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Menthol, Nicotine, and Flavoring Content of Capsule Cigarettes in the US

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Abstract

Objectives: Characterize physical design features of cigarette brands sold in the US according to the delivery method of menthol that may affect sensory perception among users.

Methods: Twelve cigarette brands, mentholated and non-mentholated, were purchased for analyses of the physical design characteristics, quantification of nicotine and menthol, and identification of flavor additives.

Results: Physical design characteristics did not differ significantly between the various cigarette brands. However, significant differences were seen in levels of menthol. Menthol levels were greatest in products that had dual delivery methods of menthol (6.7mg/cigarette; SE=0.27) followed by products mentholated in a filter capsule only (5.7mg/cigarette; SE=0.25), and those mentholated in the tobacco only (3.8mg/cigarette; SE=0.12); products that were not mentholated had the least (0.38mg/cigarette; SE=0.31). Finally, flavor additives with a mint flavor profile other than menthol were identified, such as pulegone and limonene, and differed between cigarette brands, which are likely contributing to the menthol flavor experience associated with use of these products.

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Human Subjects Statement
This research did not involve human subjects.

Conflict of Interest Statement
All authors of this article declare they have no conflicts of interest.

Conclusions: The regulation of menthol delivery method, flavorings added to the capsule, and/or menthol concentration may be beneficial for the public health as these factors are likely creating unique sensory experiences.

Keywords

menthol; cigarettes; tobacco product; nicotine concentration; menthol concentration; flavor additives

INTRODUCTION

Cigarettes are carefully engineered to attract consumers.[1] The “taste” of a cigarette refers to the appeal of that product to a consumer’s sense of smell, touch, and taste; how the smoke smells when traveling through the mouth and nose, the sensation of the smoke on the tongue, gums and throat, and the taste of the smoke in the mouth.[2] The combination of these sensations refers to the cigarette’s sensory properties.[2] Many design features of the cigarette can affect the sensory properties of a cigarette.[1–3] For instance, filter ventilation allows ambient air to enter the tipping paper, which is wrapped around the filter, reducing emission yields and creating a “lighter” taste;[1,3,4] the presence of a filter, the type of filter materials, and filter elements such as flavor capsules influence smoke constituent yields and cigarette taste;[1,4] nicotine is known to be bitter and harsh;[5] and flavor additives, such as menthol, can be added to reduce sensitivity to nicotine and add a minty flavor.[6] Various combinations and levels of cigarette design features are used to create different sensory experiences to appeal to certain subsets of consumers.[1]

Mentholated cigarettes accounted for more than one-third of the cigarettes sold in the US in 2016, and this percentage has been increasing steadily since the early 1960s[7] Menthol reduces the harshness of cigarette smoke and irritation caused by nicotine, which contributes to initiation and continuation of cigarette use.[8–13] Almost all cigarettes, mentholated and non-mentholated, contain some level of menthol, but how it is added may not be clear unless the design feature is observable.[6,14] Menthol can be added to a cigarette by spraying the cut tobacco during blending, adding it to the pack foil, injecting onto the tobacco stream in the cigarette maker, injecting into the filter on the filter maker, use of a crushable capsule in the filter, or any combination of the above methods.[6] Capsule cigarettes contain a spherical capsule made from gelatin placed in the middle of the cigarette filter.[15] The capsule can be crushed at any time during the smoking experience to release a flavor liquid in to the cigarette filter.[15] In the US, there are only 2 brands that supply mentholated cigarettes with crushable flavor capsules in the filter tip: Camel (Crush, Menthol, and Menthol Silver) and Marlboro (NXT).

Various flavor additives,[16] at varying concentrations of flavor additives,[17] can be used to create the characterizing flavor of menthol. In addition, the flavor additives used in the crushable filter capsule are protected from evaporation creating a fuller flavor.[15] On the other hand, when the flavor additive is added to the tobacco it is burned and has potential for migration,[15,18] and all of which may alter the smoking experience. Participants have claimed that Camel Crush does not taste like a normal cigarette as you do not get much smoke, the

