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Hyperbaric Therapy "Long Life Oxy-Lord" As New Protocol Facing the Oxidative Stress associated with metabolic imbalance such as Neurodegenerative and Cancer diseases

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Abstract

Motor neuron diseases (MNDs) are progressive neurological disorders that affect motor neurons, such as amyotrophic lateral sclerosis (ALS), which can cause rapid loss of muscle control and paralysis. Although there is currently no definitive cure, new treatments are being developed, including epigenetic therapies. Hyperbaric oxygen therapy has emerged as an innovative strategy within this category, demonstrating its ability to restore biological processes involved in mitochondrial renewal and slow the progression of MNDs. Humans act as natural hyperbaric chambers, regulating their internal pressure through oxygen combustion, and this internal pressure must be balanced with external pressure to ensure optimal energy flow between the individual and their environment. To maximize the effectiveness of interventions such as hyperbaric oxygen therapy, understanding individual genetic variability is crucial. Genetic polymorphism analyses, which represent the most precise and advanced method for identifying specific genetic variations, are essential for understanding how these variations affect the individual's response to oxidative stress and alterations in energy production. These analyses allow for the personalization of critical oxygen doses (CDO) and the adaptation of therapy protocols to the patient's specific genetic needs, thereby optimizing treatment outcomes with epigenetic therapies, among which oxygen therapy is essential. We have developed the LONGLIFE OXY-LORD algorithm, which adjusts the pressure in the hyperbaric chamber based on factors such as body size and cranial, thoracic, and abdominal morphology. This algorithm correlates the individual's morphology with their pathophysiol-

ogy to estimate the CDO, which is crucial for ensuring adequate oxygen flow. Integrating genetic polymorphism analyses into this methodology would allow for a more precise estimation of the CDO, considering how individual genetic variations influence the body's ability to handle oxidative stress. We propose using probiotics as oxygen carriers and aerobic microorganisms as fixators and evaluate how oxygen contributes to metabolic activation and neurotransmitter transmission through damaged neural connections. Additionally, olive oil is used to protect these circuits from further damage. Integrating genetic polymorphism analyses into hyperbaric therapy and the "Long Life Oxy-Lord" protocol has the potential to significantly enhance the therapeutic approach to Oxidative stress associated with metabolic imbalance against neurodegenerative and cancer diseases, enabling more personalized and effective treatments.

Keywords: Motor neuron diseases, MNDs, Genetic polymorphism analyses, Hyperbaric chambers, oxygen, LONGLIFE OXY-LORD algorithm, critical dose of oxygen, Exosomes, olive oil, cannabinoids, aerobic microorganisms, neurodegenerative, Cancer.

INTRODUCTION

Motor neuron diseases (MNDs) are a group of progressive neurological disorders that destroy motor neurons, the cells that control skeletal muscle activity such as walking, breathing, speaking, and swallowing. This group includes diseases such as amyotrophic lateral sclerosis, progressive bulbar palsy, primary lateral sclerosis, progressive muscular atrophy, spinal muscular atrophy, Kennedy's disease, and post-polio syndrome [1].

MNDs are classified according to whether the loss of function is due to a genetic mutation (inherited) or sporadic (no family history); and whether they affect the upper motor neurons, lower motor neurons, or both [2].

Inherited MNDs are usually caused by changes in a single gene.

Though there are several types of MNDs, they all cause muscle weakness that gradually worsens over time and can lead to physical disability. In some people, these diseases are fatal. Weakness in muscles that control breathing can lead to respiratory insufficiency, a condition in which the lungs cannot properly take in oxygen or expel carbon dioxide. This is a feature of most MNDs. Symptoms may include breathlessness, shortness of breath that occurs while lying down, recurrent chest infections, disturbed sleep, poor concentration and/or memory, confusion, morning headaches, and fatigue [3].

Types of motor neuron diseases

Amyotrophic lateral sclerosis (ALS), formerly known as Lou Gehrig's disease, can affect the upper and/or lower motor neurons. It causes rapid loss of muscle control and eventual paralysis [4].

More about amyotrophic lateral sclerosis.

Spinal muscular atrophy (SMA) refers to a group of hereditary diseases that affect lower motor neurons. The most common form is caused by a mutated or missing gene known as the survival motor neuron gene 1 (SMN1), which causes the neurons to deteriorate, producing muscle weakness and waste [5].

More about spinal muscular atrophy.

Spinal muscular atrophy with respiratory distress

type 1 (SMARD1) is a very rare form of SMA caused by mutations in the IGHMBP2 (immunoglobulin helicase μ-binding protein 2) gene. Symptoms appear during infancy, between the ages of 6 weeks and 6 months. Children with SMARD1 suddenly may be unable to breathe due to diaphragm paralysis and may develop weakness in the muscles of their hands and feet [6].

Congenital SMA with arthrogryposis is a rare disorder that appears at birth. Symptoms include severe joint contractures, making babies unable to extend or flex the affected joints. In most children, both the arms and legs are affected. Other symptoms include scoliosis (curvature of the spine), chest deformity, respiratory problems, unusually small jaw, and drooping eyelids. [7]

Progressive bulbar palsy (PBP), also known as progressive bulbar atrophy, is due to injury of the upper motor neurons in the brainstem or the lower motor neurons connected to the brainstem. The brainstem controls the muscles needed for swallowing, speaking, chewing, and other functions [5].

