm vigor, normality, serum testosterone, the pregnant rate of patients' spouses were improved respectively in both two groups ( $P < 0.01$  or  $P < 0.05$ ), and group A had better results than group B ( $P < 0.05$ ). LH, FSH in group A decreased significantly after the therapy. Group A had higher sperm penetration assay (SPA) percentages than group B ( $P < 0.05$ ), and the pregnant time of patients' spouses in group A was earlier than that in group B ( $P < 0.05$ ).

CONCLUSION: Varicolectomy with HBO can more effectively regulate reproductive hormone, improve semen quality, SPA index and pregnant rate than solitary varicolectomy in treating infertile patients with varicocele and can markedly shorten the pre-pregnant time.

#### A closer Look



Figure 1. A: The large varicocele can be seen through the scrotal skin.  
B: Illustration of a patient with a large left-side varicocele.

Varicolectomy is the most common operation performed for male infertility.

Varicocele is found in approximately 10-15% of unmarried military recruits, 35 % of infertile men who have never fathered a child and 81 % of men who were once fertile but are now infertile (secondary infertility).