taste is mintier, and the cigarettes burn more quickly than other mentholated cigarettes brands, such as Newport.[19] Although these qualitative differences have been identified in focus groups, there are few studies assessing what design features may influence these opinions. For instance, Camel Crush may have higher filter ventilation than other products, which would decrease the concentration of smoke per puff.[3] Camel Crush may be perceived as mintier because it has a higher concentration of menthol in the capsule compared to a product mentholated in the tobacco (eg, Newport). Therefore, Camel Menthol products that are marketed as "menthol to fresh" (eg, mentholated in tobacco and a capsule) are expected to have the most menthol, followed by capsule products, products mentholated in the tobacco, and finally products that are not mentholated. In addition, various flavorings may be used to create different minty, cool flavor profiles. This exploratory study aimed to assess the differences in physical design features (eg, pressure drop, ventilation, menthol concentration, flavor additives, nicotine concentration) according to the delivery method of menthol of popular mentholated and non-mentholated cigarette brands sold in the US.

METHODS

Cigarette Products

Cigarette products analyzed in this study were purchased from retail stores in the Buffalo Niagara region of Western New York State in September, 2018. The use of tradenames in this study is for identification only. Camel, Marlboro, and Newport cigarette brands were analyzed because Camel and Marlboro are the only brands sold in the US that offer a cigarette flavored with a crushable filter capsule, these are some of the most popular brands sold in the US,[20] and they provide mentholated and non-mentholated brand varieties. Cigarette brand varieties purchased included Camel Crush, Camel Menthol, Camel Menthol Silver, Camel Blue, Camel Red, Marlboro NXT, Marlboro Menthol, Marlboro Red, Marlboro Gold, Marlboro Black, Marlboro Ice, and Newport cigarettes. One cigarette pack of each sub-brand was required for standardized methods, but 4 packs were purchased as per our laboratory protocol to ensure we had a stock of products from the same time point. Cigarette packs were stored unopened at −20°C in the Tobacco Research Laboratory at Roswell Park Comprehensive Cancer Center (Buffalo, NY) until analysis in October 2018.

Cigarette Physical and Design Characteristics

Analyses of cigarette product physical features were conducted at Roswell Park following a standardized procedure from the International Organization for Standardization (ISO) 3402:1999.[21] Prior to analyses, one cigarette pack for each sub-brand was conditioned for a minimum of 48 hours at 22°C ± 2.0°C and 60% ± 2.0% relative humidity in a Parameter Generation and Control environmental chamber (Black Mountain, NC). For each sub-brand, 5 cigarettes were randomly selected from each pack for analyses. Digital calipers were used to assess cigarette length and diameter, filter length, tipping paper length, distance to filter ventilation holes, and the length of the tobacco rod. Filter weight was gravimetrically weighed using a Mettler-Toledo analytical balance with and without the filter capsule. The weight and moisture content of the tobacco was measured using an HR83 or HB43-S Moisture Analyzer (Mettler-Toledo, Ohio, USA). The moisture of the tobacco is the percent change in tobacco weight after it is heated with a halogen bulb at 125°C until an asymptote

is reached. Lastly, the cigarette filter ventilation and pressure drop was assessed pre- and post-crushing of the filter capsule using a Borgwaldt PV-10 (Borgwaldt-KC, Richmond, VA, USA). The ventilation of cigarettes allows for the smoke to be diluted with air upon inhalation[22]: the closer to 100% ventilation, the greater amount of air that dilutes the smoke.[22] The pressure drop expresses the ease of inhalation. Tobacco weight per cigarette, overwrap (the difference between filter length and tipping paper length), and the density of the tobacco rod and filter without the filter capsule, (total gram weight of the tobacco and filter were divided by the respective volumetric measures including length and diameter) were calculated for each of the 5 cigarette sticks sampled. The measurements for the 5 cigarette sticks for each sub-brand were averaged to create the data point for that particular sub-brand. The data is available upon request.

Nicotine and Menthol Quantification

The nicotine and menthol content of the cigarette products in this study were determined by liquid/liquid extraction into an organic extraction solvent containing an internal standard, which was analyzed using gas chromatography with mass spectroscopy detector (GC/MSD), following the MTBE method of CORESTA Recommended Method N° 62.[23] Nicotine and menthol quantification occurred simultaneously with the physical characteristic methods.

Sample preparation.—Unopened packs of cigarettes were used for this analysis to minimize loss of menthol due to volatilization. Once the package was opened, one whole cigarette was randomly selected, weighed using an analytic balance, and sliced opened longitudinally to expose the cigarette filter and tobacco rod. The entire cigarette (tobacco filler, cigarette filter, and cigarette paper) was used for quantification. Samples with filter capsules were analyzed with the capsule crushed as well as without the capsule, and all samples were run in triplicates (3 cigarette sticks per sub-brand). 1R5F and 3R4F reference cigarettes (Center for Tobacco Reference Products, University of Kentucky, Lexington, KY) were included in the analysis as controls.

GC/MSD conditions.—An Agilent Technologies (Santa Clara, CA) 7890B GC with a 5977A Series single quadrupole MSD was used for nicotine and menthol quantification. The GC/MSD was set up following the manufacturer's instructions. The separations were performed on an Agilent HP-5MS Ultra Inert capillary column (30m length, 0.250mm inner diameter, and 0.25μm film thickness). MSD data was collected in the scan mode with a mass range of 20–260amu. Peak matching and retention time was used to identify menthol (m/z = 71), nicotine (m/z = 84), and quinoline (m/z = 129). A nicotine calibration range of 30–600μg/mL (R^2 = 0.9972) was used to determine nicotine in whole cigarette samples. A low menthol calibration range of 0.24–4 μg/mL (R^2 = 0.9994) was used to determine menthol in whole non-mentholated cigarette samples, and a high menthol calibration range of 30–600μg/mL (R^2 = 0.9976) was used to determine the menthol in whole mentholated cigarette samples.

Sample concentration derivation.—Nicotine calibration standards in the concentration range of 30–600μg/mL were used to determine amount of nicotine in cigarette tobacco. A low concentration range of 0.24–4 μg/mL was used to determine menthol content in the

tobacco of non-mentholated cigarettes, and a high concentration range of 30–600μg/mL was used to determine menthol content in the tobacco of mentholated cigarettes. The ratio of nicotine peak area to quinoline peak area, as well as the ratio of menthol peak area to quinoline peak area, was plotted, and the equation of the linear trend line was used to determine the concentration of nicotine and menthol in the samples (μg/1.5mL). Concentrations were adjusted for the sample volume in the GC vial, the volume of MTBE added, entire cigarette weight, and per cigarette tobacco weight to determine the milligrams of nicotine and menthol per gram of tobacco. The lower limit of detection (LOD) for nicotine and menthol was defined as 3.3 times the standard deviation of the respective calibration gradient divided by the slope of the respective calibration gradient. For samples with analytic results below the LOD, a value equal to the LOD divided by the square root of 2 was imputed.

Qualitative chemical analysis of compounds and flavor additives found in the cigarettes.—Chemical flavors added to the capsules were analyzed using GC/MSD and assessed using the Flavor and Fragrance Natural and Synthetic Compounds Library version 3 (FFNSC3) as well as the National Institute of Standards and Technology Database version 14 (NIST14) in conjunction with the Agilent Mass Hunter Software. Retention time (RT), mass to charge ratio, and mass to charge ion was also provided for each compound identified by the GC/MSD databases. A match factor of 85 was used as a threshold for identifying chemical flavor compounds. In addition, compounds were excluded if they did not appear in at least 2 out of the 3 cigarette samples to minimize random hits, or if they had a RT within one minute of the MTBE solvent (RT = 1.7 min) or the internal standard (RT = 2.5) to prevent identifying compounds that may be products of reactions with the internal standard or solvent. Pubchem,[24] the Flavor and Extract Manufacturers Association of the US (FEMA),[25] and the Good Scents Company[26] websites were used to identify common uses and flavor profile and odor when applicable.

Data Analysis

Analysis of variance (ANOVA) with Tukey post-hoc tests were used to compare product design features, including nicotine and menthol concentrations, by mentholation status (non-menthol, menthol in the tobacco only, menthol in a crushable filter capsule only, or menthol in both the tobacco and a crushable filter capsule). Data analyses were completed using Statistical Package for the Social Sciences Version 21.0 (IBM, Armonk, NY). A p-value of <0.05 was considered statistically significant.

