HYPERBARIC OXYGEN CHAMBERS

Baromedic Healthcare Pvt. Ltd

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Baromedic Healthcare Pvt. Ltd; is a company established in 2012 with the sole objective of promoting Baromedic healthcare products and treatments in the world market.

The company is promoted by professionals who have more than 20 years of experience in the field and has developed indigenously the technology for the manufacture of Hyperbaric chambers.

In past 10 years time, we have done installations in the Defense Establishments and various Hospitals in Indian market

Our HBOT chambers meet ASME-PVHO1-NFPA CODES & undergo a multi-stage inspection at the design, manufacturing, assembly, shipping and installation levels to ensure patient safety and maximum results.
What is HBOT?

- Hyperbaric oxygen therapy (HBOT) is breathing 100% oxygen while under increased atmospheric pressure.

HBOT Application

- HBOT is an effective treatment for acute and chronic tissue damages of all types—any cause, any duration, any location.

The Therapy

- When a patient is given 100% oxygen under pressure, hemoglobin is saturated, but the blood can be hyper-oxygenated by dissolving oxygen within the plasma.
- The patient can be administered systemic oxygen in pressurized chambers.
- The therapy can be used for routine wound care, treatment of most dive injuries, and treatment of patients who are ventilated or in critical care.
The role of Oxygen in our body...

- Oxygen floods areas that are oxygen starved to stimulate cell growth and regeneration.

- Hyperbaric oxygen acts as an anti-viral and anti-bacterial, as “bad” bacteria and viruses typically cannot tolerate oxygen.

- Hyperbaric oxygen is an immune modulator, supporting the immune system to bring T and B cells within normal function.

- Oxygen reduces tumor growth in cancer patients.

- Hyperbaric oxygen increases neural brain function due to oxygen saturation.

- Oxygen displaces toxins and other impurities to assist in detoxification of your system.

- Hyperbaric oxygen provides many other condition specific benefits.
Greatly increases oxygen concentration in all body tissues, even with reduced or blocked blood flow;

Stimulates the growth of new blood vessels to locations with reduced circulation, improving blood flow to areas with arterial blockage;

Causes a rebound arterial dilation after HBOT, resulting in an increased blood vessel diameter greater than when therapy began, improving blood flow to compromised organs;

Stimulates an adaptive increase in superoxide dismutase (SOD), one of the body's principal, internally produced antioxidants and free radical scavengers; and,

Aids the treatment of infection by enhancing white blood cell action and potentiating germ-killing antibiotics.
Vasoconstriction = Reduces Edema and Swelling

Aniogenesis and proliferation of fibroblasts

Enhancement and regulation of the immune system

Antibacterial on its own and Leukocytes (WBC) kill bacteria more efficiently

Endothelial cell proliferation, resolves brusing and reduces scarring

Slight Ph shift to Alkaline, body temperature regulates

Enhancement of some antibiotics. WBC oxidative killing synergism

Collagen synthesis and cross linking

Healing of nerve Endings and reduction in pain and pain cycles
HYPERBARIC OXYGEN TREATMENT

HYPERBARIC: The Complete Treatment

- Oxygen diffusion in plasma is optimised
- Destroys harmful bacteria
- Reduces swelling (oedema)
- Aids in reduction of stress related symptoms
- Improves the effectiveness of the immune system
- Improves blood flow (Ischemia)
- Assists in reducing inflammation
- Addresses tissue hypoxia (provides more oxygen to tissues and organs)
HBOT can reduce lactic acid released from ischemic parts

HBOT increases ATP which is the energy factor used for nutrition and regeneration of tissues
**Conditions Treated With Hyperbaric Therapy**

**FDA Approved Conditions**

- Actinomycosis
- Air or Gas Embolism
- Carbon Monoxide Poisoning and Smoke Inhalation
- Gas Gangrene
- Cyanide poisoning
- Crush Injury and other Acute Traumatic Ischemias
- Decompression Sickness
- Diabetic Wounds
- Necrotizing Soft Tissue Infections
- Osteomyelitis (Refractory)
- Radiation Tissue Damage
- Severe Anemia
- Skin Grafts and Flaps (Compromised)
- Thermal Burns
**Conditions Treated With Hyperbaric Therapy**

