We recently described increased 8-izoprostane in exhaled breath condensate in pneumoconioses and their correlation with individual factors.

**Introduction**

Asbestosis is an incurable interstitial lung disease caused by the inhalation of asbestos fibers. It is characterized by inflammation and pulmonary fibrosis. It has unpredictable, but mostly progressive development. Additionally, asbestos exposure leads to an increased risk of mesothelioma and lung cancer. There are no markers available to measure the activity and prognosis, and there is no effective treatment for asbestosis1. Similarly, silica after chronic inhalation leads to another interstitial lung fibrosis, silicosis. Accordingly, no markers for monitoring underlying events are available and no causal treatment is known. The mechanisms of fibrogenic dusts-induced disease development and progression are not well understood. High cytotoxicity and long pulmonary retention of these fibrogenic dusts are major factors responsible for their long-term effects. Defining the mechanisms triggered by exposure to asbestos and silica could facilitate early diagnosis by identifying markers of early diseases and could elucidate novel therapeutic strategies.

Surface radicals on fibrogenic particles and iron-derived reactive oxygen species are considered to be among the key events in the development of fibrosis and lung cancer. After reaching the alveoli, fibrogenic dust particles are phagocytosed by pulmonary macrophages, which become activated and release reactive oxygen intermediates, chemokines, cytokines and arachidonic acid metabolites, such as leukotrienes (LTs) and isoprostanes1. We recently described increased 8-izoprostane in exhaled breath condensate, both in patients with asbestosis4 and silica exposure4.

LTs are pro-inflammatory and pro-fibrogenic mediators derived from the 5-lipoxygenase pathway of arachidonic acid metabolism. LT B4 is known to rise during chronic obstructive pulmonary disease exacerbations7. Additionally, the influence of recent smoking, another source of reactive oxygen species, on the concentrations of LT B4 in the exhaled breath condensate has been described1.

Exhaled breath condensate examination appears to be a simple and non-invasive method for studying lower respiratory tract events in vivo9. It contains several biomarkers of inflammation and oxidative stress, and collection can be repeated several times without any adverse effects, even in severely ill patients.

**Methods**

LTs B4, C4, D4, and E4 were measured in exhaled breath condensate in subjects who came to the Department of Occupational Medicine for regular follow-up due to their past exposure to asbestos or silica.

Ninety-two subjects with previous exposure to asbestos for 24±2 years (mean age 69±2 years) in three asbestos manufacturing plants, mostly in the production of asbestos insulation and textile materials, asbestos-cement roof, and pipe, were examined. Control group consisted of 46 subjects (mean age 65±3 years). Classification of the occupational cumulative asbestos fiber dust dose in three fiber-year classes yielded the following distribution: 58 (nearly 63 %) subjects were classified in fiber-year class III (100 and more fiber-years), 18 (20 %) in fiber class II (25–99 fiber-years) and 16 (17 %) in fiber class I (< 25 fiber-years). A fiber-year is defined as the cumulative asbestos dust dose in the workplace of 1·106 [(fiber m−3)×years]. Exposure estimation was based on measurements available since 1949, according to Hagemeyer et al10.

Sixty subjects with silicosis and mean exposure (24±3 years) to silica were examined (mean age 67±2 years). The control group had 25 subjects, with mean age 65±5...
Leukotrienes in asbestos-exposed and controls; \*P<0.05
chronic silicosis and asbestosis. It thus appears plausible that LTs are increased and could point to the continuing process of fibrosis. Smoking and alcohol consumption have been described to increase markers of inflammation and oxidative stress in blood. However, in this study, using exhaled breath condensate, this effect was not seen.

These results support the hypothesis that asbestos and silica are the main cause of increased LT D4 in exhaled breath condensate in our patients. However, additional factors influencing the balance in antioxidant/oxidant status probably play contributing roles. Even if the clinical significance of increased LT D4 in the exhaled breath condensate is not yet sufficiently clear, fibrogenic dusts appear to be the main factors, in addition LT E4 positively correlated with fibrogenic dusts exposure level.

