

Absorption of nicotine by man during cigar smoking

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The absorption of nicotine during cigar smoking was studied in 7 male subjects each of whom smoked a single cigar labelled with a known amount of ($2'$ - ^{14}C) nicotine, range 41.3 to 45.5 μCi . The cigars were 77 mm long and similar to small commercially available varieties. The smoke transfer characteristics of exogenous radioisotopically labelled nicotine were similar to those of endogenous material (Houseman & Hopper, 1974).

Cigars were smoked at one puff per min down to a standard butt length, total 14–23 puffs. After each puff the subject exhaled into a smoke collecting mask through which air was drawn continuously. The cigar itself was mounted in a smoking cartridge designed to collect all the sidestream smoke and ash. Before smoking, a brachial artery catheter was inserted and blood samples were taken at intervals during and following the cigar. Samples were analysed for nicotine and cotinine using a radiochemical method (Turner, 1971).

The cigars contained 16 mg nicotine in total. An average of 33% of the total nicotine was taken into the smoker's mouth as mainstream smoke and was thus available for absorption, a higher proportion than the 25% found previously for cigarettes (Armitage, Dollery, George, Houseman, Lewis & Turner, 1975). The proportion of the mainstream smoke nicotine which was retained varied considerably, between 36 and 97%. The average dose of nicotine retained by the 7 subjects was 2.1 mg, range 1.0 to 4.5 mg. Subjects who retained most nicotine had the highest peak arterial blood concentrations of nicotine which ranged between 8 and 64 $\mu\text{g/l}$. In two subjects the rates of

rise in arterial nicotine concentrations, 1.7 and 3.8 $\mu\text{g l}^{-1} \text{ min}^{-1}$, were comparable to the rates previously measured in inhaling cigarette smokers, range 3.5 to 5.3 $\mu\text{g l}^{-1} \text{ min}^{-1}$. In other subjects the rate at which the nicotine was absorbed was less 0.4–0.7 $\mu\text{g l}^{-1} \text{ min}^{-1}$.

Nicotine in cigar smoke is thought to be absorbed mainly from the buccal mucosa, facilitated by the alkaline pH of the smoke (Armitage & Turner, 1970). This process is much less rapid than alveolar absorption following inhalation of smoke into the lung. Cigar smoke is more irritant than cigarette smoke and is thought to be inhaled only rarely. The lower mortality of exclusive cigar smokers compared with cigarette smokers supports this supposition (Hammond, 1966). However, the rapidity and completeness of nicotine absorption observed in the present study raises the possibility that some smokers can inhale cigar smoke. If habituated cigarette smokers retain the habit of inhaling smoke when they switch to smoking cigars then they may be at particular health risk since even small cigars contain more nicotine and tar than the strongest cigarette.

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