NORMOBARIC CHAMBERS

## 1. Why normobaric chambers may be interesting to you?

The natural conditions in which we live are generally considered the most favourable for human health and life. However, there are opinions that this view may be wrong. Many specialists indicate selected parameters of the atmosphere in which we live. These parameters include: atmospheric pressure and the composition of air: **oxygen, carbon dioxide and hydrogen.**
Current observations show that certain changes of these parameters may unlock natural processes of regeneration and health improvement in human body. These changes of atmosphere parameters may be implemented in a normobaric chamber.

Normobaria is little known area of science. In Poland Dr. Jan Pokrywka is one of its pioneers. He built a normobaric house, where he lives examine his patients.
His observations suggest that a therapy with increased baric pressure in the atmosphere with altered composition, may improve patient health by:

- increasing body oxygenation by providing better oxygen saturation of our cells,
- increasing the production of stem cells,
- reducing inflammation,
- stimulating the production of collagen and elastin that improve skin elasticity,
- enhancing mental and physical performance of the body as well as memorization and concentration abilities.

The observations of Dr. Jana Pokrywka indicate that the therapy in normobaric chamber often brings many beneficial effects. Many patients are offered with new opportunities to take care of their health, including slowing down the ageing process, rebuilding cells after trauma e.g. stroke and cancer.

Normobaric chambers are present on the Polish market and used for regeneration and biological renewal. They were also used to conduct a research evaluating the influence of a controlled normobaric environment on vascular endothelial functional parameters, cardiovascular functional parameters and on the autonomic nervous system, as well as on cognitive functions. The research was carried out by a team of scientists managed by Prof. Pawel Zalewski of Collegium Medicum of Nicolaus Copernicus University in Torun.
If the current observations are confirmed by scientific studies, normobaria may become effective form of adjuvant therapy for conditions such as stroke, cerebral palsy, heart attack, multiple sclerosis and asthma. Wide availability of normobaric chambers may provide a new quality in the approach to the preventive healthcare.

## 2. How does the normobaric chamber work?

**a) Comparing the atmosphere parameters the normobaric chamber to hyperbaric chamber and average atmospheric conditions:**

| | Conditions in the normobaric chamber | Conditions in the hyperbaric chamber (depending on the exposure) | Average atmospheric conditions at the sea level |
|---|---|---|---|
| Pressure | 1 500 hPa | 1 500 - 3 500 hPa | approx. 1 000 hPa |
| Humidity | max. 65% | 40-60% | 30-60% |
| **The composition of air** | | | |
| - oxygen ($O_2$) content | 35-40% | 22-99% | 20,94% |
| - $CO_2$ content | 0,5-1,5% | approx. 0.03-0.08% | 0,036% |
| - hydrogen ($H_2$) content | 0,50% | approx. 0% | 0,0001% |
| - nitrogen (N) content | approx. 60% | approx. 0-77% | 78,08% |

**b) The importance of these parameters for human health**

### OXYGEN

Oxygen is absolutely necessary to sustain life processes in the body. We may survive without food for weeks or days without water, but we would die in a few minutes without oxygen. Human body needs oxygen to convert carbohydrates, fats and proteins present in our diet into heat and energy. This process is called metabolism. Oxygen is an essential element in the respiratory processes of most living cells. One of the main functions of oxygen is to sustain life in medical and biological meaning.

### CARBON DIOXIDE

To oxygenate the body at the cellular level, the arterial blood must include not only the appropriate amount of oxygen but also carbon dioxide. Only then, these gases may act in synergy. The increased carbon dioxide content in the blood allows human cells to better absorb oxygen, facilitating the disconnection of oxygen from haemoglobin in the capillaries where it is most needed.

Oxygen entering the capillary cells is connected with haemoglobin located in the erythrocytes. Haemoglobin is a protein with a high affinity with oxygen: 1 molecule of haemoglobin binds four molecules of oxygen. This connection is transient and bound haemoglobin is known as oxyhaemoglobin.

Formation of oxyhaemoglobin is influenced by the amount of carbon dioxide - at low concentrations of this gas (as in pulmonary alveoli), haemoglobin easily binds with oxygen. In this way the bound oxygen leaves the lungs and travels to the body tissues.

