

# Nicotine and other poisons

## What's in tobacco smoke?

There are more than 4,000 chemicals in tobacco smoke.<sup>1,2</sup> Nicotine, tar and carbon monoxide are well known. Nicotine is the addictive drug that keeps you coming back for more. Tar is the black, sticky substance that damages your lungs. Carbon monoxide is the gas that hitches a ride on your red blood cells and takes the place of some of the oxygen in your bloodstream.

Some of the other chemicals found in cigarettes (and some of their other uses) are:<sup>1,2</sup>

- ammonia (household cleaning agent)
- acetone (nail polish remover)
- naphthalene (mothballs)
- methanol (rocket fuel)
- formaldehyde (which preserves the dead)
- phenol (disinfectant)
- hydrogen cyanide
- metals (76 metals including arsenic, cadmium, nickel)
- radioactive compounds (polonium-210 and potassium-40)
- acetic acid (vinegar)
- toluene (industrial solvent)
- pesticides.

## What's nicotine?

Nicotine is a chemical substance found in tobacco leaves. Addiction to nicotine is what keeps you smoking. Nicotine is as addictive as heroin or cocaine.<sup>3</sup>

## How does nicotine work?

From the moment that you inhale tobacco smoke, it takes four seconds for the nicotine to reach your blood stream and about ten seconds to reach the brain.<sup>4</sup> Once the nicotine has attached itself to special sites in the brain, many relaxing chemicals are released. But this effect only lasts for a short time and then the addicted smoker needs to 'top up' their nicotine. One of the reasons people continue to smoke is because they enjoy the effect of these relaxing chemicals being released by the brain.<sup>5</sup>

## Why is nicotine a problem for health?

The worst problem for health caused by nicotine is that it is so addictive. Most regular smokers would prefer not to smoke, and only continue because they are addicted to nicotine. Smoking tobacco accounts for the largest proportion of preventable illness and death in Australia. Immediate effects of nicotine on the body include increased heart rate and blood pressure and constriction of blood vessels. Over time, ingestion of nicotine from smoking combines with carbon monoxide to damage the lining of blood vessels and make blood platelets stickier. In combination these effects contribute to the development of heart disease.<sup>5</sup>



Although nicotine is among the most toxic and fast acting of all poisons, the dose from smoking is too low to cause acute poisoning (smoking poisons you slowly). However, there is a serious risk for children who ingest cigarettes and care should be taken with cigarettes and extinguished butts, which contain concentrated nicotine. Before developing a tolerance to nicotine, the smoker may experience mild effects of nicotine toxicity.<sup>6</sup> The nicotine in nicotine replacement therapy (NRT) products, such as the patch, gum, lozenge, sublingual tablet or inhaler is safe if used according to the product directions (see Products to help you quit smoking). The average dose of nicotine from NRT is about one third to one half of that obtained from smoking.<sup>7,8,9</sup> A person who is dependent on nicotine is extremely unlikely to experience any toxic effect from using NRT.

## How does your body get rid of nicotine?

Most of the nicotine (80 per cent) is broken down in the liver. Nicotine is also filtered from the blood by the kidneys and removed in urine.

## What is tar and why is it a problem for health?

The word 'tar' describes the particulate matter which, generated by burning tobacco, forms a component of cigarette smoke.<sup>10</sup> Each particle is composed of a large variety of chemicals consisting mainly of nitrogen, oxygen, hydrogen, carbon dioxide, carbon monoxide, and a wide range of volatile compounds.<sup>1,10</sup>

In condensed form, tar is a sticky brown substance that is the main cause of lung and throat cancer in smokers.<sup>10</sup> Tar can also cause unsightly yellow-brown stains on fingers and teeth. Some tar is exhaled, some is coughed up, and some is absorbed by the lungs, which can cause lung cells to die. Cigarette smoke damages the 'cilia' (fine hairs that line the upper airways to protect against infection). When cilia are damaged, tar can penetrate further into the lungs.

## What is carbon monoxide and why is it a problem for health?

Carbon monoxide is a poisonous gas that competes with oxygen in the blood.<sup>11</sup> This is the same gas that is found in car exhaust fumes. Carbon monoxide binds to red blood cells, making it harder for the body to carry oxygen to the muscles and organs.<sup>12</sup> In large quantities, carbon monoxide is rapidly fatal. Smokers can have up to 10 times the amount of carbon monoxide in their bloodstream than non-smokers.<sup>1,13</sup> Heavy smokers may have the oxygen carrying ability of their blood cut by as much as 15%.<sup>14</sup> Smoking in pregnancy can lead to a dramatic reduction in the amount of oxygen available to the developing baby.

## Other chemicals and additives.

As tobacco is not classified as a food or drug in Australia,<sup>15</sup> there are no standards or controls on what may be used in the growing and production of tobacco, including additives and agricultural chemicals.<sup>16</sup> Herbicides, insecticides, fungicides, fertilisers and other agricultural chemicals are routinely used in tobacco growing.<sup>16,17</sup>

Additives are added to cigarettes in the manufacturing process to:<sup>11,17</sup>

- add flavour, including sugar, honey, liquorice, cocoa, and chocolate liqueur to lessen the harshness of the smoke<sup>18</sup>
- lessen the irritating effects of smoke. Menthol and eugenol numb the throat<sup>18</sup>
- change the chemistry of nicotine. Ammonium salts and acetaldehyde (in burnt sugar) increase nicotine's addictive potential<sup>11,18</sup>
- change the chemistry of smokers' brains to make them more receptive to nicotine.<sup>18</sup>

There are a number of problems with additives:

- Additives such as sugar and honey might seem harmless because we are used to eating them, but when additives in cigarettes are burnt, they can change into different chemicals, some of which are toxic. For example, liquorice and sugar produce cancer-causing chemicals when burnt. Also, these substances are inhaled into the lungs, which are delicate and much more vulnerable to harm than the stomach and intestines.<sup>18</sup>
- The health effects of additives on smokers are not made public by the tobacco companies, and many may not be known at all.<sup>18</sup>
- Some additives make tobacco smoke less harsh and taste better. It may make it easier for children to learn to smoke, and make smoking more agreeable to smokers.<sup>18</sup>

There is no such thing as a 'safer' cigarette or 'healthier' tobacco. All tobacco smoke is damaging to health. The best way to prevent exposure to the chemicals in tobacco smoke is to avoid exposure to tobacco smoke.

### For further information contact:

Tobacco and Health Branch  
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If you would like to quit smoking contact the **Quitline 131 848** or speak with your doctor or pharmacist.  
Visit the website: [www.quitnow.info.au](http://www.quitnow.info.au)

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