PBP symptoms worsen over time and include trouble chewing, speaking, and swallowing. People with progressive bulbar palsy may also have weakness in the tongue and facial muscles, twitches, and a reduced gag reflex. They may also experience weakness in the arms or legs, but it is less noticeable than other symptoms [5].

Because they have difficulty swallowing, people with PBP are at risk of choking and inhaling food and fluids, including saliva, into the lungs. They may also laugh or cry at inappropriate times, called pseudobulbar affect or pathological laughing and crying. Some symptoms of stroke and myasthenia gravis are similar to those of progressive bulbar palsy (e.g. slurring of the speech and choking) and must be ruled out prior to diagnosis [7].

Many ALS experts consider PBP to be a form of ALS because the majority of individuals who begin with this form of the disease eventually develop more widespread MND symptoms. Indeed, many clinicians believe that PBP by itself, without evidence of abnormalities in the arms or legs, is extremely rare [7].

Primary lateral sclerosis (PLS) affects only the upper motor neurons, causing difficulty and slowness in the movements of the arms, legs, and face. Symptoms include weakness, muscle stiffness and spasticity, clumsiness, slowing of movement, and problems with balance and speech. The disorder often affects the legs first, followed by the torso, arms and hands, and, finally, the muscles used for swallowing, speaking, and chewing [7].

PLS is more common in men than in women, with an onset that generally occurs between age 40 and 60. PLS progresses slowly over years or even decades. Extensive testing is required to rule out other disorders before diagnosing PLS. A neurologist may need to track the person's symptoms for several years before making a diagnosis [7].

There is no cure for PLS and the rate of symptom progression varies. Many people can walk without assistance early on, but most will need canes, walkers, wheelchairs, or other assistive devices to prevent falls and injuries as the disorder progresses [7].

Progressive muscular atrophy (PMA) is an uncommon subtype of ALS marked by slow but progres-

sive damage to the lower motor neurons. It affects men more often than women, and usually at symptoms begin later in life than typical ALS. People with PMA usually notice weakness in their hands or feet followed by spreads into other body regions. They may have weakness in the torso muscles and may have trouble breathing. Exposure to cold can worsen the person's symptoms. Other symptoms may include muscle wasting or shrinking, clumsy hand movements, twitches, and muscle cramps [7].

Kennedy's disease is an inherited lower motor neuron disorder that affects men. The onset of symptoms varies, but usually begins between the ages of 20 and 40. Kennedy's disease is also known as spinal and bulbar muscular atrophy (SBMA), bulbospinal muscular atrophy, or X-linked spinal and bulbar muscular atrophy. It is caused by mutations in the gene for the androgen (male sex hormone) receptor. Daughters of people with Kennedy's disease have a 50% chance of having a son affected with the disease [2].

Kennedy's disease is slowly progressive. Early symptoms include tremor of the hands when they are outstretched, muscle cramps with exertion, and fasciculations. Eventually, individuals develop weakness in their arms and legs. Weakness of the facial and tongue muscles may occur later in the disorder and often leads to difficulty swallowing, slurred speech, and repeated cases of pneumonia. Some people develop gynecomastia (excessive enlargement of male breasts) and low sperm count or infertility. Others may develop diabetes [2].

Post-polio syndrome (PPS) usually occurs 15-40 years after a person has polio, an infectious viral disease. PPS is believed to be the result of deterioration of the motor neurons over many years that leads to loss of muscle strength and dysfunction. It is not contagious and only someone who has had polio can develop PPS. Not everyone who has had polio will develop PPS [2].

The polio vaccine has essentially eradicated polio from the U.S. However, polio still exists in some countries, where cases of PPS still occur [2].

PPS is rarely life-threatening, but the symptoms, which include muscle weakness, fatigue, atrophy, and scoliosis, can significantly interfere with a person's ability to function independently.

Who is more likely to have motor neuron diseases?

MNDs occur in both adults and children. In children, MNDs are typically caused by specific gene mutations, as in spinal muscular atrophy. Symptoms may be present at birth or appear in early childhood. In adults, MNDs are more likely to be sporadic, meaning the disease occurs with no family history. Symptoms typically appear after age 50, though onset of disease can occur at any age.

While some MNDs are inherited, the causes of most MNDs are not known. In sporadic or non-inherited MNDs, environmental, viral, and/or other factors may play a role in the development of the disease.

How are motor neuron diseases diagnosed and treated?

Diagnosing MNDs

There are no specific tests to diagnose MNDs in most cases. Symptoms vary among individuals and, in the early stages, may be similar to other diseases, making diagnosis difficult. However, there are ge-

netic tests for SMA, Kennedy's disease, and some genetic causes of ALS.

To diagnose MNDs, a doctor will obtain a thorough medical history and perform a physical exam followed by an extensive neurological exam to assess motor and sensory function, hearing and speech, vision, coordination and balance, thinking, and changes in mood or behavior.

The following two tests can identify whether the person may have a nerve or muscle disease, or an MND.

Electromyography (EMG) is used to diagnose lower motor neuron disorders, as well as disorders of muscle and peripheral nerves. It assesses electrical activity in the muscles during movement and at rest.

A nerve conduction study is usually done in combination with an EMG. Nerve conduction studies measure the speed and size of the signal from the nerves using small electrodes taped to the skin.

Additional tests may include:

Laboratory tests of blood, urine, or cerebrospinal fluid can rule out other disorders that may have symptoms similar to MNDs.