Conclusion

This study suggests that exhaled breath condensate analysis of LTs is useful in fibrogenic dust exposed subjects, especially LTD4 and LTE4. LT D4 was higher both in the subjects with asbestos exposure and in the silicotics and might point to the activity of the fibrogenic process; on the other hand LT E4 correlated with the level of exposure – asbestos fiber-years and category of silica exposure. On the other hand, LT C4 correlated with chronic obstructive pulmonary disease. No correlation with daily alcohol consumption, cigarettes/day or systemic diseases was found for LTD4 and LTE4, which supports the theory that analysis of exhaled breath condensate reflects solely processes ongoing in the lungs.


REFERENCES

Epidemiology of addictive substances: comparison of Czech and Italian University students’ experiences

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Key words: addictive substances usage, university students, Italy, Czech Republic

Introduction and aim of the survey

This work is a component part of a long-lasting monitoring of students drug usage realized at our faculty. Legal and illegal substances usage can considerably affect young people life. Recent researches point up to stagnation of problematic drug users in contrast to a group of occasional experimenters whose numbers have been increasing.

Our survey gathers data about addictive drugs attitudes and experiences of students of the University Hradec Králové (UHK) and Tomas Bata University in Zlin (UTB) in the Czech Republic and of the University of Camerino (UC) in Italy. Aim of this work is to maintain the continuity of data collection and their update regarding the problems of university students’ addictive drugs usage as well as their extension to international level.

Material and methods

The monitored population comprises 805 participants: 305 students of UC (45.6 % males, 54.4 % females); 270 respondents from the UHK (28.5 % males, 71.5 % females) and 231 students of UTB (43.7 % males, 56.3 % females) in the Czech Republic.

The average age of Hradec Králové’s students was 21.2±1.9 years, of Zlin’s students 20.7±1.9 years and of the Italians 23.2±3.1 years. Data collection was carried out via questionnaires completed by students themselves, it was effectuated during the academic year 2005/2006 and it was absolutely anonymous and voluntary. The questionnaire was comprised of a socio-demographical part, of a part regarding students’ attitudes and experiences with legal and further with illegal substances and finally of a part mapping prevalence of infection diseases allied to addictive substance usage (viral hepatitis and HIV infection). Mainly close questions were attached by several half-open and open ones.

Data evaluation was realized via Microsoft Excel and statistical analysis was carried out via chi-square test.

Results

Socio-demographical part

Students from Hradec Králové and Zlin were mainly of the Czech nationality (95.0 %), students from Camerino mainly of the Italian nationality (83.9 %). There were 50.9 % Czech and 48.5 % Italian subjects coming from a town with more than 10 000 inhabitants.

Czech students live rather together with parents whereas Italian live alone (P<0.05). This matter can be influenced both by the higher average age of Italian students and by the diverse temper of either nation. Accordingly one tenth of Czech (10.2 %) as well as Italian (10.5 %) students live together with a person using illegal addictive substances.

Parents of Czech participants (60.9 % of their fathers and 61.1 % of their mothers) achieved mostly secondary education, either apprenticeship or finished with leaving examination; analogical Italian education was achieved by 39.6 % of fathers and 41.6 % of mothers.

Legal substances experience

The participants smoked their first cigarette in average age of 13.8±2.9 years (the Czechs), respectively in 15.5±1.8 years in average (the Italians). Smoking attitudes are recorded in Table I.

It was evidenced via chi-square test that there were significantly more non-smokers among Czech students and significantly more regular smokers among the Italians (P<0.05).

The average age of first experience with alcohol was stated by the Czechs in average age of 12.4±2.8 years, by

<table>
<thead>
<tr>
<th>Smoking</th>
<th>The Italians [%]</th>
<th>The Czechs [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>46.7</td>
<td>57.7</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>5.9</td>
<td>7.0</td>
</tr>
<tr>
<td>Rarely</td>
<td>9.5</td>
<td>12.0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>8.9</td>
<td>11.8</td>
</tr>
<tr>
<td>Regularly</td>
<td>28.2</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Table I Smoking
The participants usually consider themselves well (CZE 41.1 %, ITA 31.1 %) or partially well informed (CZE 47.7 %, ITA 57.7 %) about drugs related issues. But while they had to state at least one institution or organization helping people with problems related to addictive drugs, only 27.8 % of Italian in comparison with 63.1 % of Czech students were able to enumerate it (P<0.05). This fact can figure possible drug prevention goals.

