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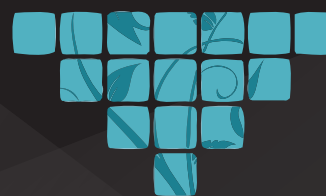
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The effects of NICOTINE on human HEALTH



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WHAT IS NICOTINE?

Nicotine is an alkaloid, a naturally occurring nitrogen-containing compound derived from plants. There are thousands of known alkaloids, including caffeine, morphine, quinine and cocaine. In addition to tobacco, nicotine is found in potatoes, tomatoes and chili peppers.

While most alkaloids are toxic at certain doses, the range of toxicity is very large. For example, the acute lethal dose of caffeine in humans is about 5 grams (5,000 mg), and, while nicotine is about 100-fold more toxic, the amount of nicotine in a cigarette is far below the threshold for acute toxicity: a cigarette contains on average about 14 mg of nicotine, of which about one mg is absorbed per smoke.

ARE THE TERMS "NICOTINE" AND "TOBACCO" INTERCHANGEABLE?

No, they are not. Although smokers get their nicotine fix from the nicotine that is released by combustion of tobacco, tobacco smoke also contains thousands of other chemicals, many of which are known carcinogens. Nicotine itself is not a carcinogen.

IS NICOTINE ADDICTIVE?

Nicotine is one of the most addictive substances known to man and is the primary substance in tobacco that causes addiction. As such, the cigarette is the most addictive product sold legally. Using comparable criteria of addiction, a large national survey of adults in United States showed that cigarettes were far more difficult to quit than alcohol, cannabis or cocaine.

There is evidence that the process of addiction can start with the first cigarette. And quitting is often extraordinarily difficult, as evidenced by the low success rate for "cold turkey" quitters, which is only improved minimally by standard cessation therapies. Many smokers do quit, eventually, but it commonly takes 5 - 15 attempts over the course of decades before long-term abstinence is attained.

HOW DOES ONE BECOME ADDICTED TO NICOTINE?

Nicotine has physical properties that enable it to circulate with ease throughout the blood and into the brain. Studies have shown that when a cigarette is smoked, nicotine reaches the

brain seven seconds after a puff. The nicotine concentration in the brain rises gradually and steadily with each puff taken.

After overnight abstinence, smoking just one cigarette will boost the amount of free nicotine in the brain ten-fold, and during afternoon smoking one cigarette will double it. The rapid increase in brain nicotine after every cigarette is believed to increase the addictiveness of smoking and therefore limits usefulness of a nicotine patch, which causes a very gradual rise in nicotine levels.

ARE THERE OTHER ADDICTIVE BEHAVIORS ASSOCIATED WITH SMOKING?

Tobacco smoking is addictive in other ways, partly because smokers are also addicted to their smoking behaviors and rituals, such as hand-to-mouth movements, after certain activities (e.g., eating, drinking, sex), the aroma and the feeling of actually inhaling the smoke (or swallowing it, the "mouth hit"). In such ways, smokers are behaviorally as well as physiologically addicted.

HOW QUICKLY DOES THE URGE TO SMOKE DEVELOP?

The latency period (the period of time to keep the urge to smoke at bay) may be days or weeks in beginning smokers, and then gradually shortens to hours and even minutes. This is a main determinant of how many cigarettes are smoked each day. Fifty percent of smokers, when asked how long they can last without a cigarette, will likely say two hours or less. Since cravings for a cigarette are unpleasant, smokers tend to smoke another cigarette sooner than this to head off this feeling.

IS SMOKING MORE ADDICTIVE IN ADOLESCENTS?

A study of 7,000 adolescents aged 14 to 15 years found that they rapidly became addicted to smoking, as judged by symptoms of loss of control over their smoking. One quarter had detectable loss of control after smoking just one or two cigarettes. Forty percent lose some control after smoking 10 cigarettes. After 10-19 cigarettes, half reported some loss of control over their smoking. Of those who have smoked 100 cigarettes or more, half had high scores for loss of autonomy, at 14 to 15 years of age.

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WHAT ARE SOME OF THE MAIN HEALTH RISKS OF SMOKING?

Smoking tobacco is a killer, with a global toll of five million people this year and rising. Some experts have predicted a loss of one billion lives this century due to smoking, if current trends continue. In fact, the cigarette causes the premature death of two out of three users. The cigarette's deadly nature is due to its smoke, while its addictiveness is due mainly to nicotine.

There is a very well established increased risk of cancer, heart disease and early death. As a group, smokers lose more than ten years of life compared with never-smokers. This damage can be mitigated. Smokers who quit before the age of 40 avoid 90 percent of this added risk of dying.

Living with a smoker increases the risk to non-smokers by 20 percent – presumably due to inhalation of second-hand smoke.

