

Testimony
Before the
Subcommittee on Health
Committee on Energy and Commerce
United States House of Representatives

Hearing entitled, "Smokeless Tobacco: Impact on the Health of our Nation's Youth and Use in Major League Baseball"

Statement of
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Good morning, Chairman Pallone and Members of the Subcommittee. I am Dr. Deborah Winn, Deputy Director of the Division of Cancer Control and Population Sciences, National Cancer Institute (NCI) at the National Institutes of Health, an agency of the Department of Health and Human Services. Thank you for the opportunity to be with you today to discuss smokeless tobacco and its health consequences. I will also provide scientific evidence demonstrating the impact that media and celebrities' health behaviors have on tobacco use among youth.

Effects of smokeless tobacco on health

Use of smokeless tobacco is an established cause of cancers in the mouth (cancer of the oral cavity) and pharynx (part of the throat), esophagus, and pancreas. In 1985, the Advisory Committee to the U.S. Surgeon General examined literature on the health risks associated with use of snuff, a type of smokeless tobacco, and concluded that: “The scientific evidence is strong that the use of snuff can cause cancer in humans. The evidence for causality is strongest for cancer of the oral cavity, wherein cancer may occur several times more frequently in snuff dippers compared to non-tobacco users. The excess risk of cancer of the cheek and gum may reach nearly fifty fold among long-term snuff users.”

The International Agency for Research on Cancer (known as IARC), a part of the World Health Organization, routinely convenes expert panels to evaluate the world’s scientific research literature on environmental agents to determine whether exposure to those agents causes cancer. It evaluated the carcinogenicity of smokeless tobacco three times. I participated as an invited expert on all three panels. These reports are considered to be highly authoritative and are used extensively worldwide to provide the scientific basis for public health action. In 1985, IARC convened an international working group of experts in smokeless tobacco that concluded that smokeless tobacco is a cause of oral and pharyngeal cancer. In 2004, the IARC panel re-affirmed that using smokeless tobacco causes oral cancer and also concluded that smokeless tobacco is a cause of pancreatic cancer. In 2009, IARC added esophageal cancer to the list of cancer types caused by smokeless tobacco use.

The evidence that smokeless tobacco causes cancer is based on studies in human populations, studies in animal models, and studies that help us understand the biological mechanisms involved in the development of cancer. First, I will tell you about the findings in studies in human populations, called epidemiology studies. Researchers conducting epidemiology studies rely on a variety of study designs to learn more about risk factors, such as smokeless tobacco use, for disease. For example, case-control studies compare past smokeless tobacco use in a group of people with the cancer of interest to smokeless tobacco use in people without the cancer of interest. Cohort studies ask people about their tobacco use behaviors and then follow these people for a period of years or decades to determine the rates of developing cancer among groups with different tobacco use behaviors. Both case-control and cohort studies show that use of smokeless tobacco products for at least 6 months is associated with a 4-or-greater-fold increased risk of oral cancer. Some studies demonstrate that risks of oral cancer increase with increasing times per day or years of use of smokeless tobacco products.

Other important risk factors for oral and pharyngeal cancers, esophageal cancer, and pancreatic cancer are smoking and heavy alcohol intake. However, these factors do not account for the effect of smokeless tobacco on the risk of these cancers. Additionally, obesity is a risk factor for pancreatic cancer; but smokeless tobacco remains associated with pancreatic cancer risk even after we take the effect of obesity on pancreatic cancer into account.

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Smokeless tobacco products are vastly different around the world. In some geographic regions such as Scandinavia, smokeless tobacco use is quite common. The IARC panel found that smokeless tobacco use was associated with an increased risk of oral cancer regardless of how the tobacco products were formulated or used in places across the globe ranging from North America to Scandinavia, Africa, and Asia.

In addition to periodontal (gum) and dental caries (tooth decay) effects, smokeless tobacco users more frequently than non-users develop leukoplakias, white patches in the mouth, and frequent and longer-term users have more patches. Leukoplakias can be pre-cancerous and, in some adults who have leukoplakia, cancer may arise. Changes in the lining of the mouth related to smokeless tobacco can occur in young people as well. A national oral examination survey of children ages 12 to 17 years in the 1980s found that 27% of children who used smokeless tobacco but only 0.4% of children who did not use smokeless tobacco had changes in their mouths that involved wrinkling of the surface of the lining of the mouth and color changes ranging from normal to white, or gray.

Potential reproductive effects of smokeless tobacco include decreased fetal growth and increased risk of preterm delivery and stillbirth.

