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UNIVERSITY OF MINNESOTA
Cancer Center

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transdisciplinary tobacco use research center

Research summary
To assess whether cutting back on 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 reducing their cigarette consumption over 26 weeks. Overall reductions in carcinogen levels were seen, but the levels were modest and were proportionally less than the amount of cigarettes reduced per day.

Policy implications
Quitting smoking is the only proven way to reduce morbidity and mortality. Smokers who are unwilling and uninterested in quitting should be encouraged to reduce their smoking. However, the primary goal should be quitting cigarette smoking.

About umntturcresearchbrief
The UMN TTURC Research Brief is a quarterly publication that provides 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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Reducing cigarette smoking: Does it reduce cancer risk?

Preventing lung cancer is important for controlling the prevalence of cancer and improving the health of the public. Because 90 percent of lung cancers are caused by cigarette smoking, prevention and cessation of smoking is a key strategy for staving off future incidence of the disease. Amidst this reality, however, more than 1 billion people worldwide still smoke.[1] For those who are unwilling or unable to quit smoking, reducing consumption of cigarettes may be an important stepping stone to abstinence.

Whether cutting back on cigarette smoking would potentially reduce lung cancer risk, however, remains unclear. In attempts to address this issue, researchers at the University of Minnesota Transdisciplinary Tobacco Use Research Center (UMN TTURC) measured the level of carcinogen uptake in those smokers who were reducing their cigarette use.

Honing in on cancer-causing agents

Over 150 smokers were involved in the UMN TTURC study. About a third of the participants (49) were initially on a waitlist, while the remaining participants (102) were immediately enrolled in a smoking cessation program. These smokers were expected to reduce their use of cigarettes by 25% in weeks 0 to 2, 50% in weeks 2 to 4, and 75% in weeks 4 to 6. For the remaining 20 weeks, they were asked to maintain the level of reduction they had reached by the first 6 weeks or to reduce even further. Smokers in the waitlist group were also enrolled in the reduction program, which began about 8 weeks after the study was initiated.

At set times throughout the study, researchers collected urine samples from participants who reduced their smoking by 40% to 70%. The purpose was to assess the presence of two tobacco-specific lung carcinogen metabolites: 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) and its glucuronides (NNAL-Gluc). Presence of these metabolites is highly specific to tobacco exposure and indicates that a potent carcinogen, NNK, has been absorbed in the body. NNK has been shown to cause lung cancer in rats, mice, and hamsters.

Modest reductions

As smokers reduced their intake of cigarettes, researchers did observe statistically significant reductions in NNAL and NNAL-Gluc. But the decreases were modest in magnitude, particularly when compared with the number of cigarettes reduced per day. For instance, a 55% to 90% reduction in cigarettes during weeks 4 to 12 after baseline produced a total NNAL (NNAL plus NNAL Gluc) reduction of only 27% to 51%. Even when

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smokers reduced their daily cigarette use by 90%—from a mean of 24.7 cigarettes per day at baseline to 2.60 cigarettes per day at week 12 of the study—total NNAL levels were reduced by an average of only 46%.

Therefore, although the study results show that reductions in lung carcinogen metabolites can be achieved by reducing smoking, the reductions are always proportionally less than reduction in cigarettes per day (see table below, which shows mean percent reduction of cigarettes and the mean percent reduction in total NNAL). That said, the 30 smokers who were able to reduce their smoking by more than 70% at weeks 8 to 12 did achieve about a 50% reduction in NNAL during that same time period. This finding is important, because it demonstrates that reductions in carcinogen uptake that may be clinically significant can be achieved by reducing cigarette smoking.

Reduction Results*

	Mean % reduction in cigarettes per day compared to baseline	Mean % reduction in total NNAL
Week 6 (N=65)	74	33
Week 12 (N=65)	74	29

*Includes only those who reduced their self-reported smoking by 40% or more during weeks 4 to 12.

What the results mean

For most participants, significantly reducing cigarettes smoked per day may not necessarily have beneficial effects in reducing cancer risk. The results indicate that when trying to reduce cigarette use, smokers are changing their smoking behavior—by taking larger puffs or puffing more often—which may offset the advantages from smoking reduction.

The individuals in this study reduced their smoking with the help of nicotine replacements (nicotine gum and in some cases, a nicotine patch) and quit-smoking tips and instruction. But less than 30 of the 151 participants were able to achieve about a 50% reduction in total NNAL in 12 weeks, and if this goal was achieved, it required an average daily cigarette reduction of more than 70% and even as much as 90%. However, whether a substantial number of smokers can sustain this low rate of smoking (without quitting) is uncertain. The purpose of this study was not to test the effectiveness of certain smoking cessation tools but rather to examine whether a reduction in the number of cigarettes smoked per day would lead to reductions in NNAL and NNAL-Gluc levels. For many people, significantly cutting NNAL levels would require more aggressive smoking cessation treatment.

Key policy implications

Smokers who are unwilling and uninterested in quitting should be encouraged to reduce their smoking. However, the primary goal should be abstinence. Abstinence is the only proven way to reduce morbidity and mortality. •

The findings from this study were published in the following article: Hecht S et al. Effects of reduced cigarette smoking on the uptake of a tobacco-specific lung carcinogen. J Natl Cancer Inst 2004;96:107-15

For more information about this study, please contact Jeanne Mettner, UMN TTURC's communications consultant, at 612.627.1857.

References

(1) Mackay J, Eriksen M. World Health Organization. The tobacco atlas. Geneva (Switzerland): World Health Organization; 2002.

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