As for the attitudes to legalization of so called “soft” drugs 4.6 % of the Czechs and 7.8 % of the Italians preferred their absolute legalization, 43.9 % Czech and 35.4 % Italian (P<0.05) students gave preference to free usage but controlled distribution, 26.5 % of the Czechs and 9.2 % of the Italians (P<0.05) prioritised free usage and punishable distribution and finally 23.0 % of the Czechs and 42.3 % of the Italians (P<0.05) were in favour of punishable both usage and distribution. Again the higher Czech benevolence to cannabis substances (e.g. “soft” drugs, “drugs which are smoked”) became evident.

Drug classification to „soft“ and „hard“ was used to risk perception assessment. Marihuana and hashish, which risk level is relatively low, are considered to be “soft” drugs. The differences between both nations were confirmed by the chi square test: Italian students are not acquainted with methamphetamine because its “role” as a stimulant is in Italy substituted by cocaine1 (P<0.05) which was in contrary incorrectly classified by more Czechs (P<0.05); the Italians are not very well informed of solvents abuse risk (P<0.05) but on the other hand they have classified cannabis, LSD, amphetamines, ecstasy, psychedelic mushrooms and methadone among “hard drugs” often than the Czechs (P<0.05). These findings can be interpreted as a result of possible international dissimilarities in drug preventive programmes, history, religion attitudes, political approaches etc.

Concerning personal experiences with addictive drugs, an experience with some substance was found out by 61.7 % Czech and 51.1 % Italian participants (P<0.05). Cannabis drugs clearly predominate among experienced substances, followed by psychedelic mushrooms in the Czech Republic and cocaine in Italy. Experiences with illegal substances are summarized in Table III.

The average age of an illegal substance first experiment was nearly the same between both nations: CZE 16.5±1.5 years and ITA 17.0±1.7 years. The substance mostly used for the first time was marijuana again (CZE: 72.5 % of drug-experienced subjects, ITA: 58.7 % of drug-experienced subjects). The most stated circumstances of first substance use were “with friends” (CZE 27.5 %, ITA 16.7 %) or a party, a celebration (CZE 8.4 %, ITA 14.7 %). Last month prevalence was found out at 10.8 % of Italian and 14.2 % of Czech students and the most used substance was cannabis again. Although some authors claim3,5, that number of regular cannabis Czech users is smaller than in some other European countries, in our survey the number of students with a 20-fold cannabis experience were similar (CZE 19.2 %, ITA 22.3 %).

Drug procuring is considered to very difficult by only

The Italians [%] The Czechs [%]

<table>
<thead>
<tr>
<th>Alcohol drinking</th>
<th>The Italians [%]</th>
<th>The Czechs [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstainer</td>
<td>15.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Only rarely</td>
<td>34.1</td>
<td>28.5</td>
</tr>
<tr>
<td>Sever times per month</td>
<td>24.3</td>
<td>47.7</td>
</tr>
<tr>
<td>Sever times per week</td>
<td>20.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Every day</td>
<td>3.6</td>
<td>1.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illegal substances experience</th>
</tr>
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</table>

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Drug procuring is considered to very difficult by only
0.6 % Czech and 2.6 % Italian students. Negative influence of drug usage was observed only by 3.6 % of Czech and 9.0 % of Italian university students; these data reflect either just usual recreational drug usage among students either fact that many students did not response these questions. Accordingly only few participants had to affront problems with police in relevance with drug usage (4.2 % CZE, 6.4 % ITA).

Discussion

Our results confirm that cannabis is the illegal substance most commonly used in all countries of the European Union (EU), with many countries reporting lifetime experience of the drug by more than 20 % of the general population. The use of cannabis is increasing, mainly among young adults. The usage extent among males is higher than among females, what is confirmed also by our survey: 56.5 % Italian and 69.7 % Czech males have used cannabis whereas “only” 39.2 % Italian and 55.1 % Czech females have tried it (P<0.05). The cannabis usage is to a great extent occasional, or it is quit beyond a certain period. Our study was carried out among young adults and that is one of the reasons, why we have found out such huge lifetime prevalence. As well we can expect that the students of medical sciences can show a higher tendency to drug experiments because of supposed “medicine-wise” and “hardihood”.

