



NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol)

NNAL is a product formed after 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) enters the body. NNK belongs to a group of chemicals called tobacco-specific *N*-nitrosamines (TSNA). This group of chemicals is found only in tobacco and tobacco products. Measuring NNAL in people's urine is a reliable way to determine exposure to NNK for smokers, for non-smokers exposed to environmental tobacco smoke (ETS), and for people who use smokeless tobacco products (chewing tobacco, snuff).

How People Are Exposed to NNK

NNK enters people's bodies when they smoke or use smokeless tobacco products. NNK also enters the bodies of non-smokers when they are exposed to environmental tobacco smoke. Workers who harvest tobacco and produce tobacco products can also be exposed through their skin and lungs.

How NNK Affects People's Health

NNK causes cancer in people. In pregnant women who are exposed to tobacco smoke or who use tobacco products, NNK and/or NNAL can pass through the placenta to the developing fetus.

Levels of NNAL in the Nonsmoking U.S. Population

Scientists at the Centers for Disease Control and Prevention (CDC) measured NNAL in the urine of 5,212 nonsmoking participants aged six years and older who took part in the National Health and Nutrition Examination Survey in 2007–2008. Smokers had NNAL levels that were about 50 to 150 times higher than in nonsmokers. By measuring NNAL, scientists can estimate the amount of NNK that has entered people's bodies.

- CDC scientists found NNAL in the urine of more than a third of the non-smokers tested.
- In studies of children exposed to ETS, levels of NNAL in urine have been 2 to 3 times higher than the levels found in ETS–exposed adults.

For More Information

- International Agency for Research on Cancer
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans—Smokeless Tobacco and Some Tobacco-specific N-Nitrosamines
<http://monographs.iarc.fr/ENG/Monographs/vol89/index.php>

- National Toxicology Program
Substance Profile—4-(N-Nitrosomethylamino)-1-(3-Pyridyl)-1-Butanone
<http://ntp.niehs.nih.gov/ntp/roc/elevnth/profiles/s131nnk.pdf>

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The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.