# umn**tturc**researchbrief

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transdisciplinary tobacco use research center

**Research summary**

To assess whether smoking "light" cigarettes reduces the amount of tobacco-specific carcinogens in the body, scientists at the University of Minnesota measured the level of carcinogen uptake in smokers who were using regular, light, and ultra-light cigarettes. No significant differences were observed among smokers of the three different types of cigarettes.

**Policy implications**

The results of this study demonstrate that machine-determined tar yields of cigarettes are limited in their ability to show actual exposure to carcinogens. Using biomarkers to measure exposure to toxins in any potential reduced-exposure product is critical to ensure accurate measurement of toxin exposure levels.

**About** umn**tturc**researchbrief

The UMN TTURC Research Brief presents timely information on emerging tobacco research from the University of Minnesota. The core aims of UMN TTURC are to examine approaches for reducing tobacco toxin exposure, determine the most effective methods for treating smokers who are unable or unwilling to quit smoking, and outline public policy implications for interventions that reduce exposure to tobacco toxins.

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## "Light" cigarettes and exposure to carcinogens

**The last five decades** have witnessed a number of changes to the design of cigarettes. By the 1950s, scientists had demonstrated a link between cigarette smoking and cancer, and manufacturers had to take action. They introduced filters and lowered the machine-measured tar and nicotine levels produced by their products—so much so that today, machine-measured tar yields of US cigarettes have dipped to less than 60 percent of what the levels were in 1950.[1] Currently, the tar levels of cigarettes are classified as either regular (those with tar levels greater than 14.5 mg), light (greater than 6.5 mg to 14.5 mg of tar) or ultra-light (those with 6.5 mg of tar or less).[2] The implication of these distinctions is that the "lighter" cigarettes are somehow associated with reduced risk.

Some studies have indicated that smokers of lower-tar cigarettes have a lower risk for lung cancer.[3] But a recent study found no difference in lung cancer risk.[4] To evaluate the extent of carcinogen exposure, researchers at the University of Minnesota Transdisciplinary Tobacco Use Research Center compared levels of applicable carcinogen biomarkers among smokers of regular, light and ultra-light cigarettes.

### Methods

The research involved two different studies. Study 1 involved 115 smokers 18 to 70 years of age who were interested in reducing their cigarette use but not in quitting for the next 30 days. Study 2 included 60 participants 18 to 80 years of age who had heart disease and were interested in reducing their cigarette intake but not in quitting. Both groups completed a questionnaire in which they noted whether they were smoking regular, light, or ultra-light tar-yield cigarettes. Researchers then measured the presence of two tobacco-specific lung carcinogen metabolites in the study participants—4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) and its glucuronides (NNAL-Glucs). Presence of NNAL and NNAL-Glucs indicates that a potent carcinogen, NNK, has been absorbed in the body. (NNK has been shown to cause cancer in rats, mice, and hamsters.) They also measured levels of 1-hydroxypyrene (1-HOP), an indicator for presence of polycyclic aromatic hydrocarbons (PAHs); long-term exposure to low levels of some PAHs has caused cancer in laboratory animals. Total cotinine, a biomarker of nicotine uptake, was also measured.

### Findings

Researchers observed no statistically significant differences in levels of

1-HOP, NNAL, NNAL-Glucs, and total cotinine in smokers of regular, light, and ultra-light cigarettes. For 149 of the subjects, researchers were able to determine the machine-measured tar yields for the cigarette type smoked. While the machine-generated values for regular, light and ultra-light cigarettes were significantly different, there was no correlation between tar levels and the levels of biomarkers. These results demonstrate no significant differences exist between the levels of lung carcinogen and nicotine in smokers of regular, light and ultra-light cigarettes—a finding that is supported by previous epidemiologic studies.

## What the results mean

If smokers of light and ultra-light cigarettes had a decreased uptake of NNK and PAH, researchers would have observed a decrease in NNAL, NNAL-Glucs, and 1-HOP. But this decrease was not found. With no detectable difference in the uptake of these lung carcinogens, we conclude that there would be no decreased risk for lung cancer in smokers of ultra-light and light cigarettes compared with regular smokers. This result mirrors a reality in the United States: despite the heavy market share of low-yield cigarettes, lung cancer mortality has not decreased to levels that would be expected.

## Key policy implications

The results of this study demonstrate that machine-determined tar yields of cigarettes are limited in their ability to show actual exposure to carcinogens. The results also reinforce conclusions from other studies that state that labels such as "light" and "ultra-light" are misleading to consumers because they interpret such labels as reduced health risk.[5] Therefore, eliminating these labels as proposed by the World Health Organization as well as other health and tobacco control agencies stand to reason. Furthermore, the results of this study demonstrate that using biomarkers to measure exposure to toxins in any potential reduced-exposure products (eg, Advance, Quest, Eclipse) is critical to ensure accurate information on levels of toxin exposure and to demonstrate that these cigarettes do not result in increased risk of some diseases. •

## References

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*Findings from this study were published in:*
*Hecht S et al. Similar Uptake of Lung Carcinogens by Smokers of Regular, Light, and Ultralight Cigarettes. Cancer Epidemiol Biomarkers Prev 2005;14(3):693-8.*

*For more information about this study, please contact Jeanne Mettner, UMN TTURC's communications consultant, at 612.889.8047.*

### Total NNAL, 1-HOP, and nicotine in smokers of three types of tar-yield cigarettes*

| | Total NNAL | 1-HOP | Cotinine |
|---|---|---|---|
| **Study 1** | | | |
| Regular | 2.11 | 1.94 | 28.2 |
| Light | 2.21 | 1.41 | 25.2 |
| Ultra-light | 2.42 | 1.58 | 27.0 |
| **Study 2** | | | |
| Regular | 3.23 | 1.53 | 25.8 |
| Light | 2.65 | 1.62 | 28.2 |
| Ultra-light | 2.33 | 1.40 | 21.9 |

*per milligrams creatinine