The Health Consequences of Using Smokeless Tobacco

A Report of the
Advisory Committee to the Surgeon General

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CONTENTS

FOREWORD

This report on *The Health Consequences of Using Smokeless Tobacco* completes the Public Health Service's initial examination of smokeless tobacco's role in the causation of cancer, noncancerous and precancerous oral diseases or conditions, addiction, and other adverse health effects. Almost 30 years after the Public Health Service's first statement on the health effects of cigarette smoking, it is now possible to issue the first comprehensive, indepth review of the relationship between smokeless tobacco use and health.

Ironically, while cigarette smoking has declined during the past 20 years, the production and apparent consumption of smokeless tobacco products have risen significantly. These increases are in marked contrast to the decline in smokeless tobacco use in the United States during the first half of this century. Indeed, smokeless tobacco products, particularly chewing tobacco and snuff, have recently emerged as popular products for the first time since the turn of the century. National estimates indicate that at least 12 million Americans used some form of smokeless tobacco during 1985 with use increasing especially among male adolescents and young male adults.

The increased use and appeal of this product assume major public health significance because the evidence reveals that smokeless tobacco can cause oral cancer, can lead to the development of oral leukoplakias and other oral conditions, and can cause addiction to nicotine. The strength of the association between these conditions and smokeless tobacco use combined with the upward trend in this behavior incites the same alarm as was true with the knowledge that spitting spread tuberculosis. That concern led to the original public rejection of tobacco chewing and dipping as unsanitary and antisocial. It is critical that our society prevent the use of this health hazard and avoid the tragic mistake of replacing the ashtray with the spittoon.

This report is the work of numerous experts within the Department of Health and Human Services and in the non-Federal scientific community. I express my gratitude for their contributions.

C. Everett Koop, M.D.
U.S. Surgeon General

PREFACE

This report discusses the health consequences of smokeless tobacco use. It constitutes a comprehensive review by an Advisory Committee to the Surgeon General of the available scientific literature to determine whether using smokeless tobacco increases the risk of cancer and noncancerous oral diseases and effects, leads to addiction and dependence, and contributes to other health consequences.

AFTER A CAREFUL EXAMINATION OF THE RELEVANT EPIDEMIOLOGIC, EXPERIMENTAL, AND CLINICAL DATA, THE COMMITTEE CONCLUDES THAT THE ORAL USE OF SMOKELESS TOBACCO REPRESENTS A SIGNIFICANT HEALTH RISK. IT IS NOT A SAFE SUBSTITUTE FOR SMOKING CIGARETTES. IT CAN CAUSE CANCER AND A NUMBER OF NONCANCEROUS ORAL CONDITIONS AND CAN LEAD TO NICOTINE ADDICTION AND DEPENDENCE.

The major overall conclusions of this report are the following:

1. It is estimated that smokeless tobacco was used by at least 12 million people in the United States in 1985 and that half of these were regular users. The use of smokeless tobacco, particularly moist snuff, is increasing, especially among male adolescents and young male adults.

2. 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 nontobacco users. The excess risk of cancer of the cheek and gum may reach nearly fiftyfold among long-term snuff users.

3. Some investigations suggest that the use of chewing tobacco may also increase the risk of oral cancer, but the evidence is not so strong and the risks have yet to be quantified.

4. Experimental investigations reveal potent carcinogens in smokeless tobacco. These include nitrosamines, polycyclic aromatic hydrocarbons, and radiation-emitting polonium. The tobacco-specific nitrosamines often have been detected at levels 100 or more times higher than Government-regulated levels of other nitrosamines permitted in foods eaten by Americans.

5. Smokeless tobacco use can lead to the development of oral leukoplakias (white patches or plaques of the oral mucosa), particularly at the site of tobacco placement. Based on evidence from several studies, a portion of leukoplakias can undergo transformation to dysplasia and further to cancer.

6. Gingival recession is a commonly reported outcome of smokeless tobacco use.

7. A number of studies have shown that nicotine exposure from smoking cigarettes can cause addiction in humans. In this regard, nicotine is similar to other addictive drugs such as morphine and cocaine. Since nicotine levels in the body resulting from smokeless tobacco use are similar in magnitude to nicotine levels from cigarette smoking, it is concluded that smokeless tobacco use also can be addictive. Besides, recent studies have shown that nicotine administered orally has the potential to produce a physiologic dependence.

8. Some evidence suggests that nicotine may play a contributory or supportive role in the pathogenesis of coronary artery and peripheral vascular disease, hypertension, peptic ulcers, and fetal mortality and morbidity.

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INTRODUCTION, OVERVIEW, AND CONCLUSIONS

DEVELOPMENT AND ORGANIZATION OF THE REPORT

This report from the Surgeon General's Advisory Committee on the Health Consequences of Using Smokeless Tobacco represents the first comprehensive assessment of the biomedical and behavioral literature describing experimental and human evidence on the health consequences of using smokeless tobacco. The content of this report is the work of numerous experts within the Department of Health and Human Services as well as distinguished scientists outside the organization.

Each chapter of the report was prepared based on manuscripts written by scientists who are recognized for their understanding of the specific content areas. Manuscripts were subjected to extensive peer review by a large number of experts in the specific areas of interest.

