

# Popular e-cigarette liquid flavorings may change, damage heart muscle cells

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Credit: American Heart Association

Chemicals used to make some popular e-cigarette liquid flavorings—including cinnamon, clove, citrus and floral—may cause changes or damage to heart muscle cells, new research indicates.

The findings, however, still leave many questions about exactly how these chemicals affect the heart, both when they are heated and when they are not, said Matthew A. Nystoriak, Ph.D., an assistant professor of medicine at the University of Louisville and the lead researcher of the study.

"These effects [from the chemicals] are kind of striking because it suggests that if this compound was interacting with the heart muscle itself, it could do something directly to change how that cell actually functions," said Nystoriak, whose research was released this week at the American Heart Association's Scientific Sessions meeting.

E-cigarettes are battery-operated devices typically used to heat liquids containing nicotine into vapor that users inhale, or vape. Many of the liquids are flavored. Some e-cigarettes resemble traditional cigarettes, while others look like cylindrical pipes or pens.

Health experts have long been concerned about the potential dangers of e-cigarettes, in part

because of uncertainty about the impact of the flavorings. E-cigarettes went unregulated by the federal government until last year.

The study examined 15 chemicals used to flavor [e-cigarette](#) liquids, both when heated and unheated. E-cigarettes heat liquids to different temperatures, and unheated particles of flavor chemicals may make their way into the heart.

Researchers found the compounds had a wide variety of reactions, said Nystoriak, who has studied cardiovascular cell function for about a decade and a half.

Those that did the most significant damage to the muscle cells that keep the heart pumping did so before being heated, he said. But, adding to the mystery of these compounds, Nystoriak said the researchers don't know how many of them break down when they are heated.

And, the reactions varied quite a bit, Nystoriak said.

The [chemical](#) used for cinnamon flavoring stopped cells from moving or contracting 24 hours later. Chemicals used for clove, floral and citrus flavoring made the [cells](#) beat faster.

The experiments were done in a petri dish and not on a real [heart](#), which leaves out many variables involved in actual consumption, he said.

According to the Centers for Disease Control and Prevention, e-cigarettes might be less harmful than conventional cigarettes but still aren't safe because data shows they can contain harmful substances such as nicotine and lead.

Researchers now need to study the effects of e-cigarette liquid ingredients under similar conditions, said Matthew L. Springer, Ph.D., a professor of medicine at the University of California, San Francisco, and an expert on how smoke and

aerosol tobacco affect vascular function.

Given the increasing variety of e-cigarette liquids, it's getting tougher and tougher to study their impact on health, said Springer, who was not involved in the study.

The chemicals are "typically rated as 'generally recognized as safe' but not necessarily safe for inhalation," Springer said.

"Cayenne pepper powder is quite safe for eating, but I would not want to inhale it," he said.

While many questions remain, e-cigarette users should pay attention to this study, Springer said.

"They should not assume that e-cigarettes are harmless just because they don't produce smoke," he said. "The best thing that you can inhale is clean air."

Provided by American Heart Association

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