MRI (magnetic resonance imaging) in MND is typically normal. However, MRI can help exclude other diseases that have symptoms similar to MNDs, such as brain and spinal cord tumors, inflammation, infection, and vascular irregularities that may lead to stroke. MRI can also detect and monitor inflammatory disorders such as multiple sclerosis and can document brain injury from trauma. It is often used to rule out diseases that affect the head, neck, and spinal cord. Magnetic resonance spectroscopy is a type of MRI that measures chemicals in the brain and may be used to evaluate the health of the upper motor neurons.

Muscle or nerve biopsy can help diagnose muscle or nerve disease; however, it is an invasive procedure, and many experts do not believe it is needed to diagnose MND.

Treating MNDs

There is no cure for most MNDs, although new treatments are under development. The outlook for individuals with MNDs varies depending on the type and the age the person’s symptoms begin. Some MNDs, such as PLS or Kennedy's disease, are usually not fatal and progress slowly. The symptoms in people with SMA type III may be stable for long periods. Some forms of MND, such as the severe form of SMA and ALS, are fatal.

Treatments are available to help with some symptoms and supportive treatment can help people maintain their independence and quality of life. Multidisciplinary clinics, with specialists from neurology, physical and occupational therapy, respiratory therapy, speech therapy, and social work are particularly important in the care of individuals with MNDs.

Medications for treating MNDs

Several medications have been approved to treat MNDs. Some of these medications can slow progression of ALS and others target the gene mutations in SMA and genetic forms of ALS. People with MND may be prescribed muscle relaxers to reduce muscle stiffness and help with muscle spasms. They may also receive botulinum toxin injections to treat muscle stiffness by weakening overactive muscles or decrease drooling. Excessive

saliva also can be treated with medications such as amitriptyline, glycopyrrolate, and atropine.

Supportive therapies for MNDs

People with MNDs may also benefit from supportive therapies and assistive devices to help them adapt to changes brought on by the disorders and maintain strength and function for as long as possible.

Physical and occupational therapy and rehabilitation may help the person improve their posture, prevent joint immobility, and slow muscle weakness and atrophy. Stretching and strengthening exercises can help reduce stiffness and increase range of motion and circulation. Some individuals may benefit from speech therapy to improve speech, chewing, and swallowing.

Heating pads can help relieve muscle pain. Mobility and communication devices may help some people maintain their independence.

People with MNDs should eat a balanced diet that provides the proper nutrients to help them maintain their weight and strength as much as possible.

In later stages of the disorders, people who cannot chew or swallow may require a feeding tube. Others may need ventilators to improve their breathing at night. Some individuals also may need to use a breathing machine during the day due to weakness in the breathing muscles.

Recently studies showed that hyperbaric oxygen therapy protects against mitochondrial dysfunction and delays onset of motor neuron disease in Wobbler mice

The Wobbler mouse is a model of human motor neuron disease. Recently we reported the impairment of mitochondrial complex IV in Wobbler mouse CNS, including motor cortex and spinal cord. The present study was designed to test the effect of hyperbaric oxygen therapy (HBOT) on mitochondrial functions in young Wobbler mice, and the onset and progression of the disease with aging. HBOT was carried out at 2 atmospheres absolute (2 ATA) oxygen for 1 h/day for 30 days. These data suggest that HBOT significantly ameliorates mitochondrial dysfunction in the motor cortex and spinal cord and greatly delays the onset of the disease in an animal model of motor neuron diseases [1].

Humans have anatomically evolved as natural hyperbaric chambers, generating their own internal pressure through the combustion of oxygen [8]. This internal pressure must match the external atmospheric pressure to facilitate a passive energy flow between the individual and their environment [9]. Each individual's internal pressure is uniquely determined by the relationship between their body size/weight and the volumes of their cranial, thoracic, and abdominal cavities. Thoracic and abdominal cavities can be thought of as the motor sources of oxygenated air supply (positive pressure pumps), while the cranial cavity functions as the receiving source (negative pressure pump). The diaphragm is the primary muscle involved in active inspiration and serves also as an important anatomical landmark that separates the thoracic and abdominal cavity. However, the diaphragm muscle like other structures and organs in the human body has more than one function, and displays many anatomic links throughout the body, thereby forming a 'network of breathing' [10]. The difference in power between these supplies and receiving sources creates a pressure gradient that drives oxygen to the

brain, which then distributes it to all the peripheral nerves through the cerebrospinal fluid (CSF) [11].

Dr. Luis Cruz Rodriguez, in his **LONGLIFE OXY -LORD** algorithm, proposes that the pressure under hyperbaric chamber based on several factors: body size/weight and the volumes of their cranial, thoracic, and abdominal cavities body size/weight and the volumes of their cranial, thoracic, and abdominal cavities. **Figure 1**. For example, a higher body may lead to higher pressure.

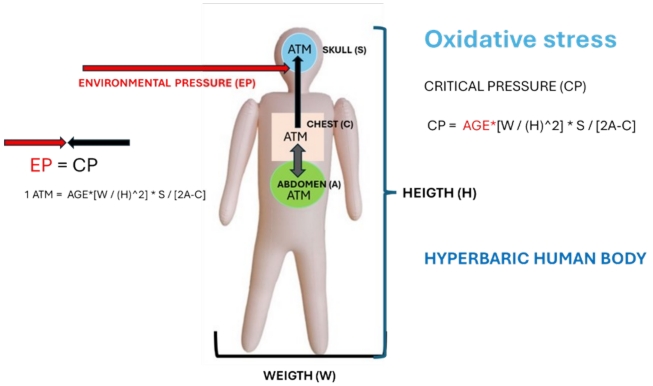

Figure 1. External environmental pressure balanced with the internal pressure of the human body. Internal pressure is dependent on oxygen metabolism. Oxidative stress can generate an imbalance between external and internal pressures and develop increased aging or metabolic pathologies.

