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FACTS TO ACT ON

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**Are Polystyrene Food and Beverage Containers A Health Hazard?**

The same styrofoam cups whose chlorofluorocarbon (CFC) content is known to cause depletion of the ozone layer now provoke concern because they contain styrene.<sup>\*</sup> In recent years, the use of polystyrene products has increased significantly, especially in fast food concessions and restaurants. Because they are so common, many people assume that polystyrene products are safe, and that a government agency, such as the Food and Drug Administration (FDA), would not allow a health-threatening product to be marketed to the public. But this question has received little attention in the United States, according to a paper entitled "Styrene Migration into Human Adipose Tissue" by George Baggett, a founding member of the Grass Roots Alliance for Solid-Waste Solutions (GRASS Roots).

A 1988 survey of adipose tissue, published by the Foundation for Advancements in Science and Education (FASE), revealed that styrene was found in human fatty tissue with a frequency of 100 percent at levels from 8 to 350 nanograms/gram (ng/g). The 350 ng/g level is one third of levels known to cause neurotoxic symptoms.<sup>1</sup> FASE also pointed out that a possible common source of styrene contamination in humans is the use of "styrene-based disposable cups."<sup>2</sup>

There are several plausible reasons why styrene-based cups could be a source of contamination. First, styrene monomer, or vinyl benzene, a colorless or yellowish oily liquid, is the feedstock in the manufacture of polystyrene. Since the manufacturing process is not 100 percent efficient, polystyrene contains some residual styrene. Second, styrene is soluble in oil and ethanol<sup>3,4,5,6</sup>—substances commonly found in foods and alcoholic beverages.

This means that ingestion of styrene can take place by using polystyrene cups to drink beer, wine, or mixed drinks, or perhaps even coffee with cream (11.5 percent fat). Ingested ethanol is rapidly diffused through the body. Thus, styrene dissolved in alcohol that is then consumed could easily be distributed to the brain and adipose tissue. Further, since alcohol crosses the placenta barrier,<sup>7</sup> this could be the vehicle of transmission of styrene monomer into the fetus, and could explain why small children have traces of styrene monomer in their tissues even though they have never been exposed to the monomer directly. The transplacental migration of contaminants, including styrene monomer, was demonstrated for the first time in 1976.<sup>8</sup>

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<sup>\*</sup>Although the name "styrofoam" is commonly used to describe foamed products made of polystyrene, it is actually a trade name used by Dow Chemical.

The fact that styrene can adversely affect humans in a number of ways raises serious public health and safety questions regarding its build-up in human tissue and the root cause of this build-up. According to a FASE fact sheet, long term exposure to small quantities of styrene can cause neurotoxic (fatigue, nervousness, difficulty sleeping), hematological (low platelet and hemoglobin values), cytogenetic (chromosomal and lymphatic abnormalities), and carcinogenic effects.<sup>9</sup> Styrene toxicity has been well documented in people exposed to the monomer through the work place; that is, in factories that produce products made from styrene.<sup>\*</sup> Styrene in the air as a vapor is immediately dangerous to life or health at 5,000 parts per million (ppm).<sup>10</sup> It has an exposure limit in the work place set at 50 ppm for an 8-hour period. Warnings on the storage of large quantities of polystyrene direct that the area be well ventilated to remove styrene vapors.

Although there is evidence that styrene causes cancer in animals, it has not yet been proven to cause cancer in humans.<sup>\*\*</sup> Styrene primarily exhibits its toxicity to humans as a neurotoxin by attacking the central and peripheral nervous systems. For example, women exposed to low concentrations of styrene vapors in the work place have experienced a variety of neurotoxic and menstrual problems.<sup>11</sup> One study on neurotoxicity of toluene and styrene notes that these "aromatic hydrocarbons have unsuspected long lasting neurological effects. The accumulation of these highly lipid-soluble [fat-soluble] materials in the lipid-rich tissues of the brain, spinal cord and peripheral nerves was apparently correlated with acute or chronic functional impairment of the nervous system."<sup>12</sup>

Baggett argues that the ramifications of styrene causing physical damage to the nervous system outweigh its impact as a carcinogen, and that the public should take all necessary measures to avoid exposure to it, especially given the growing evidence that ailments like Parkinson's Disease are linked to man-made toxins.

According to Baggett, the polystyrene industry's response to the question of adverse health effects has been to actively seek ways to reverse negative public opinion about plastic products. Baggett attributes these maneuvers to "bottom line mentality." For example, in response to results of public opinion polls conducted during the 1980s, which indicated that an increasing percentage of the general public believes plastics are harmful to health and the environment, the plastics industry proposes a 150 million dollar public relations campaign. But, Baggett comments, a public relations campaign to save the industry from public condemnation would contribute nothing to establish scientific facts about styrene. He suggests that the styrene industry spend its money researching and developing non food-related products and non-disposable products to limit the effects of styrene on human health and the environment.

The bottom line for citizens is that, in addition to environmental damage and threats to worker health in the production of polystyrene, the use of this substance in food and beverage containers may present a serious health hazard to consumers. Further independent study is needed to establish the health

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<sup>\*</sup>Other than its use in polystyrene production, styrene monomer is used to form ABS plastic, resins, polyesters and insulators.

<sup>\*\*</sup>Of note, however, is the fact that in 1987, the International Agency for Research on Cancer, Lyon, France, reclassified styrene from a Group 3 (not classifiable as to its carcinogenicity) to a Group 2B substance (possibly carcinogenic to humans). See *SIRC Review*, Styrene Information and Research Center, Washington, DC, April 1990. Furthermore, the metabolites of styrene are mandelic acid, a known mutagen, and styrene oxide, a known carcinogen.

and environmental effects of styrene. Until this issue is resolved, citizens may want to consider discontinuing their use of polystyrene.

For a complete copy of "Styrene Migration into Human Adipose Tissue," send a \$5.00 check or money order to the Institute for Local Self-Reliance.

#### References

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