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CORRELATION BETWEEN PESTICIDE RESIDUES IN BLOOD OF HOGS AND PESTICIDE RESIDUES IN THEIR TISSUES AND ORGANS

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The use of pesticides in agriculture and livestock raising has shown to be very successful. However, such use has caused the problem of pesticide residues. Day after day, this problem gets more and more serious. Having in mind that pesticide residues accumulated in tissues and organs of men are first of all the result of contaminated food intakes, it is quite clear why a special attention is paid to all foodstuffs.

The main source of contamination of animals is the feed the same as in the case of men; accumulation of pesticides in animals is carried out in the same way as in men, for example, chlorinated hydrocarbons are for the most part accumulated in fatty tissues.

Among a large number of institutions /manufactueres, users, health authorities/ interested in the problem of pesticides, food industry - specially meat industry - is in an exceptional and very delicate position. The residues are formed outside the meat industry plants, and the methods of raw material decontamination do not exist at the present level of meat technology; if the quantities

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of pesticide residues proved in meat and meat products are over the prescribed tolerance limits, the undesirable consequences will be suffered by the foodstuff manufacturers. On the base of the above facts laid out in brief, it can be seen that the problem of pesticide residues is of the same importance for meat industry as the problem of shelf life, only that the former is considerably more difficult to be solved at present. A special difficulty represents the fact that unallowed quantities of residues are proved either in finished products or in tissues and organs of slaughtered animals, that means at the moment when nothing more can be done in order to prevent the loss.

x

x x

Within the program for the solution of pesticide problems, the Yugoslav Institute of Meat Technology have set the following tasks:

1/ To carry out the analysis of tissues and organs taken on the slaughter line from animals of known origin, in order to obtain a survey of animal contamination in various regions. The obtained data should serve as a criterion whether the application of pesticides in a certain region was proper or improper, as well as a base for undertaking the corresponding measures. 2/ In order to prevent slaughter of highly contaminated animals, to examine the possibility of evaluating the quantity of pesticides in tissues and organs of animals on the base of some indices obtainable in alive animals.

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- 3/ Having in mind that pesticides contained in feed are the main source of contamination of animals, to determine what quantities of pesticide residues in feedstuffs can be tolerated without the risk of obtaining meat and meat products with unallowed quantities of residues. Such determination will be done by analysing the feed given to experimental animals as well as by analysing their tissues and organs after slaughter.
- 4/ To carry out the analysis of pesticide residues in finished products for a longer period of time, in order to obtain a more complete picture of the efficiency of undertaken measures. At the same time, the data on compliance with or deviations from regulations governing tolerant doses would be obtained.

The above mentioned program, which is partly underway, will be continued for the next several years. This paper presents only the results obtained within the tasks given under 1/ and 2/.

X

X

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EXPERIMENTAL

Analysis of chlorinated hydrocarbon residues was carried out in 104 samples of fatty tissue, muscular tissue, liver and kidney obtained from 26 hogs, and in 80 samples of blood, fatty tissue, muscular tissue, liver and kidney obtained from 16 hogs.

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The samples were taken on the slaughter line, closed in plastic bags, frozen, and delivered to the laboratory in frozen state. After the preparation of samples, extraction and clean-up /4, 7, 8/, the chlorinated hydrocarbon residues were determined by the method of gas chromatography, on the Varian-Aerograf, gas chromatograph, Model 2100-20, by means of electron capture detector with tritium foil. Glass column /5' x 1/4'' x 4 mm/ packed with 5% fluoro--silicon QF-1 /FS 1265/ on Varaport 30, 100/120 mesh.

Operating conditions: detector temperature 200°C, injection temperature 210°C, column temperature 185°C, carrier gas flow 80 ml/min, and the quantity of the injected sample 10 /41.

RESULTS AND DISCUSSION

The samples of fatty and muscular tissue, liver and kidney of the examined animals were analysed only for chlorinated hydrocarbon residues. Due to the fact that chlorinated hydrocarbons are for the most part accumulated in fat, their residues in foodstuffs of animal origin represent the greatest problem. From the group of chlorinated hydrocarbon compounds, the residues of EHC, lindane, aldrine, dieldrine, heptachlor, heptachlor epoxide, DDT and its products of metabolism were determined.

The examination results for all samples of tissues and organs derived from both groups of hogs are given in Table 1.

