# Smoking and Nutrition

Mgr. Veronika Mlčochová*

*Department of Preventive Medicine, Masaryk University Brno, Faculty of Medicine, Kamenice 753/5, 625 00 Brno, Czech Republic*

**Abstract:** Smoking cigarettes is considered as a world-wide problem, which is not only medical, but also social. Addiction to nicotine causes chronic and often relapsed diseases, which are interconnected with many other illnesses and which frequently result in the death. Smoking cigarettes causes not only a disease (which does not occur so often in the case of non-smokers), but it also influences life style of smokers. It has been proved that smokers' eating behaviour is more risky (they eat more fried food, less vegetables and fruits...), therefore they are more likely to fall ill with the non-infectious mass disease.

**Keywords:** Cigarette smoking, nutrition, eating habits, micro (macro) nutrients, smoking cessation, lifestyle.

## INTRODUCTION

At the beginning of the 21st century the tobacco addiction is rated among global human problems. Cigarette smoking is in our society still tolerated and it is more or less considered as a bad habit than a drug addiction.

Many diseases have in its multifactor-etiology exactly smoking. It is necessary to point out the fact that smoking belongs to most easily controllable causes of premature morbidity and mortality.

Negative consequences of smoking are not imminent, are often underestimated and in long time horizon seem to be unreal. Between start of the smoking and consequences emergence is an estimated time delay of 20-30 years. Up to one quarter of the smokers die in the productive years. This people would not get ill and would not die so early at all if they did not smoke.

Not only do the smokers, by smoking itself, damage their health, but, moreover, they frequently unconsciously just as a consequence of the smoking change their behavior, attitudes and habits and influence in the negative aspect also all their lifestyle!

## INFLUENCE OF SMOKING ON HEALTH

Smoking negatively reflects in many areas of health, and thus let's remind its main consequences. According to the statistics it contributes with around 30% to malignant tumor mortality, 25% to cardiovascular disease mortality (CVD) and about 70% to mortality of chronic obstruction lung disease (CHOLD) [1, 2]. Owing to smoking comes to changes of immune system (acrolein is toxic to cysteine, and thus there is a deficiency of glutathione and is toxic to leukocytes resulting in reduced immunity to infection) [3]. There are also consequences between smoking and nervous system. It is reported higher risk of development of Alzheimer disease, schizophrenia, anxiety and depressions [4, 5]. Studies documented some thyroid dysfunction [6]. In comparison with non-smokers in smokers is 1, 7 x more frequent occurrence of stomach and duodenum ulcer disease [7]. Further then smoking speeds up skin aging, increased formation of wrinkles, skin and hair quality aggravation and has negative influence on dentition condition [4, 5]. Newer studies confirm the fact that smoking is connected with development of diabetes mellitus of second type (development risk is 44% higher than in non-smokers) [8].

In women there is significant negative impact in the area of reproduction (fertility disturbances, more frequent abortions etc.) and during pregnancy, when smoking endangers not only the women themselves and the pregnancy course (e.g. premature placenta separation), but also yet unborn child (lower body weight and so called fetal tobacco syndrome). A menopause comes significantly earlier in women smokers compared to non-smokers wherewith comes to increase of the risk of osteoporosis occurrence [9-11].

## SMOKING IMPACT ON ALIMENTATION BEHAVIOR

Now let's take a look on smoking from different point of view than are only direct consequences of smoking caused by inhalation of tobacco smoke itself. Indirect effects of smoker's behavior are present in all areas of lifestyle and this way they, to high extend,

*Address correspondence to this author at the Department of Preventive Medicine, Masaryk University Brno, Faculty of Medicine, Kamenice 753/5, 625 00 Brno, Czech Republic; Tel: +420777066713;
E-mail: mlcochova@mail.muni.cz

E-ISSN: 1929-5634/13 

influence, in negative meaning, alimentation habits which can result in development of many non-infectious diseases of mass occurrence.

