A Potent Toxin

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Fluoride is a chemical compound of the element fluorine found naturally in food, water and air. Humans are also exposed to fluoride from municipal water supplies (when it's added), dental treatments, coal burning, pesticides, fertilizers, pharmaceuticals, bricks, tiles and ceramics, and steel and glass fiber industries. According to a World Health Organization 2002 publication, fluoride has both beneficial and detrimental effects on human health, with a narrow range between the intakes at which these occur.1

Fluoridation of drinking water began in Grand Rapids, Michigan in 1945. Currently, an estimated 300 million people are exposed to fluoridated water, including 5.5 million in the United Kingdom and 144 million in the United States.2 Although the controversy over fluoridation of drinking water continues in the U.S., 97 percent of Western Europe has chosen not to fluoridate their water.3

At the center of the debate regarding fluoridation is the health effects associated with fluoride exposure including goiters, osteoporosis, obesity (due to its effects on the thyroid), fluorosis, and lymphoma. This article, the first in a two-part series, will concentrate on the negative effects that fluoride has on brain physiology and the cognitive changes that occur after fluoride exposure.

Fluoride and the Brain

Numerous studies have investigated the effects of fluoride exposure on the brain. One study examined DNA damage and apoptosis, or programmed cell death, in the brains of rats treated with fluoride. This study showed that compared to rats not exposed to fluoride, the fluoride-exposed rats had increased DNA damage in the pallium, hippocampus and cerebellum and increased apoptosis in the pallium and hippocampus, areas of the brain important for cognition.4 Research has also shown that fluoride accumulates in the human pineal gland, which is the gland that secretes the hormone melatonin.5

Another study evaluated the effect of fluoride on the synaptic cleft width in the hippocampus of mice. The synaptic cleft is the area in which nerve cells functionally communicate via neurotransmitters. This study showed that fluoride exposure results in a decreased thickness of post-synaptic density and increased width of the synaptic cleft, and correlated to impaired learning ability of the mice.6 In another study, fluoride exposure was shown to affect brain membrane lipid content. In this study, rats exposed to fluoride for 7 months showed decreased total brain phospholipid content; particularly affected were phosphatidylcholine, phosphatidylethanolamine and phosphatidylserine.7

Yet another study evaluated the role of fluoride on acetylcholinesterase, an enzyme that breaks down the neurotransmitter acetylcholine and is the target for several medications used to treat Alzheimer's disease. This study showed that pregnant rats exposed to fluoride in their drinking water and their offspring had elevated acetylcholinesterase activity.8 A similar study investigated the impact of fluoride intake on neurotransmitter levels in the brains of rats. This study found that fluoride intake resulted in memory impairment, increased dopamine levels in the striatum and increased noradrenaline and serotonin levels in the striatum, hippocampus and neocortex. Furthermore, removal of fluoride exposure for 2 weeks did not reverse these findings. The study authors stated that the memory

impairment caused by fluoride exposure may be related to the neurotransmitter alterations in discrete brain regions.9

Oxidative Damage

The mechanism in which fluoride damages the brain remains unknown, although numerous studies indicate that fluoride causes oxidative damage to brain tissue. Animal studies indicate that at low levels of exposure over 10 weeks, fluoride increases reactive oxygen species and decreases glutathione levels.10 Another study examined levels of antioxidants, antioxidant enzyme activity and lipid peroxidation in the brains of 3 generations of rats exposed to high dosages of fluoride. This study showed that fluoride exposure resulted in significantly increased lipid peroxidation, decreased levels of the antioxidant glutathione, and decreased activity of antioxidant enzymes including catalase, superoxide dismutase, glutathione peroxidase and glutathione S-transferase. This study also showed that these changes were more pronounced with each subsequent generation.11 A similar study also found that fluoride decreased glutathione and antioxidant enzyme activity and increased levels of malondialdehyde, a marker of oxidative stress, in the brains of rats. This study showed that the addition of the potent antioxidant hormone melatonin reversed these findings.12

Fluoride Lowers IQ

Most alarming are the studies regarding fluoride intake and decreased intelligence quotient (IQ) scores, particularly in children. Studies have shown that fluoride in the drinking water and elevated urine fluoride levels have been associated with decreased IQ scores, and verbal and performance evaluations in children.13 A meta-analysis of 13 published studies reviewed the association between fluorosis, or increased fluoride intake, and IQ. The analysis concluded that exposure to high levels of fluoride may adversely influence children's intelligence development.14 A second meta-analysis investigated the correlation of IQ and fluoride intake in both high and low-fluoride areas. In this analysis, 16 studies were evaluated. This review demonstrated a consistent and strong association between the exposure of fluoride and low IQ scores. The results of the analysis showed that children in an area with high fluoride exposure had 5-times the risk of developing a low IQ compared to children from an area with no or low fluoride exposure.15