Anatomical imbalances between the supply sources (abdomen and thorax) and the receiving source (cranium) can result in inadequate oxygen flow to the brain. Insufficient oxygen at the neuronal level may trigger signals that lead to metabolic disturbances linked to oxidative stress. One critical consequence of such disturbances is the onset of oxidative stress—a complex biological response that plays a dual role in cellular physiology. Oxidative stress, though essential for survival in critical situations like immune defense, becomes harmful when not properly regulated. In response to infections, immune cells like macrophages release reactive oxygen species (ROS), such as hydrogen peroxide, to destroy harmful pathogens like bacteria (Pseudomonas aeruginosa) and parasites [12]. This controlled oxidative burst is vital for neutralizing threats and maintaining homeostasis. However, if oxidative stress persists beyond its intended short duration, it may result in the accumulation of reactive molecules that damage essential cellular components. Prolonged exposure to elevated ROS levels can damage lipids, proteins, and even DNA, causing structural alterations, mutations, and disruptions in normal cellular functions. These changes increase the likelihood of developing chronic diseases, including cancer, neurodegenerative conditions, and cardiovascular disorders, as oxidative stress overwhelms the body's antioxidant defenses. Thus, while oxidative stress is a necessary short-term adaptation, its chronic form can have profound, far-reaching consequences on overall health and disease progression [13]. **Figure 2**

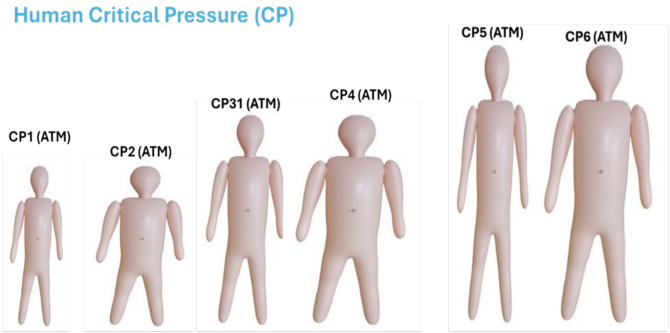

Figure 2. Each individual has a unique critical pressure based on their morphological conditions. This pressure changes with age, as it is influenced by the aging process.

Dr. Luis's algorithm correlates the individual's morphology with their pathophysiology to estimate the **critical dose of oxygen (CDO)** associated with oxidative stress. The CDO represents the oxygen level required within the cranium to ensure proper oxygen flow from the thoracic and abdominal cavi-

ties. To estimate the duration of oxidative stress, biochemical parameters like creatinine, glucose, and ketosis levels in the blood are used. The CDO, measured in ATM/min, can be instrumental in tailoring hyperbaric oxygen therapy to an individual's specific physiological and morphological needs [14]. **Figure 3.**

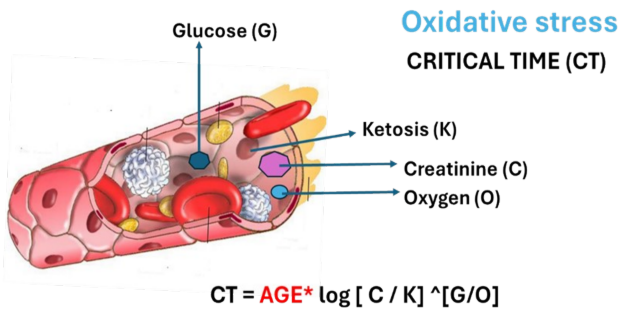

Figure 3: Dr. Luis Cruz Rodriguez, in his **LONGLIFE OXY-LORD** algorithm, proposes that the duration of oxidative stress is also personalized based on several factors: blood levels of creatinine, glucose, and ketosis, blood pressure, oxygen saturation, age, and body temperature. For example, higher glucose levels may lead to longer oxidative stress duration due to increased sugar-oxygen interactions.

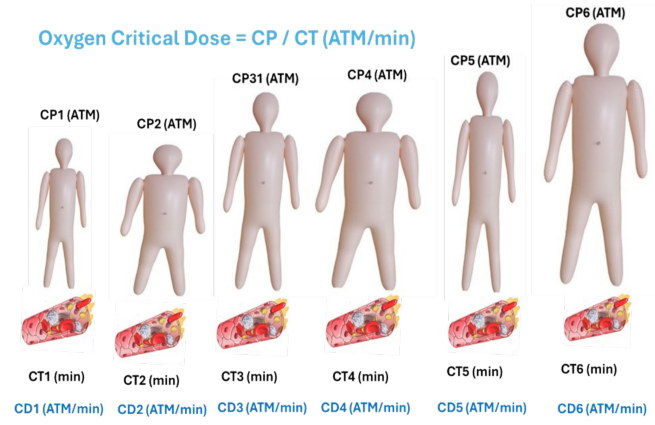

Figure 4. Each individual has a unique Critical Oxygen Dose, determined by the correlation between Critical Pressure and Critical Time for oxygen metabolism. This is the dose that could be applied in hyperbaric chambers for the treatment of neurodegenerative diseases, cancer, and endocrine disorders such as diabetes.

