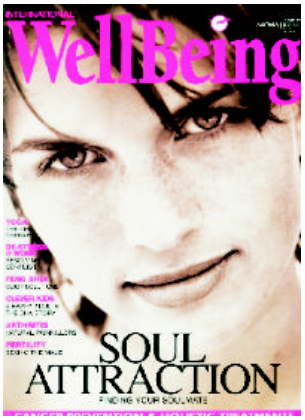

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INTERMITTENT HYPOXIC TRAINING

Rejuvenation, healing and enhanced athletic performance are just a few of the benefits

by Rosalba Courtney

Only a few times in my adult life can I remember feeling the unbounded exuberant energy of childhood and experiencing it continuously for days at a time – a feeling of my body being light and movement effortless, drawing energy from a seemingly bottomless well. One of those times was when I was trekking in the Himalayas, descending from an altitude of 5000 metres. Walking up had been a fairly gruelling experience, but on the way down I felt like I could walk all day and never tire.

High altitude for health

Athletes have known for many years of the benefits of altitude adaptation in enhancing performance. Using the principle of 'train high and live low', they have been able to perform better at sea level when their bodies compensate for oxygen levels lower than those found at altitude by becoming more efficient at utilising oxygen. What's more, altitude adaptation has implications well beyond giving elite athletes that extra edge. Russian medical researchers and others are finding increasingly that adaptation to altitude has tremendous potential for enhancing the health of the average person and modifying the course of many chronic illnesses. Are people who are acclimatised and live at altitude healthier than those living at sea level'? The answer seems to be a clear

diseases found commonly at lower altitudes occur less at high altitude. The Indian Army recorded the incidence of 18 different diseases in 130,700 soldiers stationed at altitudes from 3692 to 5538 metres over a period of seven years. When the rates of disease were compared to those found in soldiers on the plains, almost all diseases had a lower incidence at altitude. The occurrence of bacterial, viral or protozoan infections was significantly lower (except for amoebic hepatitis and lobar pneumonia). Diabetes, hypertension, ischemic heart disease, asthma, rheumatoid arthritis, several types of gastric disorders, skin diseases, psychiatric ailments (including neurosis and psychosis) and anaemia all occurred with much lower frequency when the soldiers were living at altitude.

Intermittent Hypoxic Training (IHT)

Living continuously at altitude for a period of months or years is not an option for most people. Russian doctors, in trying to find a solution to acclimatising pilots, athletes, mountaineers and cosmonauts to low-oxygen environments, discovered that adaptation to low-oxygen environments could occur rapidly in a clinical setting and without the side effects of altitude sickness. The oxygen levels found at altitude were administered in a controlled manner and given in measured intermittent doses. The technique became know as Intermittent Hypoxic Training (IHT), whereby oxygen levels of between 10 and 15 per cent (equivalent to an altitude range of 2500-6000 metres) are administered by a machine known as a Hypoxicator, which separates air through a semi-permeable membrane. The person is asked to breathe the high-altitude air for just a few minutes at a time while their blood oxygen levels are continuously monitored. They then breathe ambient or normal air for a few minutes, giving their body time to adjust back to normal conditions. The time spent alternating between low-oxygen air and normal air is 60 to 90 minutes at a time. The procedure is generally carried out once or twice a day for a total of 16 to 30 sessions. Researchers found that this technique allowed adaptation to altitude to occur with less stress to the body than continuous exposure to low oxygen. Because the dose and the blood oxygen levels are totally controlled, there is no danger of altitude sickness. The intermittent nature of the hypoxic exposure means the adaptation to lowland is not lost, as is the case in normal acclimatisation to altitude. Adaptation to intermittent hypoxia has the unique attribute of activating the body's own internal production of antioxidants in the brain, liver and heart as a result of the frequently repeated re-oxygenation that occurs on breathing room air. This differs from continuous hypoxia, which actually reduces

