

THE SURVEILLANCE STUDIES ON THE CONTENTS OF HEAVY METALS AND ARSENIC IN POLISH MEAT PRODUCTS DURING THE PERIOD OF YEARS 1998 – 2000.

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Background

Consumers are looking for food products that are safe and of high quality. Following recent scandals with contamination of animal products with dioxins they are also very responsive to any information regarding presence of chemical residues in meat products. For six years the Institute has been involved in food quality monitoring studies supported by the Ministry of Agriculture. The main purpose of these studies is to monitor the presence of persistent contaminants and the level of contamination of food products during the growing, harvesting, processing and/or preparation for consumption. These studies are creating base for risk evaluation and analysis, followed by risk management and communication. In the monitoring program, besides organic contaminants such as chlorinated hydrocarbons (PCBs, chlorinated pesticides), the attention is given to heavy metals and arsenic. The whole monitoring program is covering

Objective

Studies in our laboratory evaluated the contents of heavy metals and arsenic in processed meat products during the period of time between 1998 and 2000. These studies could create base for risk assessment and evaluation of exposure polish consumer to Potentially harmful substances. In turn it would allow taking correction action to diminish exposure as required by HACCP risk management.

Materials and methods

Studies were performed on samples of meat products collected randomly during the period 1998 – 2000 years from the market in different regions in Poland. The samples (875 in total) comprised of dry and semi dry sausages, fermented meat products, pates, processed by-products such as liver and/or kidney and/or blood sausages, and smoked and cooked meat pieces.

According to the used analytical methodology the samples were digested with nitric acid in micro oven (Milestone typ 1200 Mega) followed by quantitative determination using atomic emission spectrometry (ICP-AES Jobin Yvon typ 138 Ultrace). The content of mercury was determined directly in the samples using vapor generation and spectrometer of Altec typ Ama 254.

The performance of applied analytical procedures was continuously examined by parallel analysis of amiable reference materials of similar matrix, or spiked samples and participation in interlaboratory studies organized by FAPAS (Food Analysis Performance Assessment Scheme) from Great Britain.

In the table 1 maximum residue limits (MRL) are presented according to the recent ordinance of the Ministry of Health in Poland issued on 27TH December 2000. For reference the limits of quantification (LOQ) of applied analytical methods are included.

Table 1

Maximum residue limits and limit of detection of applied methods					
Micro element	Cadmium Cd	Lead Pb	Arsenic As	Mercury Hg	Zinc Zn
MRL mg/kg	0,050	0,60	0,20	0,020	50,0
LOQ mg/kg	0,009	0,070	0,07	0,0005	0,01

Results

The results of the determinations of heavy metals and arsenic in subsequent years are presented in table 2 and shown on figures 1-4. For evaluation of the range of the presence of studied elements minimum and maximum values are also included as well as median values and 90 percentile. The results of determination are compared with maximum residue limits.

As we can see from the presented results and figures the levels of heavy metals and arsenic are far below maximum residue limits, and are in general very low. For arsenic the median value is even below the limit of quantification. The differences in cadmium contents between different regions of Poland are not significant with slightly higher values for southwest region of the country. There were some incidental cases of the content of over MRL but in total they compromise 1,1% of all studied population. These minorities consist of processed by products (liver/kidney sausages).

Low level of lead could be attributed to the common use of unleaded fuels for the last 10 years. The low level of mercury, which used to be much higher in previous years, could be endorsed by very strict regulations regarding disposal of mercury waste.

In general the contents of heavy metals and arsenic, during the time span of the studies, were similar and on rather low level. Comparison of the results of this study with the level of contamination of animal tissues is also proving that meat processing in general is not the main source of contamination but it is rather environmental conditions of animal husbandry and feed quality that are to be blamed. Further lowering of heavy metal levels in meat products would require reduction of emission of heavy metals to environment and/or effective surveillance of feed ingredients.

Conclusions

1. Processed meat products in Poland contain low levels of heavy metals and arsenic, which are far below values permitted by legal regulations in Poland. From that point of view these products could be recognized as safe ones for consumer.
2. During the last three years the levels of contamination of processed meat products were stable.

