INTRODUCTION

This presentation contains a collection of information on the product AIRZONE.

As the only technology distributor, we would like to present you the benefits it brings innovative application of devices causing the hypoxia phenomenon.

Hypoxia is a phenomenon of oxygen deficit in tissues, leading to insufficient oxygenation of the body. The beneficial effects of hypoxia in the environment has been known for years, leading to athletes commonly opting to train in the high-altitude areas of mountains in order to improve their physical performance. Spending several weeks in such conditions helps body increase its physical capacity, which significantly improves athletic performance.

This effect, caused by slight hypoxia, induces specific body adaptations, which, after returning to lowland conditions (sea level) results in an increase in physical capabilities (improved sport performance).

The first devices that used the hypoxic environment appeared in the late 1990s. They allow to induce the body responses in lowland conditions which are similar to high-altitude settings.

With the AIRZONE system, athletes do not need to leave for high-mountain camps, because hypoxic effects are attainable in specially adapted rooms.

AIRZONE is developed by Polish scientists and engineers in the form of permanent rooms, mobile spaces and tents in which atmospheric air is modified by lowering or increasing the oxygen concentration.

This allows for the creation of specific conditions of hypoxia (high-altitude conditions) or normobaric hyperoxia (conditions of increased O2 concentration). The entire process occurs without changes in atmospheric pressure. Also, the technology allows users to control and regulate temperature and humidity of indoor air, even over very extreme ranges. With innovative technological solutions, users can adapt small spaces, large halls and individual sports devices to suit their needs.

Unique features of AIRZONE products include:
- safety of use,
- ease of use,
- effectiveness.
By reducing blood and tissue saturation with oxygen, a number of physiological (adaptive) responses are triggered in the human body, aimed at improving the supply of oxygen to cells. The primary response is the increase in the secretion of the hormone erythropoietin (EPO) in the kidneys, which is responsible for increasing the production of red blood cells in the bone marrow.

Consequently, the concentration of haemoglobin in the red blood cell rises, leading to increased oxygen transport to working muscles.

Changes are observed also in the muscles themselves, including the formation of new blood vessels (angiogenesis) or an increase in the activity of oxidative enzymes used to generate energy during physical exercise.

Thanks to these adaptations, the use of oxygen supplied with blood to muscles is improved. Hypoxia also leads to the improvement of oxygen transport in the body and its use in tissues.

Laboratory investigations have shown that the use of hypoxia opens up opportunities for improving the human capacity up to 10%, which significantly translates into improved sports performance.
THE EFFECTS OF HYPOXIA

REDUCTION IN THE OXYGEN SATURATION

By reducing the oxygen saturation of the blood, a number of adaptive reactions occurs in the body, aimed to improving the oxygen supply to tissues and its effective use in tissues.

ERYTHROPOIETIN

The basic adaptive reaction to long-term hypoxia is the production of the hormone erythropoietin (EPO) in the kidneys, which is responsible for increasing the production of erythrocytes in the bone marrow. As a result, oxygen transport to working muscles improves.

CHANGES IN MUSCLES

The muscles undergo changes such as: density of the blood vessels network, increase in the density of mitochondria, increase in the activity of oxidative enzymes used to generate energy during activity. Thanks to this, the use of oxygen supplied with blood is improved in the muscles.

IMPROVED SPORTS RESULTS

Laboratory tests indicate that the use of hypoxia together with optimal training gives the opportunity up to 10% improvement in the body’s efficiency, which significantly causes into an improvement of sports performance.
As a result of the conducted research, the following adaptation mechanisms were determined to the state of hypoxia affecting the improvement of exercise capacity.

**INCREASE IN HEMOGLOBIN**

*to 10%*

**NON-HEMATOLOGICAL CHANGES**

**improvement of aerobic capacity (long-term efforts > 2min)**
- intensification of angiogenesis (formation of new blood vessels)
- increase of myoglobin concentration in muscles
- increase in cardiac output
- increase of the density of mitochondria in muscle cells
- reducing the energy cost of effort (lower O₂ consumption)

**Improving anaerobic capacity (short-term efforts <2min)**
- increase in buffer capacity of blood and tissues by 8-15% (improvement of non-oxygen efficiency)
- increase of glycotic muscle activity (improvement of anaerobic capacity)
BENEFITS OF HYPOXIC TRAINING
USING HYPOXIC TRAINING, WE GAIN

Being or training in conditions imitating high altitude settings improves the body's endurance at sea level as well as in the specific mountain conditions, which gives athletes a real advantage over others.

By adapting the cardiorespiratory and muscular systems, athletes get the effect of improved stamina and endurance.

Correctly applied in the training process, hypoxia leads to the improvement in both aerobic and anaerobic capacity. Thanks to this, the body's ability to perform various types of exercise is enhanced, allowing to enjoy the benefits of better sporting performance in almost every sport.

The benefits of hypoxic training include:

- improving the body's capacity during hypoxia and increase in maximal oxygen consumption (VO$_{2\text{max}}$) and anaerobic threshold,
- an increase in the buffer capacity of blood and tissues, i.e. the possibility of intensive interval or anaerobic exercise,
- improvement of restitution, between efforts, stimulation metabolism and fat tissue burn
- increased muscle hypertrophy and strength gain along with resistance training
The inclusion of hypoxia as a result of a fire in the building, results in a decrease in the oxygen content in the air, which causes a slowdown in the spread of fire and minimized losses.
AIRZONE APPLICATION IN SPORT

Using the AIRZONE system, you can implement any of the popular methods of hypoxic training depending on the needs of the training process.

