

Effects of “Ice” Flavored E-Cigarettes with Synthetic Cooling Agent WS-23 or Menthol on User-Reported Appeal and Sensory Attributes

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Background: “Ice” flavored e-cigarettes combine standard characterizing flavors with coolants, including the synthetic compound, WS-23, or menthol. This study tested the effect of exposure to flavored e-cigarettes with WS-23 or menthol additives on the appeal and sensory experience of vaping.

Methods: Adult current tobacco users (vapers, cigarette smokers, and dual users; N=84) completed a single session, double-blind administration of one standardized puff from various custom manufactured e-cigarette solutions using a pod-style device in randomized sequences. Solutions with tobacco, fruit, and mint flavors were varied according to presence of cooling additives (WS-23 vs. menthol vs. none) in both 2% and 4% nicotine salt formulations. Immediately following each administration, participants rated the solution’s appeal and sensory attributes (0-100 visual analogue scale).

Results: Participants (mean[SD]=38.6[13.5] years, 52.4% male, 70.2% White; 38.1% dual users) rated EC Flavors with WS-23 (vs. no cooling agent) significantly higher in appeal, liking, willingness to use again, smoothness, and coolness and lower disliking, bitterness, harshness ($p \leq .005$). WS-23 (vs. menthol) solutions were rated significantly smoother (mean difference $b=5.42$; $p=.001$) and cooler ($b=7.38$; $p<.001$) and less harsh ($b=-3.36$; $p=.045$). The effects of cooling agent additives did not significantly differ across fruit, tobacco, or mint; 2% vs. 4% nicotine concentration, or smoking status, indicating generalizability of the effects of synthetic cooling agent across potential covariates.

Conclusion: Adding WS-23 to e-cigarettes to create “ice” flavors appear to make the vaping user experience more appealing, regardless if tobacco, fruit, or mint “ice” flavors. WS-23 may provide more desirable sensory attributes than menthol in “ice” flavored e-cigarettes.

Statement of CTP Relevance: The current findings may inform review of premarket tobacco applications of e-cigarette products that contain cooling constituents, including menthol and non-menthol agents like WS-23, and future potential product standards.