The population investigations show that amphetamines are the second abused substances next to the cannabis in the EU. The life-time prevalence (LTP) of amphetamines moves between 2 % and 11 % among young adults (15-34 years old). In Italy, the use of amphetamines and ecstasy among young adults is under 1 %, but the cocaine use nears to 2 %. The cocaine usage is abandoned in the age of young adulthood or it is occasional. Its use was confirmed by 5.4 % subjects (15-44 years) in Italy in 2003 (LTP) and 3.4 % of subjects of general population interviewed in 2003 admitted to having used amphetamine derivates at least once in their life. We have evidenced rather higher numbers in Italy: the amphetamines’ LTP of 8.5 % and the cocaine’s LTP of 13.4 %. The situation in the Czech Republic differs because of the methamphetamine (“pervitin”) spread which substitutes cocaine. Some authors claim that its prevalence among university students rises up to 4.1 % (ref.), in our study there were 5.2 % of students experienced with “pervitin”. The experience with cocaine among university students in the Czech Republic is 2.8 % (ref.), in our survey there were 3.6 % of cocaine-experienced participants. As for the other substance quite often used by Czech subjects, psychedelic mushrooms, its prevalence varies around 9 % among Czech students in general, what is significantly lower number (P<0.05) than in our study (17.6 %).

The general population studies indicate that the perception of risk relating to the influence of illegal substances use can affect their consumption. Obviously for that specific population segment that considers drugs harmless, the risk of being exposed is much greater. We have confirmed distorted perception of cannabis by the students: this drug is subconsciously classified as a legal one; we presume it so because of 19.1 % Czech and 38.5 % Italian (P<0.05) experienced students who have skipped over the questions determined for subjects with drug experience. The spread of cannabis is associated with a generalized underestimation of actual health risks and psycho-behaviour consequences. Subjects not perceiving cannabis use as dangerous are four times more likely to use it over those who perceive the risk. This hypothesis was supported by our findings which have disclosed experienced students’ opinion tendency to the cannabis legalization rather than among inexperienced subjects (P<0.05).

Conclusions

Our results confirm the accretive experimental usage of cannabis drugs among European young people and as well they reflect specifics of drug scenes of both countries.
The young people in Europe have similar experiences with legal and illegal substances; the founded differences can be caused by social, historical and political factors etc.

This survey has contributed to data mapping in the field of drug related problems and it has brought a new comparison of students’ attitudes and experiences in the European Union.

REFERENCES


Selenium is an essential trace element. It is an integral part of enzymes, which are critical for control of the numerous chemical reactions involved in brain and body functions. Selenium has a variety of functions. The main one is its role as an antioxidant in the enzyme selenium-glutathione-peroxidase. This enzyme neutralizes hydrogen peroxide, which is produced by some cell processes and would otherwise damage cell membranes. Selenium also seems to stimulate antibody formation in response to vaccines. It also may provide protection from the toxic effects of heavy metals and other substances. Selenium may assist in the synthesis of protein, in growth and development, and in fertility, especially in men. It has been shown to improve the production of sperm and sperm motility1,2.

Introduction

Selenium forms in foods

Foods contain a number of different selenium forms. In animal foods, there are specific selenium proteins where selenium is incorporated via selenide as selenocysteine, while selenomethionine, and possibly also selenocysteine to some extent, are non-specifically incorporated as analogues to methionine and cysteine in foods both of animal and plant origin1,3. Selenomethionine, as well as the inorganic forms selenite and selenate, are the most common forms in food supplements and fodder additives. In addition to these forms a number of uncharacterized forms exist, e.g. in fish (Åkesson and Srikumar), but their contribution to total dietary selenium is unknown (SCF). Fish, shellfish, red meat, grains, eggs, chicken, liver, and garlic are all good sources of selenium. The amount of selenium in vegetables is dependent on the selenium content of the soil. Brewer's yeast and wheat germ, both considered "health foods," are also good sources of selenium1,3.

Bioavailability of different forms of selenium

Most forms of selenium salts organic bound selenium, i.e. selenomethionine and selenocysteine, are easily absorbed from the gastrointestinal tract. Only a few studies on the bioavailability of selenium have been performed in humans. Selenium in blood or serum is most effectively raised by selenium-rich wheat or yeast selenium (the latter may vary in quality), probably because of non-specific incorporation of selenomethionine into proteins. Inorganic selenium as selenate and selenite can be incorporated specifically into selenium proteins via selenide as selenocysteine and increase seleno-enzyme activity until saturation.