Even at low levels, fluoride has been found to have a toxic effect. A recently published study investigated the correlation between fluoride intake of less than 3.0 mg/L in drinking water and IQ. In this study, 331 children between 7 and 14 years of age were evaluated for IQ, dental fluorosis and fluoride levels in the drinking water. The researchers found that even at low levels of fluoride, as urine fluoride levels increased, IQ scores decreased in these children. More specifically, for each increase of 1 mg/L of urine fluoride, there was a 0.59-point decrease in IQ. Urine fluoride levels also correlated with dental fluorosis. The researchers concluded that low levels of fluoride exposure in drinking water had negative effects on children's intelligence and dental health.16 Furthermore, research has shown that children who were born and grew up in an area with elevated fluoride exposure exhibited reduced mental work capacity.17

Protecting Against Fluoride Toxicity

Filtering the water is one way to reduce fluoride burden. However, it is important to note that the typical counter top and refrigerator filter systems do not take fluoride out of the water. A special "fluoride certified" system that often includes reverse osmosis or distillation and which has documented effectiveness for removal of fluoride can be used for those wishing to lessen fluoride burden.

Several vitamins and supplements have been shown to optimize brain health and function and can be taken to counteract the effects of fluoride exposure. Melatonin, a hormone secreted from the pineal gland, has significant antioxidant activity and has been shown to reduce DNA damage from toxins such as fluoride.18 In one study, mice were administered fluoride and either melatonin or pineal proteins for 28 days. The brains of the mice were evaluated for malondialdehyde, a marker of oxidative stress; glutathione, a potent antioxidant; and several antioxidant enzymes including superoxide dismutase, glutathione peroxidase, catalase and glutathione reductase. Fluoride treatment was shown to increase malondialdehyde and decrease glutathione levels and activity of the antioxidant enzymes. The addition of melatonin or pineal proteins was shown to decrease malondialdehyde levels, increase glutathione and increase the antioxidant enzyme activity in the brains of the mice.

The researchers stated, "Together, our data provide direct evidence that buffalo pineal proteins and melatonin may protect fluoride-induced oxidative stress in brains of rats through mechanisms involving enhancement of enzymatic and non-enzymatic antioxidant defense system. Therefore, this study suggested that pineal proteins and melatonin can be useful in control of neurotoxicity induced by fluoride."12

Iodine/iodide (as found in Iodoral®) is another natural substance that supports brain health and counteracts the negative effects of fluoride. Research indicates that low iodine levels are associated with an increased risk of lower IQ in children.19-20 This is an interesting finding, given that iodine supports thyroid health and fluoride is harmful to the thyroid, indicating that fluoride's negative effects on IQ may be in part connected to the thyroid. Furthermore, iodine supplementation markedly increases urinary excretion of fluoride.21 This is because iodine competes with fluoride for use by the body.

The B vitamins riboflavin and niacin (found in ATP Cofactors) also support cellular energy (ATP) production as well as function as cofactors for the transport of iodide into the tissues, and thus work synergistically with Iodoral. Furthermore, research indicates that riboflavin increases fluoride excretion in the feces. One study showed that as the dosage of riboflavin increased in rats, there was a proportional decrease in fluoride retention.22

When fluoride is removed from the body, a detoxification reaction can occur in some people. To help combat the lack of mental clarity that occurs during this detoxification reaction, phosphatidylserine, glycerophosphocholine (GPC) and acetyl-L-carnitine (found in Brain Vibrance™) can be used to energize the brain and eliminate foggy thinking. Phosphatidylserine has been shown to improve cognitive impairment in elderly subjects as well as improve mental or physical performance under stress in younger subjects.23-24 GPC increases levels in the brain of choline and the neurotransmitter acetylcholine, which is involved specifically in learning and memory and has been shown to support cognitive function.25-26

Acetyl L-carnitine arginate, acetyl L-carnitine, Gotu kola (Centella asiatica), Ginkgo biloba and uridine (found in Neuron Growth Factors—NGF™) support the regeneration of neurites and dendrites in the brain27-28 and can thus counteract the damaging effects of fluoride on brain cells. In addition, a special bioavailable form of curcumin called Longvida®, green tea, vitamin D3, niacin and serrapeptase (all found in DejaVida™), support healthy cognition and fight the free radical damage29-31 that occurs in the brain after fluoride exposure.

Conclusion

Numerous studies indicate that fluoride has neurotoxic effects, lowering IQ and producing cognitive changes. By consuming natural substances that optimize brain health, support cognitive function and fight oxidative stress, we can protect ourselves against this omnipresent toxin.

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