HYPOTHALAMIC NEWSLETTER

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Stress on Oxidative Damage and Disease

Stress is responsible for the generation of free radicals, which damage cells, causing illness and aging. Stress requires more energy, which means that a higher oxygen intake is needed, and more oxidative stress is generated. This oxidative stress is the cause of many diseases, for example “coronary heart disease (CHD), hypertension, metabolic syndrome, diabetes, and kidney dysfunction”.

Stress can also have a factor on immunity, and the health of an organism. When an organism is under stress, there is an increase in glucocorticoids, and catecholamines, which fight inflammation and have a part in a body’s fight or flight response. When these hormones are activated, there are severe effects on the immune system, including a reduction in NK cell activity, which are cells vital in killing tumors or cells infected with a virus, and other prospects of the immune system such as the generation of antibodies, inevitably leading to an immune system with less efficiency.

These different pieces of data can prove the effect that stress and oxidative stress have on certain respiratory and cardiovascular diseases. Pro-inflammatory responses from oxidative stress are proven to play an important role in

the inflammatory and dangerous aspects of certain respiratory diseases such as asthma and COPD.

In addition, when different episodes of acute or physiological stress are repeated, there may be an induced chronic inflammatory process leading to atherosclerosis, a disease involving the build-up of fat, cholesterol, and other substances in the artery walls. Stress activating the nervous system alongside other systems causes the release of various stress hormones, which induce a heightened state of cardiovascular activity injuring the endothelium. These, along with the activation of other processes, promote the inflammatory process.

The decline in an organism's physiological abilities is known as aging. The process of aging includes loss of hearing, decrease in body water, declination in muscle strength and sensation with taste, as well as other problems with the cardiovascular and respiratory systems. A theory aligned with aging is called The Free Radical Theory, where free radicals give rise to damage accumulated in the cells, which eventually leads to organs to stop working. As previously mentioned, there is a correlation between stress and the generation of free radicals through oxidative damage, which leads scientists to believe that stress can lead to accelerated aging.

With this aging comes other problems, some of them being neurological. Neurological disorders are from imbalances between antioxidant defenses and ROS, which interferes with the neurological abilities of the brain. When stress occurs over and over again chronically, the inflammation is correlated with diseases of aging, such as Alzheimer's, Parkinson's disease, and other disorders that degenerate the brain. The brain highly utilizes oxygen, which is why stress has such an effect on it, due to the oxidative stress that results from them. Since stress, as stated in the previous paragraph, results in accelerated aging, it can lead to

certain diseases regarding the brain that are typically regarded with older individuals.

Overall, it's clear to see the fatal and concerning process that results in only degenerative effects on not only the brain but an organism's organs and overall abilities. Chronic stress and oxidative damage should be considered with importance. Certain treatments for this damage have been seen in different cultures, including the Rayasana in medicine for Indian culture. Although certain cures for these degenerative diseases have been made throughout time, the most timeless prevention for this chronic problem would be focusing on oneself, meditation, and cultural practices dealing with reducing stress throughout centuries.

Neurological Complications of Sickle Cell Anemia

Genetic disorders occur when a person's DNA experiences an abnormal change, different from its normal sequence. Sickle Cell Anemia is a genetic disorder that deforms the red blood cells in a body. Abnormal hemoglobin within the red blood cells forms strands that cause the blood cells to deform into the sickle shape. Their deformed shape can block blood flow, causing a pain crisis. The red blood cells die early and create a shortage of healthy red blood cells.

The main function of red blood cells is to transport oxygen to the body's tissue. This genetic disorder brings about a red blood cell shortage and causes the physical symptom of fatigue. Pain or more specifically periodic pain in your joints, chest, and abdomen are also physical signs of the disorder. Other signs include the swelling of hands and feet, vision problems, and frequent infections.

This disease affects multiple organs within the body with varying complications. When the disease begins to affect the Central Nervous System, it can increase morbidity and death rates.

The disease has led to neurological complications such as silent cerebral ischemia, hemorrhagic stroke, cerebral fat embolism, and cerebral venous sinus thrombosis.

Patients with Sickle Cell Anemia experience stroke as a recurrent and serious complication. In children with the disease, for example, there are around 285 strokes in a pool of 100,000 children a year. There are two types of stroke to highlight, one being Ischemic stoke and the other being Hemorrhagic stroke. A hemorrhagic stroke takes place when a blood vessel either in the brain or on the surface of the brain breaks and bleeds into the brain. This is a severe condition that causes the death of brain cells and tissue within minutes due to swelling and pressure. In comparison to Ischemic stroke, Hemorrhagic stroke has a higher mortality rate.

Cerebral Ischemia, also known as Brain Ischemia, is a condition that is caused by a lack of blood flow into the brain. This causes a limited oxygen supply or cerebral hypoxia.

This condition then leads to brain tissue death, cerebral infarction, or even an Ischemic Stroke. Sickle Cell in children makes them more at risk for brain damage due to their abnormal shaped blood cells.

As previously stated, the sickled shape of the cells clogs blood flow and leads to a stroke in the brain. In general, the disease does lead to an increase in the risk of stroke.

However, this risk is more prominent in children since their internal body structures are smaller than in adults. When blood clots form in the brain's venous sinuses, it's referred to as Cerebral Venous Sinus Thrombosis. Having sickle cell presents an increased risk of this condition because the Sickle Cell trait is one of its most common causes. Thus leading to more complications such as pulmonary hypertension and osteonecrosis.

