

Smoking and dental health

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This short article describes the principal physical effects of smoking. Despite substantial research evidence that information by itself may have little influence on behaviour, teachers should find the facts presented here useful as a resource.

The mouth receives the brunt of the hot, toxic gas and minute irritant particles contained in the smoke from burning tobacco. Among the hundreds of compounds found in tobacco smoke, some have been identified as undoubtedly harmful to health. The gas, for example, contains high concentrations of carbon dioxide and up to 5% of carbon monoxide, as well as noxious hydrocarbons including ammonia and hydrogen cyanide. Nicotine produces the characteristic dependence on tobacco, but in addition it has actions on almost every organ of the body including the tissues that attach the teeth to the jaws.

It has been found that people who smoke have more dental decay and more severe gum disease than non-smokers. This may be because smokers pay less attention to their teeth and clean them less often. Heavy smokers run the risk of developing cancerous changes in the surface tissues that line the mouth cavity, including the tongue. Cancer of the mouth is not common, but is extremely unpleasant and carries a high mortality. The effects of smoking on oral health have been ably documented in an HEA Occasional Paper (Palmer, 1987).

Irrespective of tooth-brushing behaviour and dental cleanliness, smoking produces adverse effects on the teeth and the gums. These are described in more detail

below. Some of these effects are quite visible; others may go unnoticed for considerable periods while continuing to harm the sufferer.

Effects visible to all

The most apparent effect is the brown or black discolouration of the teeth. This is due to the condensates of tobacco tar which seep into the enamel cap, and may go even deeper into the dentine which forms the bulk of the tooth. The degree of staining varies from smoker to smoker, and is not necessarily proportional to amount of tobacco smoked. Stains that have seeped below the tooth surface cannot be removed: they remain in the tooth permanently and cannot be polished off.

Effects noticed by others

The characteristic stale mouth odour, often unsuspected by the smoker, is difficult to hide. Smoking is a major offender in the production of bad breath, but the offender can rapidly adapt to the smell. Some components of tobacco smoke are absorbed directly into the blood stream in the mouth or the lungs. These substances are then exhaled because of the blood-air interchange which takes place in the lungs. The odour of the exhaled breath is related to the odour intensity of the tobacco smoked and this

varies quite markedly between different tobaccos.

Effects which are unnoticed

It has frequently been observed that smoking is associated with increased amounts of debris and tartar on the teeth, which may explain why smokers have more gum disease than non-smokers. Gum disease itself often goes unnoticed for years because it so rarely causes any pain or discomfort.

Smoking has four local effects on the gum tissues. These are (1) increased salivation resulting in increased tartar formation, (2) reduced flow of cleansing fluid from the gum crevice, (3) adverse changes in the oral bacteria, and (4) reduced activity of defensive white blood cells in the mouth.

(1) Increased salivation

The observation that smoking increases the flow of saliva, well-known to every novice smoker, was first described as early as 1776. This effect could well explain why smokers are more prone to tartar (calculus) formation. Calculus consists of calcium salt crystals incorporating bacteria and food debris which become mineralised by the calcium salts in the saliva.

An increase in salivary flow has been shown to produce other complex changes in the mouth which favour the mineralization of soft accumulations around the neck of the teeth. However, irrespective of these changes the increased salivary flow-rate will increase the dose of calcium into the mouth during smoking, so providing more minerals for calcification.

(2) Reduced gum fluid flow

In the 1960s, researchers discovered that fluid was continuously pumped from the gum tissue into the gum crevice at the neck of the tooth, and out into the mouth. This evidently has the purpose of washing out bacteria and debris from the gum crevice, and of transporting defensive white blood cells to the gum margin to kill invading bacteria.

The most recent research indicates that smoking reduces this fluid flow,

possibly by constricting the blood vessels which provide the fluid for the pump mechanism (constriction of blood vessels is a well-known effect of smoking). This in turn reduces the supply of white cells to combat disease-producing bacteria. The overall effect is to reduce the resistance of the gum to disease.

(3) Effect on oral bacteria

The products of tobacco smoke undoubtedly have antibacterial properties. In a fascinating laboratory experiment conducted in 1890, tobacco smoke was passed through a solution containing a bacterial culture. Smoke from a quarter of a cigar was sufficient to sterilize the solution. While such experiments as these must be interpreted with care, they are consistent with the findings of more recent research showing that bacteria which normally inhabit the mouth are highly susceptible to tobacco smoke.

There are wide variations between individuals in the types of bacteria growing around the teeth and gums, and between different parts of the mouth in the same individual. This makes it difficult to detect consistent differences in bacteria between smokers and non-smokers. Nevertheless, smoking produces a low-oxygen atmosphere in the mouth which kills the more delicate and harmless bacteria, but allows aggressive oxygen-phobic organisms to flourish in their place. It is these latter which are associated with (even if they are not the cause of) the destructive form of gum disease which results in the breakdown of the tissues which support the tooth in its socket, and lead to the eventual loss of the tooth.

A recent report from Edinburgh showed that 98% of cases of acute gum infection by these same oxygen-phobic organisms occurred in cigarette smokers.

(4) Reduced activity of white blood cells

Experiments in man and animals indicate that smoking depresses the activity of white blood cells in the mouth. They became less mobile and less able to attack invading bacteria. There is also good evi-

dence that smoking reduces local immunity to gum diseases; it is known that smoking depresses general immunity to disease.

Summary

Tobacco smoke appears to have small but noticeable effects on the ecology of the mouth. Smoking may promote destructive gum disease, although it does not ordinarily lead to tooth loss. Nevertheless, it is apparent from clinical observation that the prospect of total tooth loss from gum disease can be a persuasive argument against smoking, especially in young people.

Reference

Palmer, R. M. (1987). Tobacco smoking and oral health. *Occasional Paper No. 6*. Health Education Authority, London.

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