	Without residues		0,001 to 0,005 ppm		0,005 to 0,01 ppm		0,01 to 0,05 ppm		0,05 to 0,1 ppm		0,01 to 0,3 ppm		0,3 to 1 ppm		Over 1 ppm	
	Number of sample	%	Mumber of sample	%	Number of samples	%	Number of sample	г %	Mumbe: of sample	r %	Wumber of sample	r %	Numbe of sampl	r %	Humber of samples	56
Lindane	5	2,7	24	13	60	32,6	78	42,4	7	3,8	5	2,7	5	2,7	ø	ø
BEC	5	2,7	26	14,1	49	26,6	83	45,1	12	6,5	8	4,3	1	0,5	ø	ø
Aldrin	158	85,8	13	7,2	8	4,3	5	2,7	ø	ø	ø	ø	ø	ø	ø	ø
Dieldrin	140	76,1	20	10,8	21	11,4	3	1,6	ø	ø	ø	ø	ø	ø	ø	ø
Heptachlor and its epoxide	136	73,9	30	16,3	16	8,6	2	1,2	ø	ø	ø	ø	ø	ø	ø	ø
DDT and metabolites	2	1,2	121	- 1	16	8,6	23	12,5	15	8,1	17	9,2	69	37,5	42	22.9

QUANTITIES OF INDIVIDUAL CHLORIMATED HYDROCARBON RESIDUES DETERMINED IN SAMPLES OF TIBSUES AND ORGANS OF HOGS

From Table 1 it can be seen that residues of DDT /presented collectively with its products of metabolism/,BHC and lindane were spread at the most. Residues of the last two pesticides were proved in relatively small quantities. Maximum established quantity of BHC amounting to 0.37 ppm was proved only in one sample, whereas in 45.1 percents of the examined samples the quantities of BHC ranged from 0.01 to 0.05 ppm and in 43.4 percents of samples the quantities were below 0.01 ppm. The values obtained for lindane ranged within approximately the same limits. Among all established residues, total DDT content was the highest - in 69.6 percents of the examined samples the established quantities ranged from 0.1 to 2.3 ppm.

Residues of heptachlor and its metabolite were not proved in 73.9 percents of the examined samples, residues of dieldrine in 76.1 percents and those of aldrine in 85.8 percents. In other samples in which they were present, the highest quantities were 0.05 ppm.

Results for each individual group of samples show that in samples of fatty tissue, muscular tissue, liver and kidney derived from the same animal, residues of the same pesticides but in different quantities were proved in general. It is observed that lindane and BHC were not proved only in 2.7 percents and DDT only in 1.2 percents of samples - in kidneys belonging to those animals whose other samples showed also relatively small quantities of residues.

Since DDT with its products of metabolism was proved in largest quantities, it is of interest to look at its disposition in the examined tissues and organs. From the total quantity tissue, about 22 percent to fat extracted

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from muscular tissue, about 2 percents to liver and about 1 percent to kidneys.

The results of blood analysis, compared with the results obtained by the examination of fatty tissues of the same animals, are presented in Table 2.

	Without residues		0,001 to 0,005 ppm		0,005 to 0,01 ppm		0,01 to 0,05 ppm		0,05 to 0,1 ppm		0,1 to 0,3 ppm		0,3 to 1 ppm		Over 1 ppm	
	Bleod	F .T.	Blood	F. 2.	Blood	7.7.	Blood	F.T.	Rood	F.2.	Mlood.	P.T.	Blood	7. 2.	Blood	F.T.
Lindane	12	ø	4	2	ø	5	ø	4	ø	3	ø	2	ø	8	ø	ø
BEC	12	ø	4	ø	8	6	ø	6	ø	3	ø	1	ø	ß	ø	ø
DDT and metabolites	3	ø	5	8	2	ø	4	ø	2	ø	ø	2	ø	8	ø	6

Tehle 2.

HUMBER OF SAMPLES OF BLOOD AND FATTY TISSUE OF HOGS WITH SPECIFIC AMOUNT OF BDT, HEC AND LINDARE

From the presented results it can be seen that residues of lindane and EHC were not found in 75 percents of the examined blood samples, whereas in other samples the established quantities were very small /to 0.05 ppm/. Explanation for this should be searched for in small quantities of the mentioned residues obtained in tissues and organs of the same animals. If the results obtained for residues of DDT are considered, it will be seen that in samples of fatty tissue the residues ranged from 0.1 to 2.15 ppm, whereas in 81.4 percents of blood samples they ranged from 0.001 to 0.1 ppm and in 18.6 percents they were not present at all. The fact that pesticide residues were proved in 81.4 percents of blood samples indicates to the possibility of obtaining in this way the data on contamination of animals. Having in mind that these data are obtained on alive animals, full attention should be paid to such way of controlling the pesticide residues. It is also encouraging that such results were obtained in animals in which the pesticide residues ranged in relatively tolerant quantities.

On the base of the afore-said, it is quite real to expect that blood of animals being contaminated to a higher extent, contains more residues. The analysis of blood made on time would prevent slaughter of highly contaminated animals.

Such results make also possible more certain diagnostics of animal poisoning with pesticides, what is very difficult due to atypic symptoms. In addition, there appears one more possibility in the study of metabolism of pesticides.

CONCLUSIONS

1/ Chlorinated hydrocarbon compounds are for the most part accummulated in fatty tissue and then in fat extracted from muscular tissue. In livers, kidneys and blood, they are found in smaller quantities.

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2/ Pesticide residues were proved in 81.4 percents of the examined blood samples. The data obtained by analysing the blood can serve as an indicator of contamination of animals.

3/ Further work should be orientated to the determination of correlation among the quantities of pesticide residues in blood and in animal tissues.

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