

Medical Daily

Secondhand Smoke Goes Electronic With Damaging Free Radicals From E-Cig Vapor

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When electronic cigarettes hit the U.S. market back in 2007, not all health care practitioners were quick to label them a safer alternative to traditional cigarettes with nicotine. A recent study conducted at the Johns Hopkins Bloomberg School of Public Health has revealed that exposing mice to e-cigarette vapor results in a compromised immune system in the lungs as well as exposure to potentially dangerous chemicals found in traditional cigarettes.

"Our findings suggest that e-cigarettes are not neutral in terms of the effects on the lungs," Dr. Shyam Biswal, a professor in the Department of Environmental Health Sciences at the Bloomberg School, said in a statement. "We have observed that they increase the susceptibility to respiratory infections in the mouse models. This warrants further study in susceptible individuals, such as COPD patients who have switched from cigarettes to e-cigarettes or to new users of e-cigarettes who may have never used cigarettes."

Biswal and his colleagues placed one group of mice into an inhalation chamber where they were exposed to e-cigarette vapor equal to actual human e-cigarette inhalation over the course of two weeks. A second group of mice were placed in a different inhalation chamber where they were exposed to air. Following e-cigarette vapor or air exposure, each group of mice were divided into three subgroups. One subgroup received nasal drops with *Streptococcus pneumoniae*, the second group received nasal drops with virus Influenza A, and the third group did not receive any virus or bacteria.

Mice that were exposed to e-cigarette vapor experienced compromised immune responses to both the virus and the bacteria more often than mice that were exposed to air. Some of the mice exposed to e-cigarette vapor also died by the end of the study due to their compromised immune systems. The research team found that e-cigarette vapor's effect on the immune system was likely due to "free radicals," highly reactive toxins found in cigarette smoke and air pollution that can cause cell death by damaging DNA and

other molecule found in cells.

"E-cigarette vapor alone produced mild effects on the lungs, including inflammation and protein damage," said Dr. Thomas Sussan, lead author and an assistant scientist in the Department of Environmental Health Sciences at the Bloomberg School. "However, when this exposure was followed by a bacterial or viral infection, the harmful effects of e-cigarette exposure became even more pronounced. The e-cigarette exposure inhibited the ability of mice to clear the bacteria from their lungs, and the viral infection led to increased weight loss and death indicative of an impaired immune response."

According to the Centers for Disease Control and Prevention, over a quarter million middle and high school students who have never smoked a traditional cigarette admitted to using e-cigarettes in 2013. This proportion of America's youth who smoked an e-cigarette increased significantly from 79,000 in 2011 to more than 263,000 in 2013. Although e-cigarettes generally contain less nicotine than traditional cigarettes, actual nicotine intake among e-cigarette users is usually equal to cigarette smokers.

A similar study conducted by researchers from France's National Consumer's Institute found that e-cigarettes contain just as much or even more toxins than traditional cigarettes. French researchers tested 10 different e-cigarette vapors looking for any signs of carcinogenic molecules commonly found in traditional cigarettes. Three of the e-cigarette molecules tested positive for formaldehyde levels that were around the amount found in traditional cigarettes. Some of the models also tested positive for acrolein levels that were higher than in normal cigarettes. Acrolein is a toxic chemical that turns to vapor when heated and causes significant damage to the lungs.

Source: Sussan T, Biswal S, et al. PLOS ONE. 2015.

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