RESULTS

Cigarette Physical and Design Characteristics

Twelve US cigarette brands were analyzed. Four brands were marketed as non-mentholated (Camel Blue, Camel Red, Marlboro Red, and Marlboro Gold), 4 brands were labelled as mentholated (Marlboro Menthol, Marlboro Black, Marlboro Ice, and Newport), 2 brands were labelled as “regular to fresh/menthol” (Camel Crush and Marlboro NXT, respectively), and 2 brands were labelled as “menthol to fresh” (Camel Menthol and Camel Menthol Silver). Camel Crush, Camel Menthol, Camel Menthol Silver, and Marlboro NXT contained

a crushable filter capsule that allows consumers to change the flavor of their product. Therefore, Camel Crush and Marlboro NXT are regular, non-mentholated cigarettes until the filter capsule is crushed, and Camel Menthol and Camel Menthol Silver are mentholated cigarettes with an additional level of menthol when the filter capsule is crushed. No statistically significant differences in any of the major cigarette design characteristics were found between various delivery methods of menthol (Table 1).

Nicotine Content

Nicotine concentrations were compared based on the cigarette brand as well as the labelled mentholation status. Statistically significant differences in nicotine concentrations per gram of tobacco were seen in three of the most common cigarette brands sold in the US ($F(2,45 = 6.7$, $p = .003$). On average, Marlboro brand cigarettes had the highest level of nicotine (17.3 mg/g of tobacco, Standard error (SE) = 0.26), followed by Camel (15.8 mg/g of tobacco, SE = 0.52), then Newport (13.7 mg/g of tobacco, SE = 0.27). Furthermore, Marlboro nicotine concentrations were significantly higher than Camel ($p = .031$) and Newport ($p = .008$) concentrations.

Significant differences were also seen in mean nicotine concentration by cigarette product mentholation status ($F(3,44) = 3.2$, $p = .034$). On average, non-mentholated products contained 16.8 mg/g of tobacco (SE= 0.67) of nicotine, products that were mentholated in the tobacco only had 16.0 mg/g of tobacco (SE = 0.76) of nicotine, products that were mentholated in a filter capsule only had 17.3 mg/g of tobacco (SE = 0.45) of nicotine, and products mentholated in both the tobacco and a capsule had 15.0 mg/g of tobacco (SE = 0.16) of nicotine. Products that were mentholated in a filter capsule only had significantly higher nicotine content compared to products mentholated in both the tobacco and filter capsule ($p = .031$). All other cigarette products did not differ in mean nicotine concentrations according to their mentholation status (Figure 1).

Menthol Content

Menthol concentrations were compared based on the cigarette brand as well as the marketed level of menthol in the cigarette. There were no significant differences in menthol concentrations per cigarette, or per g of tobacco, between cigarette brands sold in the US. On average, Camel brand cigarettes had 3.4 mg/cigarette (SE = 0.57) of menthol, Marlboro brand cigarettes had 2.9 mg/cigarette (SE = 0.53) of menthol, and Newport brand cigarettes had 3.1 mg/cigarette (SE = 0.04) of menthol.

When quantifying menthol, products mentholated in a filter capsule only (Camel Crush and Marlboro NXT) are classified as a non-mentholated product without the capsule, and products mentholated in the tobacco as well as with a filter capsule (Camel Menthol and Camel Menthol Silver) are categorized as menthol in the tobacco only without the capsule. Significant differences in menthol concentrations were seen between cigarette product menthol level per cigarette ($F(3,44) = 103.3$, $p < .001$). Non-mentholated products contained about 0.38 mg/cigarette (SE = 0.31) of menthol, products mentholated in the tobacco only had 3.8 mg/cigarette (SE = 0.12) of menthol, products mentholated in a filter capsule only had 5.7 mg/cigarette (SE = 0.25) of menthol, and products mentholated in both the tobacco

and filter capsule had 6.7 mg/cigarette (SE = 0.27) of menthol. Menthol concentration per cigarette differed by menthol delivery (all p's ≤ .001), except for products mentholated in a filter capsule only versus products mentholated in both the tobacco and a filter capsule (Figure 2).

The approximate amount of menthol provided by the capsule was determined by subtracting the amount of menthol in the cigarette without the capsule (filter, cigarette and tipping paper, and tobacco) from the amount of menthol in the cigarette with the capsule (filter, filter capsule, cigarette and tipping paper, and tobacco). The capsule in Camel Crush products provide about 5.1 mg/capsule (SE = 0.25), Camel Menthol products provides about 2.5 mg/capsule (SE = 0.09), Camel Menthol Silver provides about 2.7 mg/capsule (SE = 0.30), and Marlboro NXT provides about 6.0 mg/capsule (SE = 0.33). The menthol content found in the capsule differed significantly by menthol delivery in that products that were mentholated in a capsule only had a higher menthol concentration in the capsule compared to the products that had menthol in the tobacco and the capsule ($t = 9.66$, $p \leq .001$).

