

Cerebrospinal Fluid and Brain Health: Optimized By Grounding

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Introduction

The function of the cerebrospinal fluid of our central nervous system has historically been viewed as providing cushioning, buoyancy and a layer of physical protection to our brain and spinal cord. However, recent research is revealing that the cerebrospinal fluid (CSF) has multiple roles in maintaining brain health, including supporting neuronal development, metabolic and nutritional support, hormone signaling, complex pulsatile flow patterns, waste removal, even possibly providing protection from neurodegenerative disease.

Our CSF is capable of signaling to the brain in a non-synaptic way, being in direct and intimate contact with the neurons of the brain and spinal cord while being an electrically bioactive, fully conductive, nutritive fluid. In fact a continual supply of CSF has constantly supported the health of our neurons from the very earliest proliferation of neuronal stem cells in fetal development [1] throughout the entire lifespan of fully mature neurons in adulthood [2].

Our CSF bathes the entire brain and spinal column, ventricles, pineal gland, thalamus, hypothalamus, pituitary glands, and other structures with nutrients, oxygen, crucial hormones (such as

melatonin, insulin and growth factors) removes metabolic waste products in the brain, and is in direct contact with photoreceptors, chemoreceptors, and mechanoreceptors, all which provide instantaneous messaging that is not dependent on synaptic transmission. Because of its pervasive contact with the entire brain and spinal column, the CSF can provide this support in a synchronized, simultaneous way throughout the entire central nervous system [3].

The Movement of Cerebrospinal Fluid

Recent research suggests that not only does the presence of CSF provide a healing, electrolytically stable environment for our brain's optimized functioning but the actual movement of the fluid itself may impact brain health as well. Researchers have found that the CSF moves and pulses in multiple ways — our heartbeat creates a pulsatile movement in the CSF [4], non-REM sleep allows the CSF to move and perfuse through the brain more deeply than it does in wakeful states [5], optical stimulation (such as strobe lights) can instigate measurable CSF movement [6], and even deep breathing can create a significant pulsatile movement of our CSF [7]. In fact, some researchers suggest that respiration may be thought of as the "primary source of pulsatile CSF motion" [8]. The stimulation of movement of our CSF via deep abdominal breathing provides a pathway through which we may have conscious control over our internal CSF movement. Through intentional deep breathing, we may have a pathway to boost brain healing via CSF flushing, delivery of nutrients and oxygen, and clearing of metabolic waste. Therefore, it would be incredibly interesting to see studies on the use of deep abdominal breathing to support brain health and

healing, to see if it may provide a novel pathway to support brain recovery that is within our conscious control.

Our glymphatic system (driven by CSF flow) is most active during sleep [9] with CSF perfusing the brain best during non-rem sleep [10,11] which may be one reason why brain rest, with low stimulation and a focus on obtaining deep restorative sleep, is recommended after brain injury [12]. While improved CSF movement may be one reason sleep is so crucial to brain health and healing, the opposite also may also be true — that decreased CSF movement may contribute to or be a potential cause of brain neurodegenerative disorders such as Alzheimers, and degenerative eye disorders, such as glaucoma [13]. Reduced sleep duration (which likewise reduces the time available for movement of CSF throughout the brain during sleep) has been linked with short term brain issues such as decreased short term memory, cognitive decline, and migraine [14-16] to long term progression of organic brain disease like Alzheimers Disease, Parkinson's disease, Huntington's disease, Multiple Sclerosis and other neurodegenerative disorders [17-20].

Novel research on CSF movement reveals that it may even be used as a battery — harvesting power from CSF fluctuations to power neural implants [21]. Is our CSF a nutritive battery, just waiting for us to learn how to optimize its use through motion? Is it possible that in addition to optimizing sleep to help protect brain health we can and should begin to optimize CSF movement via deep breathing, in order to further protect our brain even while we are awake? One recent study showed that intentional, slow breathing decreased blood biomarkers of Alzheimers disease — decreasing plasma amyloid beta and tau levels in only 4 weeks [22]. Another study found that a breathing program significantly improved cognitive performance in elderly study participants [23]. Could the mechanism of action of these breath work benefits come from boosted CSF flow? I hope many more future studies include an examination of the potential impact that deep breathing might have in stimulating brain healing to help elucidate if increased CSF movement in the central nervous system improves outcome after brain injury and/or may help decrease onset or delay progression of neurodegenerative diseases.

Electrical Grounding of Cerebrospinal Fluid

No matter how our CSF supports brain function and health, grounding may be a unique and novel pathway to help exponentially magnify these benefits. Because our CSF is an electrolytic, fully conductive solution, it provides instantaneous grounding to our entire central nervous system whenever our body is grounded.

Grounding is simply touching the earth directly to put the body into a healing state. Decades of research are beginning to show just how healing grounding is [24]. Studies on the neuromodulative role of grounding have shown that grounding immediately shifts brains waves, boosting alpha brain wave patterns on EEG within milliseconds [25], deepens sleep [26] and significantly improves mood [27]. These results suggest that connecting our electrical

central nervous system with the earth's electrical field can have such a supportive impact on our brain it not only supports brain function it can even improve our outlook and how we feel.

Evolutionarily, it seems to be well beyond chance that our planet pulses out with an electrical heartbeat — known as the Schumann Resonance — which creates an electrical field that our conductive bodies function optimally in [28]. The center of our cognition and our entire consciousness as we know it — our brain and the electrical fluid it's protectively supported in — all operate in the healing electrical fields that our planet produces. Researchers have found significant coherence between the electrical activity of our planet and the electrical activity of the human brain in real time EEG/EFL studies [29]. This electrical activity between the planet and our brain is synchronized to such a magnitude, amplitude and frequency that it allows for information processing to occur — a real time “ping” from the planet to our human brains [30].

Going one-step further and making conductive contact with the earth — touching the surface of the planet directly with the body, even just a fingertip or a toe — grounds our electrical system and provides a host of health benefits to our electrical function. Grounding improves heart rate variability (HRV) [31], increases blood perfusion [32] decreases blood viscosity [33] support muscles contraction during exertion [34-36] instantaneously shifts brain wave patterns and reduces ambient stress levels [37] along with supporting deeper, more restorative sleep at night [38], improving sleep quality [39] and optimizing our body's autonomic nervous system function through vagal tone support [40].

Because we know that the CSF is an electrolytic bath that provides the ideal environment for our brain to function in, it would be exceedingly interesting to begin to study the impact that grounded CSF has on the health and function of the human brain verse non-grounded CSF. Might the electrical activity of the earth even impact the movement of pulsatile activity of our CSF through our brains? The Schumann frequency is a pulsatile rhythm of DC electrical activity that is often described as the earth's double heartbeat because of its dual oscillations [41]. If our breathing, our heartbeat, and even the brain waves of our sleeping brain allow the CSF to increase the flow of nutrients, oxygen and hormones and the removal of metabolic waste, effectively rinsing out our brains to optimize it's function, it makes intuitive sense to me that the earth's pulsating electrical field would also have an active hand in encouraging this flow and be at least in part the mechanism of action behind why grounding puts the human body in such a healing state.

I highly encourage future research into the healing nature of our CSF to include an examination of it's groundable electrical, conductive properties as well as an examination of any impact the earth's pulsatile electrical field may have on the pulsatile movement of CSF within our own brains.

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