Does Styrene affect the human body?

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Abstract

This paper shows how styrene affects the human brain and body with the use of both animal and human studies.

These studies have been done by several different countries because of the health effects on the workers that come in contact with styrene.

One of the main side effects of styrene contamination is depression. The US Census Bureau estimates the US population to be 294,517,388 people. (population clock) According to a study done by the drug company that sells Paxil (a drug prescribed for depression) over 20 million people in the US are diagnosed with depression. This is approximately 10 percent of the population.

Further more a study done by the makers of Imatrix (a migraine relief drug) claims that 28 million people suffer from migraines. Styrene is a suspected trigger for migraines because of its affects on serotonin.

Introduction

In a population of approximately 297 million people (US 2000 censes) it is estimated that over 20 million people are challenged with depression and 28 million people are affected with migraines. Depression and migraines have been on the rise for the past two decades. Government research suggests that styrene has effects and/or triggers to both of these illnesses. Because of the prolific use of styrene in our environment and especially the use of styrene as a food additive and for food packaging more research needs to be done on the oral effects on the human body. Research shows that styrene affects dopamine and serotonin, major neurotransmitters in the body.

Hypothesis

Styrene affects major neurotransmitters in the body causing major health effects.

Styrene Research and Findings

The Swiss have found that styrene is considered a POP (Persistent Organic Pollutant), this means the contaminant gets passed down through generations. In this research case because the contaminant styrene is stored in fatty tissue it is passed from mother to child in the breast milk. (Sharon King Hoge)

This has been confirmed in studies in several different countries as well as the US. The Swiss study said that 50 – 90% of the lifetime contaminants are passed to an infant in 1 year of breast-feeding. However the US study goes further and claims that it's on the average of 75%.

In 1992 several government agencies along with the Polystyrene Council stated that styrene was being used as a food additive in a short list of foods that included ice cream, candy and bake goods. The primary consumers are children.

In 2004 this list has grown: (wheat, beef, strawberries, peanuts, coffee beans and the spice cinnamon have been added. Styrene is used as a flavoring additive to such food as baked goods, frozen dairy products, soft candy, and gelatins and puddings, with permission from the U.S. Food and Drug Administration (FDA)). (Polystyrene Packaging Council) Not only has the list grown but also the Polystyrene Council claims that styrene is a natural chemical in many foods. This goes against government claims that say styrene is not a natural chemical but a chemical reaction.

Styrene is a petroleum by-product. Altering benzene, a known carcinogen, also creates it. Styrene is a by-product of anything that burns. Therefore the Polystyrene Council's claim that styrene is a natural forming chemical is wrong.

If we look at all the foods on the list they each have a fat component which styrene clings to. The abundant use of styrene in our environment has caused a cyclic process. Styrene is dispersed in the air through auto emissions, incinerators, etc. Styrene is then returned to the earth when it rains and is absorbed into the ground, which is then absorbed into the plant life.

Beef is listed. It has been found that some grains use styrene as an additive. The styrene absorbed into the grass that the cattle eat also needs to be taken into consideration.

Most studies that have been done have been on workers who are in contact with styrene fumes. Through these studies a guideline has been set for how much styrene can safely be inhaled. Over the years the PMs (parts per millionths) in the air safely allowed has decreased from 400 PMs to 50 PMs in an eight hour day. Even at this scant amount styrene has been found to affect the central nervous system as well as other body organs.

According to several government agencies styrene affects the following:

- Acute (short-term) exposure to styrene in humans results in mucous membrane and eye irritation, and gastrointestinal effects.

- Chronic (long-term) exposure to styrene in humans results in effects on the central nervous system (CNS), such as headache, fatigue, weakness, and depression; peripheral neuropathy; and minor effects on some kidney enzyme functions and on the blood. These studies focus primarily on inhalation and not oral contamination. (Environmental Protection Agency (EPA))

Most research was done between 1956 and 1978 on the oral Health risks of styrene. New research has been on going in the last several years. “The Oral RfD for styrene may change in the near future pending the outcome of a further review now being conducted by the Oral RfD Work Group.” (EPA, IRIS)

Studies also show that styrene affects dopamine and serotonin in the body.

Dopamine is important in regulating motor activity and coordination. Serotonin, which only accounts for 2% of the neurotransmitters in the brain, is very prolific in the central nervous system which spans the whole body.

Serotonin is also networked through two other parts of the body, the intestinal wall and blood vessels. There are at least four different serotonin receptors with some evidence to suggest that there are others as well that are affected:

5-HT_{1A}. Agonists reduce blood pressure, temperature, and anxiety. This receptor has also been widely implicated in depression.

5-HT_{1C}. May regulate cerebrospinal fluid production and cerebral circulation. This subtype is speculated to be involved in the regulation of analgesia, sleep, and cardiovascular function.

5-HT_{1D}. This subtype is the most abundant 5-HT1 receptor in the CNS, but is also found in vascular smooth muscle mediating contraction. Agonists at this site are effective in

treating acute migraine headaches. May serve as an autoreceptor inhibiting neurotransmitter release.

5-HT_2 receptors. Located primarily in the vascular smooth muscle, platelets, lung, CNS, and the GI tract, these appear to be involved in gastrointestinal and vascular smooth muscle contraction, hypertension, and migraine. Antagonists have potential use as antipsychotic agents.

5-HT_3 receptors. These receptors appear to be involved in reducing pain, nausea, and emesis. Potential use of agents acting at this site include migraine, anxiety, and cognitive and psychotic disorders.

5-HT_4 receptors. Activation of these receptors increases intracellular processes that promote neurotransmitter release.(University of Toledo)

This shows the correlation of the health affects to the different serotonin receptors

Other researchers have called the gut the second brain because “dysfunction of the brain coincides with inflammation of the gut”, styrene impacts the gut lining which sends messages to the brain. (Dr. Pincott)

It should be noted that also in this research, Dr. Pincott points out that fat cells when biopsied have styrene residues 100% of the time.

This is significant because it shows that oral consumption of styrene has more of an affect than previously thought.

Conclusion

Styrene affects the body in many adverse ways. It creates health problems that are complex and hard for doctors to truly diagnose. Styrene affects the quality of life.

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