Adaptive Medicine and IHT

Since the beginning of time, living things, from simple viruses and bacteria to humans, have shown the seemingly miraculous ability to adapt to changes in their environment. In humans the process of adaptation is more efficient and more fascinating than in any other species. Our genetic characteristics and potentials are not fully expressed until something challenges us to adapt. In this way, challenges and stresses help us to develop strengths and abilities we might not otherwise have developed. As we adapt to one level of any environmental or even emotional stress, we become capable of handling even larger doses in the future. This ability is what enables, for example, weightlifters to lift unimaginable loads well beyond their own bodyweights. This is why our species (and all other currently living species) has survived and even thrived despite environment changes and times of extreme difficulty and social upheaval. IHT forms an important branch of an emerging new discipline called Adaptive Medicine. The Russian Academy of Medical Sciences has a Department of Adaptive Medicine, one of its aims being to look at the therapeutic potential of IHT. An International Academy of Adaptive Medicine was formed in 1990 by an interdisciplinary group of scientists and clinicians from many countries including Japan, Australia, Germany and the USA. Its aim is to develop further understanding and share information about the ways in which the adaptive process enables the body to respond to different stress stimuli, with a view to treating and preventing different diseases. The scientific definition of stress as given by Dr Hans Selye, one of the first researchers to really study stress in the laboratory, is: "A stressor is anything that challenges an organism to adapt." In this context, heat, cold, physical exercise, electrical stress, lack of food, hypoxia of altitude and even emotional or psychological turmoil are stress factors that can be used to strengthen us if we experience them in amounts we can tolerate and to which we scan adapt. Almost all of these factors have been used as means to help people restore health. On the other hand, too much of any of these stress factors, carried on for too long without sufficient recovery time, can exhaust the adaptive mechanism and contribute to disease rather than health. If you fast, use saunas or cold baths, begin an exercise program to get fit or undertake IHT, you are engaging the principles of adaptation for the restoration of health. One of the amazing things about adaptation is what's known as 'cross adaptation'. Adaptation to one type of stress or load will, to some extent, increase the body's ability to cope with

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stresses of another type. It is well know that a regular exercise program is associated with an increased tolerance to stress. Stress-related diseases such as hypertension, heart disease, ulceration of the stomach or duodenum, diabetes, dermatological diseases and disordered immunity have all been shown to have improved outcome with both exercise and IHT. Protection comes because the body becomes more tolerant and resistant to stress. Dr F Z Meerson, one of the most prolific writers and researchers in the field of Adaptive Medicine, describes in his book *Essentials of Adaptive*

- Fade away of the stress reaction
- Increased activity of the central and peripheral stress limiting systems
- Desensitisation of target organs

Using oxygen more efficiently

Oxygen deficiency is associated with many diseases. It has been postulated to play a role in many metabolic diseases, including

cancer, fatigue, epilepsy and poor neurological functioning. For this reason it might seem difficult to accept that hypoxia, or lack of oxygen, might actually be a more powerful healing factor than therapies that promote giving oxygen. IHT increases the efficiency with which the body takes up, transports and utilises oxygen. The heart and lungs are stimulated to increase their functions and even over the long term to increase in size. Blood vessels dilate and new capillaries are formed in the heart, brain and skeletal muscles. In the blood, levels of erythropoietin (EPO), haemoglobin and myoglobin increase. All these factors make the blood capable of carrying more oxygen. On a cellular level there is a growth of the cellular structures needed for the metabolism of oxygen. If you undergo IHT, the net effect is a decrease in the need for oxygen by about 20 per cent and an increase in the ability to use oxygen, as measured by VO2 max. Like a finely tuned motor vehicle, if you are adapted to altitude with IHT you can run on less fuel with less wear and tear to your 'motor'. And when you need to run in high gear you can do so and use all the fuel or oxygen you need to achieve maximum performance. Once the body has built the structures such as new capillaries, new blood components, new cells for the heart and lungs, new mitochondria and enzymes for using oxygen, it has increased its functional reserve and can extract more oxygen from normal lowland atmospheric air. The body now has an increased functional reserve that can offset fatigue and enhance areas of functioning in the body that require oxygen. If you were to rely on administered oxygen, like hydrogen peroxide or oxygen administered in a hyperbaric chamber, the effects might be available to the body for only the short length of time the oxygen is in your system,

