

Impact of flavors on initiation, cessation, switching, and health effects



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Flavored Tobacco Product Use

- Appealing to all ages
 - Primarily used by youth and young adults
- Often product first ever used
- Sensory stimulus
 - Physical sensations in the mouth and throat
 - Taste and smell of product
 - Branding with bright colors and descriptors
- Influence harm perceptions

Current Policies

- Tobacco Control Act
 - Characterizing flavors other than menthol are prohibited in cigarettes (2009)
 - TPSAC Report to evaluate the impact of menthol cigarette use on public health
 - Prioritized enforcement of the deeming rule to restrict the manufacturing, distribution and sale of flavored cartridge-based ENDS, except tobacco or menthol (2020)
- Other state and local bans

TPSAC Menthol Report

- Do not appear to differ in toxicity
- Increases smoking initiation
- Greater addiction
- Reduced success when trying to quit
- Increases appeal

“Menthol cigarettes pose a public health risk above that seen with nonmenthol cigarettes”

Impact of Current Policies

- Prevalence and frequency of use decreased
- Evade restriction
- Substitution
 - Product
 - ENDS device or brands
 - Flavor (menthol or tobacco flavors)

Flavor use among polytobacco users

- PATH W3 Adults
 - Analyzed inconsistencies in flavor preference among polytobacco users of different types of flavored tobacco products
 - Cigarettes were excluded

Flavor Inconsistencies between Flavored Tobacco Products among US Adults

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Objective: Banning flavors in some tobacco products, while allowing them in others, may shift consumer preferences towards products in which flavors are still allowed. In this study, we examine flavor popularity and inconsistencies in flavor preference across non-cigarette tobacco products among US adults. **Methods:** We used data from the Population Assessment of Tobacco and Health Study Wave 3 to assess the prevalence of flavor preference for users of non-cigarette tobacco products (N = 9037), as well as flavor inconsistencies between products among polyusers (N = 3183). **Results:** Most users of flavored tobacco products reported using one flavor category per product. Fruit and tobacco were among the most commonly used flavor categories of ENDS, hookah, traditional cigars, and cigarillo/filtered cigars. Menthol/mint was the most common flavor among snus/smokeless users. Polyusers of ENDS and traditional cigars had the largest inconsistency, where about 68%-76% used different flavors across products. Conversely, polyusers of traditional cigars and cigarillos/filtered cigars had the lowest inconsistency (25%-28%). **Conclusions:** Flavor preferences differed according to product, suggesting that consumers are not likely to switch across products to maintain a flavor preference. Future research should assess flavor preferences prospectively to improve understanding of the potential benefits of flavor bans.

Key words: flavored tobacco products; electronic nicotine delivery systems (ENDS); cigars; hookah; smokeless tobacco; tobacco polyusers

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Flavor Inconsistencies among Polytobacco Users (N = 3183)

Flavor, N(%)	ENDS v. Traditional Cigars N = 677	ENDS v. Cigarillos/ Filtered cigars N = 1,101	ENDS v. Hookah N = 955	ENDS v. Smokeless N = 548	Traditional cigars v. Cigarillos/ Filtered cigars N = 1,021	Traditional cigars v. Hookah N = 374	Traditional Cigars v. Smokeless N = 393	Cigarillos/ Filtered cigars v. Hookah N = 531	Cigarillos/ Filtered cigars v. Smokeless N = 420	Hookah v. Smokeless N = 210
Fruit	508 (76.3)	687 (62.8)	448 (47.4)	332 (58.7)	304 (28.1)	217 (64.1)	227 (56.1)	262 (50.7)	235 (56.0)	134 (67.0)
Mint/ menthol	484 (73.1)	596 (55.0)	388 (39.8)	447 (80.4)	281 (26.1)	203 (57.6)	258 (63.1)	203 (40.0)	285 (67.8)	144 (68.8)
Candy/ sweets	495 (74.9)	641 (58.8)	449 (45.6)	270 (47.8)	293 (26.7)	207 (60.2)	214 (54.1)	227 (43.2)	183 (45.3)	82 (39.7)
Beverage	477 (70.6)	603 (55.1)	304 (31.4)	172 (31.3)	277 (25.5)	201 (57.4)	211 (52.6)	213 (40.8)	189 (46.5)	59 (27.3)
Other flavor	453 (69.2)	51 (47.9)	263 (26.4)	165 (31.2)	269 (25.3)	195 (56.0)	203 (50.8)	183 (34.2)	177 (44.0)	59 (28.5)
Chocolate	459 (69.2)	403 (47.3)	275 (27.5)	163 (31.2)	273 (25.1)	204 (58.3)	201 (51.6)	179 (34.9)	164 (43.0)	56 (29.1)
Clove/Spice	444 (68.2)	521 (49.3)	264 (25.6)	148 (27.8)	273 (25.2)	197 (58.1)	201 (51.4)	201 (40.0)	173 (44.6)	61 (30.2)

NOTE: The prevalence of inconsistencies represents the percent of consumers who report using the flavor category for one of the products but not the other. Five flavored tobacco product users were missing data for regular flavor.