The report includes a "Preface" that presents the essence of the entire report and an "Introduction, Overview, and Conclusions." The body of the report consists of the following four chapters:

- Chapter 1—Prevalence and Trends of Smokeless Tobacco Use in the United States
- Chapter 2—Carcinogenesis Associated With Smokeless Tobacco Use
- Chapter 3—Noncancerous and Precancerous Oral Health Effects Associated With Smokeless Tobacco Use
- Chapter 4—Nicotine Exposure: Pharmacokinetics, Addiction, and Other Physiologic Effects

HISTORICAL PERSPECTIVE

The use of smokeless tobacco is a worldwide practice with numerous variations in the nature of the product used as well as in the customs associated with its use. In the United States, smokeless tobacco consists of chewing tobacco and snuff. The predominant mode of use of these nonsmoked tobaccos is oral, although they may be placed in or inhaled into the nasal cavity. Tobacco sniffing, however, has been and remains a rare practice in the United States.

Smokeless tobacco was used in the United States in the early 1600's when snuff made its way to the Jamestown Colony in Virginia through the efforts of John Rolfe in 1611 *(1)*. Evidence of tobacco chewing, however, was not found until a century later in 1704 *(2)*.

The use of tobacco, including smokeless tobacco, has been controversial since its introduction. In the past, tobacco use was considered by some as beneficial. As early as 3500 B.C., there are indications that tobacco was an article of established value to the inhabitants of Mexico and Peru. It appears that people who frequently lacked sufficient food alleviated their hunger pains by chewing tobacco *(3)*. Smokeless tobacco was also thought to have several medicinal uses. Among Native Americans, for example, chewing tobacco was used to alleviate toothaches, disinfect cuts, and relieve the effects of snake, spider, and insect bites *(4)*. Moreover, during the 19th and early 20th centuries in America, dental snuff was advertised to relieve toothache pain; to cure neuralgia, bleeding gums, and scurvy; and to preserve and whiten teeth and prevent decay *(1)*.

On the other hand, tobacco use historically has had numerous adversaries, including the following *(1)*:

- In 1590 in Japan, tobacco was prohibited. Users lost their property and were jailed.
- King James VI of Scotland in the early 1600's was a strong antismoking advocate who increased taxes on tobacco 4,000 percent in an attempt to reduce the quantity imported to England.
- In 1633, the Sultan Murad IV of Turkey made any use of tobacco a capital offense, punishable by death from hanging, beheading, or starvation. He maintained that tobacco caused infertility and reduced the fighting capabilities of his soldiers.
- The Russian Czar Michael Fedorovich, the first Romanov (1613–1645), prohibited the sale of tobacco, stating that users would be subjected to physical punishment and that persistent users would be killed.
- A Chinese law in 1683 threatened that anyone possessing tobacco would be beheaded.
- During the mid-1600's, Pope Urban VIII banned the use of snuff in churches, and Pope Innocent X attacked its use by priests in the Catholic Church.
- Other religious groups also banned snuff use: John Wesley, the founder of Methodism, attacked its use in Ireland; the Mormons, Seventh-Day Adventists, Parsees and Sikhs of India, Buddhist monks of Korea, members of the Tsai Li sect of China, and some Ethiopian Christian sects forbade the use of tobacco.

- Frederick the Great, King of Prussia, prevented his mother, the Dowager Queen of Prussia, from using snuff at his coronation in 1790.
- Louis XV, ruler of France from 1723 to 1774, banned snuff use from the Court of France.

Scientific observations concerning the health effects of smokeless tobacco use were first noted in 1761 by John Hill, a London physician and botanist who reported five cases of polypuses, a "swelling in the nostril that was hard, black and adherent with the symptoms of an open cancer" *(5)*. He concluded that nasal cancer could develop as a consequence of tobacco snuff use (sniffing).

Evidence that suggested a possible association between smokeless tobacco use and oral conditions in North America and Europe was not reported until 1915 when Abbe identified several tobacco chewers among a series of oral cancer patients and commented that smokeless tobacco use may be a risk factor for this cancer *(6)*. In the late 1930's, Ahblom observed in Sweden that more patients with buccal, gingival, and "mandibular" cancers than with other cancers reported the use of snuff or chewing tobacco *(7)*. In the United States, case reports of oral cancer among users of snuff or chewing tobacco appeared in the early 1940's *(8)*. The first epidemiologic study of smokeless tobacco was not conducted until the early 1950's *(9)*. Since that time, several scientists have described a pattern of increased risk of oral cancer among smokeless tobacco users.

Investigations of other possible health effects of smokeless tobacco use (e.g., noncancerous oral effects, addiction, and other physiologic consequences) are more recent subjects of scientific inquiry that have been undertaken primarily in the past two decades.

A brief review of the health consequences of smokeless tobacco was presented in the 1979 Surgeon General's report on smoking and health *(10)*. Since that review, the results of additional studies addressing the role of smokeless tobacco in health have become available and thus provide the basis of this current comprehensive review.

REVIEW METHODS

For the purpose of evaluating the scientific evidence to be included in this report, the Advisory Committee called upon the same criteria to determine causality as have been used for a number of Surgeon General's reports on smoking for the past two decades. The following criteria were used as the primary guidelines for assessing whether any associations between smokeless tobacco use and each of the disease areas or health conditions under examination were likely to be causal in nature: