Menthol Cigarettes: Setting the Research Agenda

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The First Conference on Menthol Cigarettes was convened in Atlanta, Georgia, on March 21–22, 2002. The purpose of the conference was to evaluate the present state of the science concerning the potential increased harm caused by adding menthol to cigarettes, and to set the priorities for further studies of menthol cigarettes. More than 80 researchers and tobacco control experts participated in the conference. This supplement to Nicotine & Tobacco Research provides a summary of the state of our knowledge of the history, sociology, epidemiology, and toxicology of menthol cigarettes as well as the proposed future research agenda.

Introduction

Menthol is unique in that it is the only cigarette additive actively marketed to consumers. It is the only aspect of cigarette design that is marketed explicitly based on its physiological effects, as an anti-irritant and a cooling agent. It is the only cigarette additive about which consumers make conscious buying choices.

Although the tobacco industry has actively investigated menthol as an additive (Best, 1993; Borgerding, 1993; Borschke, 1993; Hopp, 1993; Reid, 1993; Wilson, 1993), relatively few studies have been published in the public health literature about the following topics:

- The emergence of menthol cigarettes
- The use of menthol cigarettes by some segments of the smoking population
- The targeted marketing of menthol cigarettes to specific population groups
- Reported reasons for menthol cigarette use
- The addictive, physiological, and toxicological properties of menthol cigarettes, which are purportedly different from those of nonmentholated brands
- The potential of menthol cigarettes to increase exposure to harmful smoke constituents
- The propensity of menthol cigarettes to aid in the initiation of smoking among adolescents
- The impact of mentholated cigarettes on smoking-related disease, disability, and death

Because fully a quarter of all cigarettes sold in the United States (Federal Trade Commission, 2003) are classified as menthol cigarettes, and because menthol cigarettes are disproportionately used by some population groups (U.S. Department of Health and Human Services [USDHHS], 1998), it is important to explore the public health impact of the popular additive.

The emergence of menthol cigarettes

Menthol cigarettes were conceived as specialty products in the 1920s and 1930s (Reid, 1993). These cigarettes were initially marketed as a luxury product, through radio and magazine ads, and especially
targeted to women smokers (Brown & Williamson, 1978). Until the 1960s, the market share of menthol cigarettes never exceeded 5% (Brown & Williamson, 1978). However, with the great migration of Blacks from the South to urban centers, peaking during and after World War II, the industry started targeting menthol cigarettes to this population. Launched in the early 1940s, the popular Black magazines (e.g., Ebony, Jet) offered a unique opportunity for precision marketing (www.johnsonpublishingcompany.com). By the 1960s and 1970s, menthol brands had become the cigarettes of choice for the majority of Black smokers (Brown & Williamson, 1978; Pérez-Stable, Herrera, Jacob, & Benowitz, 1998; Wagenchnecht et al., 1990). Whereas only about 25% of White smokers use menthol cigarettes, more than 70% of Black smokers choose them; other population segments are now adopting menthol use, including young people, Asian and Pacific Islander Americans, and women (USDHHS, 1998). Today, menthol cigarettes represent about 26% of all cigarettes sold in the United States (Federal Trade Commission, 2003). Newport cigarettes are the leading menthol brand and are second only to Marlboro in overall market share.

Why it is important to study menthol cigarettes

One urgent question that needs to be answered is whether menthol cigarettes contribute to the health disparities between European American and Black smokers. Although Blacks tend to smoke fewer cigarettes per day than do European Americans (Caraballo et al., 1998; Clark, Gautam, Hlaing, & Gerson, 1996; Djordjevic et al., 2002; Kabat & Hebert, 1994; Wagenchnecht et al., 1990), incidence and mortality rates of lung cancer and other smoking-related diseases are significantly higher among Blacks. For example, average age-adjusted annual incidence rates for lung cancer in the United States between 1992 and 1998 were 54.7/100,000 for Whites and 71.6/100,000 for Blacks; mortality rates, for the same period, were 48.8 for Whites and 59.1 for Blacks (Jemal, Thomas, Murray, & Thun, 2002). The age-adjusted smoking-related lung cancer death rates in the United States among Black males and White males were 15.7 and 21.9, respectively, in 1950; 47.8 and 47.3, respectively, in 1965; and 107.7 and 73.6, respectively, in 1990. Whether these trends reflect the trends of use of menthol cigarettes by Blacks remains to be determined (Centers for Disease Control and Prevention, 2003).

