The survey of the residues of organochloride pesticides, polichlorinated biphenyls and heavy metals in polish meat products

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Purpose

The purpose of this surveillance study was to evaluate the level of contamination with organochloride pesticides (OCP), polichlorinated biphenyls (PCB), and heavy metals of selected meat products manufactured in Poland in 1997 year.

Material and Methods

OCP and PCB were determined in 400 samples and heavy metals - in 286 samples of meat processed products collected randomly from the market.

The OCP and PCB were determined using following procedure. First the fat was extracted from the samples followed by separation of OCP and PCB from matrix by solid phase extraction (SPE). The OCP and PCB extracts were analyzed by gas chromatography with selective detection by electron capture detector (ECD). The confirmations of OCP and PCB residues were done by means of GC/MS SIM technique.

Following compounds were the subject of this study: ΣDDT (DDT, DDD, DDE), α, β, γ - Hexachlorocycloxane, Hexachlorobenzene (HCB), Chlordane, Dieldrin, Endrin, Heptachlor and Methoxychlor and PCB congeners: 28, 52, 101, 138, 153 and 180.

The content of arsenic, lead, cadmium, mercury, zinc and copper were determined by the induced plasma spectrometry (ICP - JY Ultrace 138). The samples were digested in microwave oven with mixture of nitric acid and hydrogen peroxide. The mercury was determined by atomic absorption technique. All analytical procedures were validated using appropriate reference materials.

Results

The content of ΣDDT (2,4'-DDE, 4,4'-DDE, 2,4'-DDD, 4,4'-DDD, 2,4'-DDT, 4,4'-DDT) in all analyzed samples was in average 109,1μg/kg fat with standard deviation ±53 μg/kg fat (Maximum Residue Level (MRL) - 1000 μg/kg fat). The α-HCH was found to be present in 97,2 % of analyzed samples with average content 43,3 μg/kg fat (MRL - 200 μg/kg fat); the levels of β-HCH and γ-HCH were 21,0 and 12,3 μg/kg fat, respectively (MRL 100 and 1000 μg/kg fat, respectively). The residues of HCB were found only in 21,5% of samples with average content 3,9 μg/kg fat (MRL - 200 μg/kg fat). In 10 samples the traces of Dieldrin was detected (Fig 1). All samples were free of residues of Chlordane, Endrin, Heptachlor and Methoxychlor.

In all samples the residues of PCB were very low with average value of ΣPCB 88,3 μg/kg fat (Fig. 2). The most commonly detected was PCB congener no 52.

The average contents of analyzed heavy metals residues in processed meat products were as follows: Cd - 12 μg/kg, Pb -91 μg/kg, As - 56 μg/kg, Hg - 0,6 μg/kg, Cu - 0,8 mg/kg, Zn - 15 mg/kg, and in all cases were below MRL established by polish regulations (MRL in meat products for Cd - 50 μg/kg, for Pb - 600 μg/kg, for 500 μg/kg, Hg - 30 μg/kg, for Cu - 8 mg/kg, for Zn - 50 mg/kg). In most part of samples the levels of As, Hg, Pb and Cd were below limits of method detection. However, there are the differences between the levels of heavy metals in sausages, poultry and offal products (Fig. 3). The reasons of these discrepancies are the differences in accumulation of selected heavy metals in different animal organs during live span. The poultry products are characterized by medium level contamination as compared to other products.

Conclusion

The levels of organochloride pesticides in surveyed meat products are very low, below MRL established in Poland as well as the content of PCB below EU MRL - 500 μg/kg fat.

The levels of heavy metal contamination in all surveyed meat products are below legal limits.

There are variations in heavy metals levels due to their different accumulation properties in animal organism.

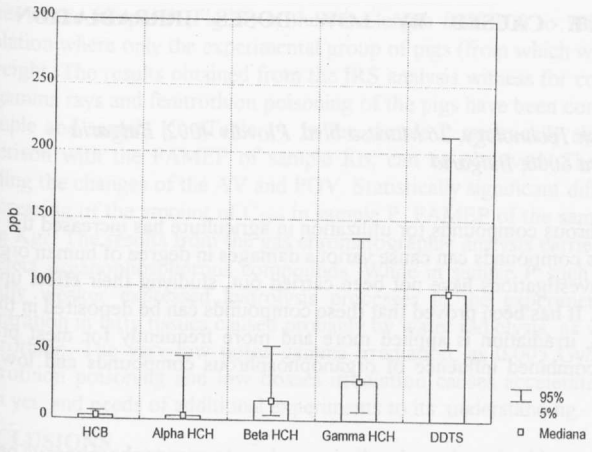

Figure 1. The levels of OC residues in meat products.

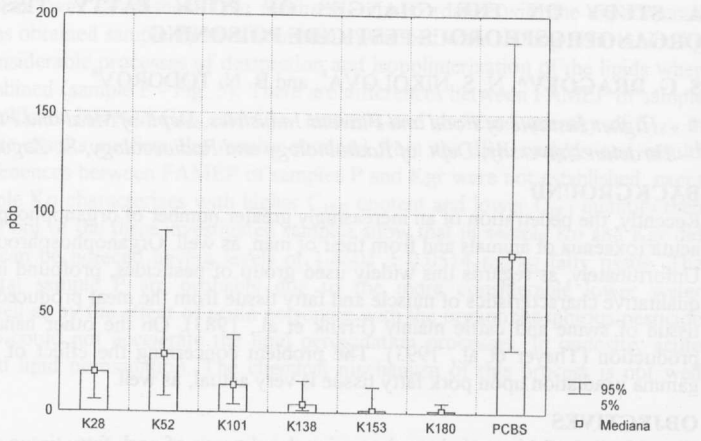

Figure 2. The level of PCB residues in meat products.

Figure 3. Levels of heavy metals in meat products.