GENERAL REMARKS

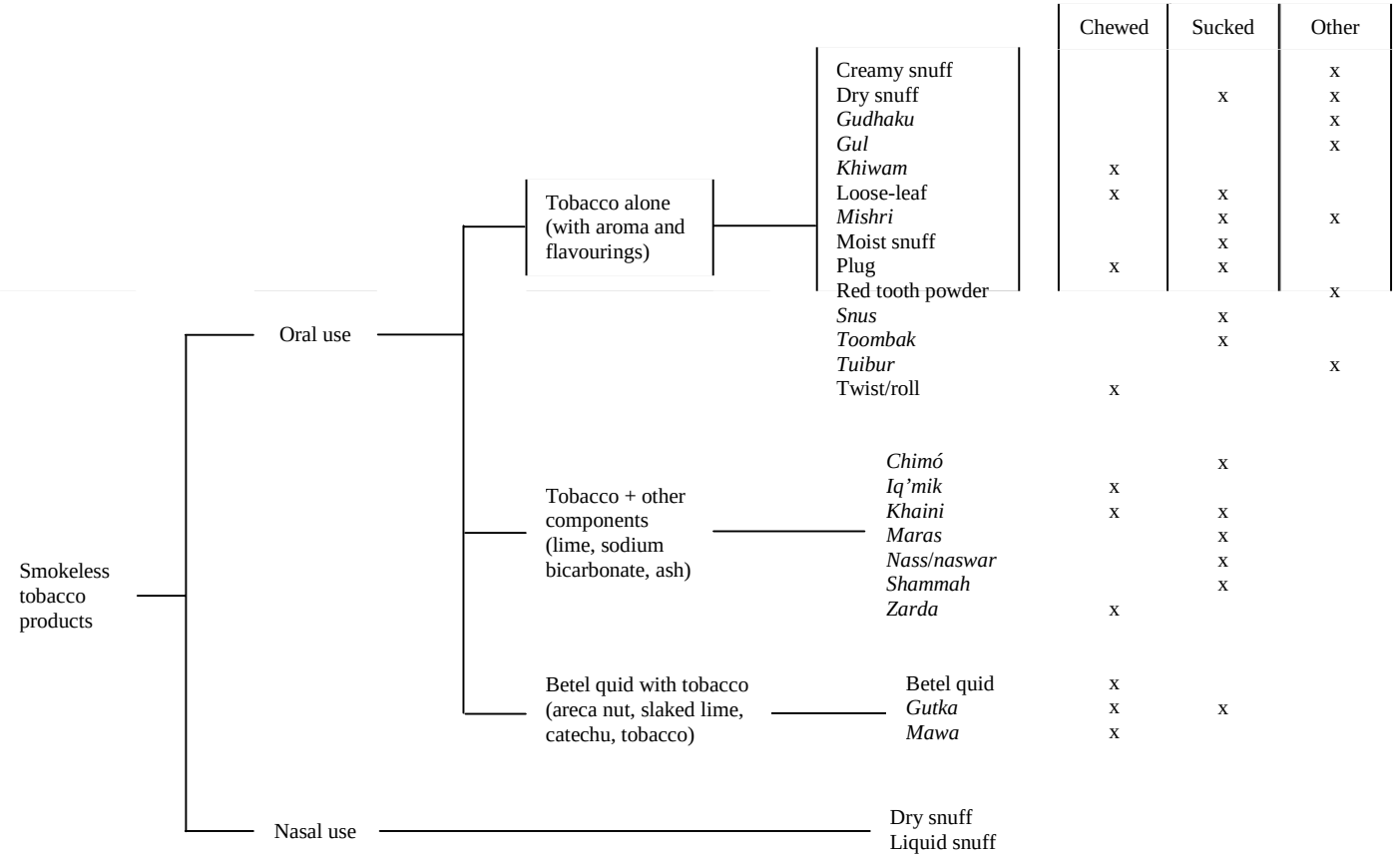
This eighty-ninth volume of the *IARC Monographs* is the third and last of a series on tobacco-related agents. Volume 83 reported on the carcinogenicity of tobacco smoke and involuntary smoking (second-hand smoke or environmental tobacco smoke) (IARC, 2004a). Volume 85 summarized the evidence on the carcinogenic risk of chewing betel quid with and without tobacco (IARC, 2004b). That volume explored the variety of products chewed in South Asia and other parts of the word that contain areca nut in combination with other ingredients, often including tobacco. In this eighty-ninth volume, the carcinogenic risks associated with the use of smokeless tobacco, including chewing tobacco and snuff, are considered in a first monograph. The second monograph reviews some tobacco-specific nitrosamines. These agents were evaluated earlier in Volume 37 of the *Monographs* (IARC, 1985), and information gathered since that time has been summarized and evaluated.