Menthol, a chemical compound extracted from the peppermint plant and classified as a mild local anesthetic, was commonly used in veterinary medicine (Kluger, 1996). Colorless and with a mint scent, menthol was first added to cigarettes in the 1920s and 1930s to mask the harshness of tobacco smoke (Reid, 1993). Some 52% of 174 Blacks interviewed in one study reported that mentholated cigarettes were less harsh on the throat, 48% stated that inhalation was easier, and 33% felt they could inhale more deeply (Hymowitz, Mouton, & Edkholdt, 1995). Since the 1960s, menthol brands have been marketed by the industry as “refreshing” and “cool” (Kluger, 1996). Menthol stimulates cold receptors, with the resulting sensation of coolness perceived not only in the mouth and pharynx but also in the lungs (Eccles, 1994, 2000). Stimulation of laryngeal cold receptors may reduce airway irritation (Orani, Anderson, Sant’Ambrogio, & Sant’Ambrogio, 1991). This sensation of coolness might result in deeper inhalation, but because of the difficulty in precisely measuring the inhalation phase of smoking, this issue has not been studied adequately. Menthol may increase salivary flow, thereby enhancing the passage of harmful smoke constituents across mucus membranes (Clark, Gautam, & Gerson, 1996; Duner-Engstrom, Larsson, Lundberg, & Fredholm, 1986). Menthol has been shown to increase significantly involuntary breath holding (Sloan, DeCort, & Eccles, 1993). Breath holding at peak inspiration could contribute to increased uptake of inhaled tobacco smoke constituents, including nicotine and cancer-causing agents, from the alveoli of the lungs into the bloodstream. Conflicting reports on the effect of menthol on smoking topography (e.g., puff volume, puff frequency) may be the result of small samples and variations in study populations (Ahijevych, Gillespie, Demirci, & Jagadeesh, 1996; Djordjevic et al., 2002).

The 1999 Massachusetts Benchmark Study of the 24 most popular U.S. filter cigarette brands and styles (6 of which were menthol brands) provided some evidence that the chemical composition of the mainstream smoke of selected menthol cigarettes differs from that of their nonmenthol counterparts (Borgerding, Bodnar, & Wingate, 2000). The machine-smoked levels of tar, nicotine, carbon monoxide, and several carcinogenic compounds in the mainstream smoke were 30%–50% higher than in the smoke of the selected nonmentholated brands. Many cigarette design characteristics (e.g., tobacco blend, resistance to draw, paper porosity, amount of tobacco in the rod, cigarette length) may contribute to differences in yield that are independent of mentholation. For example, Newport, the most popular menthol brand in the United States, is a “full flavor” cigarette with no filter ventilation holes, whereas the most popular nonmentholated brand, “full flavor” Marlboros, averages 8% ventilation in the hard pack version and 11% ventilation in the soft pack (Borgerding et al., 2000).
Emerging research on menthol cigarettes

When menthol was introduced into cigarettes, the tobacco industry and some members of the scientific community studied the effects of menthol on human tissue. In the mid-1940s, Brown & Williamson commissioned a literature search on the toxic effects of menthol (Brown & Williamson, circa 1946). Thus, the industry knew early on that menthol, when tested on animals, had distinct properties that had to be accounted for in the delivery of nicotine to cigarette smokers.

