

Potentially dangerous synthetic cooling agents are used at high levels in e-cigarettes and refillable vaping liquids

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High levels of potentially dangerous coolants like menthol in vaping products.
Credit: ATS

E-cigarette makers are adding potentially dangerous levels of the

synthetic cooling agents WS-3 and WS-23 to disposable e-cigarettes and e-cigarette refills sold in the U.S., according to research published at the ATS 2022 international conference.

Mint and menthol-flavored [e-cigarettes](#) are highly popular due to their "[cooling](#)" effect. E-cigarette suppliers recently started marketing synthetic cooling agents as additives that have a cooling effect, but lack a "minty" odor. Yet, there is very limited knowledge about the content of synthetic coolants in e-cigarettes marketed in the U.S.—or about their [health risks](#).

"In a prior study we discovered that a synthetic cooling agent, WS-3, was added to Juul electronic cigarettes marketed in Europe," said presenting author Sven Jordt, Ph.D., associate professor in anesthesiology and associate professor of pharmacology and cancer biology, Duke University School of Medicine, Durham, North Carolina. "Juul was the most popular e-cigarette brand at the time. This led us to explore whether synthetic cooling agents are also added to electronic cigarettes marketed in the United States."

Dr. Jordt and colleagues began their study by looking at e-liquid vendor sites, searching for certain terms such as "kool/cool" and "ice." They looked to see whether the companies sold cooling agents W-3 and WS-23. They focused much of their research on "ice" as well as "non-ice" varieties of Puffbar—currently the most popular e-cigarette brand, which was designed as a disposable e-cigarette to evade the Food and Drug Administration's regulation of "pod" devices such as Juul, which use exchangeable cartridges.

The researchers characterized e-liquids and synthetic coolants using gas chromatography/mass spectrometry, which identify different substances within samples. They then calculated the margin of exposure (MOE) to determine the risk associated with synthetic coolant exposure from [e-](#)

cigarette use. An MOE of 100 means that the user's exposure is 100 times lower than levels proven to cause toxic effects in the organs of animals. Scientists studying potentially harmful substances are aware that MOE below 100 indicates increased risk.

"When the MOE is below 100, regulators such as the FDA or World Health Organization should review the safety of the product and advise manufacturers about steps to make the product safe to use," stated Dr. Jordt, who also pointed out that he and the research team modeled regular vaping use scenarios from occasional use to heavy use.

The scientists detected WS-3 in 24 of the 25 refill e-liquids they identified. Nearly all (13 out of 14) disposable Puffbar flavor varieties contained WS-23, with 5 of 14 also containing WS-3, in both "ice" and "non-ice" flavors.

Alarmingly, modeling consumption of vaped e-liquids revealed MOEs below the safe margin (

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