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# What's in a cigarette

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## Cigarette composition

Cigarettes look deceptively simple, consisting of paper tubes containing chopped up tobacco leaf, usually with a filter at the mouth end. In fact, they are highly engineered products, designed to deliver a steady dose of nicotine.

Cigarette tobacco is blended from two main leaf varieties: yellowish 'bright', also known as Virginia where it was originally grown, contains 2.5-3% nicotine; and 'burley' tobacco which has a higher nicotine content (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.<sup>1</sup>

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. They include humectants (moisturisers) to prolong shelf life; sugars to make the smoke seem milder and easier to inhale; and flavourings such as chocolate and vanilla. While some of these may appear to be quite harmless in their natural form they may be toxic in combination with other substances. Also when additives are burned, new products of combustion are formed and these may be toxic. The full list of 600 permitted additives can be viewed on the Department of Health's website<sup>2</sup> For further information on tobacco additives, see also the ASH/ICRF report, Tobacco Additives.<sup>3</sup>

The nicotine and tar delivery can also be modified by the type of paper used in the cigarette. Using more porous paper will let more air into the cigarette, diluting the smoke and (in theory) reducing the amount of tar and nicotine reaching the smoker's lungs. Filters are made of cellulose acetate and trap some of the tar and smoke particles from the inhaled smoke. Filters also cool the smoke slightly, making it easier to inhale. They were added to cigarettes in the 1950s, in response to the first reports that smoking was hazardous to health. Tobacco companies claimed that their filtered brands had lower tar than others and encouraged consumers to believe that they were safer.

## 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, nearly 85% of the smoke in a room results from sidestream smoke.<sup>4</sup>

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.<sup>5</sup>

## What is tar?

“Tar”, also known as total particulate matter, is inhaled when the smoker draws on a lighted 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 amounts. 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 nicotine (from an average of about 2mg in 1955-61 to about 0.9mg by 1996).<sup>6 7</sup>

Until January 1992, information about tar yields of cigarettes was given in a general fashion on cigarette packets and advertisements as a result of a voluntary agreement between the tobacco industry and the Government. Under the terms of The Tobacco Products Labelling (Safety) Regulations 1991, which implemented EU requirements for health warnings on tobacco, cigarette packets were required to include a statement of both the tar and the nicotine yield per cigarette on the packet itself.

In 2001, a new EU directive regulating tobacco products became law.<sup>8</sup> This replaced two previous directives on labelling and tar yield. The directive placed upper limits on yields of tar (10mg), nicotine (1mg) and carbon monoxide (10mg) for all cigarettes manufactured and sold within the EU.

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 ASH Essential Information on: 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.<sup>9</sup> 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.<sup>10</sup> 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.<sup>11</sup> 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 beat rate and blood pressure, leading to the heart needing more oxygen. However, compared to other components of tobacco, nicotine is 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. For more information on stopping smoking see ASH's fact sheets: [Stopping smoking: the benefits and aids to quitting](#) and [Stopping smoking: ASH's 15 tips](#)

**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, thus allowing the blood to carry less oxygen. Heavy smokers may have the oxygen carrying power of their blood cut by as much as 15%.<sup>12</sup>

For further information see ASH's report on tobacco smoke composition.<sup>13</sup>

**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. For example, BAT has begun testing a new type of cigarette that includes a specially treated tobacco and charcoal filter.<sup>14</sup> However, to date, there is little evidence that minor modifications to tobacco products have any significant impact on reducing the risk of developing tobacco-related diseases. By 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.<sup>15</sup> A report by the Royal College of Physicians concluded that harm reduction can be achieved by providing smokers with safer sources of nicotine that are acceptable and effective cigarette substitutes. To achieve this, nicotine product regulation must be reformed as there is currently little incentive for companies to produce such products.<sup>16</sup> For further information on harm reduction see [www.ash.org.uk/current-policy-issues/harm-reduction-product-regulation](http://www.ash.org.uk/current-policy-issues/harm-reduction-product-regulation)

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