**Off Label Conditions**

- ADD/ADHD
- ALS
- Alzheimer’s
- Anoxic Brain Injury
- Autism
- Bell’s Palsy
- Cancer
- Cerebral Palsy
- Chronic Fatigue
- Chronic Inflammatory Disease
- Crohn’s disease
- Decreased Immune Function
- Diabetes
- Fibromyalgia
- General Wellness/Prevention
- Heart Disease
- Infections
- Immune Dysfunction
- Lyme Disease
- Macula Degeneration
- Meniere’s Disease
- Migraines
- Mitochondrial Disorders
- Multiple Sclerosis
- Near Drowning
- Peripheral Neuropathy
- Post Electrocution
- Raynaud's Phenomenon
- Reflex Sympathetic Dystrophy Retinitis Pigmentosa
- Rheumatoid Arthritis
- Severed Limbs
- Sickle Cell Crisis
- Spinal Cord Injury
- Sports Injuries
- Stroke
- Surgery Pre and Post
- Traumatic Brain Injury Trigeminal Neuralgia
- Vascular Disease
- Venomous Bites
- *and other conditions*
HBOC Treatments...CASE STUDIES

Crush Injury motorcycle accident

HBOT in Multiplace chamber

Fungal Infection following C-Section

Post 06 HBO sits

HBOT Healing Power

Post Surgery & HBOT

Post Graft
HBOT can do adequate oxygenation for heart muscle (myocardium) through plasma in case of blockage of involved coronary artery.
# Hyperbaric Oxygen Therapy in Global Ischemia, Anoxia, and Coma

## Table 2

Human Studies

### Category I: Hyper Acute Period (0 - 3 hours post cerebral injury)

<table>
<thead>
<tr>
<th>Author</th>
<th>Date</th>
<th>Diagnosis</th>
<th>Number of Patients</th>
<th>Length of Coma/Neuro Insult Pre-Hyperbaric Oxygen Therapy (HBOT)</th>
<th>Timing of HBOT</th>
<th>HBOT Protocol</th>
<th>Results/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hutchison</td>
<td>1963</td>
<td>Global Ischemia/anoxia. Asphyxiated neonates (apnea). No in chamber ventilator support available.</td>
<td>65</td>
<td>3-38 minutes</td>
<td>3-38 minutes</td>
<td>2-4 ATA/30 X 1, 14 patients treated more than 1</td>
<td>79% resuscitation rate (25% died later of other causes). Overall, 55% discharged from hospital “well”. Most deaths due to Hyaline membrane disease or stillborn.</td>
</tr>
<tr>
<td>Ingvar</td>
<td>1965</td>
<td>Coma; progressive thrombotic CVA of the brainstem. Patient was pre-terminal</td>
<td>1</td>
<td>Not mentioned</td>
<td>“At signs of failing circulation”</td>
<td>“2.0-2.5 ATA… for 1.5-2.5 hours”</td>
<td>Rapid awakening in chamber with increase in blood pressure and decrease in heart rate. Death shortly after the end of 1 HBOT.</td>
</tr>
<tr>
<td>Saltzman</td>
<td>1965</td>
<td>“Various forms of cerebral ischemia.” Some in coma but only 5 of 25 is level of consciousness specifically identified.</td>
<td>25 (2 patients in coma in hyperacute or acute coma, 23 patients a few hours to 30 days after CVA)</td>
<td>1. 5 hours 61 year old patient with stupor and hemiplegia, suspected embolic clot. 2. 2.5 hours 58 year old with deep coma and hemiplegia, suspected air embolism</td>
<td>1. 5 hours 2. 2.5 hours</td>
<td>1. 2.02 ATA/ &gt; 1 hour, 1 treatment. 2. 2.36 ATA/ 5 hours, 1 treatment</td>
<td>First patient dramatic awakening five minutes into HBO with improvement in hemiplegia. Discharged from hospital with mild residual deficit. Second patient dramatic awakening 10 minutes into HBO with improvement in hemiplegia. Discharged from hospital with only partial paralysis of the right leg. Remainder of patients probably described in Heyman study: 3 patients dramatic temporary improvement, 8 patients less dramatic temporary improvement, 12 patients no change during HBOT. 24 of 25 patients with only 1 treatment. One patient with 3 treatments.</td>
</tr>
<tr>
<td>Viart</td>
<td>1969</td>
<td>Hepatic coma infants (2 viral, 1 toxic); HBOT plus exchange transfusions</td>
<td>3</td>
<td>Not mentioned</td>
<td>Not mentioned</td>
<td>Not mentioned</td>
<td>One died of pulmonary oxygen toxicity with “36 hours of HBOT”, two survived. All three with normalization of consciousness.</td>
</tr>
</tbody>
</table>
Transportation of Oxygen in the Human Brain Under Hyperbaric Conditions