WHAT ARE SOME OF THE CARCINOGENS LINKED TO SMOKING?

Once the cigarette is lit, the high temperatures (800 degrees Centigrade) from the burning tobacco produce a huge variety of toxic chemicals. It is essential to note that the high temperature of burning promotes the chemical reactions that would normally not take place under non-combustion conditions.

The cancer-causing constituents of tobacco smoke consist of: 1) smoke solids or particulates; 2) volatile small molecules, many of which are carcinogenic, found in the gases and vapor. Thus, anyone smoking a cigarette will get a “double hit” of toxins – the particulates and carcinogenic chemicals.

Constituents in the gas phase account for most of the estimated cancer and non-cancer risk in cigarette smoke. The invisible gases and vapors make up over 95 percent of the mass of cigarette smoke. Included in these gases are some of the most carcinogenic and toxic chemicals in tobacco smoke. These include: 1,3-butadiene, acrylonitrile, acetaldehyde and benzene, and carbon monoxide.

Tar is another bad actor. A small but significant portion of the cancer risk from cigarette smoke comes from the “tar” (the particulate solids minus water and nicotine) that makes smoke

visible. These particulates contain a variety of potent carcinogens called nitrosamines, a number of which are only formed by combustion of tobacco. These chemicals do not exist in unburned tobacco.

Also present in tobacco smoke are heavy metals, hydrogen cyanide and the known carcinogen benzo[a]pyrene.

WHAT IS TOBACCO HARM REDUCTION?

Harm reduction, as it pertains to addiction, refers to policies, programs and practices that aim to reduce the damage associated with the use of psychoactive drugs in people unable or unwilling to stop using them. The defining features are the focus on the prevention of harm, rather than on the prevention of drug use itself. Tobacco harm reduction is the practice of encouraging smokers to use less harmful tobacco products, or non-tobacco-derived sources of nicotine, when they find they cannot quit cold turkey.





WHAT METHODS ARE AVAILABLE TO HELP SMOKERS QUIT?

There are a wide variety of products designed to help smokers quit by supplying the addictive nicotine without the thousands of chemicals that are formed during combustion. Most approved products are only minimally effective at accomplishing this, however. These products include:

Approved Nicotine Replacement Products

- Nicotine gum, which has been approved in the U.S. since 1984. It has provided limited success because it does not duplicate the feeling provided by smoking a cigarette. The gum delivers a steady-state level of nicotine. Although the dose is roughly the same as that obtained by smoking for about one day, the absence of the immediate high from a cigarette does not mimic the immediate burst of pleasure that smokers crave.
- Nicotine patches
- Nicotine lozenges
- Nicotine inhalers

None of these products cause cancer, heart disease or lung disease.

Non-nicotine cessation drugs

These include bupropion/Zyban, a commonly used antidepressant, and varenicline/Chantix, developed as a blocker of nicotine's effects upon the brain. Neither drug contains nicotine, however.

Smokeless tobacco

- Moist snuff or snus, comes in small sachets that are neither spit nor chewed. The small packet is placed under the upper lip, remains there for 15-60 minutes as the user desires, and then is disposed of. Snus does not raise the risk of oral cancers.
- "Chaw," "dip" and "spit" preferred in rural America have risks somewhere in between snus and smoking. All forms of oral/smokeless tobacco are less harmful than inhaling the combustion products of cigarettes.
- Dissolvable tobacco products: orbs, sticks, etc.

Electronic cigarettes

Electronic cigarettes (e-cigarettes) are nicotine delivery devices that have become extremely popular in recent years. They consist of a cartridge containing a solution of pharmaceutical grade nicotine, water and an inert vaporization vehicle and flavorings.

The solution is heated by a battery to about 350 degrees Centigrade – far lower than the temperature of burning tobacco – and delivers a pre-set amount of nicotine with each puff.

Their risk is expected to be far less than cigarettes, since the nicotine is delivered as a vapor – unaccompanied by the complex mixture of smoke and toxic chemicals that arises from the combustion of tobacco.



WHAT'S THE BOTTOM LINE?

- The addiction to nicotine for smokers is undisputed, but it is quite unnecessary for smokers to sacrifice their lives to obtain this nicotine. *Smokers smoke for the nicotine, but they die from the smoke* – specifically, the repeated inhalation of toxic, carcinogenic volatile chemicals, and tar.
- It is the addiction to nicotine that keeps smokers lighting up repeatedly over the course of days, weeks, months and years. This will eventually cause the premature deaths of two-thirds of all smokers.
- Nicotine is not a carcinogen, and is not toxic in the amount delivered by a cigarette.
- Many physicians falsely believe that nicotine is the main toxicant and cancer-causing agent in smoke. This fallacy needlessly hampers efforts to provide smokers with all the tools to help them stop smoking.