Although the industry had an early interest in the use and effects of menthol added to cigarettes, the public health community was not conducting extensive menthol-related research. Studies of the effects of smoking menthol cigarettes are now emerging. In 1989, the first epidemiological study of health effects of smoking menthol cigarettes was published (Hebert & Kabat, 1989), and several others have followed (Carpenter, Jarvik, Morgenstern, McCarthy, & London, 1999; Kabat & Hebert, 1991, 1994; Muscat, Richie, & Stellman, 2002; Sidney, Tekawa, Friedman, Sadler, & Tashkin, 1995; Stellman et al., 2003). To date, epidemiological studies of the relationship between smoking menthol cigarettes and cancer risk have shown mixed results and have been limited by problems such as too few subjects exclusively smoking menthol cigarettes for too short a time. Because little is known about the brand- and style-switching habits of smokers, classifying subjects as exclusively menthol or nonmenthol smokers for a long enough time period is difficult. For instance, it is not known if the “worried well” may switch to menthol cigarettes because they perceive them to be less harmful or if subjects with a persistent cough may switch to a mentholated brand for its local anesthetic and cooling properties. Both possibilities may cause a misclassification bias of unknown magnitude in epidemiological studies. Also, the increased “dose” delivered with menthol cigarettes may be no more than the equivalent of a few cigarettes a day among heavy smokers, or even a single extra cigarette among lighter smokers (the classification into which Black smokers generally fall). Thus, parsing out the additional harm associated with smoking menthol cigarettes might require very large sample sizes or the exclusive use of menthol cigarettes for long periods. Apart from research on lung cancer, not many studies have been reported in the literature on the effect of menthol cigarettes on noncancer health outcomes such as nicotine addiction, cardiovascular disease, chronic obstructive pulmonary disease, and birth outcomes.

The comparative studies of the uptake of smoke constituents, including nicotine and carcinogens, among smokers of menthol and nonmenthol cigarettes, as determined by measuring the levels of biological markers, are now emerging (Benowitz, 2002; Djordjevic et al., 2002; Melikian et al., 2002; Zhang et al., 2003). One study reported that the levels of urinary 1-hydroxypiperene (a marker of exposure to carcinogenic polycyclic aromatic hydrocarbons [PAH]) per cigarette smoked by male menthol smokers were about 2.7-fold higher than the levels measured among nonmenthol cigarette smokers based on equimolar benzo(a)pyrene dosage delivered in the mainstream smoke. This observation suggested that menthol may enhance the uptake of PAH from mainstream smoke and alter metabolism, or that racial differences in the metabolic activation of carcinogens are factors in uptake and metabolism of PAH (Zhang et al.). The absence of a crossover component, in which subjects are tested while smoking both menthol and nonmenthol styles, has been a significant limitation in the interpretation of some studies. Thus, it is not known if the results were attributable to interaction among individual differences in smoking (such as inhalation or breath-holding patterns), addiction and disease susceptibility, and the preference for menthol cigarettes, rather than menthol smoking per se. This distinction is important given that cigarette smoking is a highly ritualistic activity developed, in part, to maintain a physiologically needed level of blood nicotine. Only crossover designs will help separate individual idiosyncratic smoking patterns from those attributable to smoking menthol cigarettes. Direct measures of body burdens of carcinogens are required to better understand the relative harm of menthol and nonmenthol cigarettes. These studies are beginning to emerge (Djordjevic et al., 2002).

Studies of the epidemiology and toxicology of menthol cigarettes and behavioral issues involved in their use are beginning to receive appropriate attention. Significant gaps in knowledge persist, however. The First Conference on Menthol Cigarettes was convened to summarize what we know and what we suspect and to state the research priorities; the output from the conference is presented in this supplement. Not only will a better understanding of the consequences of adding menthol to cigarettes contribute to knowledge about the role of menthol role in the initiation and progression of tobacco use, addiction to cigarettes, and the rate of smoking-related diseases, but it is hoped that studying menthol as an additive will lead to development of models to study the health impact of other cigarette additives and cigarette designs, including emerging potential reduced-exposure tobacco products.

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