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PRELIMINARY ASSESSMENT OF EXPOSURE OF CHILDREN AND ADOLESCENTS TO ACRYLAMIDE ORIGINATING FROM FOOD

WSTĘPNA OCENA NARAŻENIA DZIECI I MŁODZIEŻY NA AKRYLOAMID POCHODZĄCY Z ŻYWNOŚCI

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The objective of the tests was to make preliminary assessment of acrylamide intake from the diet in the category of children and adolescents falling into 7 – 18 age bracket. In the population of consumers eating potato crisps and French fries the average intake of acrylamide in the population of studied children and adolescents amounted to about 65 µg/person/day.

Słowa kluczowe: akryloamid, spożycie, dzieci, młodzież
Key words: acrylamide, intake, children, adolescents

INTRODUCTION

Numerous tests [2–4, 7, 10, 11, 15] showed that acrylamide is characterised by neurotoxic activity and causes damage of central and peripheral nervous systems of both laboratory animals and human beings. In laboratory animals the genotoxic [13, 14] and carcinogenic [1, 5, 6] activity of acrylamide was also proven. Therefore in 1994 the International Agency for Research on Cancer (IARC) [8] classified acrylamide as a compound probably carcinogenic for humans.

In April 2002 a group of scientists from Stockholm University acting jointly with the Swedish National Food Administration (Livsmedelsverket) announced that acrylamide is produced during thermal processing of food and can be found in fried and baked products [16].

The objective of the study was to make preliminary assessment of acrylamide intake from the potato crisps and French fries in the population of children and adolescents falling into 7 – 18 age bracket all over Poland and health hazard assessment.

MATERIAL AND METHODS

The tests covered 957 persons from all over Poland: 533 girls and boys aged 7-13 and 424 girls and boys aged 14-18. The inputs included the 24-hour recalls carried out using 'Album of photographs of food products and dishes' [18] that were carried out from September to November 2000 under FAO project called 'Household Food Consumption and Anthropometric Survey' [17].

To estimate acrylamide intake from the diet its content in potato crisps and French fries was taken based on analytical studies carried out by the National Food and Nutrition Institute in the 2004-2005 period. The average acrylamide content in potato crisps amounted to 998 μg/kg, whereas in French fries – 337 μg/kg product [12].

The results were evaluated with the use of Microsoft Excel 2000 and the Statistica ver. 6.0 statistical package.

RESULTS AND DISCUSSION

The average acrylamide intake from potato crisps in the population of school children aged 7-13 was 10.4 μg/person/day, whereas in the population of adolescents aged 14-18 – 8.2 μg/person/day. This difference was not statistically significant. Data statistical analysis showed that intake of acrylamide ($p < 0.05$) from potato crisps was significantly higher in the population of children at school age than in the population of adolescents (Figure 1). With reference to French fries the situation was the opposite. In the population of adolescents aged 14-18 the acrylamide intake was approximately 1/3 higher in this product category than in the population of children, however, the difference was not significant.

Based on study findings it was found out that acrylamide intake from potato crisps and French fries was only present in 16.3% of surveyed children aged 7-13 and by 11.8% of

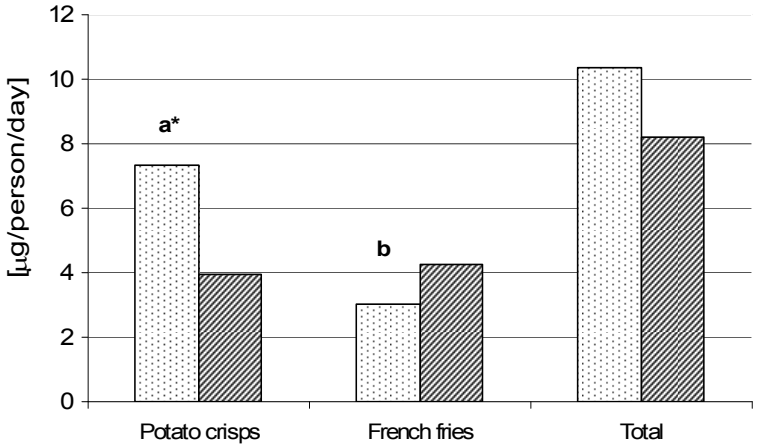

Fig. 1 Acrylamide intake from potato crisps and French fries in the population of children and adolescents

* - statistical significant difference ($p < 0.05$)

