

Smoking immediately upon waking may increase risk of lung and oral cancer

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The sooner a person smokes a cigarette upon waking in the morning, the more likely he or she is to acquire lung or oral cancer, according to Penn State researchers.

"We found that smokers who consume cigarettes immediately after waking have higher levels of NNAL—a metabolite of the tobacco-specific carcinogen NNK—in their blood than smokers who refrain from smoking a half hour or more after waking, regardless of how many cigarettes they smoke per day," said Steven Branstetter, assistant professor of biobehavioral health.

According to Branstetter, other research has shown that NNK (4-(methylnitrosamino)-1-[3-pyridyl]-1-butanone) induces lung tumors in several rodent species. Levels of NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol) in the blood can therefore predict [lung cancer](#) risk in rodents as well as in humans. In addition, NNAL levels are stable in smokers over time, and a single measurement can accurately reflect an individual's exposure.

Branstetter and his colleague Joshua Muscat, professor of public health sciences, examined data on 1,945 smoking adult participants from the National Health and [Nutrition Examination Survey](#) who had provided [urine samples](#) for analysis of NNAL. These participants also had provided information about their smoking behavior, including how soon they typically smoked after waking.

The researchers found that around 32 percent of the participants they examined smoked their first cigarette of the day within 5 minutes of waking; 31 percent smoked within 6 to 30 minutes of waking; 18 percent smoked within 31 to 60 minutes of waking; and 19 percent smoked more than one hour after waking. In addition, the researchers found that the NNAL level in the participants' blood was correlated with the participants' age, the age they started smoking, their gender and whether or not another smoker lived in their home, among other factors.

The team published its results in the March 29 issue of the journal *Cancer, Epidemiology, Biomarkers and Prevention*.

"Most importantly, we found that NNAL level was highest among people who smoked the soonest upon waking, regardless of the frequency of smoking and other factors that predict NNAL concentrations," Branstetter said. "We believe these people who smoke sooner after waking inhale more deeply and more thoroughly, which could explain the higher levels of NNAL in their blood, as well as their higher risk of developing oral or lung cancer. As a result, time to first cigarette might be an important factor in the identification of high-risk smokers and in the development of interventions targeted toward early-morning smokers."

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Provided by Pennsylvania State University

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