ENDS Flavors & Behavioral Transitions

- ITC Project (2016-2018)

Goniewicz et al. *unpublished*

- Dual users who used fruit/sweet flavor ENDS were more likely to discontinue smoking than those who used tobacco flavor

- PATH Study (2014-2017)

Kasza & Goniewicz *unpublished*

- Similar findings, though they rendered insignificant when adjusting for other factors

Tab.1. ENDS flavor and discontinuing cigarette smoking: ITC Project data, 2016-2018.

Baseline: Dual users, ENDS flavor	Follow-up: Discontinue cig. smoking			
	n	%	AOR ¹	95% CI
Tobacco	387	9.6	Referent	
Menthol/mint	145	8.3	0.9	0.4-1.7
Fruit/sweet	354	13.8	1.6	1.0-2.6

¹Adj for country, sex, age, education, income

Tab.2. ENDS flavor and discontinuing cigarette smoking: PATH Study data, 2014-2017.

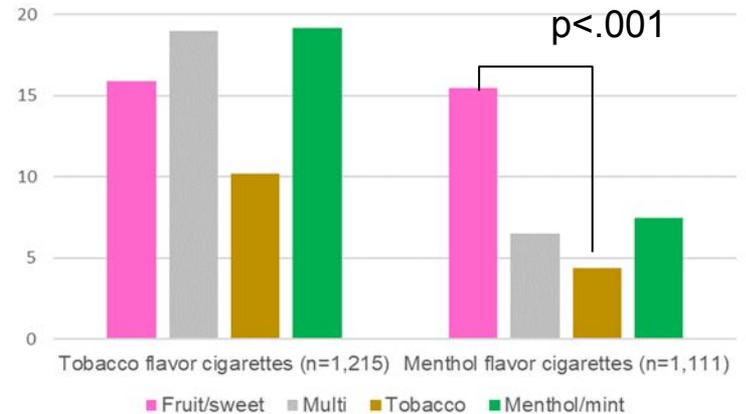
Baseline: Dual users, ENDS flavor	Follow-up: Discontinue cig. smoking			
	n	%	AOR ¹	95% CI
Tobacco	526	9.4	Referent	
Menthol/mint	347	9.0	1.2	0.7-2.1
Fruit/sweet	1174	15.7	1.4	0.9-2.1
Multi	279	10.2	1.0	0.5-1.8

¹Adj for age, sex, race, ethnicity, dependence, ENDS use frequency, ENDS device type, cigarette flavor use, time

ENDS Flavor Use and Cigarette Discontinuation by Cigarette Flavor – PATH Study

- Menthol smokers who used tobacco flavor ENDS had lower rates of discontinuing smoking than menthol smokers who used fruit/sweet flavor ENDS after adjustment
- No associations were found for tobacco flavored cigarette users

Percentage of dual users who discontinued cigarette smoking, stratified by cigarette flavor use



ENDS Flavors & Health Effects

- CRoFT Cohort Study
 - 12 monthly study visits
- Daily, exclusive ENDS users (N=126)
 - 60% completed
- Collected data on flavor use, biological samples, and underwent numerous respiratory tests
- 71% (n=90) were former smokers

5U54CA228110-05 (PI Goniewicz)