In the tissues, due to high concentrations of carbon dioxide, oxyhaemoglobin disintegrates and the released oxygen diffuses into the cells.

$CO_2$ reduction in blood increases binding of oxygen with blood haemoglobin of blood, thus preventing oxygen release and restricting the flow of oxygen to the cells (Bohr's effect), causing their hypoxia. Moreover, increasing the amount of $CO_2$ causes the release of oxygen from the oxyhaemoglobin and thereby higher oxygenation of the cells.

Carbon dioxide is essential for the release of oxygen in the capillaries.

## HYDROGEN

Hydrogen acts on the cells of the human body as an antioxidant, anti-inflammatory and anti-apoptosis factor. Oxidative stress is the imbalance between oxidants and antioxidants, i.e. between the amount of antioxidants and free radicals in the body.

Excess in production of free radicals is often caused by unhealthy lifestyle.

The consequences of body contamination are serious diseases, including cancer, respiratory diseases and kidney diseases or hormonal abnormalities. People may also suffer diseases of the nervous system, e.g. Parkinson's or Alzheimer's disease, as well as problems with the cardiovascular system which may cause a heart attack.

There are different ways to combat the antioxidant stress, such as a proper diet rich in vitamin C, A and E. The reduction may be also obtained by providing the body with an increased amount of hydrogen.

## INCREASED ATMOSPHERIC PRESSURE

Research in hyperbaric chambers have shown that breathing pure oxygen at increased pressure, increases the solubility of oxygen in blood plasma several times compared with breathing ambient air.

Oxygen starts its travel to tissues in the quantities that are not achievable by organism in standard conditions. The increased pressure makes the transfer of oxygen to tissues possible also in case of severe shortage of haemoglobin, and in theory even in its total absence.

Staying in a place with higher pressure also increases the number of stem cells that are used for the regeneration of body cells.

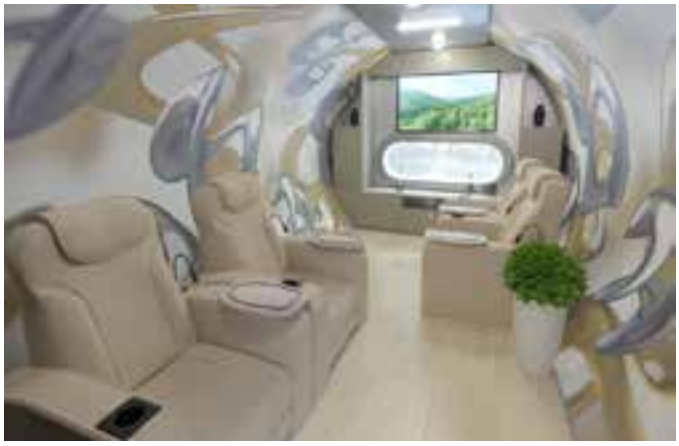
## 3. What is normobaric chamber?

Normobaric chamber is a place where the human body may oxygenate. It is a pressure chamber, made of steel in the shape of a cylinder, which may be used at the same time by several people (our normobaric chambers are designed for 11-40 persons). The chamber may consist of several rooms equipped in a manner enavling a whole-day stay. The pressure in the chamber is normobaric is approx. 1500 hPa.
The chamber is equipped with an airlock which allows users to enter and exit at any time without the need to change the parameters inside the chamber, ensuring quick adaptation of human body to an elevated pressure. Inside, there are relaxation areas and other utilities (including a bathroom).

Until recently, Poland had only one operating normobaric chamber (constructed in 1339), which was installed in Szczawno-Zdrój, a spa town near Walbrzych. It was used to treat patients suffering from asthma and other respiratory diseases. . The chamber was called the pneumatic chamber.

**Exterior of modern normobaric chamber with the entrance airlock:**

**Interior of the chamber: relaxation room and VIP room.**



The oxygen therapy has been studied in Poland and around the world for many years. Its effects and advantages were revealed by using hyperbaric chambers.

## 4. What is hyperbaric chamber?

Hyperbaric chamber is also a place where the human body can oxygenate. It is a special room, often in the shape of a cylinder, which may be used by one or several people, where pure oxygen is supplied at elevated pressure up to 3500 hPa.

