MSG – Does it Damage the Human Brain?
Excitotoxins – The Taste That Kills - by: Russell Blaylock, MD

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Excitotoxins are taste enhancers that are found in abundance in many food products and have been shown to cause damage to human brain cells. This dietary factor may be the cause of many degenerative diseases like Parkinson's, Huntington's, ALS and Alzheimer's Disease according to neurosurgeon, Dr. Russell Blaycock, MD. Is there any truth to this? In this paper I hope to provide information to help you become better educated about the dangers of excitotoxin additives in foods so you can make better choices for a healthier future for you and your family.

Since this is a complicated topic let's start with a basic understanding of how the brain works in relationship to exposure to MSG and other food enhancing chemicals known as "excitotoxins." Excitotoxins include MSG, hydrolyzed vegetable protein, astartame (sold as NutraSweet) and cystein. These excititoxins all have a similar impact on select neurons in the brain; they cause them to become over stimulated and to actually fire continuously until they exhaust themselves and die!

The Human Brain

First, let's discuss the brain. It is made up of many sections and each section provides a specific set of functions in the operation of the body. It is like a giant computer but is much more sophisticated. The brain is only 2% of the body's total weight and yet it uses 20% of its oxygen and 25% of its glucose (energy producing molecules). The majority of the energy used in the brain is for supporting impulse generation and transmission. The brain never rests. Neurons fire like dominoes and race across the empty spaces between the neurons at speeds of up to 200 miles per hour. The chemical transfers fly across the gaps between the neurons with trillions of messages every second. A properly functioning brain is required for all operations within the body and overstimulation of parts of the brain can cause destruction of these fragile neurons and their connections. In layman's terms listed below are the various parts of the brain and what functions they are responsible for.

Area of Brain	Function
Frontal Lobes	Allow us to learn restraint and to keep our emotions controlled, tact, socially acceptable behavior, tenacity and the ability to focus on a single task are all regulated here. The back side of these lobes regulates some movement; the right side controls the left side of the body and the left side controls the right side of the body
Parietal Lobes	Integrate all parts of the brain so we have a clear picture – When this part of the brain is damaged (as with Alzheimer's Disease) the person cannot find the way home.
Occipital Lobe	Is the visual lobe of the brain which takes data from the optic nerves in the eyes and connects this information to may areas of the brain.
Temporal Lobes	Store and feeds back recent and distant memories – this area is known as the "hippocampus" and is also damaged in Alzheimer's Disease
The Ventricles	Are a series of caverns deep in the core of the brain (corpus callosum) is the cooling system of the brain and also a transport system for chemicals, hormones and electrolytes. Since all neurons in the brain work together (not

	independently) this is a critical system and is filled with crystal clear cerebral spinal fluid that circulates throughout the entire brain.
Thalamus	Situated above the brain stem it is an integration unit like a miniature brain. It performs many complex functions and even has an independent reaction to some functions like pain, crude touch, language and possibly even some memory.
Striatum	All automatic movements are controlled here, like swinging your arms when you walk. This area is affected with cerebral palsy where movements become jerky instead of smooth.
Brain Stem	Consists of two hemispheres called the cerebellum. Impulses originate here like breathing, heart rate, balance and motor nerves of the face, neck and cranial nerves. It is responsible for our alertness and keeps us awake (people in a coma have an injury to this part of the brain). The upper area of the cerebellum is important in the causation of Parkinson's Disease
Hypothalamus	This wedge shaped part of the brain controls the release of hormones that travel to the pituitary gland and regulate growth metabolism, the onset of puberty and all endocrine systems. It also regulates hunger, fullness, sleep and waking cycles, autonomic systems, emotions and our biological clocks

Most parts of the brain have a blood-brain barrier that protects these fragile systems from internal and external toxins. The brain must stay in balance to work properly and several factors affect this. We know the brain is generally very resilient, however, certain areas of the brain are very sensitive and the hypothalamus is one of these areas. Since the brain is a chemical factory that depends on infinitesimal amounts of chemicals in the correct balance to allow for proper functioning; fluctuations in that balance can cause serious problems. Details of how the brain actually works still remain a mystery. It is like a cosmic universe unto itself.

We do know that chemical deviations in the brain can be of great concern, especially in the formative years when the brain is growing and the blood-brain barrier is not yet fully formed. Deviations late in life are also of special concern as the cumulative effect of years of various levels of abuse (a diet high in excitotoxins) and injury (head injuries, stokes, etc.) can cause the onset of many neurological diseases like Parkinson's, Huntington's, ALS and Alzheimer's Disease.

Scientists have learned from many studies that certain parts of the brain are especially sensitive to excitotoxins. High concentrations of these chemicals in the blood affect the brain. Toxic chemicals in the brain include glutamate and enormous amounts of glutamate are added to foods as taste enhancers – monosodium glutamate (MSG) is one the most serious offenders, along with aspartate and cystein.

A blood-brain barrier helps protect the brain from free radical damage and also exposure to excitotoxins. However, some parts of the brain have no blood-brain barrier. These include the hypothalamus, circumventricular organs, pineal gland and a small nucleus of the brain stem. Where the barrier exists can also become damaged and develop leaks. This happens when there has been a stroke, head injury, degenerative disease, infection, fever or low blood sugar (hypoglycemia). When this happens toxins can enter the brain and cause damage.

So let's look at the whole picture. When we eat the primary function of food is to support the chemical reactions of the brain and the body. Cells absorb nutrients using a lock and key system.

