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Lower Nicotine Cigarettes May Not Lower Harm

Editor's note: In 2005, nearly 21% of American adults smoked cigarettes, and 81% of them smoked every day. For smokers unable or unwilling to quit, tobacco products that reduce the adverse health effects of smoking may be an attractive option. Potentially reduced exposure products (PREPs) were developed by the tobacco industry in response to smokers' health concerns. PREPs purportedly lower the tar and/or nicotine levels of cigarettes, although the actual harm reduced remains questionable. One of the most recent additions to this product class are cigarettes that use genetically modified tobacco to reduce nicotine levels. This Issue Brief summarizes studies that investigate [1] how this product is used and [2] the messages smokers take away from product marketing. These complementary studies send a cautionary signal about the ability of these new cigarettes to reduce the harmful effects of smoking.

About Quest® and other potential harm-reducing products

Currently marketed in eight states, Quest® cigarettes are one of the most recent entries in the class of products designed to reduce exposure to toxic substances in tobacco. However, whether such products actually reduce harm depends on how smokers use the product.

- Quest® uses genetically modified tobacco to reduce nicotine levels. The cigarettes are manufactured with three progressively lower nicotine levels (0.6, 0.3, and 0.05 mg) and marketed as allowing smokers to "step down" to nicotine-free smoking. Each of the three levels deliver equivalent levels of tar during standardized tests, and thus, still pose health risks.
- Previous studies demonstrate that smokers may change their smoking behavior when switching to "light" cigarettes, by taking larger or more frequent puffs. The lower nicotine cigarettes in these studies had design features that allowed smokers to extract more nicotine by increasing puffing or occluding filter ventilation holes.
- Such "compensatory" behavior may mean that smokers are exposed to as much, if not more, harmful substances than regular cigarettes. Whether smokers alter their smoking behavior with Quest® cigarettes is unknown.
- Quest® cigarettes are not marketed for use as a smoking cessation device, nor are any health claims explicitly made in the product's advertising. As such, Quest® advertising is not regulated by the Food and Drug Administration (FDA). Instead, the content of ads falls under the purview of the Federal Trade Commission (FTC), whose primary goal is to ensure that products are marketed in a manner than is truthful, not misleading, and adequately substantiated.

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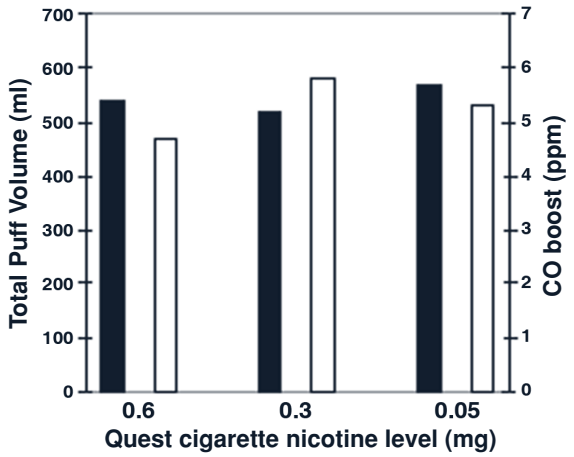
Laboratory study measures puff volume and carbon monoxide after smoking Quest® cigarettes

Strasser and colleagues conducted a laboratory study to evaluate whether compensatory smoking occurs as nicotine levels in Quest® cigarettes decrease. How a cigarette is smoked is referred to as "smoking topography" and includes measures such as number of puffs, puff volume, duration, and velocity.

- Smokers of "light" cigarettes can increase their nicotine levels by changing their smoking topography. In contrast, smokers who use Quest® may not be able to increase their nicotine levels through compensation, especially when the genetically modified tobacco contains virtually no nicotine. However, most smokers are unlikely to be fully aware of this feature, and thus may continue compensatory smoking.
- The researchers investigated the effects of using Quest® cigarettes on smoking topography and carbon monoxide exposure. Fifty adult smokers participated in the study, in which they smoked Quest® cigarettes using a machine that measures smoking behavior. Cigarettes are placed in a sterilized mouthpiece attached to an air-filled tube which leads to a pressure transducer.
- Participants first smoked their own brand to allow them to become accustomed to the smoking topography device. Thirty minutes later, they smoked each of three levels of Quest® cigarettes, thirty minutes apart. Participants completed a questionnaire that asked them to rate the cigarette they had just finished. None of the participants had previously used the product, and both study staff and participants were unaware of the nicotine level of each cigarette.
- The researchers measured total puff volume after each cigarette, as an indicator of changes in smoking behavior. They measured carbon monoxide from breath samples taken before and after each cigarette. The difference between pre- and post-cigarette carbon monoxide is considered the carbon monoxide "boost," and is a biochemical indicator of exposure to smoke.

Lower nicotine cigarettes can produce compensatory smoking and increased carbon monoxide exposure

- Total puff volume increased as nicotine levels in Quest® cigarettes decreased. Puff volume when smoking the 0.05 mg nicotine cigarette was significantly greater than when smoking the 0.3 mg nicotine cigarette, and moderately greater than the 0.6 mg nicotine cigarette.
- Carbon monoxide boost was significantly greater after smoking the 0.05 mg and 0.3 mg cigarettes compared to the 0.6 mg nicotine cigarette.



The effect of cigarette nicotine level on total puff volume (solid bars); and average carbon monoxide boost (open bars).