The LONGLIFE OXY-LORD protocol offers a sophisticated method for estimating the body's potential to generate pressure through oxygen combustion, grounded in the principles of human anatomy and physiology. This protocol evaluates two key factors: the pressure generated by oxygen utilization and the duration over which this combustion can be sustained, both of which are directly linked to the energy reserves available in the bloodstream, primarily in the form of glucose and other metabolic fuels. By calculating the ratio of these two estimates—oxygen-generated pressure over time—the protocol provides a predictive model for determining the critical oxygen dose required to support an individual's metabolic demands under specific pathophysiological conditions, such as hypoxia or oxidative stress.

The actual dose of oxygen administered, however, is adjusted based on the individual's ideal body mass index (BMI) and normal blood glucose levels. These factors ensure that the oxygen supply is personalized, optimizing its efficacy in meeting the body's metabolic needs without overloading the system. This approach acknowledges that ideal BMI and glucose levels provide a baseline for metabolic efficiency, allowing for more precise dosing.

Once the oxygen dose is administered, the protocol continues with regular monitoring. Weekly assessments of body weight and blood glucose levels track any physiological changes, offering insight into how well the body is responding to the oxygen therapy. These trends are essential for fine-tuning the treatment, as fluctuations in weight or glucose can indicate shifts in metabolic function or underlying health conditions. Ultimately, the LONGLIFE OXY-LORD protocol integrates these

data points to not only manage oxygen dosing but also to promote long-term metabolic balance and overall health optimization [15, 16].

LONGLIFE OXY-LORD Hyperbaric Therapy Protocol:

1. 15-minute oral presentation of the protocol to the patient and/or companion.
2. Written consent for the proof-of-concept treatment for oxidative stress.
3. Measurement of cranial, thoracic, and abdominal diameters, along with the patient's Height.
4. Recording the patient's age.
5. Weight measurement.
6. Blood pressure reading.
7. Oxygen saturation level in the blood.
8. Blood glucose and ketosis levels.
9. Blood creatinine levels.
10. Body temperature.
11. Determination of the **critical dose of oxygen (CDO).**

This data will help estimate the CDO, such as a value of 80.93 ATM/min, which can be applied in hyperbaric chambers as follows:

Low-Pressure Hyperbaric Chambers (1.2 to 1.6 ATM):

- 80.93/1.2 = 67.44 min (not recommended as it exceeds 60 minutes)
- 80.93/1.3 = 62.25 min (not recommended as it exceeds 60 minutes)
- 80.93/1.4 = 57.80 min (recommended)
- 80.93/1.5 = 53.95 min (recommended)
- 80.93/1.6 = 50.58 min (recommended)

For individuals with CDO values between 96.0 ATM/min and 192 ATM/min, two sessions of 1.6 ATM for 60 minutes each are recommended. For example:

- CDO: 120.45 ATM/min
- CDO/2 = (120.45 ATM/min) / 2 = 60.23 ATM/min at 1.6 ATM, duration = 37 min.

High-Pressure Hyperbaric Chambers (1.7 to 2.5 ATM):

- 80.93/1.7 = 47.60 min (recommended)
- 80.93/1.8 = 44.90 min (recommended)
- 80.93/1.9 = 42.59 min (recommended)
- 80.93/2.0 = 40.47 min (recommended)
- 80.93/2.1 = 38.53 min (recommended)
- 80.93/2.2 = 36.79 min (recommended)
- 80.93/2.3 = 35.19 min (recommended)
- 80.93/2.4 = 33.72 min (recommended)
- 80.93/2.5 = 32.37 min (recommended)

For individuals with CDO values between 150.0 ATM/min and 300 ATM/min, it is recommended to use high-pressure hyperbaric chambers for two sessions of 2.5 ATM for 60 minutes each. For example:

- CDO: 220.44 ATM/min
- CDO/2 = (220.44 ATM/min) / 2 = 110.22 ATM/min at 2.5 ATM, duration = 44 min.

For individuals with CDO values exceeding 300 ATM/min, even multiple sessions at 2.5 ATM may not yield optimal results, but they can still help reduce the CDO value.

Probiotic and Oxygen Transport System:

We propose an innovative approach of using probiotics as dual-function agents: oxygen carriers in the form of exosomes and fixatives in the form of aerobic microorganisms. This novel application leverages the natural biological activity of probiotics to enhance oxygen transport and distribution within

the body. Exosomes, [17,18] small vesicles produced by cells, can encapsulate oxygen and transporting it through various tissues, potentially serving as efficient oxygen carriers. Aerobic microorganisms, meanwhile, act as fixatives, stabilizing oxygen in targeted regions and facilitating its sustained release into the peripheral tissues.

The comparison of arteries and veins to a blowgun offers an insightful analogy, illustrating how oxygen naturally moves through the body's circulatory system. In this metaphor, oxygen diffuses effortlessly into peripheral tissues due to natural respiration and pressure differentials between the body's cavities, akin to the gentle propulsion of a blowgun dart. The smooth flow of oxygen, driven by the physiological balance between internal pressures and the body's demand for oxygen, allows for an efficient, low-pressure distribution of oxygen to vital tissues.