Thanks to the AIRZONE system, it is possible to create high-altitude conditions anywhere, which means that the climate can be used in everyday training to maximize its effectiveness.

The developed AIRZONE technology is the way to modern training of the future, in particular in disciplines in which due to the limited infrastructure in natural conditions are impossible.

Research on the most effective methods has led to the development of the following methods of high-altitude training:

- live high – train high – LH/TH
- live high – train low – LH/TL
- intermittent hypoxic training – IHT
The **AIRZONE** system significantly accelerates the recovery process.

Hypoxia stimulates the tissue regeneration process, which shortens the time of recovery.

Thanks to the rehabilitation in hypoxic conditions, users can significantly reduce the deterioration of the level of performance caused by the exclusion from the training process. This is particularly important especially in professional sports, where the recovery of an athlete is a real race against the time.
After exceeding 2500 m above sea level, the risk of acute mountain sickness increases sharply. In addition, incorrect acclimatization to high altitudes (> 5000m n.p.m.) may result in the development of high-altitude cerebral edema HACE, which is a direct life-threatening condition.

Training with AIRZONE system is a great tool in the preparation process before approaching high altitudes.

The exposure of the human body to the conditions similar to those observed at high altitudes induces a number of acclimatization processes. The aim of the acclimatization is to adapt to new environmental conditions.

If this process is started and continued before going to the mountains, the risks of the decline in physical fitness and developing acute mountain sickness is largely reduced.
HYPOXIC TRAINING IN HORSES

Hypoxic training is effective for improving athletic performance in humans. This training concept is effective for improving athletic performance of not only endurance athletes but also athletes in comparatively short-duration sports (Czuba et al. 2014, 2017, 2018).

The recent study of Ohmura et al. (2017) demonstrated that hypoxic training may have the potential to enhance normoxic performance of well-trained thoroughbred horses.

In clinical research trials which studied the length of hypoxic exposure necessary for increase in hematological variables, a minimum of 9-10 hours of hypoxia per day, delivered consecutively for 3 weeks was needed before the beneficial effects of altitude acclimatization were demonstrated on sport performance.
The results of many studies demonstrate that hypoxic training in horses has the ability to maximize the aerobic capacity as well as horse’s aerobic power output, resulting in the ability to sustain maximal power output for longer periods of time, and recover from these efforts more quickly.

With AIRZONE system you will improve effectiveness of the horses training, as well as reduce the time for recovery and the possibility of injuries after intensive training.

The AIRZONE altitude system for horses can have a form of an altitude stall or a single altitude chamber for a horse. An altitude chamber could be equipped with running treadmill for horses.
Application in type II diabetes

The AIRZONE system can directly improve the health of patients with T2D.

Studies have shown that suitably selected exercises performed in hypoxic conditions (above 2,500 m above sea level) allow for triggering in a short time responses based on the increasing contents of glucose transporters (GLUT), making glucose transport into the cells much easier and contributing to the reduction in blood glucose volume.

The greater content of glucose transporters is associated with the activity of the hypoxia-inducible factor (HIF). The same factor indirectly participates in the development of blood micro-vessels to effectively stop diabetic angiopathies.

Simultaneous physical exercises additionally contribute to the consumption of glucose and increased insulin sensitivity.

In addition, a reduction in the cholesterol levels is observed (Chiu et al. 2004, John et al 1995).

Application in obesity

The AIRZONE system is an effective tool in combating obesity. Training in hypoxic conditions allows users to expand the network of blood vessels in fatty tissue, helping burn fat faster and get rid of cellulite.

At the same time, with the hypoxic effect leads to a greater release of leptin, which reduces appetite and stimulates the release of free fatty acids, used as a source of energy during physical activity (Wiesner et al. 2009, Nikolaus et al. 2010, Lippi et al. 2010).

The benefit of training in hypoxia is that the resulting of changes adaptivity in the body persist much longer after its completion and thanks to further reduction of body fat will run more efficiently.

Staying in hypoxic conditions contributes to the increase in basic metabolic rate of up to 30% at an altitude of 4300 m (Butterfield et al. 1999), which is critical in combating obesity. It should be noticed that hypoxia leads to appetite suppression, which may contribute to easier weight loss (Kayser 1992).

Application in cardiovascular diseases

The AIRZONE system has also a very beneficial effect on the muscles. It has been shown that incidents of myocardial infarction are extremely rare in people living at high altitudes (Majid et al. 2011), which is caused by the cardioprotective effect of hypoxia.

During exposure to hypoxia, mitochondrial ATP-dependent potassium channels (mitKATP) in the myocardium are activated first. This leads to hyperpolarization of the cell membrane, which in turn causes reduced shrinkage, helping to save energy and oxygen.

Another positive factor is the stimulation of the vascular endothelium to release larger amounts of nitric oxide (NO) than usual. The greater presence of nitric oxide causes the expansion of the coronary vessels, allowing blood to flow through them into fully permeable vessels. Nitric oxide also releases hepatocyte growth factor (HGF), which has been demonstrated to have cardioprotective and regenerative effects (Kolar et al. 2004).
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