The reasons why smokers and non-smokers have different alimentation habits are various. One of possible mechanisms of these deviations is weakened gustatory sense in smokers, but also modified smell sense (which subsequently influences taste) [12]. Therefore maybe smokers prefer less sweet and on the contrary choose dishes which are well seasoned (salty, fried dishes). The smokers also often replace the dish itself with the cigarette [13]. Smoking delays mouth-cecum transit time, an effect most likely due to nicotine. The longer period for which the stomach is filled helps to prolonged feeling of full stomach [14]. In smokers are also monitored changes in energy metabolism. By the effect of the nicotine comes to increased energy expenditure in average of 5 -10 % what is app. 880 kJ daily (this effect is lower in obese people of app. 300 kJ). The significant role also plays regulation mechanisms. The trigger of the change can be increased production of leptin induced by nicotine. The leptin is a protein hormone formed mainly by fat tissue, the receptors are in hypothalamus. Leptine level informs brain about amount of fat tissue and inhibits creation of neuropeptide Y, one from the factors which increases appetite most [15].

Results of meta analysis report that smokers consume in higher amount eggs, meat, sausages, potatoes and products from potatoes (mainly fries), generally eat more fried meals and livestock foodstuffs with visible fat, whereas was monitored low consumption of milk, yogurts, cheese and breakfast cereals, fish, fruit, vegetable, potable water and juices (fruit and vegetable). Insufficient intake of fruit and vegetable shows itself especially in nutrients deficiency, essential for right body function including antioxidant activity [13, 16-18].

The smokers in comparison with non-smokers then have also higher intake of caffeine from coffee, tea and coke based beverages. More frequent consummation of coffee is often linked with faster metabolism break down of caffeine induced by nicotine effects, thus the smokers have to repeat stimulation effect of coffee more often than non-smokers (see Tables **1**, **2**) [13, 16, 17].

Smokers' preferences with regard to particular food results in general effect this way:

Meta analysis of 51 published studies from 15 different countries which monitored more than 78 thousand of respondents carried out complex evaluation of alimentation habits of smokers and non-smokers. The nutrition intake of smokers and non-smokers significantly differed. Namely these alimentation differences can deepen, in smokers, harmful effects of smoking and participate this way on genesis of tumor diseases and of ischemic heart disease (IHD). The smokers have higher intake of total energy and fat, especially saturated ones (SFA)

**Table 1: Taste Preferences in Smokers and Non-Smokers [13, 16, 17]**

| Higher appetite (and consummation) | Lower appetite (and consummation) |
|---|---|
| Meat, meat products | Fish |
| Eggs, potatoes and potatoes products (especially French fries) | Breakfast cereals |
| Butter, cream | Milk, yogurts, cheese |
| Livestock foodstuffs with visible fat | Sweets (Candies) |
| Generally fried meals | Fruit, vegetable |
| Caffeine from coffee, tea and coke based beverages | Potable water, juices |

**Table 2: Smokers' Alimentation Effects [16]**

| | | | |
|---|---|---|---|
| Higher energy intake | 4,9% | Lower PUFA intake | 6,5% |
| Higher intake of total fat amount | 3,5% | Lower fibre intake | 12,4% |
| Higher intake of saturated fat | 8,9% | Lower vitamin C intake | 12,4% |
| Higher intake of cholesterol | 10,8% | Lower vitamin E intake | 10,8% |
| Higher consummation of alcohol | 77,5% | Lower beta-carotene intake | 11,8% |

compare to non-smokers. Consummation of alcohol is also notably increased in smokers. In smokers we monitor lower intake of fibre, vitamins, omega-3 and omega-6 fatty acids [13, 16, 17]. To changes of alimentation habits, along with above mentioned causes, lead also other circumstances.

According to the claims of some smokers, particular foods weaken cigarettes smoking pleasure (namely milk and milk products, fruit and vegetable) others on the contrary intensifies (alcohol, meat) [17, 18].

