sn he Tł

to] ab

PA

06

inf

0v

53: Ch

J.A Kai Z.L Raj i G

Quality aspects of meat products - conclusions from food monitoring program in Poland.

Obiedziński M.W., Borys A., Bartnikowska E., Jankowski P., Cieślak B., Cozel A., Wegrzyn A., Grześkiewicz St., Karpiński R. Meat and Fat Research Institute, 02-532 Warsaw, Rakowiecka St.36, Poland

Background

Evaluation of the chemical residues in food products both in plant and animal origin is becoming more and more important due to the consult awareness towards the safety and health aspects. The hygienic features of food chain and methods of production and processing of food equally important for the consumer as nutritional and sensory attributes of food products. The strategy of providing the human population we safe and health food calls for plan of establishing and executing the effective food monitoring system, as a tool to achieve above present strategic targets. In the implemented food monitoring system in Poland these fundamental principles are implemented. The monitoring system of food quality is not only indicating the actual state of contamination level, but is also revealing the long - term trends. The system not deal with environmental contaminates, but as well with residues left over during production or processing and other important componed which are significant for nutrition and consumer protection. (Obiedziński and Jankowski 1996).

The livestock serve as food for humans, in the form of processed meat and dairy products. In this respect it is not only important to determ the level of contaminants - such as heavy metals, chlorinated pesticides (OCPs), polychlorinated biphenyl's (PCBs) and polynuclear around hydrocarbons (PAHs) - ingested with foodstuffs but also pay attention to the risk associated with consumption. Chloroorganic pesticides polychlorinated biphenyl's belong to the group of xenobiotics which due to its persistence in environment and lipophylic character dangerous for human beings and animals. The most commonly they are detected in animal origin products due to their lipophylic character Poland the DDT was banned in early 1970s, but up to now some residues are found in animal tissues and food products. On the other polycyclic nuclear hydrocarbons PAHs are ubiquitous environmental contaminates of the biosphere and represent a very important group chemical carcinogens or cocarcinogens. Reports of some studies on total diet in a number of developed countries indicate that food constituare important source of human exposure to PAHs. The Toxicological Committee of Polish Academy of Science recognized PAHs as a group of the most important compounds which presence in human environment should be evaluated and monitored. In presented studies we report our finding regarding selected residues in polish meat products which were observed during pilot phase of the monitoring program.

Materials and Methods

The samples of meat products were collected according to sampling plan of monitoring from the five regions of Poland which different in environment pollution, and kept frozen (-30°C) until further analysis. The analytical method used was employing of rigid gel columners samples clean-up and further separation and quantification of OCPs - PCBs and PAHs by means of HRGC-ECD and HRGC/ respectively, as published previously (Obiedzinski et al. 1996). In brief the OCP and PCB were analyzed by high resolution is chromatography with ECD detector on semi-polar capillary columns (BPX-35), and the PAH fraction was analyzed by HRGC/MS system SIM mode. The meat products samples for heavy metal residues were digested by microwave technique prior to analysis by ICP. The performance of adopted analytical methods was verified with food samples spiked with standards on the levels 1,0; 0,5 and 0,05 ppm for CC PCB and 10, 5 and 1 ppb for PAH and analysis of available certified reference materials. Following adoption of the procedure, the route performance was introduced using available certified OCP and PCB CRM and heavy metals CRM materials and spiked with PAHs.