Oxygen (O₂) molecules become smaller under hyperbaric pressure and therefore more soluble. The smaller size allows oxygen to dissolve into all body fluids - plasma, cerebrospinal, interstitial, lymphatic, and synovial.

Under normal conditions, O₂ binds only to the hemoglobin (Hb) in red blood cells and is transported to the brain by blood supply.

Under hyperbaric conditions, the brain is saturated by oxygen, allowing O₂ to reach areas previously inaccessible by blood supply or blocked by damage.
1. HBO reduces chance of stroke recurrences.
2. HBO relieves muscle spasticity and increases muscle strength.
3. HBO improves mobility and fine motor function.
4. HBO improves walking and balance.
5. HBO increases exercise capacity.
6. HBO improves sensitivity.
7. HBO improves mental function including speech and memory.
8. HBO improves visual acuity.
9. HBO improves bowel and bladder control and reduces sexual deficit.
STROKE
HBO reduces chance of stroke recurrences
Hyperbaric Oxygen Therapy for Diabetic Foot Wounds

Before

After

Before

After
A diabetic patient was referred for HBOT of his Wagner Grade III diabetic foot ulcer which was non-healing after one year, with amputation planned within 24 hours.

After three weeks (26 HBOT sessions) his wound showed considerable healing.

After 50 completed HBO sessions healing is evident.
Hyperbaric Oxygen Therapy for Diabetic Foot Wounds

Before

After HBOT
Success of a graft after multiple HBOT sessions

Before

After
Delayed Radiation Injury (Soft Tissue and Bony Necrosis)
Necrotizing Soft Tissue Infections
A non-healing Achilles tendon rupture following dehiscence of the suture line. After a second failed attempt at suturing the wound, HBO therapy was considered.

The wound completely healed after 20 HBO treatments at 2.0 atmospheres absolute for 90 minutes, each with routine wound care and supplemental oral antibiotic therapy.
Arterial Insufficiencies:
Central Retinal Artery Occlusion

Visual improvement has been reported even with delay of HBOT.
Mrs. J has been having problems with her legs for about 10 years. She had Varicose veins and developed chronic venous stasis ulcers. Her skin had formed open sites that didn't bleed and didn't hurt. But a foul-smelling odor and constant drainage had kept her from leaving her house. Through a strict regimen of debriding and customized dressings and Hyperbaric Oxygen, her wound healed completely in a matter of weeks. Efforts were then made to improve her diet, start her on a walking program, and lace her in customized stockings. Today, she's not only wound-free for the first time in a decade, she also has better circulation in her legs.
This is the foot of a 48 years old, diabetic and smoker. He had been feeling extremely sick and started complaining of his feet bothering him. Thinking that it would just get better with time and rest he stayed at home and in bed. When the problem started becoming unbearable, he decided to have a doctor look at his feet who diagnosed he had cellulites of the feet. He was then admitted for IV antibiotics and further wound care. He continued this treatment including debridments for the next week. Ten days later, he was able to leave the hospital walking on both feet.
64 year old female insulin dependent diabetic, 18 days post femoral anterior tibial bypass. Post op wound infection grew out pseudomonas and failed to heal. Completely healed with 40 HBO treatments and skin grafting.
55 year old female post transmetatarsal amputation secondary to gangrene of the hallux. Wound healing impaired by chronic steroid therapy for arthritis. Complete healing after 37 adjunctive hyperbaric treatments.
52 year old male post surgical excision of cancer of the floor of the mouth followed by radiation therapy. Presented with osteoradionecrosis of the mandible and oral cutaneous fistula which failed to heal with conventional therapy. Complete resolution with a total of 91 Hyperbaric treatments and two flap procedures.
Our Product: Hyperbaric Oxygen Chamber

