

Study finds that marijuana and e-cigarettes can harm the heart as seriously as traditional cigarettes

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E-cigarettes and marijuana have harmful effects on the heart similar to those caused by tobacco cigarettes, opening the door to abnormal heart

rhythms, reports a team of researchers at UC San Francisco.

The study is published November 15, 2022 in the journal *Heart Rhythm*.

"We found that cigarettes, [e-cigarettes](#), and [marijuana](#) greatly interfere with the electrical activity, structure, and neural regulation of the heart," said lead author Huiliang Qiu, MD, Ph.D., a postdoctoral scholar in the UCSF Division of Cardiology. "Often, any single change can lead to arrhythmia disease. Unfortunately, these adverse effects on the heart are quite comprehensive."

For the heart to work well, it must pump blood efficiently and with correct timing. The heart has its own electrical control system resulting from nerves that control it. It also has the ability of electrical impulses to move through the heart muscle in a way that synchronizes the entire heart to correctly time the pumping. If parts of the heart don't correctly handle the electrical signals, then different regions of the heart act asynchronously—essentially fighting against each other, rather than functioning as a single efficient pump, resulting in arrhythmias that can be life threatening.

Smoking [tobacco](#) leads to several kinds of harmful [cardiovascular effects](#), including increasing the chances of arrhythmias. E-cigarettes and heated tobacco products (sometimes called heat-not-burn products) have become popular because the public perceives them as being less harmful than smoking. Similarly, legal recreational marijuana has become more common in recent years, and is also frequently viewed by the public as being safer than smoking tobacco.

In this study, researchers exposed rats for eight weeks to a single daily session of exposure to Marlboro Red cigarette smoke, aerosol ("vapor") from the popular e-cigarette JUUL, aerosol from the heated tobacco product IQOS, smoke from marijuana cigarettes, and smoke from

modified marijuana that lacks all cannabinoids, compared to just air. The exposures modeled a single session of actual smoking/vaping: The rats inhaled the smoke or aerosol for five seconds twice a minute for five minutes, with clean air in between the smoke inhalations. This was done once per day for five days/week for eight weeks.

During that time, the heart function in the rats exposed to the products (but not air) got progressively worse and blood pressure increased.

At the end of the study, the researchers conducted various tests to determine electrical and physical properties of the hearts. They found that all the products led to increased scarring in the hearts, a decrease in the number of [blood vessels](#), a change in the type of nerves found in the heart, a reduction in the important ability to vary heart rate, and a higher likelihood of developing arrhythmias.

"It's notable that all of these tobacco and marijuana products had such similar effects," said senior author Matthew Springer, Ph.D., a UCSF professor of cardiology. "And what's really striking is that this was caused by a single realistic smoking/vaping session per day."

Springer pointed out that there are some limitations to the study. "While rats are a good model for many cardiovascular effects of humans, there are still differences and one can't draw firm conclusions about effects on humans from rat studies alone," he said.

He noted, however, that the results are consistent with various reports from the medical literature about heart rhythm disturbances in users of e-cigarettes or marijuana. The observation of various physical disturbances in the heart, like the [scarring](#) and the nerve changes, suggests a similar explanation, despite the differences in nicotine or cannabinoid content.

"The bottom line is that e-cigarettes, IQOS, and marijuana [cigarettes](#) still

involve many of the potential harmful effects of smoking tobacco," Springer said, "None of these products should be assumed to be a harmless replacement for smoking. In other words, just breathe air."

From UCSF, co-authors are Hao Zhang, MD, Ph.D.; Daniel Han, BA; Ronak Derakhshandeh, MS; Xiaoyin Wang, MD; Natasha Goyal, MBBS; Mina Navabzadeh, PharmD; Poonam Rao, MBBS; Emily Wilson, MS; Leila Mohammadi, MD, Ph.D.; and Jeffrey Olgin, MD.

More information: Huiliang Qiu et al, Increased vulnerability to atrial and ventricular arrhythmias caused by different types of inhaled tobacco or marijuana products, *Heart Rhythm* (2022). [DOI: 10.1016/j.hrthm.2022.09.021](https://doi.org/10.1016/j.hrthm.2022.09.021)

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