Deficiency

Selenium deficiency is relatively rare in healthy well-nourished individuals. It can occur in patients with severely compromised intestinal function, or those undergoing total parenteral nutrition. Alternatively, people dependent on food grown from selenium-deficient soil are also at risk.

Selenium deficiency can lead to Keshan disease, which is potentially fatal. Selenium deficiency also contributes (along with iodine deficiency) to Kashin-Beck disease. The primary symptom of Keshan disease is myocardial necrosis, leading to weakening of the heart. Kashin-Beck disease results in atrophy, degeneration and necrosis of cartilage tissue. Keshan disease also makes the body more susceptible to illness caused by other nutritional, biochemical, or infectious diseases. These diseases are most common in certain parts of China where the soil is extremely deficient in selenium5.

Selenium is also necessary for the conversion of the thyroid hormone thyroxine (T4) into its more active counterpart, triiodothyronine, and as such a deficiency can cause symptoms of hypothyroidism, including extreme fatigue, mental slowing, cretinism and recurrent miscarriage7.

The amount of selenium available in the soil for plant growth and corresponding variations in the intake of selenium by humans varies considerably among regions and countries. In most European countries the mean intake levels are much lower, in the lower range of 30–90 µg Se day\(^{-1}\), except for Finland, that has a somewhat higher mean intake (60 µg Se day\(^{-1}\)) due to import of wheat rich in selenium. The margin between the present mean intake, excluding supplements, in the European adult population...
and an UL (adult) of 300 µg day⁻¹ would be between 2, 7 to 10. The mean intakes of non-vegetarian adults in different studies are Belgium 28–61 µg day⁻¹, Denmark 41–57 µg day⁻¹, Finland 100–110 µg day⁻¹, France 29–43 µg day⁻¹, United Kingdom 63 µg day⁻¹, Norway 28–89 µg day⁻¹, Spain 79 µg day⁻¹, Sweden 24–35 µg day⁻¹, and Czech 37 µg day⁻¹ (ref.1,6–9).

States of mild to moderate Se deficiency have been proposed as contributing to a large number of conditions, such as cardiovascular disease, infertility, ageing, eye disease, diabetic retinopathy and cancer. In none of these has the deficiency been associated with reduced glutathione peroxidase levels. There is no firm link been established, although the potential involvement of a mild impairment in antioxidant activity with reduced glutathione peroxidase levels cannot be discounted. Thus, low Se states have been associated with platelet aggregability and prospective studies have also suggested an increased risk of stroke and coronary heart disease in subject with low serum Se (ref.10).

Toxicity

Although selenium is an essential trace element it is toxic if taken in excess. Exceeding the Tolerable Upper Intake Level of 400 micrograms per day can lead to selenium toxicity. Symptoms of selenosis include a garlic odour on the breath, gastrointestinal disorders, and hair loss, sloughing of nails, fatigue, irritability and neurological damage. Extreme cases of selenosis can result in cirrhosis of the liver, pulmonary edema and death.

Elemental selenium and most metallic selenides have relatively low toxicities because of their low bioavailability. By contrast, selenate and selenite are very toxic, and have modes of action similar to that of arsenic. Hydrogen selenide is an extremely toxic, corrosive gas. Selenium also occurs in organic compounds such as dimethyl selenide, selenomethionine and selenocysteine, all of which have high bioavailability and are toxic in large doses.

Selenium poisoning of water systems may result whenever new agricultural runoff courses through normally-dry undeveloped lands. This process leaches natural soluble selenium compounds (such as selenates) into the water, which may then be concentrated in new "wetlands" as it evaporates. High selenium levels produced in this fashion have been found to have caused certain congenital disorders in wetland birds11,12.

Daily requirements

The amount of dietary selenium (as DL-selenomethionine) required to saturate the selenium need of extracellular GSH-Px was used as one of the approaches to define a Dietary Reference Intake for Selenium in the USA in 2000 (55 µg day⁻¹ for adult men and women) (NAS). A so-called Population Reference Intake of 55 mg selenium per day for adults, but also other levels of intakes based on other criteria, was established by the Scientific Committee for Food of the European Commission.

