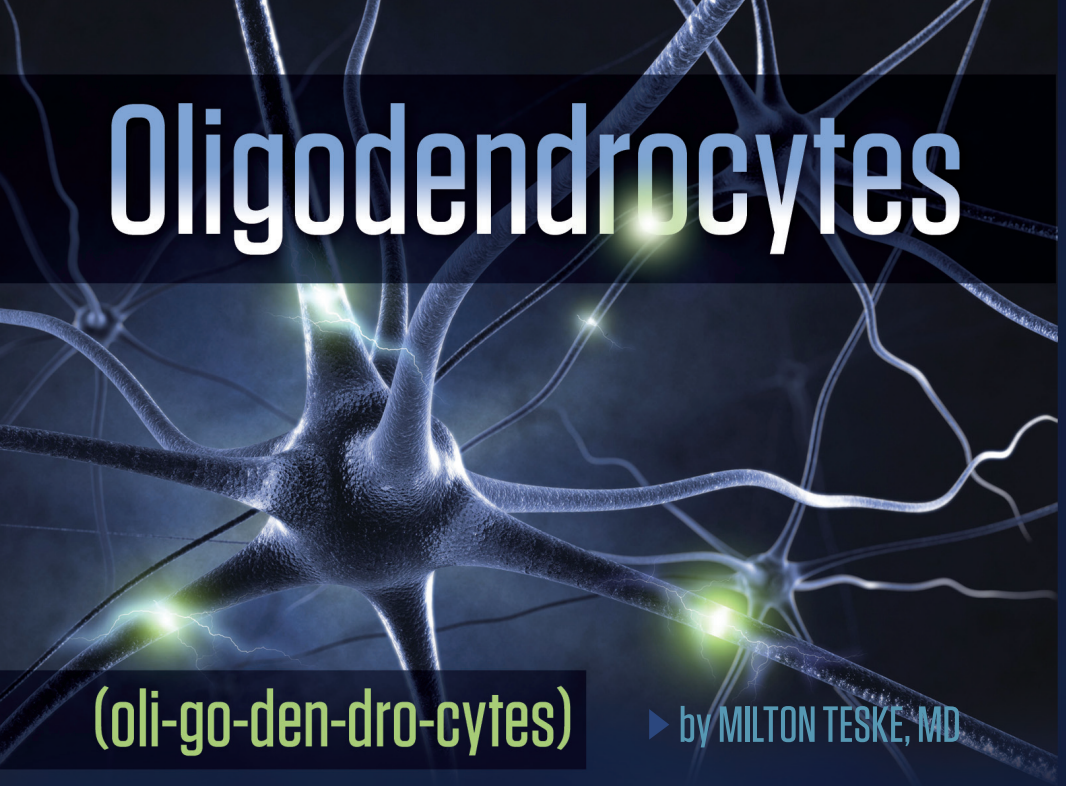


Oligodendrocytes

(oli-go-den-dro-cytes)

by MILTON TESKE, MD

Your brain has about 100 billion neurons in it. Some have described the brain as a giant computer, but the more we understand about the function and structure of neurons the more we are beginning to realize that each neuron is actually like an entire computer and the brain like a network of 100 billion computers all wired together. The cables connecting this network are called axons and points of connection are called synapses. There are over 100 trillion of these synapses. The combined function of this computer network is where you create every thought you think and store every memory you have. Every emotion you experience, every sight you see, every fragrance you smell is experienced here. This network controls the movement of your muscles; it controls the beating of your heart and every breath you take. Here it is that the soul communes with the God who created it.

But the brain isn't all neurons. About half of the cells in the brain are various support cells whose function is to protect and nourish and help the neurons so they can carry on their complex and vital electrical activities. We won't begin to describe all of the various types of support cells and their functions here today but will focus our attention on just one type of support cell called an oligodendrocyte.

