

ROLE OF VITAMIN E OIL IN CAUSING VAPING RELATED SEVERE LUNG ILLNESS

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NOTE: The Nicotine and Cannabis Policy Center (NCPC) at the University of California, Merced provides timely information to assist policy makers at the state and local level to make evidence-based decisions regarding nicotine and cannabis policies. The information in this brief is based on our own research as well as syntheses of the most recent evidence.

CURRENT RESEARCH:

This research is based on a systematic review of available literature by the Rapid Response Core of UC Merced's Nicotine and Cannabis Policy Center (NCPC). The evidence suggests that Vitamin E likely coats the lungs and interferes with the exchange of gases and subsequently lead to a rare condition called lipoid pneumonia. These patients tend to present with cough, fatigue and shortness of breath, fever, malaise and chest pain due to lipid or fat deposition in their immune cells. These findings suggest an urgent need for public health agencies and the government bodies to monitor and regulate the additives being sold in markets.

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BACKGROUND:

There has been a steady increase in the use of E-cigarettes and Vaping in the U.S. As per the CDC in 2017, 2.8 percent of U.S. adults were current e-cigarette users.¹ It was reported in 2018 that more than 3.6 million U.S. middle and high school students used e-cigarettes in the past 30 days. As per the 2018 Monitoring the Future annual survey of drug, alcohol, and cigarette use in 8th, 10th, and 12th graders conducted by the National Institute of Drug Abuse (NIDA), with a sample size of more than 44,000 students, about 37 percent of 12th graders reported vaping in 2018, compared with 28 percent in 2017.² In the past few months there have been several cases of serious lung illnesses associated with the use of these devices. As per the latest figures released by various public health agencies, a total of 54 deaths and more than 2500 cases of severe lung illness have been reported and found to be associated with vaping in all 50 states.³

PUBLIC HEALTH INVESTIGATION:

As per the report of an initial public health investigation conducted by the officials of the New York Public Health Department, where 34 cases of this illness were identified, high levels of Vitamin E acetate were found in cannabis samples obtained from nearly all the cases in the state.⁴ As a part of this investigation, the FDA analyzed 12 viable nicotine samples and 18 viable THC products. The results revealed that Vitamin E acetate was found in 10 of the 18 THC products. Since then, the CDC has conducted an investigation to determine the cause of E-cigarette, or vaping product use-associated lung injury (EVALI). The researchers analyzed samples from 51 EVALI cases from 16 states and a comparison group of samples from 99 healthy people for vitamin E acetate, plant oils, medium chain triglyceride oil, coconut oil, petroleum distillates, diluent terpenes and other products. Vitamin E acetate was identified in bronchoalveolar lavage (BAL) fluid samples from 48 of the 51 EVALI patients, but not in the BAL fluid from the healthy comparison group.⁵

VITAMIN E DESCRIPTION:

According to the NIH, Vitamin E is a naturally occurring fat soluble vitamin with distinct antioxidant activities. It is found in 8 different

forms, of which alpha tocopherol is found to be useful for human beings. It occurs naturally in foods such as nuts, seeds and vegetable oils. Besides its antioxidant effect, it also plays an important role in gene regulation, cell signaling and immune response.⁶ Recently, it has been in the news due to its association with the occurrence of serious lung illnesses in individuals who have used Electronic cigarettes and Vape pens.

MECHANISM OF ACTION:

Vitamin E acetate is a chemical which is routinely used in a variety of dietary supplements and skin care products. It is also used as an oil a variety of marijuana products as a thickening agent. During the process of vaping, the oil gets heated and evaporates. Thereafter, it enters the lungs, where it cools down and coats the lung surface. While Vitamin E can be easily broken down in the digestive tract, there is no known mechanism to break down the Vitamin E which coats the lungs. It may interfere with the exchange of gases and subsequently lead to a rare condition called lipoid pneumonia. These patients tend to present with cough, fatigue and shortness of breath, fever, malaise and chest pain due to lipid or fat deposition in their immune cells. Moreover, when the lung cells die, they generate an inflammatory response leading to the entry of additional cells into the lungs to clean up the debris. This inflammatory reaction may eventually lead to the accumulation of liquid in the lungs which may further lead to difficulty in breathing.⁷

POLICY IMPLICATIONS:

According to the 2018 National Survey on Drug Use and Health marijuana is the most widely used illicit drug among youth between the ages of 12 to 17 years. The NIDA has reported that nearly 7 in 10 teenagers are currently exposed to ads related to E- cigarettes. Most of them are not aware of what they are smoking in their E- cigarettes with nearly 66 percent responding that it was just flavoring and nothing else. There has been a sharp increase in the number of high school seniors who admitted to vaping in the past month up from 7.5 percent in 2018 to 14 percent in 2019. Although initially marketed as a way to quit regular cigarettes, most teenagers responded that the top 3 reasons to vape were to experiment (60.9 percent), flavor of the product (41.7 percent) and to have a good time with friends (37.9 percent), with only 6.1 percent reporting that they used them to quit smoking.⁸

In the recent years there has been growing support for the legalization of marijuana use in many states across the U.S. As per the recent figures 33 states and the district of Columbia have passed laws which permit the legal use of marijuana in some form. This has led to a spike in marijuana use in the country. The use of flavoring agents has been major driver of growth in sales among teenagers and youth which has led to disastrous consequences. One of the current policy recommendations include restricting or banning the use of flavored vape products. In recent months, Massachusetts and other states, including Michigan, Montana, New York, Oregon, Rhode Island, Utah and Washington, have temporarily banned or restricted the sale of vaping products. Recently the FDA announced a ban on the production and sale of flavored vaping products and raised the legal age for purchasing such products from 18 to 21 years.⁹

While these policies help to curb the use of these products among the vulnerable youth population, it falls short in addressing the problem of the ease of availability of contaminated vape products in the illicit market. According to the New York State Department of Public Health, Vitamin E was not approved as an additive for the state's legal marijuana program. It has been noted that most of the cases which have been reported so far, have used vaping products which were bought on the streets with only a single case involving products bought from a legal dispensary. The FDA reports that in most of the cases associated with the use of THC products, the fluids contained vitamin E acetate, at an average concentration of 50 percent by weight with the range varying from 23 to 88 percent.¹⁰ The researchers discovered that pure THC oil has a viscosity similar to that of vitamin E acetate and that mixing THC oil with vitamin E acetate was very common in the illicit market.¹¹

The latest study published in the New England Journal of Medicine in which the researchers discovered the presence of Vitamin E acetate in samples collected from 48 out of 51 EVALI patients in 16 states provides strong evidence linking the compound to the occurrence of lung injury.¹² Despite the discovery of this association little has been done to curb the flow of contaminated vape pens in the illicit market beyond trying to educate users not to purchase such products or to purchase only from legal dispensaries and vendors

to protect themselves. There exists a wide gap between what needs to be done and what is currently being done to protect the public from the harmful effects of these contaminated products. Although there has been a relative decline in the number of cases of lung injury since the onset of the disease in July 2019, these findings point towards the growing need for an urgent discussion about and prompt action by public health agencies and the government bodies towards ensuring the safety of the vaping products being sold in the market nowadays.

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