In all, there are multiple neurological complications that involve Sickle Cell Anemia. Common issues are

strokes due to the sickle-shaped blood cells in one's body. Ischemic and Hemorrhagic strokes are the most common.

Other complications include Cerebral Venous Sinus Thrombosis and Cerebral Fat Embolism. There are treatment options available for the disease such as Stem cells or Bone Marrow Transplants. However, these procedures involve many risks and are therefore not performed very often.

Brain Implants

Brain Implants also referred to as neural implants are special devices that keep the communication between the brain and the body alive.

These medical devices are usually connected directly on the surface of the brain or the cortex. These devices can also record, transmit, and track the functionality of the brain's condition. Brain Implants use electrical stimulation which is where electricity gets sent to neurons to counter a number of neurological conditions that may cause the brain to not function properly. Many conditions like Parkinson's disease and Epilepsy.

Since we have become more technologically advanced in the medical field and engineering, more medical tools have been developed, and many people have gotten Neuro implants. These implants can change people's lives and benefit them in various ways. Many people who are paralyzed have implants to control robotic parts. There are many different Neural Implants out there and they each serve a purpose depending on the patient's condition and which implant fits the best for that person.

Like previously mentioned before, there are many different Brain Implants out there. The common one implant DBS (Deep Brain Stimulation) is used for treating Parkinson's disease, essential tremor, etc.

During a DBS procedure, they insert neurotransmitters which send electricity to different parts of the brain. Another implant called Stentrode is a nano electronic strand of electrodes that first start off as a liquid and then progressively hardens into a substance.

Stentrodes are inserted in the blood vessels and with the use of catheter angiography, these make it a lot more low risk and don't need a full open skull surgery. These tiny devices can track the state of neurons wirelessly and these devices are very common in many patients who are paralyzed. The last implant is called a bioresorbable implant are very thin electric sensors that can melt away and be absorbed by the body. These electric sensors can track the state of the skull and brain after surgery or injury and can also frequently monitor temperature and pressure.

This makes it a lot easier so there's no need to have more surgeries to remove it when it naturally goes away.

Brain Implants might work for some people, might not work for others. This can come down to many factors: cost, procedure, side effects, etc.

Some pros of Neural Implants are how they can help minimize your symptoms, treatment, and have a very high rate of success after the procedure. Neuro Implants can help decrease your need for meditation and many people who get it tend to have lived their best lifestyle and increase their energy.

Neural Implants aren't that common amongst people due to cost, surgery process, progansis, and the multiple side effects. These implants can be crazy expensive, even with insurance help, it can still range from a few thousand up to 100,000. Even with patients having the cost covered the actual surgery can be frightening due to the patient being conscious during the procedure as they make incisions in the scalp. In every surgery there's always risks.

Even with the high success rate, the complexity of the brain can cause many complications. These complications can go from bleeding, stroke, and can gather fluid in the brain. After the device has been placed in the brain, overtime the implant can end up having a malfunction or in need of a replacement in battery.

To prevent this, these implants need to be monitored regularly. There are many positives and negatives when it comes to brain stimulation so it can ultimately be a tough decision for the patient.

All of these brain implants have definitely made an impact on many people's lives and each of them serve a purpose to help fight back and challenge all sorts of neurological conditions.

Red Blood Cells

Have you ever accidentally cut your finger and caused blood to suddenly pour out of the wound ? Or maybe you were playing basketball on the pavement and scraped your knee? No matter the situation, I'm sure we've all experienced a cut or scrape that caused a familiar red liquid to ooze out from under the skin.

This fluid is known as your blood and it is largely composed of your red blood cells, also known as the donut-shaped forms you see on the side. Continue reading to find out more about this specialized cell and its importance.

Red blood cells, also called erythrocytes, are so tiny that their size and shape are impossible to see with the naked eye. This is why when we see blood, we only see a red liquid flowing together instead of millions of individual cells. A normal red blood cell has a diameter of about 7.3-7.7 (µm).

In other words, the diameter is about 0.0073-0.0077 millimetres (mm) wide. Red blood cells have a flexible, biconcave disk shape that

maximizes the cell's surface-area-to-volume ratio. Their extremely thin and flattened form makes it easy for oxygen and carbon dioxide to diffuse across the cell's membrane and reach its center more efficiently.

Red blood cells carry oxygen from the lungs to the rest of the body. They also pick up carbon dioxide, which is the waste product of metabolism, and take it to the lungs, where it is exhaled and excreted. Mature red blood cells lack a nucleus and most cellular organelles, which means that the amount of oxygen the cell needs for its metabolism is very little.

Therefore, most of the oxygen it carries can be given out to the rest of the body and not withheld to maintain its own functions. Anemia is a condition in which the body lacks the required amount of healthy red blood cells to carry enough oxygen to the cells.

Anemia is a condition in which the body lacks the required amount of healthy red blood cells to carry enough oxygen to the cells. This condition, also known as low hemoglobin, can make you feel dizzy, weak and fatigued, among other symptoms. Untreated anemia can lead to serious consequences, such as heart failure, which is why it is important to have an iron-rich diet filled with other important vitamins in order to help raise your red blood cell count.

Patients with severe, chronic anemia can undergo blood transfusions to help them recover. Red blood cells are used in these blood transfusions, which can help anyone with chronic diseases such as anemia, leukemia, kidney disease, etc.

However, it can also be used for someone who has lost a large amount of blood through some sort of trauma, such as a car accident, a natural disaster, etc. To prepare for blood transfusions, these red blood cells are taken directly from the body by extracting the plasma, which is the liquid part of the blood

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