Our products conform to ASME-PVHO I-NFPA codes and standards
Our Product: Capacity & Specifications (M - 8)

**Main Chamber Capacity**
- Two Beds and Four Seats OR
- One Bed and Six Seats OR
- Eight Seats OR
- Customized - Combination to be specified while ordering

**Air Lock Chamber Capacity**
- One Seat

**Chamber Specifications**
- Length (overall) : 7000 mm
- Inside diameter : 2400 mm
- Length (Main chamber) : 5500 mm
- Length (airlock chamber) : 1500 mm
- Access door opening : 800 mm W x 1800 mm H (Rectangular)
- Penetrations Additional 4 nozzles, 50mm dia will be provided at suitable location..
- Working pressure : 3 ATA
- Pressurization rate : 0.1 kg/cm²/minute to 0.25 kg/cm²/min adjustable
Our Product: Hyperbaric Oxygen Chamber M 3

Our products conform to ASME-PVHO I-NFPA codes and standards
Our Product: Capacity & Specifications ( M-3 )

Main Chamber Capacity
- One Bed OR
- One Bed and Two Seats OR
- Four Seats

Chamber Specifications
- Length (overall) : 3400 mm
- Inside diameter : 1500 mm
- Length (Main chamber) : 2800 mm
- Access door opening : 800 mm W x 1100 mm H (Rectangular)
- Penetrations Additional 2 nozzles, 50mm dia will be provided at suitable location..
- Working pressure : 3 ATA
- Pressurization rate : 0.1 kg/cm²/minute to 0.25 kg/cm²/min adjustable
PRODUCT UTILITIES FOR M-8 & M-3

UTILITIES

- Medical lock for main chamber
- Intercom /Sound powered communication system
- Oxygen & Carbon dioxide monitors with alarm
- CO2 Scrubber
- Fresh air ventilation
- Oxygen masks with dump facility for exiled CO2. with built in microphone.
- Entertainment facility
- Air conditioning of chamber for comfort
- Optional patient monitoring system for ECG, EEG, Pulse oxymetry etc.
- Optional PC-PLC based controls with HMI interface & data logging and Patient history spread sheet
- 100% Redundancy with auto and manual controls.
- Breathing quality air supply
- Detailed documentation with hard & soft copies and on line support through Team viewer software.
• Air Supply System with Ventilation
• Inter Communication System
• Oxygen Supply System with masks
• Temperature & Humidity System
• Closed Circuit TV
• $O_2$ and $CO_2$ Analyzers
• Fire Fighting System
• PLC based SCADA system
HYPERBARIC OXYGEN CHAMBERS : SYSTEMs

- Manufactured as per ASME- PVHO 1-NFPA
- 3rd Party design certification
- Material Selection
- Q.A.P. of process
- Certified Welders
- Radiography of Joints
- FEA for safe stress levels as per standards
- View Port manufacturing facility

ASME International
HYPERBARIC OXYGEN CHAMBERS : SYSTEMS

BREATHING QUALITY COMPRESSED AIR SYSTEM

- Breathing Quality Air
- Oil Free compressors
- 3 Stage Ultra Filters
- All valves with class 6 leakage standards
- Certified SS pipeline welding (Argon Arc welding)
- Zero Failure rate
- Redundancy in system

Ingersoll-Rand

ELGI
HYPERBARIC OXYGEN CHAMBERS : SYSTEMS

Oxygen System

- Oxygen Manifold
- Oxygen Masks designed for patient comfort
- Ensures 100% delivery of Oxygen
- Needs a positive pressure during inspiration, amount of pressure is patient dependent
- Exhaled gases are released outside the treatment area
HYPERBARIC OXYGEN CHAMBERS : SYSTEMS

Oxygen System

Oxygen Hoods

- Useful for patients who experience difficulty with mask
- Patient friendly, maintains eye contact
- Used in children
HYPERBARIC OXYGEN CHAMBERS: SYSTEMS

COMMUNICATION SYSTEM

- Sound Powered Two-way Handset
- Two-way microphone unit
- One to many Broadcasting
- Closed Circuit Cameras with remote pan and tilt functions.
  (Wireless option available)
CLIMATIC SYSTEM

- Maintains comfort conditions inside the chamber during treatment
- Uses Pneumatically operated Motors
- Parameters controlled by means of Controller with calibrated sensors