Therefore smokers demonstrably show unsuitable alimentation habits, which are harmful for our health. Excessive intake of energy, food rich in fat and more frequent consummation of fried food, lack of fiber in food can lead to health damage, to blood cholesterol increase, risk of arteriosclerosis and with it connected health complications. Insufficient consummation of milk products in smokers is followed with risk of osteoporosis occurrence, which is potentiated by premature menopause in women smokers.

## SMOKING INFLUENCE ON MICRONUTRIENTS

A cigarette smoking is connected with an oxidation stress. It is a great source of free oxygen radicals [19]. Free radicals damage bio molecules and help this way to development of many diseases. Therefore it is for the health of our organism necessary for these particles to be, immediately after its creation, caught and destroyed. Antioxidants ensure degradation of these radicals. In the alimentation of the smokers is in comparison with non-smokers lower intake of micronutrients, ensuring antioxidant protection of the organism (vit. C, E, B group vitamins, beta carotene, trace elements etc.) and there is simultaneously higher metabolic turn over of these important elements [13, 20].

In comparison with non-smokers the active smokers have in average by 21-25% lower concentration of circulating vitamin C in the sera, even lower value were found in adolescent smokers. Low values of vitamin C in plasma are not caused only by food selection with its lower content, but also by direct impact of the cigarette smoking on vitamin C content in blood plasma. Lower concentrations of Vitamin C in plasma of the smokers are caused by higher demand for vitamin C turn over due to its antioxidant activity. Metabolic turn over of vitamin C is in smokers up to 35-40% higher than in non-smokers and thus is real risk of hypo vitamin condition [13, 21].

Carotenoids – several studies proved that in comparison with non-smokers the active smokers have lower concentration of alpha and beta carotene, lutein, zeaxanthine, lycopene and cryptoxanthine. Intake of beta carotene was in average by 17% lower in smokers and by 4% lower by former smokers than in non-smokers [13, 21]. According to the results of meta analysis from year 2008 supplementation with beta carotene is not recommended in smokers. In combination with smoking the beta carotene has pro-oxidative effect and increases risk of lung cancer incidence in smokers [22, 23].

In the studies were found also lower concentrations of vitamin E in sera resulting from lower intake in food and from increased breakdown as with by vitamin C. Vitamin E intake in smokers was lower in average by 10,8% [13].

In smokers the vitamins B group concentration is lower probably only by unsuitable composition of the food. Especially lower intake of vitamins B5, B and folacin compounds was observed in smokers. Interaction of the cigarette smoke with coenzymes of folacin compounds and B12 leads to their transformation into an inactive form which may have impact on homocysteine metabolism changes. For instance cyanide from tobacco smoke inactivates methyl-cobalamine, which results in Vitamin B12 concentration decrease. Also activity of folacin is decreased by matters included in cigarette smoke. Lack of this vitamin also increases risk of lung cancer occurrence in smokers. Naturally it is not true that the smoker who uses folacin to excess is protected from this tumor [20].

Trace elements are also negatively influenced by smoking. Among important elements which are essential for organism antioxidant activity are selenium, copper, zinc and iron. Several studies prove connection between smoking and lower concentration of selenium in blood plasma and erythrocytes in contemporary smokers but also in children of smokers exposed to passive smoke. In smokers is found higher copper concentration in blood which has pro- oxidation effects. The zinc level is lowered especially in heavy smokers [10, 20, 24]. Smoking causes changes in enzymes activity (i.e. catalase (Fe), ferro oxidase (Cu), seleniumgluthation perooxidase) which is result of oxidation stress. Also were documented short-term changes in concentration of circulating micronutrients before and after smoking of one cigarette [20, 24].

## CIGARETTE SMOKING AND BMI

Despite worse alimentation habits and lower body activity, which are factors leading to overweight, the smokers have lower body weight and BMI than non-smokers. In one study the women smokers had by app. 2kg lower weight than non-smokers women with the same height, in men this difference can be up to 5kg. Resulting values of BMI in connection with smoking are not in all studies clear. Not only smoking itself but also number of smoked cigarettes influences BMI [13, 15, 25].