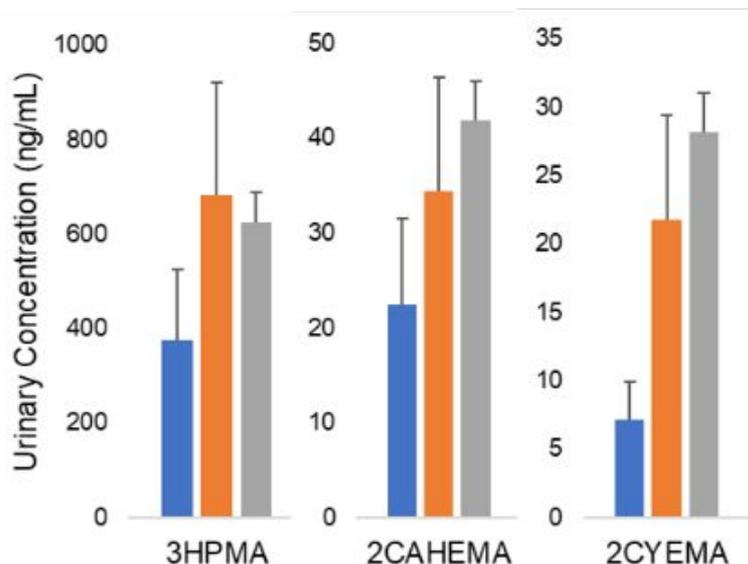


Transitions in Flavor Use

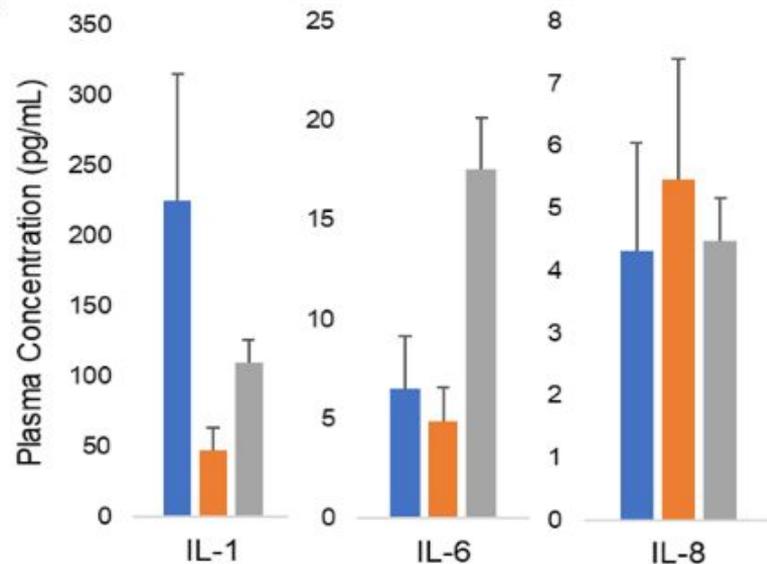
- Among those who quit smoking after initiating ENDS use
 - 71% initiated with fruit-flavored ENDS
 - 20% initiated with tobacco-flavored ENDS
- Current flavor use during study period
 - 73% fruit
 - 26% menthol
 - 14% tobacco
- Most common pattern of switching was between fruit- and menthol-flavored ENDS
- Few switched from
 - Tobacco- to fruit-flavored ENDS (n=5)
 - Fruit- to tobacco-flavored ENDS (n=4)

Biomarkers

Biomarkers of Exposure (BoE) in Urine of Flavored ENDS Users



Biomarkers of Potential Harm (BoH) in Plasma of Flavored ENDS Users

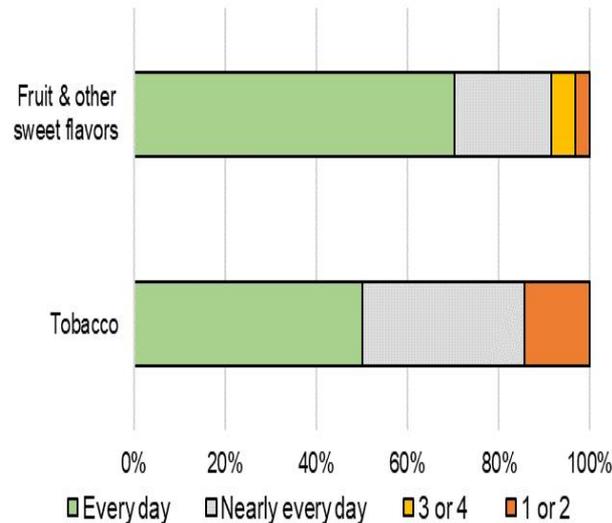


■ Tobacco flavor ■ Menthol or Mint flavor ■ Fruit & other sweet flavors

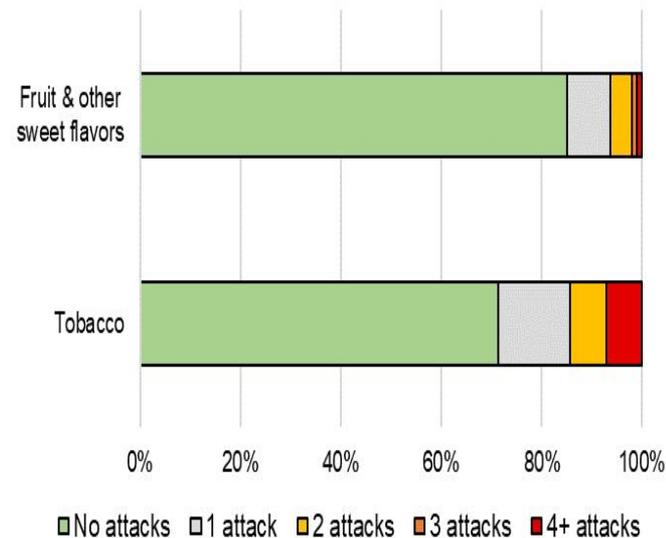
Respiratory Health Symptoms

- No differences in respiratory test results between fruit- and tobacco-flavored ENDS users

Over the past 3 months, in an average week, how many good days (with little chest trouble) have you had?