22 °C 55 % RH
HYPERBARIC OXYGEN CHAMBERS : SYSTEMS

PATIENT MONITORING SYSTEM

- Gathers on-line information of Patients condition
- Datalogging facility of different parameters
- Patient history can be viewed
- Infrared system For Data Transmission
HYPERBARIC OXYGEN CHAMBERS : SYSTEMS

SAFETY SYSTEM

• Real time $O_2$ and $CO_2$ monitoring system
• Self Programmable Hi-Low limits & Audio/ Visual Alarms
• Fire fighting system as per NFPA standards for quick response
• Flameproof wiring
• Flameproof paints & fabric for upholstery.
HYPERBARIC OXYGEN CHAMBERS: SYSTEMS

PLC & SCADA SYSTEM

- SCADA based command and control.
- Auto/Manual option
- Centralized control
- Data logging
- Report generation
MULTI UTILITY CONTROL PANEL

Centralized Control of all Parameters. Ergonomically Designed
HYPERBARIC OXYGEN CHAMBERS : INSTALLATIONS

We have successfully Manufactured, Installed and commissioned Hyperbaric Chambers at following locations:

- 4 Bed +4 Seats Chamber at Leh
- 2 Bed + 4 Seats Chamber at Indraprasth Apollo Hospital, New Delhi
- 1 Bed Chamber installed at Sikkim
- 2 Bed Chamber at Apollo Hospital, Ahmedabad
- 2 Bed Chamber at Kargil
- 2 Bed + 4 Seating Chamber at IAM, Bangalore
- 2 Bed+4 Seatung Chamber at Oxymed Hospital, Chennai
- 2 Bed+4 Seats Chamber at Godrej Memorial Hospital, Mumbai
- 2 Bed+4 Seats Chamber at Yashwantrao Chavan Hospital, Pune
BAROMEDIC HEALTHCARE PVT LTD. Has technology transfer agreement with Kasco Industries who have MOU with DRDO Lab. For manufacturing Hyperbaric & Hypobaric chambers as per ASME-PVHO I-NFPA
Certificate of Compliance
From ABS
Conforming to
ASME-PVHO I & NFPA Standards
Core Competence

- Experienced Design team with expertise in Finite Element Analysis as per ASME - PVHO I
- Well established manufacturing facility
- Third party approved and certified designs
- Implementations of latest NFPA safety standards
- State of the art View Port manufacturing as per ASME-PVHO I
• Certified compressed air and oxygen pipeline

• State of the art Control Panel and monitoring systems

• Experience in setting up total Hyperbaric facilities as per Standards

• Back up provided by Panel of experts in Implementing HBOT
Conclusions

• We are poised at an exciting era of the revival of Hyperbaric Medicine.

• Must familiarize referring Physicians with recent research and remove skepticism of the sixties

• Strict scientific and ethical practices must be followed.

Our patients need the best that medical science can offer to alleviate suffering. We as physicians must do all we can to ensure early recovery and minimal morbidity.
HYPERBARIC OXYGEN CHAMBERS : INSTALLATIONS

Two Bed Chamber at Apollo Hospital
Monoplace Chamber with Air Lock Chamber at North Sikkim
HYPERBARIC OXYGEN CHAMBERS : INSTALLATIONS

2 Lying+4 Seating Chamber for IAM, Bangalore
HYPERBARIC OXYGEN CHAMBERS : INSTALLATIONS

HBO CHAMBER AT GODREJ HOSPITAL, MUMBAI
MODEL M3 INTERIOR
ONE BED & TWO SITTING PATIENTS
MODEL M8: 2 BEDS & 4 SEATS OR 1 BED & 6 SEATS OR 8 SEATS COMBINATION AVAILABLE
Installation

- Installation and Commissioning is done by an Expert team of BHPL
- Installation is offered for certification and Certificate obtained by BHPL
- Periodic visits undertaken by BHPL team to Supervise and verify the Performance
- On line support by our expert team is offered for operations of the system

Training

- Documented Operating Procedures are provided for the operations of the HBOT Centre
- On site Training for Doctors and Nurses are Provided by BHPL Team
- Periodic visits for up gradation of training and discussions on case Histories is arranged
- On line access to Expert Doctors is provided for support and help
Our Support – *Installation and Training*...

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Thank You

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