

Vaping CBD causes more severe lung damage than vaping nicotine, new study shows

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Vaping cannabidiol (CBD), a compound found in marijuana, leads to more severe lung damage than vaping nicotine, according to a study by researchers at Roswell Park Comprehensive Cancer Center. Until now,

research on the health effects of vaping, or using e-cigarettes, has focused almost exclusively on vaping nicotine as opposed to CBD. Previous research has documented the effects of smoking cannabis, but the effects of vaping cannabinoids such as CBD were not previously known.

Led by Yasmin Thanavala, Ph.D., of the Department of Immunology, the Roswell Park team has conducted the first study comparing the pulmonary effects of acute inhalation of vaporized CBD and [nicotine](#). The results are shared in a new research paper, "Not all vaping is the same: differential pulmonary effects of vaping cannabidiol versus nicotine," published in the journal *Thorax*.

Vaping involves using a device that heats a liquid containing nicotine or other substances, such as CBD, to create an aerosol that can be inhaled. For this study, the team compared two commercial vaping products: a CBD product containing 50 mg/mL of CBD (natural flavoring), dissolved in a solution of medium chain triglycerides—fats derived from coconut or palm oils; and a nicotine product containing 5.0% nicotine (Virginia Tobacco flavor) dissolved in a solution of propylene glycol, a synthetic food additive, and vegetable glycerin, made from plant-based oils.

The preclinical study involved both in vivo models and in vitro cultures of human cells, which were exposed to filtered air, nicotine aerosols or CBD aerosols for two weeks. "We believe this is the first-ever report on what happens to various immune cell types and markers of damage and inflammation measured in the lung following in vivo inhalation exposure," says Dr. Thanavala.

Among other results, the researchers found:

- The number and severity of focal lesions—areas of [tissue](#)

[damage](#)—in the lung were greater after inhalation of CBD aerosols than nicotine aerosols.

- Myeloperoxidase (MPO) activity was significantly greater following exposure to CBD aerosol vs. nicotine [aerosol](#). MPO, an enzyme, promotes inflammation and damage to lung cells.
- Inhalation of CBD aerosols resulted in greater inflammatory changes and higher oxidative stress in the lung.
- Exposure to CBD aerosols killed purified human [neutrophils](#) at a higher rate than nicotine aerosols (44.5% vs. 21%). Neutrophils in the lungs protect against bacteria, viruses and fungi.
- CBD aerosols were more toxic to cultures of human small airway [epithelial cells](#) and disrupted the integrity of the lung epithelial barrier.
- Inhalation of CBD aerosols resulted in significantly lower numbers of pulmonary interstitial macrophages compared with inhalation of nicotine aerosols (11,460 cells in CBD-vape vs. 27,727 cells in nicotine vape). Among other roles, pulmonary interstitial macrophages are responsible for reducing inflammation and protecting against infection.

This work underscores how important it is for [healthcare providers](#) to zero in on the specifics of a patient's smoking history, Dr. Thanavala notes, keeping in mind that for many people, the word "smoking" applies exclusively to smoking combustible cigarettes.

"Our findings suggest that vaping cannabis may not only cause significant lung injury, but can also increase susceptibility to respiratory infections, lead to poor responses to prophylactic vaccinations or cause worsening of symptoms in patients with underlying pulmonary inflammatory disease. So it's not enough for care providers to ask people, 'Do you smoke?' The next step is, 'Do you vape?' If the answer is yes, you need to ask, 'Do you vape nicotine or do you vape cannabis?'"

Dr. Thanavala and colleagues note, "While cannabis has proven [health benefits](#) in [pain management](#), sleep, relieving the symptoms of chemotherapy-induced nausea/vomiting in [cancer patients](#), and in patients experiencing seizures, there is simply a lack of robust evidence about cannabis safety when delivered from vaping products."

They add that further research is needed—first, to investigate the long-term effects in people who regularly vape CBD and nicotine, and second, to evaluate the effects of vaping products that contain other types of cannabinoids, including tetrahydrocannabinol (THC), the psychoactive component of cannabis.

Tariq Bhat, Ph.D., Department of Immunology, served as first author of the paper. Other contributors include Suresh Kalathil, Ph.D., Department of Immunology; Maciej Goniewicz, Ph.D., Department of Health Behavior; and Alan Hutson, Ph.D., Department of Biostatistics.

Dr. Thanavala has been at the forefront of research on the health effects of [vaping](#) cannabinoids. In 2020 she led a team of researchers from Roswell Park and the National Center for Environmental Health at the Centers for Disease Control, who were first to [report](#) (in *The New England Journal of Medicine*) that a potentially fatal condition called EVALI—E-cigarette or Vaping use-Associated Lung Injury—was associated with vitamin E acetate, frequently used as a cutting agent in e-cigarette liquids containing THC, the psychoactive agent in cannabis.

More information: Tariq A Bhat et al, Not all vaping is the same: differential pulmonary effects of vaping cannabidiol versus nicotine, *Thorax* (2023). [DOI: 10.1136/thorax-2022-218743](https://doi.org/10.1136/thorax-2022-218743)

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