Studies in laboratory animals including rats and mice also show that smokeless tobacco causes cancer. Smokeless tobacco contains tobacco-specific nitrosamines. Nitrosamines are a chemical family that includes some known carcinogens. Tobacco-specific nitrosamines are found only in tobacco products. These include 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) and N'-nitrosonornicotine (NNN). IARC has determined that there is sufficient scientific evidence that NNK and its metabolite 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) and NNN are carcinogens in experimental animals. NNN and NNK, or their metabolites, can be found in the saliva and urine of smokeless tobacco users.

Scientists have a fairly clear understanding of the biological mechanisms whereby smokeless tobacco use causes cancer. One main pathway to carcinogenesis occurs when metabolites of chemicals found in smokeless tobacco attach to DNA, causing a genetic mutation. This mutation leads to other cellular disruptions and ultimately results in cancer. Other carcinogens found in small amounts in smokeless tobacco are aldehydes and metals.

Smokeless tobacco is addictive. The landmark 1988 report, *The Health Consequences of Smoking: Nicotine Addiction: A Report of the Surgeon General*, which focused on nicotine addiction, had three major conclusions:

1. Cigarettes and other forms of tobacco are addicting.
2. Nicotine is the drug in tobacco that causes addiction.
3. The pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

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Cancer is not the only adverse health affect associated with the use of smokeless tobacco. A recent report summarized the data from relevant studies in the medical literature regarding use of smokeless tobacco and myocardial infarction (also known as “heart attack”) and stroke. Of the 8 studies, primarily studying men, “ever use” of smokeless tobacco was associated with a 13% increased risk of fatal heart attack. Of the 5 studies examining the incidence of stroke, ever use of smokeless tobacco was associated with a 40% increase of stroke. If non-fatal heart attacks or strokes were included in the analyses, the risks were somewhat lower. The risks did not appear to increase with greater years or frequency of smokeless tobacco use. More research is needed to assess smokeless tobacco use as a risk factor for heart attack and stroke and to determine the preventive value of strategies designed to aid cessation of smokeless tobacco use.

The American Cancer Society Cancer Prevention Study II focused on the consequences of quitting cigarette smoking versus substituting smokeless tobacco for cigarette smoking. This study compared 111,952 cigarette smokers (with no other tobacco use behaviors) who quit smoking entirely with 4,443 smokers who switched from smoking to using smokeless tobacco. After 20 years of follow-up, the risk of dying from lung cancer, coronary heart disease, stroke and obstructive pulmonary disease was higher among those who switched from smoking to smokeless tobacco use than among those who quit smoking entirely. A case-control study of risk of myocardial infarction showed that persons who smoked tobacco and used snuff had a greater risk of heart attack than those who only smoked. Even light and intermittent cigarette smoking increase the risk for cardiovascular diseases, lung cancer, certain other diseases, and all-cause mortality. Because of these findings regarding increased heart attack risks in those who switched from smoking to smokeless and the health risks even among light and intermittent smokers, there is great concern about health consequences to persons who both smoke cigarettes and use smokeless tobacco. These additional risks could significantly impact the manner in which the risks of smokeless tobacco use would be communicated to the public.

Effects of media and celebrities’ health on youth risk behaviors

Research findings show that adolescents engage in more risky behaviors, including tobacco use, to the extent that they endorse positive prototypes of individuals who engage in those behaviors. In short, when adolescents associate a particular behavior with people or personality characteristics they admire, they are more willing to try that behavior. This happens in part because adolescents identify with the prototype. Baseball players, like many athletes, serve as role models and prototypes, and are probably considered the “prototypical” user of chewing tobacco. There is also corollary evidence that *positive* role models can help *prevent* smoking onset. There are high rates of smokeless tobacco advertising in magazines read by youth, several of which are sports-related. Considerable research has demonstrated effects of smoking in the entertainment media (e.g., movies and television characters) on uptake of tobacco use among adolescents. Exposure to smoking in movies increases positive attitudes toward smoking and intentions to smoke. Epidemiologic studies consistently demonstrate a dose-response

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relationship between exposure to smoking in movies and smoking initiation, after controlling for peer and family smoking, parenting style, sensation seeking, and demographic characteristics such as gender and ethnicity. These findings have also been replicated in other cultures.

Several opportunistic studies show that celebrity health behaviors (e.g., Magic Johnson's announcement of his HIV status and Katie Couric's televised colonoscopy on the Today show) have immediate behavioral effects.

Although I have focused today on smokeless tobacco, the scientific evidence continues to confirm that tobacco use in any form causes cancer. NCI encourages anyone who does not use tobacco not to start and encourages anyone who does use tobacco to quit. There are many effective approaches at the community and the individual level to prevent tobacco initiation and to quit.

Thank you for this opportunity to present this information to you. I would be happy to answer any questions.