The key to absorption of the nutrients by the cell is often either sodium or calcium, which opens the lock. In the brain neuron calcium opens the cell allowing it to receive the nutrients and this triggers the neuron to fire and transmit signals. When the neuron is exposed to excitotoxins the brain's locking system is disrupted and the neuron fires incessantly until the neuron dies.

Here is the concern. Within the brain we know there are at least three types of glutamate receptors (and there may be as many as 20 more sub-types). MSG triggers all three types of glutamate receptors in the brain to fire. Zinc, magnesium and glycine are the locks on the system that block the calcium channel from staying open in the presence of unwanted toxins, thereby shutting the door. The American diet, however, is typically very low in both zinc and magnesium. Thus, the door to the neuron does not shut in the presence of MSG or other exicitotoxins, and the neuron continues to fire until the neuron actually becomes exhausted and dies. This is why these toxins are called "excitotoxins."

Areas of the brain that have the highest number of glutamate receptors are the most sensitive to excitotoxin injury. These include: the cortex, striatum, hippocampus, hypothalamus, thalamus, cerebellum and visual and auditory systems. As excitotoxins MSG and NutraSweet activate a number of brain systems that affect sensory perception, memory, orientation to time and space, cognition and motor skills. The affects of excitotoxin exposure are cumulative over the years.

How much MSG is really in our diet and how long has it been there?

In 1909 Professor Ikeda and his friend Saburosuke Suzuki began making a taste enhancer called MSG. By 1933 the Japanese were using over 10 million pounds of MSG per year. In 1948 the Armed Forces (wanting to make the rations taste better) held a conference with food giants like Pillsbury, Oscar Mayer, Libby, Stokley, Campbell Soups, Continental, General Foods and Bordens and they all started using MSG in their foods. The amount of MSG used has doubled every decade since 1940. It is now found in our foods under various labels which include: hydrolyzed vegetable protein, vegetable protein, natural flavorings and spices. These definitions of taste enhancers can be from 30% to 60% MSG and not have to be disclosed on a food label. Manufacturers also do not have to disclose several known carcinogens as the FDA does not regulate those. Taste enhancers are now big business and some of the worst offenders include soups because the MSG is in liquid form and is so readily absorbed into the blood stream and then carried on to the brain. Diet sodas are also serious offenders as they contain NutraSweet and are also a liquid.

Are there any studies that document damage from MSG?

There have been many studies that document the danger of excitotoxins. One study completed in 1957 by Lucas and Newhouse, Ophthalmology residents, studied the affects of MSG on animals and found that 100% of the nerve cells in the inner layer of the retina were completely destroyed by the introduction of MSG. In 1968 Dr. Olney from the Department of Psychiatry at Washington University in St. Louis repeated the same tests and found the same retinal destruction but also observed widespread destruction of the neurons to the hypothalamus and other adjacent areas of the brain. Both studies showed the worst destruction in newborn and immature animals. Similar damage was demonstrated when NutraSweet was used in the tests instead of MSG. The exposed animals also grew up, as adults, to be shorter in stature, obese and to have reproductive problems as well as an early onset of puberty. Thanks to Dr. Olney's efforts MSG was voluntarily removed from baby foods in 1969. Since the child's brain is four times more sensitive to MSG than the adult brain this was a very important change.

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Humans are also more sensitive to excitotoxin exposure than any other species. Blood levels of MSG in humans are 20 times higher than a similar exposure in monkeys and 5 times higher than in mice. Our MSG levels also remain elevated in the blood and brain for much longer periods of time than is demonstrated in any other species.

Is there any way to counteract the MSG as it seems to be in all packaged foods?
Neutralizing factors to excitotoxin poisoning in the brain appear to include Vitamin C and Vitamin E. It is interesting to note that the highest concentrations of Vitamin C in the body are concentrated in the brain. Other antioxidant helpers are beta carotene, Vitamin K, Vitamin D, Vitamin A and the minerals magnesium, chromium, zinc and selenium.

Scientists are now discovering that the calcium channels (which keep the neurons open to invasion by the excitotoxins and eventually exhaust the cell by causing it to fire incessantly until it dies) are very specific. The excitotoxin chemicals only attack neurons with glutamate receptors and ignore all other cells. Neurons with glutamate receptors include 50% of the fore brain synapses and are concentrated in areas of the brain known to be affected by chronic diseases such as Alzheimer's Disease, Huntington's, Parkinson's and ALS.

Why is low blood sugar a cause for alarm?
First of all, when MSG or other excitotoxins enter the blood stream everyone has a built in higher or lower sensitivity to these toxins based on their individual resilience. When a person is hypoglycemic the body is weak, the mind is fuzzy and neurons are already firing spontaneously because of the low blood sugar condition in the brain. Since the brain needs very large doses of glucose to function properly hypoglycemic individuals already lack the energy needed by the brain to operate properly. These tired neurons are now further stimulated by the addition of the MSG or other excitotoxins and the overstimulation causes the affected cells to die. High doses of MSG cause rapid death and low doses cause a slower death. Keeping a normal blood sugar level is critical to brain function and excitotoxin protection. Excessive exercise (like marathon runners and tri-athletes etc.) can induce hypoglycemia and these people need to take extra care not to exhaust the body because the brain does not get adequate nutrition when we are in a hypoglycemic state and it therefore becomes especially susceptible to damage.

Reference:
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