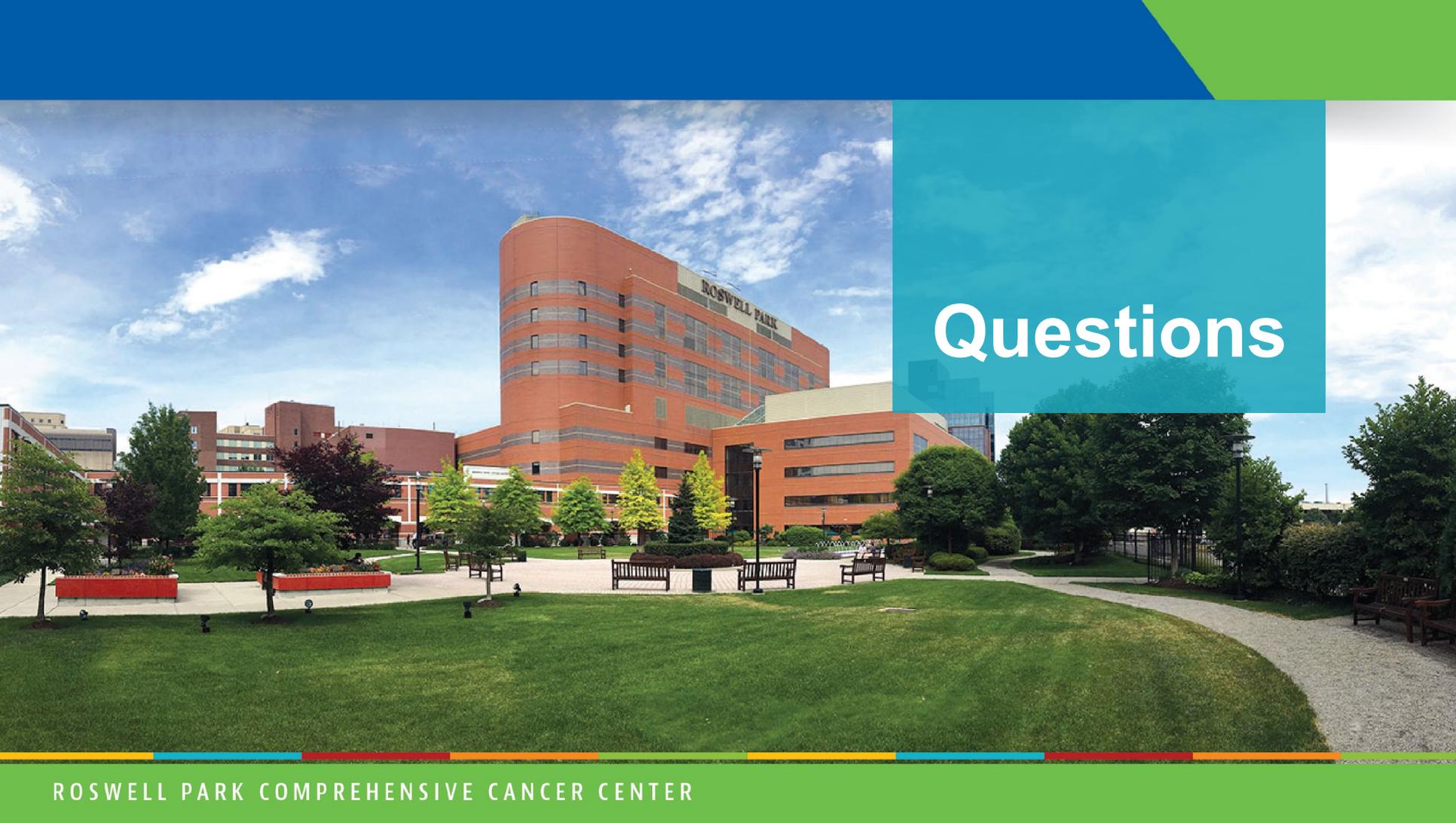


During the past 3 months, how many severe or very unpleasant attacks of chest trouble have you had?



Conclusions

- Use of ENDS with different flavors is associated with
 - Differences in behavioral transitions
 - Differences in exposure to respiratory toxicants
 - Different levels of inflammatory mediators
 - Differences in respiratory health indicators

A wide-angle photograph of the Roswell Park Comprehensive Cancer Center. The main building is a large, multi-story structure with a prominent curved section on the left, finished in reddish-brown brick with horizontal bands of windows. The name "ROSWELL PARK" is visible on the upper part of the building. In the foreground, there is a well-maintained courtyard with a large green lawn, several trees, and wooden benches. A paved path winds through the courtyard. The sky is blue with scattered white clouds. A teal semi-transparent box is overlaid on the right side of the image, containing the word "Questions" in white text.

Questions

ROSWELL PARK COMPREHENSIVE CANCER CENTER