

What's in a cigarette?

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CIGARETTE COMPOSITION

Cigarettes look deceptively simple; slim paper tubes containing chopped up tobacco leaf and usually with a filter at the mouth end. However, in reality, they are highly engineered products, designed to deliver a steady dose of nicotine.

Cigarette tobacco is blended from two main leaf varieties. Firstly, there is yellowish 'bright', also known as Virginia where it was originally grown, which contains 2.5-3% nicotine. Then there is 'burley' tobacco which has a higher nicotine content of 3.5-4%. US blends also contain up to 10% of imported 'oriental' tobacco, which is aromatic but relatively low (less than 2%) in nicotine.¹

In addition to the leaf blend, cigarettes contain 'fillers' which are made from the stems and other bits of tobacco, which would otherwise be waste products. These are mixed with water and various flavourings and additives. The ratio of filler varies among brands. For example, a high filler content makes a less dense cigarette with a slightly lower tar delivery.

Additives are used to make tobacco products more acceptable to the consumer. Around 600 additives are currently permitted for use in tobacco products in the United Kingdom.² They include humectants (moisturisers) to prolong shelf life; sugars to make the smoke seem milder and easier to inhale; and flavourings such as chocolate, vanilla and menthol. While some of these additives may appear to be harmless in their natural form they may be toxic in combination with other substances.

When additives are burned, new products of combustion are formed and these may be toxic.^{3,4} Flavourings which characterise the taste of cigarettes are prohibited, following the implementation of the revised EU Tobacco Products Directive in May 2016, although the deadline for phasing out menthol cigarettes has been extended until 2020.⁵ Full details about the Directive and its provisions are available from the [European Union website](#).

The nicotine and tar delivery can also be modified by the type of paper used in the cigarette. Porous paper allows more air into the cigarette, diluting the smoke and (in theory) reducing the amount of tar and nicotine reaching the smoker's lungs. Filters were added to cigarettes in the 1950s, in response to the first reports that smoking was hazardous to health. Filters are made of cellulose acetate and trap some of the tar and smoke particles from the inhaled smoke. They also cool the smoke slightly, making it easier to inhale. Tobacco companies once claimed that filtered brands had lower tar than others and encouraged consumers to believe that they were safer. This has proven to be false (see "[Health Warning: Low tar cigarettes are a deliberate con](#)").

It has been argued that cigarette filters should be banned entirely, not only because of the false impression of safety they imply but also because of the impact on the environment.^{6,7}

TOBACCO SMOKE

Tobacco smoke is made up of “sidestream smoke” from the burning tip of the cigarette and “mainstream smoke” that is delivered to the smoker via the filter or mouth end.

Tobacco smoke contains thousands of different chemicals, which are released into the air as particles and gases. Many toxins are present in higher concentrations in sidestream smoke than in mainstream smoke and, typically, approximately 89% of the smoke in a room results from sidestream smoke.⁸

The particulate phase includes nicotine, “tar” (itself composed of many chemicals), benzene and benzo(a)pyrene. The gas phase includes carbon monoxide, ammonia, dimethylnitrosamine, formaldehyde, hydrogen cyanide and acrolein. Some of these have marked irritant properties and more than 60, including benzo(a)pyrene and dimethylnitrosamine, have been shown to cause cancer.⁹ In 2003, the Tobacco Manufacturers’ Association published an analysis of the tobacco smoke content of 25 of the UK’s leading cigarette brands where they concluded that the chemical yields of tobacco smoke is consistent across different cigarettes.¹⁰

WHAT IS TAR?

“Tar”, also known as total particulate matter, is inhaled when a smoker draws on a lit cigarette. In its condensate form, tar is the sticky brown substance, which can stain smokers’ fingers and teeth yellow-brown. All cigarettes produce tar, but the brands differ in the amount released. The average tar yield of British cigarettes (as measured by a standard machine method by the Government Chemist) declined from about 30mg per cigarette in the period 1955-61 to 11mg in the late 1990s. There have also been reductions in the amount of nicotine in British cigarettes (from an average of about 2mg in 1955-61 to about 0.9mg by 1996).^{11 12}

Under the terms of the 2001 EU Tobacco Products Directive, maximum yields for cigarettes were set for tar (10mg), carbon monoxide (10mg) and nicotine (1mg).¹³ A new EU Tobacco Products Directive was agreed in May 2014.¹⁴ This Directive removes the requirement for quantitative information on tar, nicotine and carbon monoxide levels from packs, as there is evidence that the information is misleading as it encourages consumers to believe that some brands are safer or more harmful than others.

