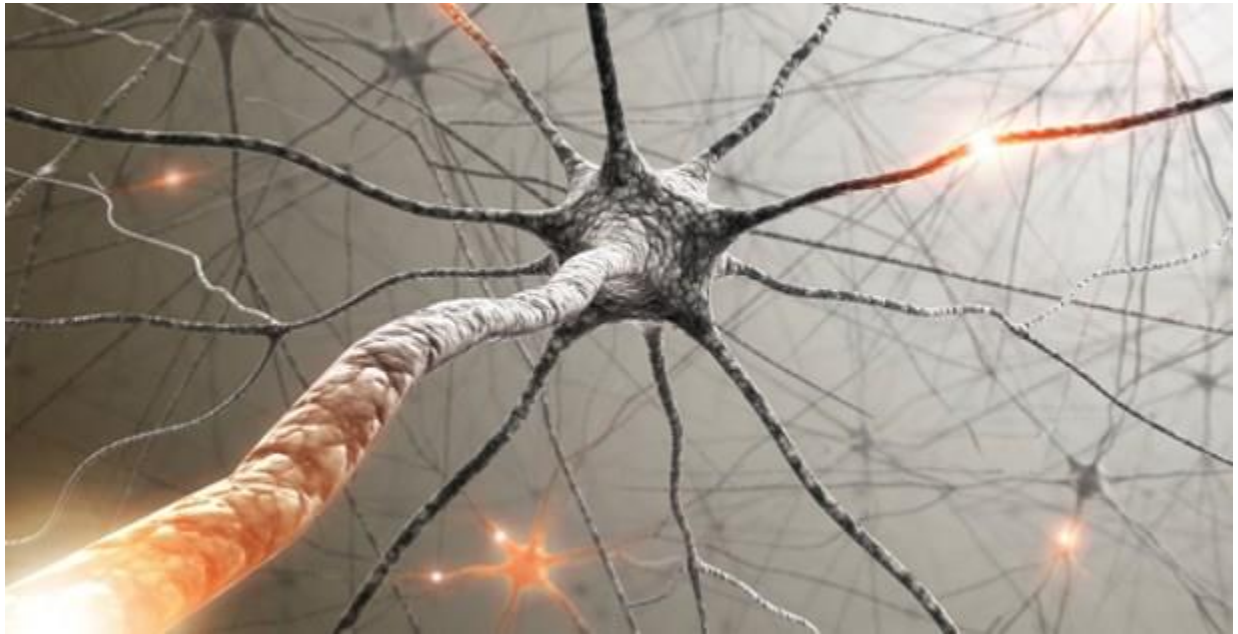


The Chemicals in the Brain are Altered After Concussion

According to [this literature review](#) on concussion, after a concussive blow occurs the neurotransmitter glutamate is released in high amounts throughout any impact-affected brain. Glutamate is a chemical normally released neuronal cells as a signal in the brain during synaptic transmission (communication between neurons), that creates a response from the target cell to change its calcium levels by opening up a calcium channel.



After concussion, too much glutamate released indiscriminately throughout the damaged areas causes all of the surrounding neurons to take in too much calcium for the neuron to function normally, as calcium is involved in energy production, axon structure, and overall proper function. This excess calcium not only causes the axons of neurons to break down and become nonfunctional, but it also prevents the neuron from producing the necessary energy it needs to function.

Hence, cognitive impairment in the form of dizziness, slurred speech, and [whole host of other symptoms](#) exist that may also depend on what part of the brain has been damaged.

In order for the neuron to resume its normal ability to function, it must return to its normal levels of calcium and glutamate. In studies of rats with concussion, the glutamate levels in their brain are fixed within a day after injury, but the calcium

problem can take at least a week to be fully restored, leaving the brain much more vulnerable to damage from further concussions.

In humans, this recovery period could be much longer with our significantly larger and smarter brains, and it says nothing about the permanent structural damage that has been done. The more neurons that need to be repaired, the longer it needs to fix itself. But it may be even longer, as researchers have also identified possible indicators that the brain chemical balance is not fully restored after an entire month.

The infamous BLUE BRAIN!

- Cell is unable to carry out regular activity due to lack of energy.
- Often entire cell groups will go dormant to preserve themselves.
- Critical function is keeping Ca/Mg balance. With decreased ATP, Mg decreases in the cell and Ca increases
- Ca is an important intercellular messenger.
- With an unregulated increase, it disrupts multiple metabolic pathways

Restoring Metabolism

The brain is now functionally semi diabetic due to the GLUT1 receptor deficiency

What are alternate brain fuels?

- Glutamine
- Lactate
- Ketones

Loss of Energy Substrate

- More of a blue brain issue
- During the hyper-metabolic phase, ATP becomes ADP and may further deplete to AMP which then leaks out of the mitochondria. No ADP, no recycling to ATP
- If there is major mitochondrial death, then ATP is very helpful. Adenosine requires a lot of energy to make. D-Ribose is the backbone of adenosine. If ketosis alone isn't working, add in this Tx:
 - Tx: D-Ribose, ATP, ALCAR, Creatine