References:

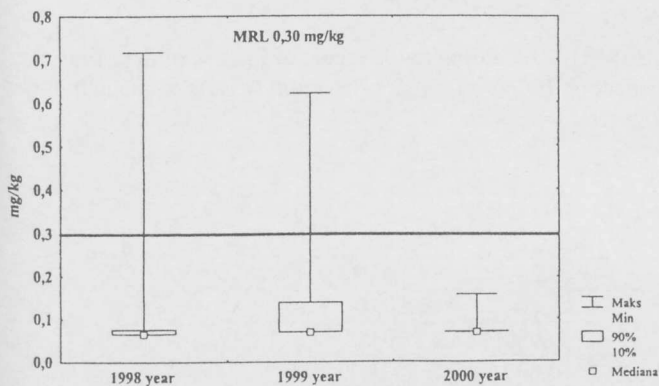
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Table 2. The contents of heavy metals and arsenic in Polish meat products during the time of 1998 – 2000 years

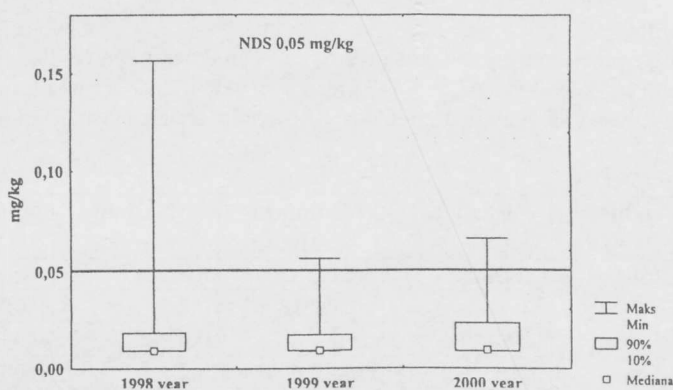
Microelement	Year	Minimum - maximum	Median	90 percentile	% MRL
Arsenic As mg/kg	1998	n.d.-0,45	n.d.	n.d.	n.d.
	1999	n.d.-0,25	n.d.	n.d.	n.d.
	2000	n.d.-0,11	n.d.	n.d.	n.d.
Lead Pb mg/kg	1998	n.d.-0,72	n.d.	n.d.	n.d.
	1999	n.d.-0,62	n.d.	0,08	13,3
	2000	n.d.-0,16	n.d.	0,14	23,3
Cadmium Cd mg/kg	1998	n.d.-0,156	n.d.	0,018	36
	1999	n.d.-0,056	n.d.	0,017	34
	2000	n.d.-0,066	n.d.	0,023	46
Zinc Zn mg/kg	1998	2,77-72,56	20,49	32,99	66
	1999	4,38-48,93	18,74	31,59	63
	2000	0,43-59,49	16,39	30,42	61
Mercury Hg mg/kg	1998	n.d.-0,0129	n.d.	0,0009	4,5
	1999	n.d.-0,0026	n.d.	0,0007	3,5
	2000	n.d.-0,0162	n.d.	0,0009	4,5

Legend: n.d. - not detected, below LOQ.

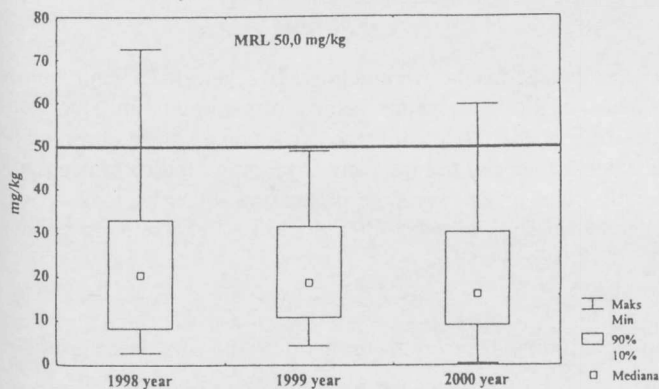
The content of Pb in Polish meat products during period of 1998-2000 years



The content of Cd in Polish meat products during period of 1998-2000 years



The content of Zn in Polish meat products during period of 1998-2000 years



The content of Hg in Polish meat products during 1998-2000 years

