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**HEAVY METAL CONTENTS (LEAD AND CADMIUM) IN SETS OF  
COURSES SERVED IN MILITARY UNIVERSITY DINNING HALL  
IN THE CZECH REPUBLIC**

SCIENTIFIC ANNOUNCEMENT

S u m m a r y

The evaluation of the chosen sets of courses has been done in this research work. Chemical analysis of sets of courses involved the determination of the content of toxic elements such as lead and cadmium by polarographic analyzer. The determined quantity of lead as well as cadmium did not exceed acceptable limits.

**Key words:** lead, cadmium, sets of courses.

**Introduction**

The presence of toxic elements in the foodstuff is connected among others with environmental pollution. Lead, cadmium, mercury and arsenic belong to the most important toxic elements. To the admittance of these elements into the food chain contribute the number of antropogenic and natural origin sources [1]. The average amounts of lead and cadmium in the earth crust are  $13 \text{ mg}\cdot\text{kg}^{-1}$ , and  $0.1 \text{ mg}\cdot\text{kg}^{-1}$ , respectively. The content of lead and cadmium is locally changeable. In slightly polluted regions the atmosphere contains  $0.005\text{--}0.3 \mu\text{g}\cdot\text{m}^{-3}$  of lead and  $0.0001\text{--}0.002 \mu\text{g}\cdot\text{m}^{-3}$  of cadmium. The lead and cadmium amounts detected in the atmosphere of large cities were  $0.2\text{--}5 \mu\text{g}\cdot\text{m}^{-3}$  and  $0.007\text{--}0.05 \mu\text{g}\cdot\text{m}^{-3}$ , respectively. In natural water sources just traces of lead and cadmium can be detected. Many water organisms powerfully store up in their bodies cadmium and other elements from water. The contents of lead and cadmium in non-contaminated soils range from  $5\text{--}40 \text{ mg}\cdot\text{kg}^{-1}$  and

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from 0.2–1 mg·kg<sup>-1</sup> of the dry matter, respectively. The figures can be essentially higher in contaminated areas. From a point of toxic elements appearance into the food chain is not important only their content in the soil, but also the accessibility for the plants [6].

Toxic elements quantity in the food is the important indicator of hygiene-toxicologic quality (Appendix No. 3 to ordinance No. 110/1997 Sb.). The quantity of lead and cadmium in plant origin food is dependent on the quantity of these elements in the soil. Their high concentration can be found in: spinach, lettuce, carrot, mushrooms (also high concentration of mercury) [4] and oil seeds. High concentration can be found in grapes, too. In animal origin food the high concentration of the lead can be found in intestines, and especially in kidneys. Meat, eggs, milk and milk products contain just traces of lead and cadmium. Tolerated daily dose for 70 kg man is 500 µg of lead and 67–83 µg of cadmium [6].

### Material and methods

The evaluation of the 13 chosen sets of courses has been done in this research work. Sets of courses have been taken from VVŠ PV dinning room.

The tested sets of courses:

1. Roasted pork, dumpling, sauerkraut.
2. Boiled beef, boiled potatoes, mixed vegetables.
3. Meat balls, potato purée, cucumber.
4. Roasted pork, potato salad, tomato.
5. Mince, boiled potatoes, sauerkraut.
6. Beef goulash, pasta, plum compot.
7. Roasted chicken, rice, cucumber salad.
8. Roasted cheese, French fries, tartar sauce.
9. Roasted cauliflower, French fries, tartar sauce.
10. Soya meat\*, rice, piquant sauce.
11. Pancakes with strawberry jam.
12. Yeast plum dumplings with poppy seeds and sugar.
13. Buns with hot vanilla cream.

Four samples have been taken from every set of courses, and all the chemical analyses have been four times repeated. The result has been presented as an arithmetic mean. Sets of courses have been divided (if possible) into the components for their weight determination. Then the components have been mixed and desiccated to the

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\* Term „soya meat“ not allowed be used by ordinance No 329/1997 Collection of Laws (podle vyhlášky č. 329/1997 Sb. [5]) and its substitute term „soya product“ – here is old title, that is used on menu

constant weight. The dry matter was mineralized in Apion apparatus and later the concentration of the lead and cadmium has been determined by polarographic analyzer.

### The results and discussion

The results of chemical analysis of the sets of courses are shown in the Tab. 1.

Table 1

The mean contents of lead and cadmium in soldiers sets of meals.

Set of courses	Weight [g]	Content of toxical elements	
		Pb [µg]	Cd [µg]
Roasted pork, dumpling, sauerkraut	507.3	15.2	9.1
Boiled beef, boiled potatoes, mixed vegetables	554.3	10.4	9.4
Meat balls, potato purée, cucumber	485.3	31.6	7.0
Roasted pork, potato salad, tomato	523.4	40.0	10.0
Mince, boiled potatoes, sauerkraut	658.9	14.8	8.1
Beef goulash, pasta, plum compot	447.3	31.1	8.7
Roasted chicken, rice, cucumber salad	644.7	7.2	5.8
Roasted cheese, French fries, tartar sauce	384.4	22.6	11.3
Roasted cauliflower, French fries, tartar sauce	382.9	56.5	2.8
Soya meat*, rice, piquant sauce	533.7	12.8	10.8
Pancakes with strawberry jam	406.2	41.8	5.0
Yeast plum dumplings with poppy seeds and sugar	556.6	7.3	14.6
Buns with hot vanilla cream	424.6	26.0	10.4

The highest content of lead has been estimated in the set of courses: Roasted cauliflower, French fries, tartar sauce. The lunch should cover about 35% of recommended daily doses of all nutrition values [3]. Second course without soup has been examined, what is about 30% of the daily dose [2]. It means, that the second course should not contain more than 30% of toxic elements daily limit. Contents of lead and cadmium have been in all the samples under the limit. It is possible to claim, that sets of courses served in VVŠ PV dinning room are from the point of the contents of toxic elements – lead and cadmium – safety.

### Conclusion

It has been determined by chemical analysis, that contents of lead and cadmium in 13 sets of courses did not exceed acceptable limits.

### References

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### ZAWARTOŚĆ METALI CIĘŻKICH (OŁOWIU I KADMU) W ZESTAWACH DAŃ OBIADOWYCH W STOŁÓWCE WOJSKOWEJ UCZELNI W REPUBLICIE CZESKIEJ

#### Streszczenie

W niniejszej pracy oceniano wybrane zestawy dań, serwowanych w stołówce uczelni wojskowej w Republice Czeskiej. Analiza chemiczna obejmowała oznaczenie zawartości metali toksycznych – ołowiu i kadmu przy użyciu analizatora polarograficznego. Oznaczone ilości ołowiu i kadmu nie przekraczały dopuszczalnych wartości.

**Słowa kluczowe:** ołów, kadm, dania obiadowe ☒