Results and discussion

In the table 1 are presented the results of our studies of OCP levels in analyzed samples of meat products. As one can conclude from the represented in table 1, the level of OCP residues is far below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country and levels of PCB are below acceptable tolerances established in our country acceptable tolerances applied in the EU (0,5 mg/kg). The levels of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the products samples from south regions of PCB are slightly higher in the compared with other regions. During the last twenty years the levels of OCPs declined considerably, and they are not create toxicolog danger for consumer. Our studies confirm the results of the other studies dealing with residues levels in animal tissues and fat. The process of meat do influence the level of neither of OCP nor PCB. In average the level of Σ HCH, HCB and Σ DDT is below 20% of tolerance The PAHs can occur as contaminates in different types of food, including vegetables, fruits, cereals, vegetable fats and oils. The contaminates of these products could course mainly for the contaminates in the contaminates in the contaminates of the contaminates in the contaminates of the contaminates in the contaminates in the contaminates of of these products could occur mainly form environment sources (Chen et al.). Meat products can contain PAHs, predominantly due to smo and heat treatment such as grilling, broiling etc. Much of the effort has been accumulated on the benzo(a)pyrene content in food which for the se time was recognized as an indicator of the hazard associated with the presence of PAHs in our environment and food as well. As can be from the figure 1, the most predominant PAHs in the chromatogram are those of low molecular weight. (m/e128-202). The average level contamination of higher molecular weight PAH (benz(a)pyrene and benzo(g,h,i)perylene) are at least several times lower as compared with molecular weight one (table 2) More detailed analysis and the times lower as compared with molecular weight one. (table 2). More detailed analysis revealed that important components in analyzed PAHs are methyl, dimethyl and substituted polycyclic compounds, what is exemplified on figure 2. The least of the least several times lower as compared with the several times and the several times and the several times are methyl, dimethyl and the several times are methyl. substituted polycyclic compounds, what is exemplified on figure 2. The levels of selected PAHs, representatives of three, four and five methyles of PAHs are shown in tables 2. 3. The levels for critical and the provided that in portant components in analyzed PAHs are shown in tables 2. 3. The levels for critical and the provided that in portant components in analyzed PAHs are shown in tables 2. 3. The levels for critical and the provided that in portant components in analyzed PAHs are shown in tables 2. 3. The levels for critical and the provided that is the provided that the provided tables are shown in tables 2. 3. The levels for critical and the provided tables are shown in tables 2. 3. The levels for critical and the provided tables are shown in tables 2. 3. The levels for critical and the provided tables are shown in tables 2. 3. The levels for critical and tables are shown in tables 2. 3. The levels for critical and tables are shown in tables are families of PAHs are shown in tables 2, 3. The levels for grilled products are higher compared to smoked, and are characterized by different grilling to higher compared to smoked, and are characterized by different grilling to higher the shown in tables 2, 3. variations. The last observation could be explained by different grilling techniques used and needs further studies (Overvik and Gustavsson) previous studies we also observed that in respect of smoking methods the use of modern smoking chambers help to decrease level contamination of the products with PAHs as compared with traditional smoking (Raport, 1996). It will the matter of further applied research study in more details grilled products and propose novel grilling techniques to diminish possibilities of PAHs formation. (Obiedziński el Karl and Leinemann).

These facts are important to make proper judgment of the risks associated with consumption of food products if only the benzo(a)pyrete used as a measure the risk of exposure. The presented levels of PAHs are in good agreement with the data published by other workers ten of 436 analyzed have level of BaP>1ppb) (Chen et al.). These observations are also supported by the fact that the level of benzo(a)pyrete which was historically used as a reference indicator of carcinogenic PAHs, is rather low, as compared to other substituted PAHs. knowledge of carcinogenic properties of different PAHs is still limited.. In other studies we concluded that the possible sources of PAHs food are environmental contamination and possible accidental contamination during processing as well as thermal treatment of varying seven

which are used in the preparation and manufacture of foods. (Examples of such processes are grilling, boiling, frying, baking and toasting and smoking.) The process for food preservation, such as drying of seeds, can also give rise to PAHs in foods when they are carried out by direct heating of foods with air containing combustion gases (Raport, 1996).

The presented on figures 3 data regarding heavy metals are clearly demonstrating that the residues levels of lead and mercury are within ^{toleration} limits (n= 590, legal limit 600 ppb and n=815, 30 ppb, respectively). Only 2,9 % of total number of 594 samples contain cadmium above legal limit 50 ppb and only 2,2 % samples of total number of 594 have level of arsenic above legal limit 500 ppb.