Adolescent girls and young women are afraid of weight gain after they quit smoking. Some women even mentioned that they consider smoking as a way of weight control and weight gain after they quit smoking is for them reason to restart smoking [13, 15].

After smoking abandonment all the changes in organism, formerly evoked by smoking, return to normal. After smoking abandonment it can come to average weight gain of 2-3kg. In comparison with smoker in non-smoker is faster stomach evacuation and decrease of feeling of postprandial fullness which can lead to more frequent food intake. Majority of ex smokers start to eat also morning and afternoon snacks, as they feel hungry sooner after the food. In this case can exist risk of weight gain, especially if they chose for snack some sweet dish or other unsuitable food. Furthermore, after smoking abandonment comes to appetite increase, which was suppressed by smoking. When smokers abandon smoking, they often increase intake of sweet. Last but not least smoking abandonment has also influence on intestinal peristalsis slow down and increases risk of constipation [13, 15, 25].

## FORMER SMOKERS AND NUTRITION

All above mentioned factors can have impact after smoking abandonment on general energy balance (energy intake increase together with decrease of its expenditure – basal metabolism decrease by app. 880 kJ). This energy imbalance can lead to weight gain, which corresponds with amount of cigarettes smoked daily, severity of obesity and insufficient physical activity at smoking abandonment. Energy imbalance usually occurs during first months after smoking abandonment and with increasing amount of the years again disappears. Thus can be considered as temporary [13, 15].

Advantages of non-smoking by far dwarf low risks coming from weight gain by 2-3kg. With increased physical activity, menu modification and with daily energy intake regulation (of about 880kJ) the smokers can give up cigarettes without worries about weight gain. 5-10kg or higher weight gain definitely can not be put by smoking abandonment [13, 15].

Interesting are founding of one examination, where were present former smokers, who had not been smoking for several years, and they had, in comparison with contemporary smokers and also non-smokers, higher intake of vitamin C, lower intake of total fat and cholesterol and higher intake PUFA and SAFA and also ate more vegetable, fish and breakfast cereals. It is probably caused by the fact that after smoking abandonment they retroactively realized how they had been damaging their organism by smoking and tried to undo these ailments by better way of living [13].

## CONCLUSION

Cigarette smoking is classified as a significant risk factor, which undoubtedly leads to health damage in many regards. In case of smoking disease occurrence is not caused only by direct impact of combustion products of cigarette smoke. Likewise was also proved indirect impact of smoking, when we observe undesired changes in alimentation habits in smokers, which even more intensifies already known consequences of smoking. Cigarettes smoking can be, due to this reason, called “multi risk factor” as by activity of factor comes to many grave consequences.

## REFERENCES

[1] Kotulán J, Hrubá D, Bencko V. Preventivní lékařství I.díl.. 1st ed. Brno: Masarykova univerzita 1993; ISBN 80-210-0336-7.

[2] Ambrose JA, Barua RS. The pathophysiology of cigarette smoking and cardiovascular disease. Am Coll Cardiol Found 2004; 43(10): 1731-37. http://dx.doi.org/10.1016/j.jacc.2003.12.047

[3] Masopust J, *et al.* Patobiochemie buňky. Praha: 2. lékařská fakulta UK 2003.

[4] Normální je nekouřit [homepage on the Internet]. Hrubá D. Aby Vaše dítě nekouřilo; c 2009 [updated 2008 January 28, cited 2009 March 1]. Available from http://www.ped.muni.cz/normalnijenekourit/rodice_.htm.

[5] Česká koalice proti tabáku, o.s. [homepage on the Internet]. Kouření ničí všechny části vašeho těla; c2011 [updated 2004 November 18; cited 2011 February 12]: Available from http://www.dokurte.cz/download/HIasky_tisk_ZMENSENE.pdf.