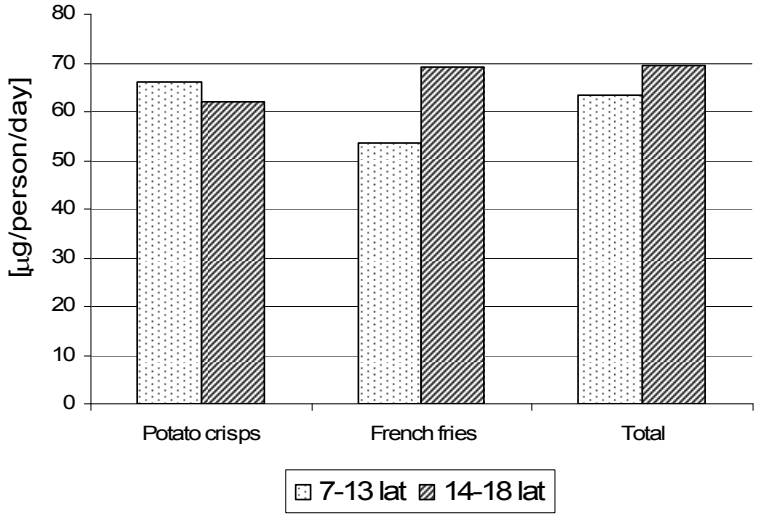

Fig. 2. Persons eating potato crisps and French fries

surveyed adolescents aged 14-18. The conversation of acrylamide intake only for persons consuming this substance led to significant increase of acrylamide intake per person per day. However, statistically significant differences between age categories and between foodstuffs representing source of acrylamide were not found out.

In the population of acrylamide consumers the average intake of acrylamide in the population of children aged 7-13 amounted to 63.4 µg/person/day, whereas in the population of adolescents aged 14-18 – 69.5 µg/person/day. The acrylamide intake from French fries and potato crisps was comparable in the population of adolescents, whereas acrylamide intake in the population of children was approximately 20 % smaller from French fries than from potato crisps. However, the difference was not significant on statistical grounds.

Given potentially hazardous activity of acrylamide and determination of its maximum daily intake by human, also in some European countries attempts were made to estimate the level of acrylamide intake from diet. The average acrylamide intake from diet by adult European was estimated to be 0.5 – 0.6 µg/kg of body mass/day, whereas in population of children and adolescents – about 0.7 – 1.4 µg/kg of body mass/day [16, 13, 9]. The conversion of our results of study for all population into kg of body mass showed that acrylamide intake in the population of children aged 7 – 13 was 0.29 µg per kg of body mass, whereas the acrylamide intake in the population of adolescents aged 14 – 18 was more than half of that i.e. 0.14 µg/kg of body mass. The analysis of data for the category of people eating French fries and potato crisps showed significant increase of acrylamide intake per kg of body mass. The acrylamide intake in the population of school children was as high as 1.78 µg/kg of body mass, whereas in the population of school adolescents – 1.17 µg/kg of body mass. The conversion of obtained results into values only for people eating these foods leads to their significant increase – they are almost double against European data. However, it should be noted that in the study discussed here only 2 sources of acrylamide in the diet were considered. These results are very disturbing.

Given potentially hazardous activity of acrylamide and results of this study it will be vital to carry out studies on acrylamide content in other foodstuffs being source of acrylamide from the diet.

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Summary

The objective of the tests was to make preliminary assessment of acrylamide intake from the diet in the category of children and adolescents falling into 7 – 18 age bracket. For the purposes of assessment the our analytical test results were used of acrylamide content in potato crisps and French fries in samples taken randomly from all over Poland, whereas the intake level was estimated on the basis of a 24-hour recalls leading by National Food and Nutrition Institute in 2000. In the population of consumers eating potato crisps and French fries the average intake of acrylamide in the population of children aged 7-13 amounted to 63.4 μg/person/day, meanwhile in adolescents population aged 14-18 – 69.5 μg/person/day. The conversion of rest results into kg of body mass showed that acrylamide intake in the children population aged 7-13 lat was 1.78 μg per kg of body mass, whereas the acrylamide intake in adolescents population aged 14 – 18 was 1.17 μg/kg of body mass. Due to disadvantageous health effect of acrylamide it is necessary to reduce the content of this compound in diet.

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Streszczenie

Celem badań było wstępne oszacowanie spożycia akryloamidu z dietą w grupie dzieci i młodzieży w wieku 7 – 18 lat. Do oceny wykorzystano wyniki badań analitycznych zawartości tego związku w chipsach i frytkach ziemniaczanych pobranych losowo z terenu Polski a wielkość spożycia oszacowano na podstawie 24-godzinnego wywiadu żywieniowego. Wśród osób spożywających chipsy i frytki ziemniaczane średnie spożycie akryloamidu w grupie dzieci w wielu 7-13 lat wynosiło 63,4 μg/osobę/dobę, natomiast w grupie młodzieży w wieku 14-18 lat – 69,5 μg/osobę/dobę. Przeliczenie uzyskanych w badaniach wyników na kg masy ciała wykazało, iż dzieci w wieku 7-13 lat spożywały 0,29 μg akryloamidu na na kg masy ciała, zaś młodzież w wieku 14 – 18 lat o ponad połowę mniej tj. 0,14 μg/kg m.c. Ze względu na niekorzystne dla zdrowia działanie akryloamidu należy dążyć do obniżenia zawartości tego związku w diecie.

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