A joint FAO/IAEA/WHO Expert Consultation (WHO) gave several modes for the calculation of requirements of the individual and populations. For a 65 kg reference man the average normative requirement of individuals for selenium was estimated to be 26 µg day⁻¹, and lower limit of the need was estimated to be 40 µg day⁻¹. For a 55 kg reference woman were 21 and 30 mg selenium day⁻¹, respectively. The latter value was estimated to increase to 39 µg day⁻¹ throughout pregnancy and to attain the values of 42, 46 and 52 µg selenium day⁻¹ at 0–3 and 6–12 months of lactation, respectively1,2,4,12. In Czech Republic the daily recommendation intake are for organic form of selenium compounds 4070 µg for male and 45–55 µg for female, 75 µg for lactation and 30 µg, 20 µg, 10–20 µg for 7–10, 4–6 and 1–3 years old children. For inorganic form of selenium compounds RDI are 1.5–2.5 mg for adolescents and adults and 0.4–1mg and 1–1.5 mg for children in age 1–3 and 4–10 years13.

Our study

In the project there were involved 933 healthy volunteers of the Czech Republic Rescue Fire brigades from selected areas of the Czech Republic. The level of selenium in serum was determined by atomic absorption spectrophotometer method (AAS Unicam, GB). Serum selenium was mineralized in microwave system (milestone, Italy) and an UL (adult) of 300 µg day⁻¹ would be between

![Graph showing the level of selenium in serum in monitored groups](image)

**Fig. 1.** The level of selenium in serum in monitored groups; (1 µmol l⁻¹ ~ 78.89 mg l⁻¹), 1 – Praha, 2 – Beroun, 3 – Kroměříž, 4 – Klatovy, 5 – Ústí nad Labem, 6 – Nový Jičín
physiological range, however, it corresponded with other findings within the Czech population. No statistically significant relations among the age of examined subjects and their serum selenium concentrations were proved. There was found only the tendency of selenium in serum to increase to higher weight, but no statistically significant of these changes was proved.

**Conclusion**

Selenium is a trace mineral that is essential to good health but required only in small amounts. Selenium is incorporated into proteins to make selenoproteins, which are important antioxidant enzymes. The antioxidant properties of selenoproteins help prevent cellular damage from free radicals. The content of selenium in food depends on the selenium content of the soil where plants are grown or animals are raised. There is evidence that selenium deficiency may contribute to development of a form of heart disease, hypothyroidism, and a weakened immune system. On the other hand, Observational studies indicate that selenium intake values of individual nutrients that are the basis for quality assessment of our food and our nutrition.

Supported by VZ MOO FVZ 0000502.

**REFERENCES**


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**Table I**

Evaluation of serum selenium concentrations in inhabitants of CZ

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Se in serum [mg l(^{-1})]</th>
<th>Frequency [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacol. level</td>
<td>&gt;140</td>
<td>0.1</td>
</tr>
<tr>
<td>Optimal level</td>
<td>100–140</td>
<td>0.7</td>
</tr>
<tr>
<td>Marginal deficiency</td>
<td>70–100</td>
<td>8.6</td>
</tr>
<tr>
<td>Mild deficiency</td>
<td>55–70</td>
<td>25.6</td>
</tr>
<tr>
<td>Deficiency</td>
<td>45–55</td>
<td>28</td>
</tr>
<tr>
<td>Severe deficiency</td>
<td>&lt;45</td>
<td>37</td>
</tr>
</tbody>
</table>

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in place of methionine, and serves as a vehicle for selenium storage in organs and tissues. Selenium supplements may also contain sodium selenite and sodium selenate, two inorganic forms of selenium. Selenomethionine is generally considered to be the best absorbed and utilized form of selenium.

The need of individual nutrients for human organism was and is verified in still new connections in many metabolic studies in people, in experimental work on animals and also in clinical and epidemiological monitoring. This need is quantified in the final phase in the form of reference intake values of individual nutrients that are the basis for quality assessment of our food and our nutrition.
CZECH UNIVERSITY STUDENTS AND LEGAL ADDICTIVE SUBSTANCES

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Introduction

The use of illegal drugs is a great social, health, economic, legal and political problem both worldwide and in the Czech Republic. Alcohol together with tobacco belongs to the group of legal addictive substances. However, negative impacts of their consumption on human health have been known for a long time. Alcohol is causally related to more than 60 different medical conditions and 4% of the global burden of disease is attributable to alcohol1. Smoking of tobacco is the main cause of lung cancer2, leads to the development of 20 different diseases and to the early deaths3.