The Oligodendrocyte

The oligodendrocytes are located throughout the entire brain and spinal cord. Their job is to protect and care for the trillions of connecting cables called axons that connect all of the neurons. Without these vital support cells doing their job of maintaining and speeding up the electrical impulses it would be impossible for the brain to function. They accomplish their job by providing a special insulating wrap around the axons that not only protects and maintains these long yet extremely thin cellular "electrical wires," but they also become a powerful electrical accelerator that gives a tremendous boost to the electrical impulse traveling down this wire.

From each oligodendrocyte there are lots of little protrusions reaching out in all directions and making contact with the axons that are passing through its location. Wherever one of these contacts an axon it flattens out and wraps around the axon. It spirals around and around the axon making a flat multi-layered sheath of **myelin.** Myelin is about 80% lipids and 20% protein. Each oligodendrocyte will reach out and build about 50 of these little myelin sheaths protecting and insulating the axons passing near it. Together with all of the other oligodendrocytes in the brain they will insulate all of the axons of the brain with thousands of little segments of myelin insulating each axon.

But the most important function of these myelin sheaths is to speed up the electrical impulses traveling through the axons. Electrical impulses normally travel across the surface of the neurons as sodium ions rush in through little sodium channels in the cell membrane then potassium ions rush out restoring the electrical potential. This is an extremely rapid process with cells repeatedly firing every millisecond if needed. But in order to send electrical impulses even more rapidly across longer distances within the brain, myelinated axons are used. The myelin acts as an electrical conductor with the electric impulse jumping from one segment of myelin to the next at nearly the speed of light. Thus the electrical messages fly from one part of the brain to the other at nearly instantaneous rates making complex brain functions possible at the speed of thought. Without the myelin sheaths covering every axon, normal brain function would not be possible.

There are a number of devastating demyelinating diseases where the myelin is destroyed and the affected areas become basically non-functional such as in multiple sclerosis. Myelin is necessary for the electric circuits of the mind to rapidly send their electric messages. And it is the cell bodies of the oligodendrocytes that support all of their attached myelin segments keeping them functioning properly. The areas of the brain that are mainly composed of axon cables connecting one part of the brain to another appear white because of the myelin and are referred to as **white matter,** while the grey matter is composed mainly of neuron cell bodies rather than myelinated axons. Oligodendrocytes are also responsible to control and regulate the electrolyte fluid surrounding neurons keeping it just right.

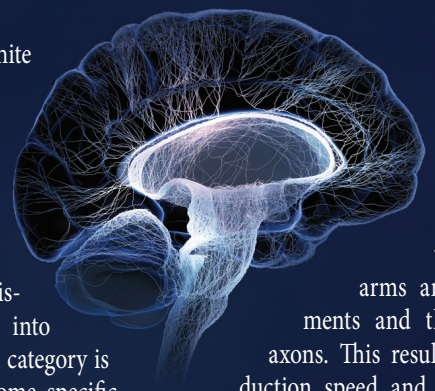
Creating Oligodendrocytes

Oligodendrocytes develop from oligodendrocyte precursor cells or **OPCs.** These OPCs can be turned on and transformed into oligodendrocytes that then send out their connecting arms and wrap their myelin sheaths around the axons. Embryological the oligodendrocytes are the last type of cells to be formed in the newly developing brain.

When a baby is born there are only a few regions of the brain that are myelinated and have oligodendrocytes. As the baby grows and the mind develops, more OPCs are switched on and turn into oligodendrocytes, thus myelinating more areas of the brain. By age 25 – 30 the brain is fully myelinated.

Myelination is an important part of intelligence. Neuroscientists have found a direct correlation — people with more white matter have higher IQs. Researchers have found that rats raised in an enriched environment with lots of different stimuli and experienc-

es will develop more white matter.



Demyelinating (de-my-eli-nating) Diseases

The demyelinating diseases can be divided into two categories. The first category is those diseases where some specific agent (like a specific antibody) targets the oligodendrocytes such as in the case of multiple sclerosis. As the cells are destroyed and the myelin disappears, the conduction speed is lost and serious disability is the result.