IHT for inflammatory conditions

In general, IHT contributes to improved immunological status. The occurrence of allergies and inflammatory diseases decreases. This has been observed in continuous exposure to altitude, as well as with IHT. Studies have been able to show improvements to conditions of an inflammatory nature, such as arthritis, asthma, allergic rhinitis, auto-immune thyroiditis and inflammatory skin diseases. Even the difficult-to-treat and disabling disease rheumatoid arthritis showed a positive response, with seven out of 10 patients receiving IHT showing less inflamed joints, reduced pain and morning stiffness and reduced need for medication. All patients reported improved mood, sleep and appetite and increased . physical activity. Asthma has received particular attention, with several studies showing significant improvement. Observations made in the Netherlands have shown that asthmatics treated in climatic chambers that simulated altitudes of 1500 to 2550 metres improved rapidly, and with 60 to 100 treatments were 'cured'. This certainly fits with the common observation that asthmatics, despite their obvious fears about altitude, usually have less asthma and do much better at altitude. I have taught the Buteyko method for the past nine years. This highly successful method (also originating in Russia) teaches that hyperventilation and loss of carbon dioxide (which is anti- inflammatory and broncho-dilating) worsen the asthmatic condition. Inflammation in the lungs is one reason asthmatics hyperventilate. Another perpetuating factor to hyperventilation could be inefficient oxygen metabolism. Until this is improved, the asthmatic will continue to hyperventilate. The improved oxygen capacity observed after adaptation to hypoxia results in the oxygen required by the body being supplied with less volume of air needing to be taken in and less hyperventilation taking place. Recent experiences with patients on artificial ventilation indicate that the stress of breathing itself might adversely affect susceptible airways. Lower ventilation levels are associated with a 30 per cent lower mortality rate in patients with severe lung disease.

Effects on the brain

The effects of altitude on the functioning of the brain and neuroendocrine system are very interesting. The Eastern tradition of spiritual aspirants going to the mountains to purify the mind and elevate the spirit might have a physiological basis. The neurotransmitters dopamine and seratonin, associated with positive mood and calmness, showed quite a significant increase in people who underwent a three-week course of intermittent hypoxic acclimatisation. Norepinephrine, the neurotransmitter associated with increased activity of the sympathetic nervous system and the so-called 'fight or flight' response, was decreased.

Neurotransmitter	(n = 5)	(n = 10)	p
Norepinephrine	186	150	<0.05
Dopamine	132	167	<0.05
Seratonin	108	238	<0.01

Results from Russia

In Russia, IHT has been used and investigated for more than 20 years. The process of full acceptance and endorsement by the Russian Ministry of Health has been slow and arduous. Proponents of the technique had to prove in numerous clinical trials the efficacy of the technique for the enhancement of general health. Clinical trials on more than 300,000 people suffering such varied conditions as neurotic and psychiatric disturbance, heart disease, female gynecological disease, paediatric diseases and many other conditions were conducted over this time and showed positive results. One of the turning points in convincing authorities of the dramatic effects possible with this therapy came with a trial involving 49 women with various gynaecological conditions who had been unable to conceite or carry through a full-term pregnancy. Amazingly, 48 of the 49 women became pregnant and delivered healthy children. The children and mothers were then followed for two years and were found to be exceptionally healthy.

Improved athletic performance

At present in the western world, knowledge of IHT has been mainly among elite athletes. In the Sydney 2000 Olympics, the Australian swimming team and various competing individual athletes had access to a Hypoxicator. Canadian Simon Whitfield, while he was not considered a contender, surprised many by coming forward to win the men's triathlon. ***7ime*** *Magazine* reported that he "...ran the last 150 metres as though he'd done nothing more strenuous that morning than taken a shower". Based on findings among other athletes using IHT, it could be speculated that incorporating IHT into his training during the 12 months before the Olympics might have helped Simon give this outstanding performance.