The attitudes of adult Czech population toward the use of legal addictive substances (drugs) may be characterised as tolerant or benevolent and their consumption is relatively high in the Czech community. In 2005, average statistical consumption of 100% spirit was 10.2 liters/year per person (including infants) in the Czech Republic4, which is one of the highest consumption in Europe5. In 2005, 26.3% and 4.1% of Czech population (age 15–64) were regular and occasional tobacco smokers, respectively6.

Such atmosphere leads to relatively high and hazardous consumption of legal drugs in the sample of adolescents. According to data from The European School Survey Project on Alcohol and Other Drugs 2003 (ESPAD), the proportion of students who had been drunk during the last 12 months was higher (68%) than the European average (53%). 18% and 13% of students (age 16–17) had used excessive amount of alcohol and had been drunk at least three times during the last month, respectively. 43% of students (age 16–17) had smoked in the last month, European average is 35%. In comparison with year 1995, increased of daily smokers among students (aged 16–17) was observed (from 23% to 27% in 2003)7.

Most surveys on drug use have been restricted to elementary and secondary school students (e.g. ESPAD). However, research has revealed that some university students drink excessive amounts of alcohol and use other addictive substances. Alcohol abuse and dependence was identified in 14% of Belgium university students8. 15% of drinking university students in the UK (ref.9) reported to drink alcohol at the hazardous level. According to Kypri et al., the majority of drinking tertiary students in New Zealand (62% of men and 48% of women) reported hazardous or harmful alcohol use10. Heavy alcohol use was also found in US and Canadian students with prevalence rates 33% and 30%, respectively11. In 1995–1999, 11% of university students in the Czech Republic were abstainers12. The survey conducted in the population of Prague (capital city of the Czech Republic) university students revealed that 14% of students consumed alcohol in a hazardous way in 2003 (ref.13).

Smoking of tobacco is not so extended as alcohol consumption in the population of university students. 26% of male and 25% of female students in the UK reported current regular smoking of tobacco13, 29% of Croatian medical students14, 24% of university students in Brasil15 and 18% of university students in Papua New Guinea16 are regular tobacco smokers. In 1995–1999, 5% and 17% of Czech university students were regular and occasional tobacco smokers, respectively12. In 2003, percentage of regular smokers among Prague university students was higher – 22% (ref.13).

Our survey was concerned on legal drug use among university students in the Czech Republic in years 2002–2006. Its general aim was to estimate the prevalence rates and examine changing patterns of legal drug use among these students, and to compare results with previous local, multi-regional and international studies among university students.

Methods

The questionnaire-based survey was performed in academic years 2002/3–2005/6 at thirteen faculties of eight universities in seven regions of the Czech Republic. Anonymous standardized questionnaires were personally administered to students during their registration at the beginning of the academic year or during seminars with obligatory participation of students. The questionnaire included questions on the use of alcohol, tobacco and illegal drugs of abuse, general socio-demographic data (e.g. age, sex, residence, financial means), knowledge and attitudes of students towards drugs of abuse.

For the assessment of alcohol intake, students were asked about frequencies of beer, wine and spirits use, the age of the first contact with alcoholic beverages, the age of the first drunkenness and the frequency of drunkenness in the last month. The consumption of any sort of alcoholic beverage at least once a week was stated as the indicator of regular alcohol consumption. Repeated drunkenness (i.e. at least two or three episodes of drunkenness per month) was used as the indicator of hazardous alcohol drinking. For
the assessment of tobacco smoking, students were asked about their current smoking status, the number of cigarettes smoked per week and the age of the first contact with tobacco smoking.

The results are presented as descriptive statistics. Associations between variables were analysed by chi-square test.

Results

Characteristics of the group

A total number of 3,484 university students completed and returned the distributed questionnaires. Average age of students was 20.8 years (range: 18–48). The number of females was higher (73 %) than that of males. For details see Table I.