By contrast, the role of a hyperbaric chamber is akin to a rifle, where oxygen is delivered to tissues under significantly increased pressure. In this case, the blood and its components are forcefully driven into peripheral tissues, saturating them with oxygen in a much more aggressive manner. The use of hyperbaric oxygen therapy aims to overcome natural limitations of oxygen diffusion by enhancing oxygen concentration in the bloodstream and increasing the pressure gradient, ensuring deeper and more rapid penetration of oxygen into tissues that are either hypoxic or require enhanced oxygenation for healing and recovery.

By integrating probiotics as oxygen carriers and fixatives into this model, we could potentially mimic or enhance the natural "blowgun" approach, offering a more sustainable and biologically harmonious alternative to the "rifle" method of hyperbaric chambers. This probiotic-based approach could improve oxygen delivery at a cellular level, promoting tissue oxygenation in a way that is both more efficient and less invasive, making it a promising therapeutic option for a wide range of conditions where oxygen supply is critical. **Figure 5**

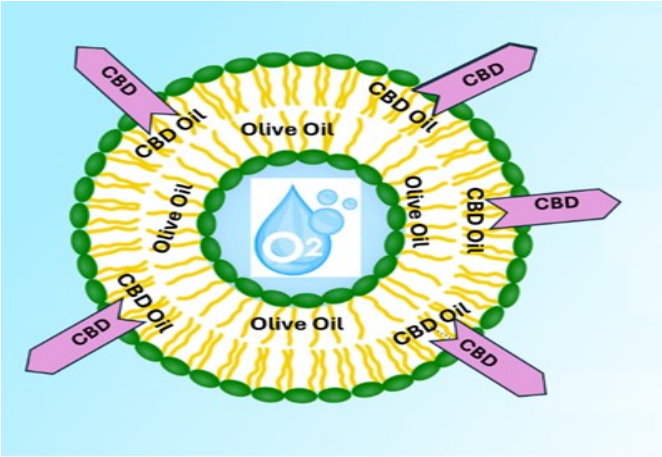

Figure 5: This figure shows the olive and CBD oils distribution as unique carrier of oxygen molecules. The CBD molecule leads the lipidic vesicles (exosomes) forward endocannabinoids receptors at neural cells. Endocannabinoid receptors are the door for exosomes charged with oxygen.

At pressures above 1.6 ATM, liposoluble proteins and oxygen can enter peripheral tissues, potentially causing metabolic changes. We suggest that olive oil infused with phytocannabinoids (CBD) without THC can serve as an oxygen transporter through the human endocannabinoid system (ECS) [19]. **Figure 6**.

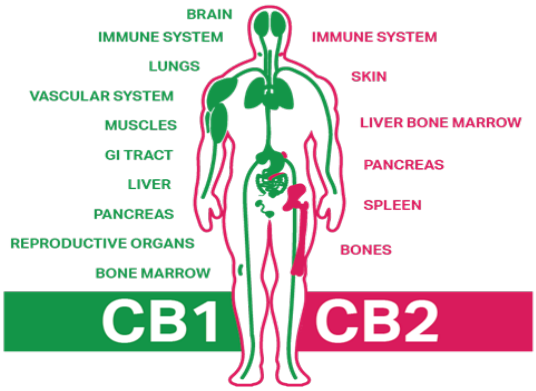

Figure 6: The endocannabinoid system (ECS) is a complex network of receptors, signaling molecules, and metabolic enzymes that most people do not know about. A building body of research shows that the ECS has a significant influence on human health and well-being, serving an essential function in the human body: restoring homeostasis via physiological and regulatory mechanisms. The ECS is made up of cannabinoid receptors, endocannabinoids, and metabolic enzymes.

When macerated with CBD and combined with supplements like biotin, moringa, keratin, hyaluronic acid, vitamins A, C, and D_3, olive oil can form nutrient-packed droplets that bind to CBD receptors on cell membranes, facilitating oxygen entry into peripheral tissues [20].

At pressures between 1.2 and 1.6 ATM, these oil droplets deliver oxygen to tissues more effectively without distorting cell surfaces, minimizing the flow of smaller molecules like lipoproteins.

The human endocannabinoid system (ECS) is a complex and intricate biological network crucial in regulating and maintaining various physiological and cognitive processes. The ECS consists of many receptors, enzymes, and endocannabinoids spread throughout the body that work together to maintain homeostasis by regulating functions such as appetite, mood, sleep, pain, and immune response, acting like a special forces unit (SWAT) when normal systems are overwhelmed. Oxygen at pressures above 1.2 ATM can act like gunpowder in a rifle barrel, triggering a powerful burst of oxygen into the bloodstream. The CBD acts like a bullet, delivering oxygen directly to target cells, promoting neuronal oxygenation through emergency pathways [21]. (**Figure 7**)

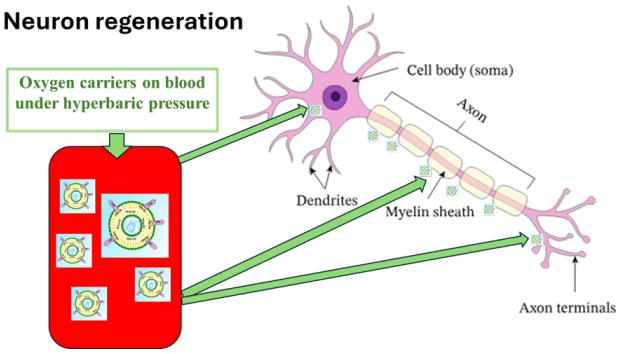

Figure 7: This figure shows how oxygen aids in metabolic activation and neurotransmitter transmission across damaged axon-dendrite connections. Olive oil, meanwhile, remains outside these circuits, potentially insulating and protecting them from further damage.