The second category is found in those conditions where some generalized disease process results in loss of white matter. The most common is ischemia, the decreased flow of blood, oxygen and nutrients due to atherosclerotic narrowing and dysfunction of the blood vessels. This gradually decreased blood supply results in a gradual diffuse decrease in the amount of myelination seen in the brain and is referred to as white matter disease. This is frequently seen on CT scans of the brain in middle age and older brains.

We often think of this white matter disease as just a natural part of aging, but it is really the result of common lifestyle related disease processes. The result is a gradual dulling and slowing of the mental functions. As it becomes more advanced, it is often referred to as dementia.

Remyelination

The good news is that God designed the body with the ability to heal and be restored. While it does not appear that the damaged mature oligodendrocytes can grow new myelin segments even if they do survive the initial injury, OPCs can proliferate and be switched on and be transformed into new oligodendrocytes that can grow new arms and new myelin segments and thus remyelinate the axons. This results in increased conduction speed and a return to normal function. This spontaneous remyelination has been well documented.

Of course we must correct the underlying disease process that is causing the destruction of the oligodendrocytes. For many demyelinating diseases, lifestyle changes have been shown to be very effective. Coming back to God's simple, whole plant food diet with exercise and the elimination of all toxic and inflammatory substances can stop the underlying cellular destruction. Then spontaneous remyelination can occur.

How Do You Switch On An OPC?

Recent studies just published in the Journal of Neuroscience by researchers from the University of Wisconsin appear to have discovered the secret of how to switch on OPCs transforming them into oligodendrocytes that can remyelinate the axons. **Sleep** is the answer. During deep sleep, the genes responsible for this transformation are turned on.

We have always known that sleep has many beneficial effects, rejuvenating and restoring our brain energy for the next day. But now we know that there are also slow, but powerful, transforming effects of deep sleep as well. It is sleep that turns the switch allowing OPCs to turn into oligodendrocytes that are so necessary to restoring or maintaining our myelinated axons at their peak function.

So, whether you are recovering from acute or chronic demyelinating disease or just wanting to maintain a good healthy white matter you now know the secret — deep, sound sleep. Sleep is the key to making new oligodendrocytes which will keep your axons well myelinated and running at peak speed.

Getting A Good Night's Sleep

What is the biggest disrupter of deep sleep in the world today? Caffeine — coffee, tea and sodas. And not just too much — even one cup of coffee in the morning will prevent the neurons in your brain from going into the deep sleep waveforms the next night.

"Coffee is a hurtful indulgence. It temporarily excites the mind to unwonted action, but the after-effect is exhaustion, prostration, and paralysis of the mental, moral, and physical powers. The mind becomes enervated, and unless through determined effort the habit is overcome, the activity of the brain is permanently lessened. … The habit of drinking tea and coffee is a greater evil than is often suspected." Christian Temperance and Bible Hygiene, pp. 34-35

Melatonin is a hormone made in the pineal gland in the very center of the brain. One of its many functions is to help put the neurons into their sleep cycle. During the day if you are outdoors experiencing sunlight, this bright level of light will stimulate the formation of melatonin in the pineal gland that will be saved up and all released at night to help put your brain into a good, sound, sleep pattern.

If you must spend the day indoors or if through the natural processes of aging you have a decreased production of melatonin, you can supplement by taking 3mg of melatonin at bedtime on a daily basis to help restore more youthful sleep cycles.

The Essential Oligodendrocyte

While we often speak in awe about the neurons of the brain, they would be a useless tangle of cytoplasm without the constant supporting efforts of the oligodendrocytes. Speed of thought and action is made possible only by this amazing, specialized cell whose action is just to support the neurons in their jobs. So in the church today some may be oligodendrocytes. They may not make the leading decisions or perform the heroic action, but both brain and muscle would be useless without their constant supporting efforts.

But regardless of which part of Christ's church you are called to be, you will need all your oligodendrocytes fully myelinating the pathways of your brain if you are to faithfully do your part in God's final work on this earth.

MILTON TESKE, MD

SECRETS UNSEALED

5949 E. Clinton Ave.
Fresno, CA 93727

559.264.2300 *(Intl. & USA)*
888.REV.1412 *(USA Only)*
SecretsUnsealed.org