This chamber has no airlock, which result in the need to reduce or increase the pressure each time a person wants to enter/exit the chamber.

How it used to be ...

Our new design ...

| | Normobaric chamber | Hyperbaric chamber |
|---|---|---|
| **Purpose** | Oxygen therapy - providing an increased amount of oxygen under pressure. Oxygen gets into the blood, lymph and cerebrospinal fluid, which nourishes the brain and spinal cord. | Oxygen therapy - providing an increased amount of oxygen under pressure. Oxygen gets into the blood, lymph and cerebrospinal fluid which nourishes the brain and spinal cord. |
| **The composition of the ambient atmosphere** | Pressure: 1500 hPa, oxygen, carbon dioxide, hydrogen. | Pressure 1500 - 3500 hPa. |
| | 37% of oxygen. | 99% of oxygen. |
| | Effect - increased tissue oxygenation by $CO_2$ and $H_2$. | Effect - tissue oxygenation. |
| **The material of the chamber** | Black steel. | Steel, plastic, or metal. |
| **Assembly** | Outdoor - near the existing infrastructure with access to utilities such as electricity, water, sewerage. | Inside a building - it does not require the supply and drainage of water. |
| **Access** | Unlimited - no changes in air parameters, free entrance and exit through the airlock. | Limited - pressure must be adjusted each time the chamber is opened and closed. |
| **Number of persons** | max. 40 | 1 to several people at the same time. |
| **Time spent in the chamber** | No limits. | 1.5 h max. |
| **The effects of prolonged use of the chamber** | None. | Headache, vomiting, fatigue. Oxygen toxicity, chemical lung disease with a single stay longer than 1.5 h. |
| **Rules of using the chamber** | Smoking is prohibited. | Very strict adherence to safety standards due to the possibility of explosion (cotton clothes and linen underwear, no make-up, no jewellery, no shoes, no metal objects, no mobile phones, computers, etc.. |
| | Possibility of watching TV, listening to music, using mobile phones, computers, free movements, eating, drinking etc. | It is absolutely prohibited to smoke, eat and drink in the chamber. |
| | | Hyperbaric oxygen therapy requires special supervision during the treatment and often a medical referral. |

| | Normobaric chamber | Hyperbaric chamber |
|---|---|---|
| **Indications** | Treatment of hard-to-heal wounds. | |
| | Acceleration of recovery after surgery. | |
| | Chronic diseases of the skin psoriasis, urticaria, rash, erythema, atopic dermatitis, acne). | |
| | Diseases associated with tissue hypoxia. | |
| | Treatment of oedema. | |
| | Cardiovascular diseases (atherosclerosis, hypertension). | |
| | Nervous system diseases. | |
| | Autoimmune diseases and other chronic inflammatory diseases. | |
| | Chronic fatigue. | |
| | Slowing down the ageing process. | |
| | Oxygenation of all the cells of the body. | Decompression sickness. |
| | Limiting inflammation. | Carbon monoxide poisoning. |
| | Accelerates development new blood vessels. | Necrotizing infections and acute soft tissue ischemia. |
| | It stimulates the regeneration of the epithelium and the production of collagen and elastin that are responsible e.g. for skin elasticity. | Musculoskeletal and multi-organ injuries. |
| | It improves mental and physical abilities of the body. | Thermal burns. |
| | It increases the ability to memorize. | Idiopathic sudden hearing loss. |
| | Perfectly oxygenates all the body cells. | Diabetic foot syndrome (lll-IV degree of Wagner scale). |
| | | Infection, ulcers, inflammation. |

| | Normobarische kamer | Hyperbare kamer |
|---|---|---|
| **Contraindications** | None. | Haemorrhage. |
| | | Certain lung diseases. |
| | | Pacemaker. |
| | | Pregnancy. |
| | | Optic neuritis. |
| | | Fever. |
| | | Pneumothorax and lung surgery within the chest. |
| | | Convulsions. |
| | | Acute ear disorders. |
| | | Sinusitis. |

**Reservation:** Information on the effects of normobaric environment is based on empirical observations and experiments conducted over the past few years by Dr Jan Pokrywka. Provide information is of demonstrative character and has not been confirmed by scientific research.