Additionally, exposure to low-pressure oxygen environments, typically ranging from 1.2 to 1.6 atmospheres (ATM), can have a significant impact on the patient's microbiota (**Figure 8**). The human microbiota, consisting of trillions of microorganisms that reside primarily in the gut, plays a crucial role in maintaining overall health, including digestion, immune function, and even mental well-being. Oxygen levels and pressure gradients are key environmental factors that can influence the composition and activity of these microbial communities.

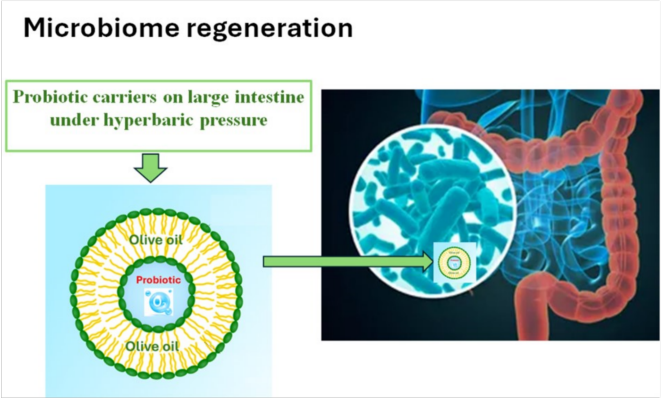

Figure 8: Olive oil, loaded with nutritional supplements and oxygen, can improve gut health by promoting aerobic microorganisms in the intestinal lining, which may lead to enhanced colonization of probiotics.

In a low-pressure oxygen environment, the delicate balance between aerobic and anaerobic microorganisms in the gut may shift. Aerobic microbes, which thrive in oxygen-rich environments, may become more active or proliferate, potentially enhancing their role in metabolic processes, such as nutrient absorption and immune modulation. On the other hand, anaerobic microbes, which typically dominate in the low-oxygen environment of the gut, may experience reduced activity or shifts in population dynamics. This change could affect fermentation processes, production of short-chain fatty acids (SCFAs), and other key metabolic functions that anaerobic bacteria are responsible for moreover, the controlled exposure to low-pressure oxygen (1.2 to 1.6 ATM) could stimulate a beneficial adaptation in the microbiota, promoting microbial diversity and resilience. This shift may support the growth of oxygen-tolerant probiotic species, which could contribute to enhanced gut health, improved immune response, and even reduced inflammation. These changes in the microbiota might also play a role in mitigating certain pathophysiological conditions, such as metabolic disorders, gastrointestinal diseases, or immune dysregulation, which have been linked to imbalances in the gut flora.

By carefully modulating oxygen pressure, it may be possible to create an optimal environment that supports a more balanced and health-promoting microbiome. This could have wide-ranging therapeutic implications, from enhancing the efficacy of oxygen-based treatments to supporting overall health and disease prevention through the targeted modulation of the microbiota.

Post-Treatment Evaluation:

Prebiotic and probiotic recommending:

The following probiotics under the Elidan Lord Trademark

1. Lord's Rincon
2. LongLife Oxy-Lord
3. Oxy Cann-Lord
4. Mind-Lord
5. Gladia-Lady
6. Gladia-Lord
7. Travel-Lord

They could be used in the treatment of oxidative stress associated with metabolic diseases such as neurodegenerative diseases and cancer.

The following prebiotics under the Elidan Lord Trademark

1. Ovarian On
2. Kidney On
3. Prostate On
4. Breast On
5. Pancreas On
6. Liver On
7. Lung On
8. Blood On

They could be used in the treatment of oxidative stress associated with metabolic diseases such as neurodegenerative diseases and cancer.

Integrating Genetic Polymorphism Analysis into ALS Research and Treatment

Genetic predisposition plays a crucial role in the pathogenesis of amyotrophic lateral sclerosis (ALS). While familial ALS is linked to specific gene mutations, sporadic ALS which accounts for most cases is influenced by a complex interplay of

multiple genetic variants. Recent research has identified numerous single nucleotide polymorphisms (SNPs) associated with increased susceptibility to ALS, underscoring the significance of genetic variability in disease risk and progression. For instance, variations in genes related to oxidative stress response and mitochondrial function can profoundly affect neuronal vulnerability and disease trajectory.

Dr. Remigio Cortes, Senior Scientist at ANTIAGE GENOME, and his team have been leading the field of genetic polymorphism analysis for over a decade, providing deep insights into how specific genetic variations influence disease outcomes. Dr. Cortes' expertise in interpreting genetic polymorphisms enables the unraveling of complex interactions between genetic makeup and environmental factors, including therapeutic interventions. By integrating advanced genetic analysis into ALS research, ANTIAGE GENOME can identify genetic variations that impact individual responses to treatments such as hyperbaric oxygen therapy (HBOT). These analyses are essential for personalizing therapeutic approaches and optimizing treatment efficacy. For example, identifying genetic variants that affect oxidative stress response can guide the customization of HBOT protocols to better address individual patient needs, alongside epigenetic therapies.