Athletes in New Zealand have had access to IHT for the past 'Ovo years. A study by Dr John Hellemans, sports-medicine doctor from Christchurch and a world triathlon champion himself, showed that after 15 to 20 daily or twice-daily sessions of IHT lasting 60 to 90 minutes, athletes' performance improved by 2.9 per cent. Blood tests also showed that IHT stimulated red blood cell and haemoglobin levels and that this correlated with improvements in performance. Dr Hellemans suggests, 'The method of IHT can be strongly acommended for any serious athlete as part of their training and preparation." Dr Hellemans found that the results of using IHT were particularly successful for athletes suffering from fatigue and overtraining in recovering full functional capacity. One dramatic case study of an elite triathlete incorporating IHT in his normal training routine over a 14-day period showed a 7.25-second-per-kilometre improvement in performance time. In addition, his resting heart rate dropped from 35 to 28, his weight dropped from 68.7 to 67.9 kilos and his red blood cell .count increased from 44 to 51 per cent.

Getting fit for non-athletes

Most of us are not elite athletes, therefore being a few seconds faster has no real significance whatsoever. What we do want, however, is to be able to carry out our day-to-day living without fatigue and with ease and enjoyment. Elite athletes balancing precariously on the pinnacle of human achievement consider themselves lucky to increase performance by three per cent. The good news is that untrained people show an even more dramatic improvement in fitness, energy and endurance when given a course of IHT. In one study with healthy but untrained men, adaptation increased the total amount of work performed on an ergometer by 27 per cent; the maximal output of their heart increased by 15 per cent; their lung capacity increased by up to 40 per cent.

Increased energy and endurance

In my practice, the main consistent benefit of using a Hypoxicator is improved energy levels. Judith (not her real name) was one of the first people to complete the course of IHT at the clinic. She was generally healthy but suffered from high blood pressure (which tended to always be a little high even with medication), some asthma, fatigue and insomnia. Although she exercised regularly at the gym three to four times a week and played golf at least twice a week, she often felt extremely tired, after, even moderate exercise. After golf she always felt really exhausted and wondered if it was a symptom of menopause. Seeing octogenarians skip up the steps to the clubhouse, she wondered why she felt so tired when she looked so healthy. Her gym sessions left her feeling really tired for about two hours. After completing 16 sessions of IHT, Judith finds she can do her exercise at a more intense level than she could previously, and without any subsequent fatigue. She says: "My energy and performance levels have increased to a marked degree. Even after extreme effort I am not as tired. I recently spent a few days cross-country skiing at a high altitude. Previously, it would have taken a couple of days for me to acclimatise. After having IHT I found I did not experience the usual headaches or tiredness. I also slept better than I did at altitude." Also, throughout the period of having IHT, Judith monitored her blood pressure. Previously it was difficult to stabilise and 'tended to be 145/95 or sometimes up to 155/100. Now it is

consistently lower, at around 125/80 to 135/85, with fewer fluctuations.

My own experience with IHT has been fantastic. In my late 40s I have achieved a level of fitness I did not enjoy even in my younger days. There are days when I just feel effervescent with energy and can work all day without total fatigue waiting to meet me afterwards.

After a stressful year of drama and tragedy, I found myself a year ago experiencing palpitations on just walking up a small hill. I felt grief at my lost health and resolved to do what I could to regain it. I began a slow and careful exercise program and was gradually building up a program of running and walking, combined with more time spent in relaxation. Even though I was starting to become fitter and the palpitations had gone, I still didn't have much endurance. However, a few weeks after starting IHT I noticed the same feeling I had experienced after trekking in the Himalayas: a combination of bliss and bouncy, resilient energy. I found for the first time in my life I could run for 30 minutes without stopping and without breathlessness or gasping. I now go out and do this almost every day – because I want to. I feel more confident that I will be able to remain fully functional and vibrant as I get older.

Hope for chronic fatigue sufferers

IHT might prove to be of tremendous help for sufferers of chronic fatigue syndrome (CFS). People with CFS frequently suffer from breathlessness, poor aerobic metabolism, lactic acid accumulation after exertion and other indicators of poor oxygen efficiency. Studies have been conducted showing that improving fitness though exercise therapy helps CFS suffers have more energy and general improved functioning. The problem is that exercise, if overdone, can also easily lead to incapacitation. IHT might prove to be a stepping stone for increasing fitness and functional capacity for people with CFS. The CFS sufferers at our clinic who have completed their acclimatisation to 11 per cent oxygen have all shown marked and even exceptional improvement in their condition over a few months.

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