

E-cigarettes: How safe are they for cardiovascular health?

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By Ana Sandoiu

More and more people turn to e-cigarettes thinking that they are a safe alternative to conventional tobacco-based cigarettes. But are they really? A new study investigates.



When it comes to cardiovascular health, are vapors safe?

Researchers from West Virginia University (WVU) in Morgantown set out to examine the impact of acute and long-term exposure to e-cigarettes (e-cigs) on the cardiovascular health of mice.

The scientists hypothesized that acute and chronic exposure to the e-cigs' vapors would cause a level of cardiovascular dysfunction comparable to that of conventional cigarettes.

The findings were presented at the Cardiovascular Aging: New Frontiers and Old Friends conference - held in Westminster, CO - by first study author Mark Olfert, Ph.D., an associate professor at WVU's School of Medicine.

E-cigs should not be seen as safe

Prof. Olfert and team examined four female mice that were exposed to e-cigs acutely (a single exposure that lasted for 5 minutes) and six female mice that were exposed to e-cigs chronically (for 4 hours every day over 5 days per week, for 8 months). The e-cigs they used were cappuccino-flavored and contained 18 milligrams of nicotine per milliliter.

The researchers examined their arteries' diameter and vasodilation - that is, the ability of the blood vessels to widen and contract. Using a technique called intravital microscopy, the researchers evaluated the reactivity of the arterioles, which are small branches of the arteries leading into the capillaries.

Prof. Olfert and team also looked at aortic stiffness, a marker of cardiovascular disease in which the aorta, the heart's main artery, loses elasticity. Aortic stiffness usually occurs with aging.

E-cigarettes 'just as harmful as tobacco' for oral health

Some of the chemicals found in e-cigs are just as damaging, if not more so, for oral health than those found in tobacco-based cigarettes.

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The scientists used Doppler ultrasonography to evaluate pulse wave velocity, often called the "gold standard" for assessing aortic stiffness.

The study found that within an hour of being exposed to 5 minutes of e-cig vapor, the arteries narrowed by 31 percent. Chronic, long-term exposure to e-cigs also resulted in aortic stiffness, which was two and a half times higher in that group compared with the control group, which was exposed to filtered air only.

Furthermore, acute exposure also resulted in a 9 percent decrease in vasodilation. The maximum aortic relaxation that was achieved in reaction to metacholine - a test commonly used to determine whether or not a patient has asthma - was 90 percent in the control group, but this reduced to 70 percent in the chronic e-cig exposure group.

The authors conclude that e-cigs have serious adverse consequences on cardiovascular health. Specifically, exposure to e-cigs seems to bring about the premature aging of the blood vessels.

"Our data provides the first evidence showing a single acute exposure has negative effects on in vivo vascular function, and that chronic exposure significantly accelerates age-associated increase in aortic stiffness, and significantly impairs aortic endothelial-dependent vasodilation."

The endothelium is a thin membrane that can be found inside the heart and blood vessels. If the endothelium does not work properly, it means that the blood vessels cannot dilate as they should.

Therefore, both endothelial function and dysfunction are considered to be significant predictors of stroke and heart attacks. The authors caution that e-cigs should by no means be viewed as safe.

"These data indicate that e-cigs should not be considered safe," the authors write, "and that they induce significant deleterious effects on endothelial function in the central and peripheral vasculature."

» E-Cigarette Use Accelerates Effects of Cardiovascular Aging

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E-Cigarette Use Accelerates Effects of Cardiovascular Aging

Blood vessel health suffers from short- and long-term exposure

Westminster, Colo. (August 12, 2017)—A new study suggests that a single exposure to e-cigarette (e-cig) vapor may be enough to impair vascular function. Researchers from West Virginia University will present findings today at the **Cardiovascular Aging: New Frontiers and Old Friends** meeting in Westminster, Colo.

The researchers studied artery diameter, the blood vessels' ability to widen (vasodilation) and aortic stiffness in female mice after short- and long-term exposure to flavored e-cig vapor. Aortic stiffness is an age-related complication in the heart's main artery (aorta) that can be an indicator of cardiovascular disease. They found that within an hour of the five-minute e-cig exposure, the short-term group's arteries narrowed by approximately 30 percent. Vasodilation decreased as well.

Long-term exposure to e-cig vapor (20 hours per week over a period of eight months) also produced negative effects of chronic e-cig use, including aortic stiffness, which was more than twice as high as control groups exposed to normal room air. "These data indicate that e-cigs should not be considered safe and that they induce significant deleterious effects" on blood vessel function, wrote the authors.

Mark Olfert, PhD, will present "Acute and chronic effects of e-cigarette vapor exposure on vascular function: new friend or old foe?" at a poster session on Saturday, August 12, from 10 a.m. to 12 p.m. in the Westminster Westin Hotel.

NOTE TO JOURNALISTS: The **Cardiovascular Aging: New Frontiers and Old Friends** conference will be held in Westminster, Colo., August 11–14, 2017. **Read the full program.** To schedule an interview with the conference organizers or presenters, contact the **APS Communications Office** or call 301-634-7209. Find more research highlights in the **APS Press Room.**

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Menopausal Status May Better Predict Blood Vessel Health in Women than Fitness Level

Released August 12, 2017 - High physical fitness is known to be related to enhanced blood vessel dilation and blood flow (endothelial function) in aging men. However, for women, endothelial function and the effect of exercise may be related more to menopausal status than fitness. Researchers from the University of Massachusetts Amherst will present their findings today at the Cardiovascular Aging: New Frontiers and Old Friends conference in Westminster, Colo.

Cardiovascular Aging Symposium Explores Dysfunction and Disease Development

Released August 12, 2017 - During the "Novel Implications for Blood Flow and Vascular Dysfunction in Non-cardiovascular Related Disease" symposium at the APS Cardiovascular Aging: New Frontiers and Old Friends conference, researchers will present findings that emphasize the interaction between age-related cardiovascular dysfunction and disease whose risk increases with age.