Synergy with Hyperbaric Oxygen Therapy

Hyperbaric oxygen therapy (HBOT) has emerged as an innovative treatment for ALS, utilizing increased oxygen availability to address mitochondrial dysfunction and enhance cellular repair mechanisms. The LONGLIFE OXY-LORD algorithm, developed by Dr. Luis Cruz Rodriguez, represents a significant advancement in tailoring HBOT protocols based on individual morphological parameters. Integrating ANTIAGE GENOME's genetic insights into this algorithm could refine the estimation of critical oxygen doses (CDOs) by considering genetic variations in oxidative stress management and mitochondrial function. This integration has the potential to improve the accuracy of HBOT, leading to more effective management of ALS symptoms and progression.

Potential of Epigenetic Therapies

Epigenetic therapies, which modify gene expression without altering the DNA sequence, offer a promising approach for managing ALS. These therapies include interventions targeting DNA methylation, histone modifications, and non-coding RNAs, which could potentially reverse disease-associated changes in gene expression. Applying epigenetic therapies in ALS may involve using HBOT as an adjunctive treatment to modulate epigenetic marks linked to stress and neuronal degeneration. ANTIAGE GENOME's genetic analysis can identify specific epigenetic targets based on individual genetic profiles, enabling more precise and effective application of these therapies.

Incorporating genetic polymorphism analysis into ALS research and treatment represents a transformative opportunity to enhance the precision and efficacy of current therapies. ANTIAGE GENOME's advanced genetic insights can provide critical information for optimizing hyperbaric oxygen therapy and epigenetic interventions, paving the way for more personalized and effective ALS treatments. By bridging the gap between genetic research and therapeutic application, we can contribute to significant advancements in ALS treatment and patient care.

After six weeks of treatment following the **LONGLIFE OXY-LORD** protocol, a complete blood count and stool analysis are recommended to reassess oxidative stress levels. For follow-up studies, we suggest antioxidant studies at a certified Lab (initially and after six weeks).

The protocol also includes strength tests that track patient progress, helping to develop personalized plans based on weight and other metrics.

This data will help estimate the CDO, such as a value of 80.93 ATM/min, which can be applied in hyperbaric chambers as follows:

Low-Pressure Hyperbaric Chambers (1.2 to 1.6 ATM):

- 80.93/1.2 = 67.44 min (not recommended as it exceeds 60 minutes)
- 80.93/1.3 = 62.25 min (not recommended as it exceeds 60 minutes)
- 80.93/1.4 = 57.80 min (recommended)
- 80.93/1.5 = 53.95 min (recommended)
- 80.93/1.6 = 50.58 min (recommended)

For individuals with CDO values between 96.0 ATM/min and 192 ATM/min, two sessions of 1.6 ATM for 60 minutes each are recommended. For example:

- CDO: 120.45 ATM/min
- CDO/2 = (120.45 ATM/min) / 2 = 60.23 ATM/min at 1.6 ATM, duration = 37 min.

High-Pressure Hyperbaric Chambers (1.7 to 2.5 ATM):

- 80.93/1.7 = 47.60 min (recommended)
- 80.93/1.8 = 44.90 min (recommended)
- 80.93/1.9 = 42.59 min (recommended)
- 80.93/2.0 = 40.47 min (recommended)
- 80.93/2.1 = 38.53 min (recommended)
- 80.93/2.2 = 36.79 min (recommended)
- 80.93/2.3 = 35.19 min (recommended)
- 80.93/2.4 = 33.72 min (recommended)
- 80.93/2.5 = 32.37 min (recommended)

For individuals with CDO values between 150.0 ATM/min and 300 ATM/min, it is recommended to use high-pressure hyperbaric chambers for two sessions of 2.5 ATM for 60 minutes each. For example:

- CDO: 220.44 ATM/min
- CDO/2 = (220.44 ATM/min) / 2 = 110.22 ATM/min at 2.5 ATM, duration = 44 min.

For individuals with CDO values exceeding 300 ATM/min, even multiple sessions at 2.5 ATM may not yield optimal results, but they can still help reduce the CDO value.

Causes of Oxidative Stress

- Environmental stressors: Exposure to pollutants, heavy metals, UV radiation, and ionizing radiation can increase ROS production.
- Metabolic processes: Normal cellular metabolism generates ROS as by-products.
- Xenobiotics: Certain medications, such as antiblastic drugs, can contribute to oxidative stress.

Effects of Oxidative Stress

⇒ Cellular damage: ROS can harm proteins, lipids, and nucleic acids, leading to cell death or mutations.

⇒ Inflammation: Oxidative stress can trigger inflammatory responses, exacerbating various diseases.

⇒ Disease associations: Oxidative stress has been linked to conditions such as:

- Cancer

- Neurodegeneration
- Diabetes
- Metabolic disorders
- Atherosclerosis
- Cardiovascular diseases
- Hypertension
- Stroke
- Chronic heart failure

Antioxidant Defense

- Endogenous antioxidants: Enzymes like superoxide dismutase, catalase, and glutathione peroxidase help neutralize ROS.
- Dietary antioxidants: Consuming foods rich in antioxidants, such as vitamins C and E, beta-carotene, and polyphenols, can support antioxidant defenses.
- Prevention and Management
- Healthy lifestyle: Maintain a balanced diet, exercise regularly, and manage stress to reduce oxidative stress.
- Antioxidant supplementation: Consider consulting with a healthcare professional about antioxidant supplements, such as vitamins C and E, to support antioxidant defenses.

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