Qualitative Analysis of Chemical Flavors found in the Cigarettes

Eleven unique chemical flavors were identified in the filter capsules by the FFNSC3 database. Menthol and menthyl acetate were identified in all capsules. Isopulegol and Limonene were identified in Camel Crush and Camel Menthol capsules, while dihydro-beta-terpinyl acetate was identified in Camel Menthol and Camel Menthol Silver capsules. Beta-bourbonene, beta-cubebene, caryophyllene, caryophyllene oxide, cis-3-Hexenyl valerate, and pulegone were identified in NXT capsules. The NXT capsules had the most compounds identified with a total of 8 compounds, while Camel Menthol had 5 compounds identified, Camel Crush had 4 compounds identified, and Camel Menthol Silver had three compounds identified. Most of the compounds were identified as a flavoring agent, three of which were also a fragrance (eg, menthol, menthyl acetate, cis-3-Hexenyl valerate), dihydro-beta-terpinyl acetate was shown to be only used as a fragrance, and limonene has been used as an insecticide in addition to being a flavor agent. The flavor profile of most of the chemical flavors of the capsules was "mint" or "cool", but some were identified as a "spice/wood" or "fruit" flavor. Furthermore, the odor profiles included more than mint. Limonene and beta-cubebene were listed as having a citrus odor, caryophyllene has a spice odor, caryophyllene oxide a wood odor, and beta-bourbonene an herbal odor. Six of the chemical additives were noted to have acute toxicity and irritation (eg, oral, dermal, eye, and/or inhalation toxicity; Table 2).

DISCUSSION

In this study, we aimed to explore various physical design characteristics of popular US cigarette brands with various menthol delivery methods, including Marlboro, Camel, and Newport, to identify features other than delivery method that may alter the sensory properties of the product. As expected, significant differences were seen in measurable levels of menthol between the various menthol delivery methods. Products with 2 delivery methods of menthol had higher levels compared to products mentholated in a filter capsule only, followed by those mentholated in the tobacco only, and products that were not

mentholated had the least. In addition to menthol, various chemical flavor additives, such as pulegone and limonene, were detected and likely contribute to or supplement the menthol flavor in these products. Our findings for menthol concentration per cigarette, menthol attributed to the filter capsule, and potential ingredients found within the filter capsule of products sold in the US were comparable to a previous study that evaluated capsule cigarette products marketed in Korea.[27]

There were no significant differences in other design characteristics (eg, ventilation, filter length and density, or tobacco length and density) that could alter the taste of the cigarette product. The cigarette design characteristics of the cigarette brands analyzed were comparable to typical US cigarettes.[28,29] Interestingly, the nicotine concentration was significantly higher in products mentholated in a filter capsule only compared to products mentholated in the tobacco as well as a filter capsule. The difference, however, is very small and warrant further investigation.

The taste and smell of a cigarette product may act as a conditional reinforcer and may increase motivation to consume nicotine through incentive salience mechanisms.[8] Menthol in cigarettes is known to reduce sensitivity to the harshness of the tobacco smoke, which contributes to initiation and continued use.[6, 8–13, 30] Menthol adds a minty taste and aroma impacting the smoking experience (eg, perceived strength, taste, harshness, smoothness, mildness, coolness, taste, and aftertaste of a cigarette) of consumers.[6, 31] Furthermore, the innovative technology of the crushable filter capsule has been shown to be appealing to young adult smokers across countries as it gives consumers the opportunity to smoke with or without menthol flavoring found within the crushable filter cpasule.[15, 32, 33]