Conclusions

onsu

food

ion

resen

s syst

not of

pone

eterm

aroma

ides

cter

acter

ner ha

TOUP

nstitu

a gr

e rep

liffet IMA GCA ion ster

r 00 routh

res

bel

108

inat

21 10

th

p

The levels of OCP and PCB residues in polish meat products are below legal tolerances established in Poland and the EU.

In general the levels of heavy metals residues are within legal tolerances.

The contamination of smoked meat products with PAHs is comparable as in another countries. More attention should be paid to substituted PAHs when evaluation of risk is carried out. The technology of grilling of meat products require revision in order to diminish the possibility of PAHs formation.

References

0) edziński M.W., Jankowski P.: Monitoring System of Chemical Residues in Food in Poland: EPRW ' 96, 1st European Pesticide Residue Workshop "Pesticides in food and drink", June 10 - 12, 1996.

Objedziński M.W., Jankowski P., Cieślak B., Węgrzyn E., Grześkiewicz St., Karpiński R., Cozel A.: Multi component - multi residue Method Method of analysis. Approach to simultaneous analysis of polycyclic aromatic hydrocarbons (PAH) and organochloride residues (OC and PCB) th food samples.: EPRW '96, 1st European Pesticide Residue Workshop "Pesticides in food and drink", June 10 - 12, 1996.

Overvik E., Gustavsson J-A.: Polycyclic aromatic hydrocarbon (PAH) emission from charcoal grilling. Atmospheric Environment, vol.29,12, 533-542, 1995.

Ch^{en} B.H., Wang C.Y., Chiu C.P.: Evaluation of analysis of polycyclic aromatic hydrocarbons in meat products by liquid chromatography. Agr. Fd. Chem., vol.44,8,2244-2251, 1996.

 $k_{af}^{\text{red. Chem., vol.44,8,2244-2251, 1996.}}$ $k_{af}^{\text{red. Chem., vol.44,8,2244-2251, 1996.}}$ $k_{af}^{\text{red. H}}$ Leinemann M.: Determination of polycyclic aromatic hydrocarbons in smoked fishery products from different smoking kilns. Lebensm. Unters. Forch. (1996) 202;458-464.

Raport z Badań Monitoringowych nad Jakością Gleb, Roślin, Produktów Rolniczych i Spożywczych w 1995 r. PIOŚ, Ministerstwo Rolnictwa Gospodarki Żywnościowej, Bibl. Mon. Środ., Warszawa 1996.

Table 1. The content of OC - pesticides and PCB in meat products, mg/kg.

Contents	ΣΗCΗ	НСВ	ΣDDT	РСВ
minimum	0,01	0,01	0,01	0,01
maximum	0,25	0,09	0,37	0,11
median	0,01	0,01	0,03	0,01
average	0,016	0,012	0,047	0,011
90% percentyl	0,03	0,02	0,08	0,01

n= 487

Table 2. PAH contents in meat products (sausages, smoked meats), ppb (µg/kg).

Contents	Phenanthrene	Fluoranthene	B(a)A	B(a)P.	B(ghi)P	Σ ΡΑΗ
max	188,0	116,0	45,0	1,8	0,6	301,5
min	0,0	0,0	0,0	0,0	0,0	0,0
median	25,0	12,0	2,0	0,2	0,0	43,0
percentyl 90%	65,0	25,0	7,0	0,5	0,2	98,0
average	31,1	14,1	3,1	0,2	0,1	48,7

n = 436

Table 3. PAH contents in grilled meat products (poultry, sausages and meat), ppb (μ g/kg).

Contents	Phenanthrene	Fluoranthene	B(a)A	B(a)P.	B(ghi).	Σ ΡΑΗ
max	180,0	120,0	44,0	2,8	1,0	337,6
min	101,3	69,0	23,0	0,9	0,4	194,7
median	145,0	101,0	29,0	2,2	0,8	288,4
percentyl 90%	172,0	116,4	40,0	2,7	0,9	325,8
average	139,3	97,6	30,6	2,0	0,7	270,2

n = 45