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# Heavy metal and arsenic contamination of food available in Novi Sad in the period from 1994 to 1999

**Key words:** Food contamination; Lead; Cadmium; Mercury; Arsenic

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Lead, cadmium, mercury and arsenic belong to the group of environmental contaminants, which can enter food chains and thus contaminate food (1). They have, or may have, toxic and/or oncogenic potential (2). Concentration of these elements in human food is restricted to quantities that are considered to be harmless, and these are regulated by specific acts of law (3-5).

The concentration of lead, cadmium, mercury and arsenic residues were examined in 456 food samples, collected at Novi Sad market, during the five-year period (from 1994 to 1998). The same food contamination was examined in 92 food samples in 1999, separately.

The lead and cadmium concentrations were determined by flame technic, using atomic absorption spectrophotometer (AAS) Pye Unicam SP-9 series and Perkin Elmer Analyst 300, after mineralization by dry ashing with ash aid. The sensitivity limit level of the method for lead was 0.08 mg/kg and for cadmium 0.02 mg/kg. Mercury concentration was determined by Pye Unicam SP-9 series AAS, using cold vapour technic, with sensitivity level limit of 0.01 mg/kg. The arsenic concentration was determined by spectrophotometry, using silver-diethyl-dithiylol-carbamatum, with sensitivity limit of 0.02 mg/kg.

The average concentrations of all investigated pollutants of food did not exceed the values

allowed by the national maximum tolerated doses (MTD). But, in a relatively small amount of samples, the concentrations of heavy metals were found highest than tolerated. The presence of lead has been established in quantities over the national maximum tolerated doses in 3.3% of the samples, cadmium in 1.97%, and mercury in 2.2% of samples. Arsenic was not found in such concentrations (Table 1). However, these,

**Table 1.** The frequency of food contamination with heavy metals and arsenic, concentration exceeding the national MTD values, from 1994 to 1998.

Food group	% of food samples with detected heavy metals and arsenic concentration exceeding the national MTD			
	Pb	Cd	Hg	As
Cereals	2.80	7.10	0.00	0.0
Vegetables	1.70	1.70	1.70	0.0
Fruits	1.60	0.00	1.60	0.0
Milk-liquid	4.70	0.00	0.00	0.0
Milk-powder	12.50	3.60	0.00	0.0
Meat-rew	0.00	0.00	10.00	0.0
Meat products	1.75	0.00	0.88	0.0
Fish-canned	0.00	0.00	0.00	0.0
Sweets	2.10	2.12	0.00	0.0
Total	3.30	1.97	2.20	0.0

relatively low, occurrences of contaminants are not to be considered encouraging. This can be accepted on the basis of the following facts:

The research was conducted in the times of an economic crisis, due to which the use of the agrochemical products was significantly reduced, as well as the distribution of fuel and an enormous decrease in industry and transportation. The overall emission of contaminants was reduced, and with it, the contamination of food. It is reasonable to assume that without the existing economic crisis contamination of food would be higher.

It is a characteristic of all of the contaminants, included in the study, to accumulate in human tissue. This means that even the smallest quantities, when below the MTD, ingested throughout the life, may present a health hazard. Constant observation is therefore neces-

sary, even with low levels of contamination, with a tendency to lower the overall intake of these contaminants to the smallest possible amount. From this point of view, the contamination of investigated food with these contaminants, involving all levels of detected concentrations, is as follows: the presence of mercury was detected in 11.4%, of lead in 10.5%, of cadmium in 8.9% and of arsenic in 0.2% of the samples (Table 2).

**Table 2.** The frequency of food contamination of all detected concentration levels of heavy metals and arsenic from 1994 to 1998 (in %).

Food group	Food samples with detected presence of heavy metals and (%)			
	Pb	Cd	Hg	As
Cereals	7.10	28.50	34.40	1.4
Vegetables	13.50	5.10	10.20	0.0
Fruits	6.30	5.10	10.20	0.0
Milk-liquid	33.30	4.70	0.00	0.0
Milk-powder	16.50	7.10	0.00	0.0
Meat-rew	32.00	0.00	10.00	0.0
Meat products	5.26	1.75	4.40	0.0
Fish-canned	31.20	43.70	56.20	0.0
Sweets	2.12	2.12	2.12	0.0
Total	10.50	8.99	11.40	0.2

The conditions of 1999, have been analyzed separately. As a consequence of the NATO bombing, it was expected that the contamination of the environment would be greater and that contaminants would enter food chains at a greater level. Analysis, on the other hand, shows that the overall contamination of food with heavy metals lowered (Table 3).

**Table 3.** The frequency of food contamination of all detected concentration levels of heavy metals and arsenic in 1999 (in %).

Food group	N	Food samples with detected concentration of heavy metals and arsenic (%)			
		Pb	Cd	Hg	As
Cereals	17	5.9	12.5	18.7	0.00
Vegetables	11	18.2	9.09	0.0	0.00
Fruits	7	0.0	0.00	0.0	0.00
Milk-liquid	4	0.0	0.00	0.0	0.00
Milk-powder	12	8.3	8.30	8.3	0.00
Meat products	9	11.1	0.00	11.1	0.00
Fish-canned	4	25.0	0.00	25.0	25.00
Fats	21	9.5	0.00	0.0	0.00
Sweets	7	14.3	0.00	0.0	0.00
Total	92	9.8	4.30	3.3	1.08

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Only in vegetables and vegetable products there was an increase in contamination with lead and cadmium. The detected quantities did not, however, exceed national MTD.

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