Alcohol use

Alcohol was the most frequently used addictive substance among university students. 44.1 % of students reported regular consumption of any sort of alcoholic beverage (from 35.1 % of students at the Faculty of Medicine and Dentistry, Palacky University in Olomouc to 65.4 % of students at the Faculty of Architecture, Technical University of Liberec). On average, 30.6 %, 20.8 % and 6.9 % of students reported regular consumption of beer, wine and spirits, respectively. Hazardous alcohol drinking was reported by 14.1 % of university students (from 31.6 % of students at the Skoda Auto University to 65.4 % of students at the Faculty of Architecture, Technical University of Liberec). For details see Table II.

Average age of the first contact with alcoholic beverages and average age of the first drunkenness were 13.1 years (range: 1–24) and 16.4 years (range: 2–25), respectively. Almost 60 % of students reported being drunk for the first time before the age of 18 (legal age limit of alcohol consumption in the Czech Republic).

Tobacco smoking

8.6 % of students were regular tobacco smokers (from 3.8 % of students at the Faculty of Architecture, Technical University of Liberec to 16.9 % of students at the Mathematical Institute, Silesian University in Opava). More than 140 pieces of cigarettes per week was smoked by 2.0 % of regular smokers, most of them (59.7 %) smoked 11–70 pieces of cigarettes per week. 20.2 % of students were occasional tobacco smokers (from 11.9 % of students at the Mathematical Institute, Silesian University in Opava to 26.9 % of students at the Faculty of Architecture, Technical University of Liberec). Occasional smokers smoked usually 1–10 pieces of cigarettes per week. For details see Table III.

Table I

Characteristics of university students

<table>
<thead>
<tr>
<th>Faculty and Dentistry</th>
<th>University and Abbreviation</th>
<th>Males [%]</th>
<th>Females [%]</th>
<th>Number of students</th>
<th>Average age</th>
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Average age of the first contact with tobacco smoking was 14.2 years (range: 2–26).

**Associations**

Sex differences in use of legal drugs were found, both regular and hazardous drinking patterns as well as tobacco smoking were reported by higher proportion of males than females ($P<0.001$, chi-square test).

There was a statistically significant association between the financial situation of students (i.e. financial means per week) and use of legal drugs. Increasing amount of financial means per week was related to the increasing proportion of regular and hazardous drinking and regular tobacco smoking ($P<0.001$, chi-square test).

**Discussion**

44.1 % and 14.1 % of university students reported regular and hazardous alcohol drinking, respectively. Such situation is compatible with the state of alcohol use in the Czech Republic. Consumption of alcohol in the Czech Republic belongs to the highest both worldwide and in Europe; more over 33 % men and 14 % women in the Czech Republic (age 18–64) consumed alcohol in a way hazardous for health. High and hazardous consumption of alcohol was also found in the population of university students both in the Czech Republic and worldwide. However, adequate comparison of our findings with those from other studies is problematic mainly because of different measures of alcohol intake, different definitions of hazardous alcohol drinking and differences in the age distribution across samples.

8.6 % and 20.2 % of university students were regular and occasional tobacco smokers, respectively. In comparison with the surveys in the population of Czech high school students (27 % of regular smokers in 2003, ref.7) and in the general Czech population between the ages 15 and 24 years (29.9 % of regular smokers in 2005, ref.6), the percentage of regular smokers among university students was lower. This situation can be explained by the long-term observed trend in the Czech Republic, that the highest percentage of regular smokers is in the group of persons with primary or incomplete secondary education. However, the part of the current occasional tobacco smokers among university students meets the criteria of regular daily smoking; they smoke more than 10 pieces of cigarettes per week and can become regular smokers in the future.

Findings of both, significant sex differences and associations between financial situation of students and their use of legal addictive substances are consistent with earlier reports on alcohol and drug use in university students.

The reliability and accuracy of the data can be subjected to discussion. We suppose that voluntary, anonymous and confidential principle of our survey improved reliability of students’ responses. Furthermore, question-
naires were personally administered to the students during situation with their obligatory participation and completed by almost all students.

**Conclusion**

Hazardous alcohol drinking and tobacco smoking is strongly associated with a wide range of negative health and psychological consequences\(^1\)-\(^3\). Our study among university students in the Czech Republic provides worrying data mainly about their alcohol consumption and supports the need of continuous education also in university students to advise them on the risks of drug and alcohol misuse.

**REFERENCES**