[6] Utiger RD. Cigarette smoking and the thyroid. New Engl J Med 1995; 333(15): 1001-1002. http://dx.doi.org/10.1056/NEJM199510123331510

[7] Parasher G, Eastwood GL. Smoking and peptic ulcer in the helicobacter pylori era. Eur J Gastroenterol Hematol 2000; 12(8): 843-53. http://dx.doi.org/10.1097/00042737-200012080-00003

[8] WebMD Health News [homepage on the Internet]. Hitti M. Smoking Linked to Type 2 Diabetes; c2007 [updated 2007 December 11; cited 2009 February 2]. Available from http://diabetes.webmd. com/news/20071211/smoking-linked-to-type-2-diabetes/.

[9] Kozák JT. Rizikový faktor kouření. 1st ed. Praha: KPK 1993; ISBN 80-85267-42-X.

[10] Provazník K, *et al*. Manuál prevence v lékařské praxi - Výživa. Praha: SZÚ 2005.

[11] Samet JM, Yoon SY. Women and the tobacco epidemic - Challenges for the 21st Century. Canada: WHO 2001.

[12] Steven M, Bromley MD.rk. Smell and Taste Disorders: A Primary Care Approach. Am Fam Physician 2000; 61(2): 427-36.

[13] Hampl JS, Betts, NM. Cigarette use during adolescence: Effects on nutritional status. Nutr Rev 1999; 57(7): 215-21. http://dx.doi.org/10.1111/j.1753-4887.1999.tb06945.x

[14] Scott AM, Kellow JE, Eckersley GM, Nolan JM, Jones MP. Cigarette-smoking and nicotine delay postprandial mouth-cecum transit. Dig Dis Sci 1992; 37: 1544-7. http://dx.doi.org/10.1007/BF01296500

[15] Rozumné hubnutí [homepage on the Internet]. Sucharda P. Obezita a zdraví - Obezita a kouření. c2012 [updated 2003 October 21, cited 2012 Nowember 28] Available from http://www.rozumnehubnuti.cz/?p=177.

[16] Dallongeville J. The cigarette smoking is associated with unhealthy patterns of nutriet intake: A meta-analysis. J Nutr 1998; 128(9): 1450-57.

[17] Mcclernon JF. The effects of foods, beverages, and other factors on cigarette palatability. Nicot Tobac Res 2007; 9(4): 505-10. http://dx.doi.org/10.1080/14622200701243177

[18] Palaniappan U, *et al*. Fruit and Vegetable Consumption Is Lower and Saturated Fat Intake Is Higher among Canadians Reporting Smoking. J Nutr 2011; 131(7): 1952-8.

[19] Ledvina M, *et al*. Biochemie pro studující medicíny. 1st ed. Praha: Karolinum 2004; ISBN 80-246-0851-0

[20] Northrop-Clewes CA, Thurnham DI. Monitoring micronutrients in cigarette smokers. Sci Direkt 2007; 377(1): 14-38.

[21] Alberg AJ. The influence of cigarette smoking on circulating concentration of antioxidant micronutrients. Toxikology 2002; 180(2): 121-37.

[22] Gabriel HE. A comparison of carotenoids, retinoids, and tocopherols in the serum and buccal mucosa of chronic cigarette smokers versus nonsmokers. Cancer Epidemiol Biomark Preven 2006; 15(5): 993-99. http://dx.doi.org/10.1158/1055-9965.EPI-05-0664

[23] Tanvetyanon T, Neplet G. Beta-carotene in multivitamins and the possible risk of lung cancer aong sokers versus fomer smkers: A mta-analysis and evaluation of national brands. Cancer 2008; 113(1): 150-57. http://dx.doi.org/10.1002/cncr.23527

[24] Alberg AJ, Chien JC, *et al*. Household exposure to passive cigarette smoking and serum micronutrient concentrations. Am J Clin Nutr 2000; 72(6): 1576-82.

[25] Chiolero A, *et al*. Association of cigarettes smoked daily with obesity in a general adult population. Obesity 2007; 15(5): 1311-18. http://dx.doi.org/10.1038/oby.2007.153

Received on 20-10-2013 Accepted on 05-12-2013 Published on 30-12-2013

DOI: http://dx.doi.org/10.6000/1929-5634.2013.02.04.5