

E-cigarette vapors, flavorings, trigger lung cell stress

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Do electronic cigarettes help people quit smoking? As the debate continues on that point, a new University of Rochester study suggests that e-cigarettes are likely a toxic replacement for tobacco products.

Emissions from e-cigarette aerosols and flavorings damage [lung cells](#) by creating [harmful free radicals](#) and inflammation in [lung tissue](#), according to the UR study published in the journal *PLOS ONE*. Irfan Rahman, Ph.D., professor of Environmental Medicine at the UR School of Medicine and Dentistry, led the research, which adds to a growing body of scientific data that points to dangers of e-cigarettes and vaping.

The investigation suggests the harm begins when the e-cigarette's [heating element](#) is activated. The heating element is designed to turn a liquid solution (known as an e-liquid or "juice") into an aerosol that mimics cigarette smoke. The inhaled vapors contain heavy metals and other possible carcinogens in the form of nanoparticles - tiny particulate matter that can reach farther into lung tissue, cell systems, and blood stream.

Rahman's study also shows that some flavored e-juices (particularly cinnamon) create more stress and toxicity on lung tissue. Researchers observed in the laboratory that human lung cells exposed to e-cigarette aerosols released various inflammation biomarkers. Mice exposed to e-cigarettes with classic tobacco flavoring also demonstrated signs of pulmonary inflammation.

"Several leading medical groups, organizations, and scientists are concerned about the lack of restrictions and regulations for e-cigarettes," Rahman said. "Our research affirms that e-cigarettes may pose significant health risks and should be investigated further. It seems that every day a new e-cigarette product is launched without knowing the harmful health effects of these products."

Rahman's laboratory also recently reported in the journal *Environmental Pollution* that toxic metals and oxidants from e-cigarettes raise safety concerns as well as potential pollution hazards from second-hand exposures and disposal of e-cigarette waste. Another recent study connected e-cigarette vapors to a higher risk of respiratory infections in young people.

In a joint statement issued January 8, 2015, the two leading cancer organizations in the United States - the American Association for Cancer Research and American Society for Clinical Oncology - said that e-cigarettes should be subject to the same Food and Drug Administration (FDA) restrictions as tobacco until more is known about possible adverse health effects. Insufficient data also exists on the value of the tool for smoking cessation.

The biggest concern is for e-cigarette users under age 18. Health experts believe e-cigarettes entice some young people to start smoking and will make it socially acceptable again. E-liquid flavorings marketed to kids and teens include fruit, dessert, and candy, and are widely available at convenience stores, gas stations, and online. Manufacturers contend it's a safer alternative to cigarettes, and consumers have pushed sales in the U.S. beyond \$1 billion.

A trend known as "dripping" allows e-cig users to drip an e-liquid directly onto the cigarette's heating element instead of using a refillable chamber to hold the e-liquids. The smoker inhales the aerosols and gets a

stronger hit, while also being able to more easily switch between flavors, brands or nicotine content. The UR study found that dripping e-liquids or e-juices to produce vapors likely generates a larger dose of toxins to the lungs.

Rahman's study notes that manufacturers typically don't disclose all materials and chemicals used to make e-cigarettes and e-juices. Without that information or long-term use studies, consumers have limited information about the potential dangers for human health and the environment, he said.

Provided by University of Rochester Medical Center

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