This current study provides preliminary data on design characteristics of popular cigarette brands sold in the US according to various delivery methods of menthol that are likely to affect consumers' sensory perceptions. Furthermore, to our knowledge, this is the first study to simultaneously assess all marketed delivery methods of menthol (non-mentholated, mentholated in the tobacco only, mentholated in a crushable filter capsule only, and mentholated in both the tobacco and a crushable filter capsule) available in the US. However, this study is limited in several ways. First, we did not assess the tobacco blend of the cigarette products, which could also alter the taste of the cigarette product. Second, this study was based on a convenience sample, which was limited by the number and varieties of menthol products, specifically capsule products, available. Third, the nicotine and menthol concentrations do not represent consumer exposure levels. Fourth, the CORESTA method was used to optimize resources to identify nicotine and menthol in cigarette material, but it was not an appropriate method to identify menthol in the capsule products alone. Therefore, development of a standardized method to quantify the amount of menthol in the capsule would beneficial. Fifth, the qualitative chemical analysis of additives was limited by the sensitivity of the peak matching by the compound databases. Therefore, the additives identified need to be assessed further (eg, confirm with standards and quantify). In addition, non-flavor additives may also influence how consumers perceive products and should be further assessed. Finally, compounds identified in the qualitative chemical analysis within the retention time of our solvent and internal standard were excluded as they may be byproducts of interactions with the solvent or internal standard.

IMPLICATIONS FOR REGULATORY SCIENCE

The delivery method of menthol, menthol concentrations, and the use of various chemical flavors are likely used to create different sensory experiences between various cigarette products to appeal to various consumers in the US. The chemical flavors in the capsule are not burned like flavoring agents located in the tobacco.[15, 19] In addition, the capsule products contain higher concentrations of menthol, which create a unique sensory experience that are different from products mentholated in the tobacco alone (eg, Newport or Marlboro Menthol) that may be appealing to a subset of consumers. The FDA has authority to regulate cigarette design elements for the protection of public health. The regulation of menthol delivery method, flavorings added to the capsule, and/or menthol concentration may be beneficial.

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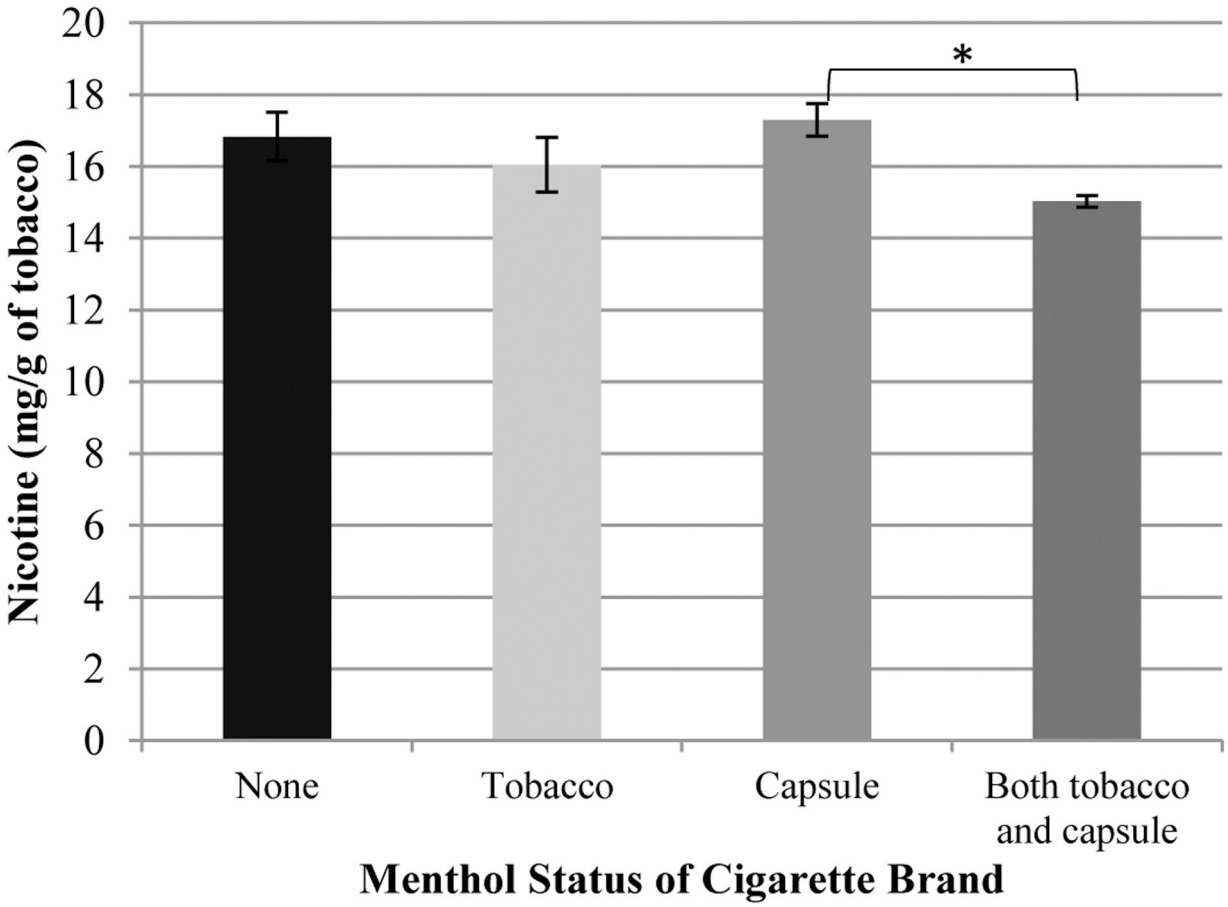