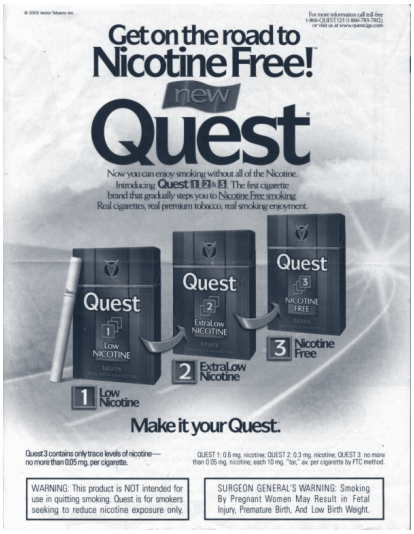
- Overall, these effects on puff volume and carbon monoxide were statistically significant, although may appear modest due to some smokers compensating while others did not.
- 1 of 5 participants had a 20% or greater increase in total puff volume when smoking the lowest nicotine cigarette compared to when smoking the highest nicotine cigarette. The majority of participants had small increases when cigarette nicotine levels decreased; only 3 participants exhibited larger total puff volume when smoking the higher nicotine cigarette.
- Further, 2 of 5 participants had a 20% or greater increase in carbon monoxide boost when smoking the lowest nicotine cigarette compared to when smoking the highest nicotine cigarette. For those who did compensate by significantly increasing their total puff volume, carbon monoxide boost increased about 300%, on average.
- At the conclusion of the study, participants were asked to identify the Quest® cigarettes with the least and most nicotine. Fifty-four

percent correctly identified the 0.6 mg nicotine cigarette as the highest, 58% identified the 0.05 mg as the lowest, and 38% correctly identified both the highest and lowest. The ability to identify these cigarettes did not affect total puff volume or carbon monoxide boost, but those who correctly discriminated cigarette nicotine level rated the 0.6 mg nicotine cigarette as strongest and most satisfying and the 0.05 mg nicotine cigarette as least strong and satisfying.

Study assesses smokers' initial responses to Quest® advertising

Outside of the controlled environment of a laboratory study, smoking behavior can be affected by how smokers perceive the new low-nicotine cigarettes. The researchers evaluated how regular smokers initially respond to a print ad for Quest® cigarettes.

- The study included 200 smokers recruited in shopping malls in 14 states (in which Quest® cigarettes are not marketed). Only 8% of participants had ever heard of Quest® cigarettes prior to the study, and none had tried them.
- The participants viewed a single Quest® print ad for 30 seconds, which is longer than most consumers spend on ads in general. The ad (shown here in small scale) describes three levels of reduced nicotine, indicates that tar levels are not reduced, and explicitly states that Quest® cigarettes are not intended to assist smokers with quitting.



- After seeing the ad, the participants answered a series of questions about the nicotine and tar content of the new cigarettes and the healthiness and safety relative to other cigarettes.
- The researchers also assessed two individual traits previously shown to influence how people respond to persuasive communication: the individual's motivation to process the information (defined in this case as perceived vulnerability to the health effects of smoking), and the need for cognition (defined as the degree to which the individual enjoys thinking about complex issues).

After reading an advertisement, many smokers incorrectly believe that Quest® cigarettes are healthier and lower in tar than other cigarettes

Despite a lengthy 30-second reading time, many smokers made false inferences about tar levels of Quest® cigarettes—the material that contains cancer-causing chemicals.

- About 60% of participants correctly answered that Quest® cigarettes are lower in nicotine. About 45% of participants inferred incorrectly that Quest® cigarettes are lower in tar.
- Participants scoring lower on perceived vulnerability and need for cognition made more false inferences about the nicotine levels in Quest® cigarettes compared with all other groups.
- Participants scoring higher on perceived vulnerability and need for cognition were more likely to infer correctly that Quest® cigarettes were no healthier than regular cigarettes.
- These findings suggest that smokers who are less motivated to think about the health effects of smoking, and who tend not to enjoy thinking critically in general, are vulnerable to misperceptions about the health and safety of Quest® cigarettes.

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POLICY IMPLICATIONS

These findings raise concern in two related areas. First, they provide behavioral and biochemical evidence for the possibility of compensatory smoking with a new low nicotine product, supporting the potential for increased, rather than reduced, harm. Second, they suggest that many smokers make false inferences about the relative safety of these cigarettes based on the product's advertisement.

- If a new cigarette is misperceived as less harmful, it may attract smokers who would otherwise have quit or reduced smoking. Further research is needed to assess how Quest® cigarettes may divert smokers from more effective ways to reduce their harm from tobacco, including trying to quit smoking.
- The FTC's legal framework for deceptive advertising considers whether the advertising conveys a message that is likely to mislead reasonable consumers to their detriment. The marketing study suggests that the Quest® advertising may mislead the public.
- These results reinforce that public health awareness campaigns should strive to increase the perception that any smoking, even smoking low nicotine cigarettes, can have serious health effects—regardless of nicotine content.

This Issue Brief is based on the following articles: A.A. Strasser, C. Lerman, P.M. Sanborn, W.B. Pickworth, and E.A. Feldman. New lower nicotine cigarettes can produce compensatory smoking and increased carbon monoxide exposure. Drug and Alcohol Dependence, 2007, vol. 86, pp. 294-300; W.G. Shadel, C. Lerman, J. Cappella, A.A. Strasser, A. Pinto, R. Hornik. Evaluating smokers' reactions to advertising for new lower nicotine Quest® cigarettes. Psychology of Addictive Behaviors, March 2006, vol. 20, pp.80-84.

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