The agent termed 'smokeless tobacco' includes a large variety of commercially or non-commercially available products and mixtures that contain tobacco as the principal constituent and are used either orally or nasally without combustion. Figure 1 presents the forms of smokeless tobacco that are evaluated in this volume and their mode of use. For all products, except those that contain areca nut, the only known source of carcinogenic agents is the tobacco. (For tobacco chewed with betel quid or areca nut, see IARC, 2004b). The expression 'smokeless tobacco' was preferred to other terms such as 'non-smoking tobacco', 'non-smoked tobacco', 'unsmoked tobacco' and 'uncombusted tobacco', despite the imprecision of this term in the English language and the potential difficulty in its translation (see IARC, 1985).

The oral and nasal use of tobacco, either in leaf form for chewing or finely powdered as snuff, is as old as its use for smoking in pipes, cigars and cigarettes. In the first half of the twentieth century, the use of chewing tobacco and snuff in Europe and North America was overtaken by a huge increase in the smoking of cigarettes. In some parts of the world, particularly in South Asia, however, smokeless tobacco is still widely used. In addition, there has been a resurgence in the use of chewing tobacco and snuff in some European countries and in the USA during the last few decades.

In recent years, tobacco manufacturing companies have developed smokeless tobacco products with potential reduced exposure, also know as PREPs. These products are promoted and marketed by industry with claims that imply reduced risks and, subsequently,

Figure 1. Forms of smokeless tobacco evaluated in this volume



	Chewed	Sucked	Other
Creamy snuff			x
Dry snuff		x	x
Gudhaku			x
Gul			x
Khiwam	x		
Loose-leaf	x	x	
Mishri		x	x
Moist snuff		x	
Plug	x	x	
Red tooth powder			x
Snus		x	
Toombak		x	
Tuibur			x
Twist/roll	x		
Chimó		x	
Iq'mik	x		
Khaini	x	x	
Maras		x	
Nass/*naswar*		x	
Shammah		x	
Zarda	x		
Betel quid	x		
Gutka	x	x	
Mawa	x		

harm. The issue regarding the use of PREPs in the reduction of harm caused by tobacco has been reviewed (Henningfield *et al*., 2002; Tomar, 2002; Hatsukami *et al*., 2004).

Some health scientists have suggested that smokeless tobacco should be used for smoking cessation, and claim that its use would reduce the smoker's exposure to carcinogens and risk for cancer. They also attribute declines in smoking in Sweden to increased consumption of moist snuff in that country. However, as discussed in Section 1 of the monograph on Smokeless Tobacco, these claims are not supported by the available evidence.

Occupational exposure to unburnt tobacco may occur during tobacco manufacture, particularly in *bidi* factories in India, which are often very small-scale industries that have poor working conditions. The workers are mainly women and are exposed to tobacco by dermal contact, and also have airborne exposure to tobacco dust and volatile components. Studies of such industries have mainly reported on the concentration of tobacco dust and particulate matter in the ambient air in the factories, as well as biomonitoring of the workers, but no epidemiological studies on tobacco-related health risks in these workers have been carried out.

While in the Americas, Europe and Oceania, the leading cancers are those of the lung, breast, prostate and colorectum, cancer of the oral cavity is one of the leading malignancies in India and many other countries in South-East Asia, and ranks first in incidence among men and third among women, after cancer of the cervix and of the breast (IARC, 2003).

Oral leukoplakia is considered to be a precursor stage of oral cancer and is also prevalent in South Asia; this precancerous lesion is therefore also discussed in Section 2, Studies of Cancer in Humans. The term 'snuff-induced lesions', which is sometimes used in research articles, is avoided because of the ambiguity in the type of lesions to which it refers.

Tobacco-specific *N*-nitroso compounds have been detected at high concentrations in snuff and chewing tobacco and were evaluated in a previous monograph (IARC, 1985). New tobacco-specific nitrosamines have been identified and isolated since that time. However, only those for which there are sufficient mechanistic data to be able to draw a conclusion on their carcinogenicity were evaluated. Many other known carcinogens have been identified in various forms of tobacco (IARC, 2004a), including smokeless tobacco. The identification of nitrosamines as carcinogenic agents does not rule out the likelihood that other compounds present in tobacco may also contribute to their carcinogenicity.

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