Since 2003, it has been illegal to describe one cigarette as being less harmful than another by using misleading descriptors such as “light” or “mild”. Furthermore, tobacco manufacturers are required to submit to the EU Member States a list of all the ingredients used in the manufacture of cigarettes, together with toxicological data on their effects on health as well as any addictive effects. For further information on tobacco regulation, see the [ASH Factsheet: Tobacco Policy in the European Union](#).

WHY LOW TAR CIGARETTES ARE NO SAFER THAN HIGHER TAR CIGARETTES

Following the discovery in the 1950s that it was the tar in tobacco smoke which was associated with the increased risk of lung cancer, tobacco companies, with the approval of successive governments, embarked on a programme to gradually reduce the tar levels in cigarettes. Although there is a moderate reduction in lung cancer risk associated with lower tar cigarettes, research suggests that the assumed health advantages of switching to lower tar may be largely offset by the tendency of smokers to compensate for the reduction in nicotine (cigarettes lower in tar also tend to be lower in nicotine) by smoking more or inhaling more deeply.¹⁵ Also, a study by the

American Cancer Society found that the use of filtered, lower tar cigarettes may be the cause of adenocarcinoma, a particular kind of lung cancer.¹⁶ These findings have been subsequently confirmed by further studies.^{17 18 19} There is no evidence that switching to lower tar cigarettes reduces coronary heart disease risk.

NICOTINE

Nicotine, an alkaloid, is an extremely powerful drug. The Royal College of Physicians has affirmed that the way in which nicotine causes addiction is similar to drugs such as heroin and cocaine.²⁰ Nicotine is contained in the moisture of the tobacco leaf: When the cigarette is lit, it evaporates, attaching itself to minute droplets in the tobacco smoke inhaled by the smoker. It is absorbed by the body very quickly, reaching the brain within 10-19 seconds. It stimulates the central nervous system, increasing the heart rate and blood pressure, leading to the heart needing more oxygen.

Compared to other components of tobacco, nicotine is actually relatively harmless. Indeed, pure nicotine can be consumed safely in the form of nicotine replacement therapy (e.g. gum, patches, lozenges etc.) to help people stop smoking. It works by helping smokers deal with nicotine cravings while cutting down or stopping smoking.

CARBON MONOXIDE

Carbon monoxide, the main poisonous gas in car exhausts, is present in all cigarette smoke. It binds to haemoglobin much more readily than oxygen which causes the blood to carry less oxygen. Heavy smokers may have the oxygen carrying power of their blood cut by as much as 15%.²¹

REDUCED IGNITION PROPENSITY CIGARETTES

Cigarettes are one of the leading causes of domestic fires and the principle cause of domestic

fires and the principle cause of domestic fire deaths.^{22 23 24} Reduced ignition propensity cigarettes (or “fire safer” cigarettes) are designed to self-extinguish if not continually smoked - for example if they are dropped or if a smoker goes to sleep while smoking in bed. Legislation requiring that all cigarettes sold in the UK conform to this standard was introduced in 2011. Illicit cigarettes, in particular counterfeit brands, may not comply with the standard and therefore potentially pose an increased fire risk.²⁵

HARM REDUCTION

Tobacco companies have known for decades that smoking is hazardous to health and have invested significant resources in trying to produce less dangerous products. These include attempts to reduce the carcinogens in tobacco as well as the production of novel nicotine delivery systems.²⁶ However, there is little evidence that the minor modifications to tobacco products made have had any significant impact on reducing the risk of developing tobacco-related diseases.

In contrast, nicotine replacement products, which have been subject to thorough safety checks and clinical trials, can help smokers reduce their tobacco consumption as well as aiding complete cessation.²⁷ A report by the Royal College of Physicians concluded that harm reduction could be achieved by providing smokers with safer sources of nicotine that are acceptable and effective cigarette substitutes.²⁸ For further information on harm reduction see the [Harm reduction & product regulation page of the ASH website](#).

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