

Nicotine Addiction

There are presently about 1.3 billion smokers world wide. This number is a rough estimation because present data is not exact for all countries, most notably China. There are about 110 million smokers in India and 52 million in the USA. It is also very common in Europe. In Austria, about 2.3 million people smoke which makes up 29% of the population. This includes about 1/3 of men and ¼ of women. The number of adolescent nicotine addicts is especially alarming. According to the 2003 report of the European School Survey Project on Alcohol and Other Drugs (ESPAD), 49% of Austria adolescents smoke, the second highest number in Europe. The rise in female smokers over the past years is also an important trend. In Austria, more than 10,000 people die every year as a result of tobacco abuse among which lung cancer is the most important cause. In 2003, 2,339 men and 993 women died of lung cancer in Austria. Smoking is the number one preventable cause of death world wide. According to the WHO, a person dies every 8 seconds as a direct consequence of smoking.

Experimentation with cigarettes usually begins during adolescents. Motivations include curiosity, peer pressure, and the desire to appear more adult. The classical process of conditioning then runs its course “automating” smoking. Smoking is coupled to certain situations (e.g. stress), tasks (e.g. drinking coffee or alcohol) and stimuli (e.g. lighting a cigarette when getting into a car). Moods are amplified and mediated by nicotine: tension is reduced, self-assurance is increased, mood is improved, concentration is increased and relaxation is amplified. The development of a nicotine addiction is also effected by genetic factors, personality characteristics, and problem solving strategies. More than 20% of 12-13 year olds who report “trying” cigarettes from time to time show the first symptoms of nicotine addiction within 4 weeks.

Nicotine has the highest addictive potential of all substances. The diagnosis of nicotine addiction is classified both in the ICD-10 and the DSM IV. In the brain, nicotine binds to nerve cells and chronic consumption leads to a desensitization of these neurons. This results in an increase in the number of receptors expressed by the neuron. Depending on the doses, nicotine has the ability both to excite and inhibit neurons, which results paradoxically in both stimulative and sedative effects. In small amounts, adrenaline and glucose are released resulting in an increase in blood pressure and the rate of heartbeat and breathing. In higher doses, nicotine has a sedative effect. Nicotine receptors are found not only in the central

(brain and spinal cord) but also in the peripheral (autonomic and muscular) nervous systems which means that the effects can be seen through out the body. Tolerance is built up after chronic nicotine abuse but only in the peripheral nervous system. Nicotine functions through the brain's reward system (the mesolimbic reward system). It causes an increase in the release of the neurotransmitter dopamine in the nucleus accumbens. It can also block the reuptake of neurotransmitter such as serotonin, noradrenalin and dopamine. When nicotine is no longer present, dopamine levels drop causing the symptoms of withdrawal. These include nicotine craving, dysphoria, impatience, anxiety, irritation, depression, difficulties concentrating, increased appetite, decreased heart rate, and sleep disturbances. These symptoms stop when nicotine is consumed. The withdrawal symptoms are much less intense than those seen in other addictions (such as opioids and alcohol) and last for 2-3 weeks. Isolated cravings, however, are experienced for much longer (months to years) and are much more likely to be the cause of relapses than the withdrawal syndrome itself.

There are many serious diseases that are associated with tobacco consumption. Cigarettes are the main cause of many cancers such as lung, pancreas, mouth, pharynx, esophagus and stomach. They are also a main factor in the development in heart disease, the number one cause of death in industrialized countries. Stroke, ulcers, and peripheral vessel diseases are usually caused by many years of tobacco consumption. The risk of developing respiratory infections, liver cirrhosis and cancer, breast cancer, impotence, and glaucoma is also significantly increased through smoking. Infants born to mothers who smoked during pregnancy have a lower birth weight than those born to non-smokers. Smoking also has negative effects on fertility for both sexes. In Europe, 30% of all deaths result from smoking. In comparison, 35% are the result of diet and 5% from excessive alcohol consumption.

A few decades ago, smoking was exclusively a habit for men and this is still the case in some countries, such as China and Japan. An interesting phenomenon seen throughout Europe is the simultaneous fall in the number of male smokers and rise in the number of female smokers. In Germany, 40.8% of 25-69 year old men smoked in 1985 in comparison to 26.1% of women in the same age group while in 2003, 34.4% of men and 30.7% of women smoked regularly. The life prevalence for addictions for men is double that of women, except in the case of nicotine addiction. Women's smoking habits are more situation dependent than men's. For example, women tend to smoke more when they are anxious, depressed, or stressed, as well as to loose weight. Social class also plays a major role in trends of tobacco

abuse: the percent of smokers rises with decreasing social class. Psychiatric patients are another group with a high tendency for nicotine abuse. There is an increased prevalence among patients with Alzheimer's, schizophrenia, attention deficit hyperactivity disorder, Parkinson's and affective disorders. One hypothesis holds that nicotine has a positive effect on the cognitive symptoms, especially in the case of dementia. Recent studies have shown this to be the case; however the improvement is so short term that it does outweigh the negative consequences of smoking.

Therapy for nicotine addiction is available in several different forms including both medications and psychological treatment.

- 1) Nicotine replacement therapy (NRT) is most commonly used with the goal of reducing withdrawal symptoms and controlling the nicotine consumption. Doses are reduced to wean addicted patients. There are many different forms available for NRT, including chewing gum, inhaler, patch, nose spray, or tablets, which have comparable affectivity. They have a 1.5-2 times higher rate of success than placebos.
- 2) Behavioral therapy is also used because of the importance of conditioned behavior in the development of nicotine addictions. These forms of therapy help patients to forget addictive behaviors and replace them with the behaviors of a non-smoker. Motivation provided by the therapist is also important and helps train self observance and control. Behavioral therapy is effective and inexpensive and it is especially sensible in combination with NRT.
- 3) The voucher based method is an established treat for many addictions, including nicotine.
- 4) Bupropion, an antidepressant medication, is also used and is the first nicotine-free medication approved by the American Food and Drug Administration for the therapy of nicotine addiction. In studies, it showed double the abstinence rates of the placebo and higher than those achieved with NRT. Another advantage of Bupropion is that it also treats the dysphoria and depression that can be seen (especially in women) during nicotine withdrawal. Weight gain associated with quitting smoking is also reduced.
- 5) Several other antidepressant medications are also used to reduce craving symptoms, including Nortriptylin and Sertralin, but with less success.

- 6) Another medication used is Rimonabant, which blocks the endogenous cannabinoid receptors CB1. It has been shown to be effective in the treatment of obesity, metabolic syndrome and nicotine addiction.
- 7) Vareniclin is available in the USA but not yet in Europe. It decreases cravings and withdrawal symptoms through a selective, partially agonistic activity on nicotine receptors.
- 8) Clonidine, a medication for treating hypertension, has also been shown to reduce withdrawal symptoms.
- 9) A future possibility of prophylactic treatment is a nicotine vaccination that is presently being tested on animals. It attempts to weaken the reward effect of smoking and keep nicotine from entering the brain by trapping it in the bloodstream with antibodies.
- 10) Alternative therapies include hypnosis, acupuncture and household remedies. These may also be helpful for some patients.