Figure 1:
Nicotine Concentration of US Cigarette Brands According to Mentholation Status, 2018
NOTE: * Indicates ANOVA Tukey post-hoc statistically significant at $p<0.05$;
None = non-mentholated

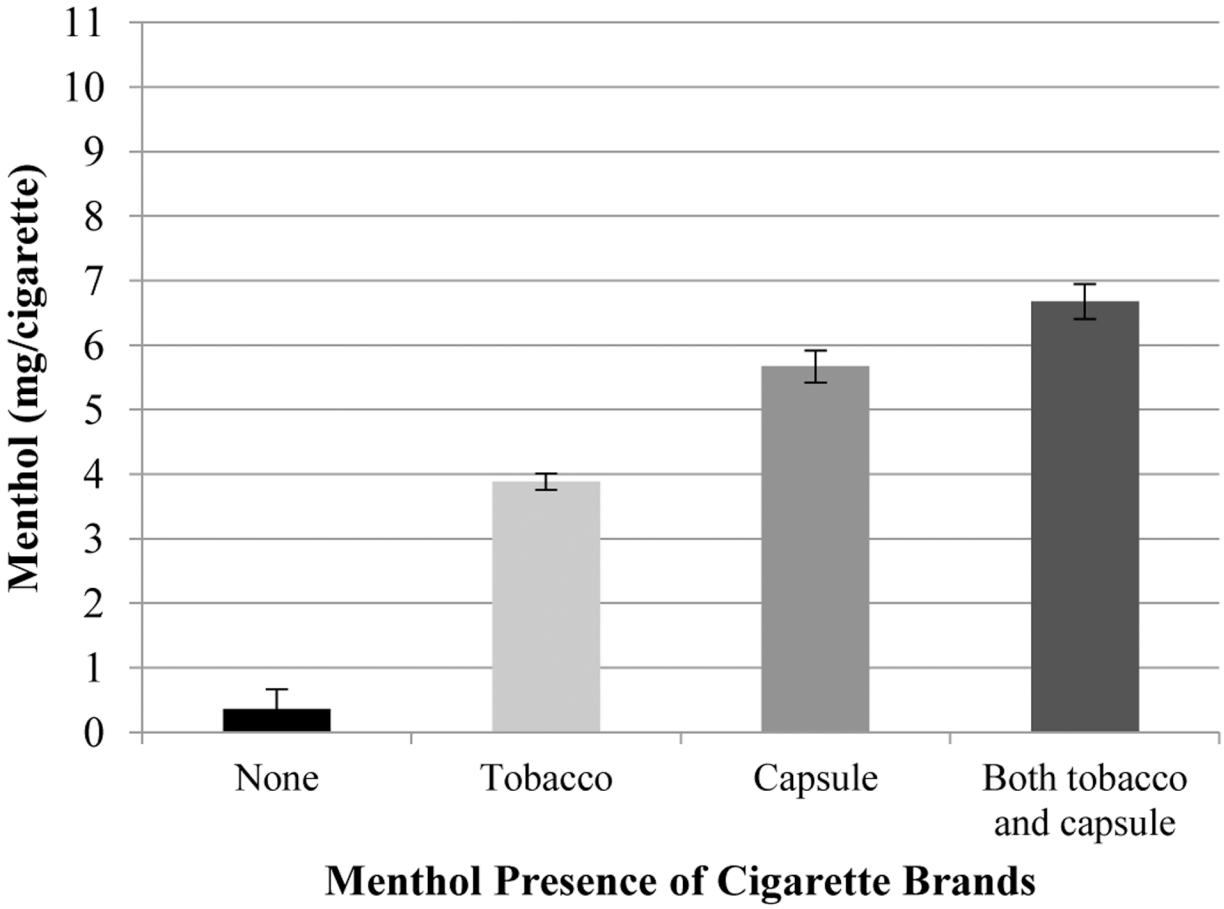

Figure 2:

Menthol Concentration of US Cigarette Brands According to Marketed Menthol Delivery Method, 2018

NOTE: ANOVA Tukey post-hoc tests found that menthol concentration differed significantly between all levels of menthol delivery at $p \leq 0.001$, except between the capsule levels

Abbreviations: None = non-mentholated

Table 1:

Design Characteristics According to Mentholation Status of US Cigarette Brands, 2018

	Non-menthol N = 4 Mean (SE)	Tobacco N = 4 Mean (SE)	Filter N = 2 Mean (SE)	Both N = 2 Mean (SE)	p-value
Cigarette Length (mm)	81.7 (1.0)	82.8 (0.4)	81.1 (1.9)	82.8 (0.03)	0.57
Tobacco Rod Length (mm)	58.8 (1.4)	59.1 (1.8)	55.1 (1.2)	56.7 (0.4)	0.40
Rod Density (mg/cm^3)	272.1 (5.5)	207.2 (61.2)	262.4 (14.5)	285.9 (14.5)	0.58
Per Cigarette Tobacco Weight (g)	0.7 (0.02)	0.5 (0.2)	0.6 (0.03)	0.7 (0.02)	0.61
Tobacco Moisture (%)	17.1 (0.5)	16.0 (1.5)	15.7 (1.2)	18.4 (0.7)	0.20
Ventilation (%)	21.4 (2.7)	13.7 (8.7)	39.0 (6.2)	26.2 (7.6)	0.19
Filter Length (mm)	23.1 (2.0)	23.8 (1.8)	25.4 (0.7)	26.7 (0.04)	0.61
Filter Density w/o Capsule (mg/cm^3)	120.9 (4.7)	131.8 (5.1)	132.7 (1.9)	127.1 (3.7)	0.33
Tipping Paper (mm)	27.8 (1.9)	28.6 (2.0)	30.6 (0.5)	30.9 (0.1)	0.62
Overwrap (mm)	4.7 (0.3)	4.8 (0.3)	5.2 (0.2)	4.2 (0.2)	0.42

NOTE: Sample size refers to the number of cigarette brands analyzed; Statistical differences were determined using chi-squared analysis or ANOVA

Table 2:

Flavor Chemicals Identified Using GC/MSD's FFNSC3 Database in the Filter Capsules of Common US Cigarette Brands, 2018

Name	CAS #	Product	Flavor	Odor	Use
Menthol	1490-04-6	All Capsules	Mint, Cool	Mint	Fragrance, Flavoring agent
Menthyl acetate	16409-45-3	All Capsules	Mint, Cool	Mint	Fragrance, Flavoring agent
Isopulegol	89-79-2	CC Capsule, CM Capsule	Mint, Cool	Mint	Flavoring Agent
Limonene	5989-54-8	CC Capsule, CM Capsule	Mint, Cool	Citrus	Flavoring agent, Insecticide
dihydro-beta-terpinyl acetate	26252-11-9	CM Capsule, CMS Capsule	N/A	N/A	Fragrance
beta-Bourbonene	119903-95-6	NXT Capsule	N/A	Herbal	Flavoring agent
beta-Cubebene	13744-15-5	NXT Capsule	N/A	Citrus	Flavoring agent
Caryophyllene	13877-93-5	NXT Capsule	Fired, Spice Wood	Spice	Flavoring agent
Caryophyllene oxide	1139-30-6	NXT Capsule	Herb, Must, Spice, Wood	Wood	Flavoring agent
cis-3-Hexenyl valerate	35852-46-1	NXT Capsule	Fruit	N/A	Fragrance, Flavoring agent
Pulegone	15932-80-6	NXT Capsule	Mint, Cool	Mint	Flavoring agent

NOTE: CC Capsule: Camel Crush Capsule; CM Capsule: Camel Menthol Capsule; CMS Capsule: Camel Menthol Silver Capsule; NXT Capsule: Marlboro NXT Capsule; N/A: Not Available