

Rapid Recovery Hyperbarics

9439 Archibald Ave. Suite 104 Rancho Cucamonga CA, 91730

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Brain Disorders/Neurological White Matter

The white matter is those areas of the nervous system rich in axons (electrical wires, for want of a better term) along which messages travel.

These messages can be related to movement, sight, etc. The axons are covered with glial cells. The glial cells are supportive cells, producing the lipid substance called myelin, which forms an insulating sheath around certain nerve fibers. The myelin can be likened to the colored plastic insulation we see around electrical wires. The messages (which can be likened to an electric current) travel down the axons, and the myelin helps keep the signal from becoming mixed up in the other axon pathways.

Different parts of the nervous system appear gray, white, or mottled. The gray matter is made up of a mix of cells and capillary blood vessels and, as its name implies, has a gray appearance. The connections between the cells are the axons (as described above), which are covered in glial cells. The glial cells, being fatty, have a high refractive index and appear white. An area of the brain rich in these is called the white matter. A part of the brain which is a good mix of cell bodies and axons (gray and white matter) is called the reticular formation as it has a netlike appearance.

White Matter, by James MD (Continued)

It would be better to refer to the outgrowths of neurons as simply fibers, because some are axons - where the signal is carried away from the cell and others are dendrites - which carry impulses towards the cell.

Those fibers that are myelinated have segments, which are covered by a wrap of myelin sheath, which is the projection of the parent cell body - the oligodendrocyte. A single parent oligodendrocyte may be responsible for up to 20 myelin segments, which are organized like the tentacles of an octopus. The wrap is like a Swiss roll, with as many of 30 turns of sheath. The sheaths abut at the nodes of Ranvier.

Conduction is along the sheath and is known as "saltatory." A non-myelinated fiber may conduct at say 0.5 meters a second where a fully myelinated fiber of the same size may conduct at 150 mps. Insulation

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from cross talk is provided by cerebrospinal fluid which is rich in surfactant,
which absorbs to the surface of the sheath and being a Zwitterion is strongly charged.

Although rarely acknowledged fibers in gray matter may also be myelinated. The oligodendrocyte has a very high metabolic rate and the sheaths are easily damaged by edema where there is protein extravasation probably due to complement activation.

Best wishes

Philip James

Wolfson Hyperbaric Medicine Unit

University of Dundee

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