CONTRIBUTION TO THE STUDY OF RESIDUE MICRO - AMOUNTS OF DDT IN RAW AND PROCESSED MUSCLE AND FATY TISSUES OF PORK

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Introduction.

The food stuffs contamination with various undisirable substances is becoming a raising proble,. Various pesticides, hormones, antibiotics, thyrostatices, emulsifiers, different dyed and other substances, as well as the products of their degradation are refered to in literature, as residues in raw and processed meat. Ths ways of food stuffs contamination with the mentioned substances are different. However, it is characteristics for pesticides to enter the animal and man tissues mainly by oral administration with the food.

Relatively great number of authors has had for object of their research a problem of contamination of food stuffs by various pesticides. Claborn et al. (1, 2, 3) have reported that chlorinated insecticides, administered orally, are accumulated in the animal organism, especially in fat tissue. Having applied DDT during experiment, these authors have found that a large accumulation of it has appeared. Besides, this pesticide proved itself to be very persistent in this case. This persistence, depending on manner of treatment, lasted between 27 and 36 weeks in the fat. Similar effects were discovered by Finley, and Philmore (4), Cummings et al- (5), Harrison and Shanks (6), Kljajić at al.(10). Very illustrative data about contamination of food stuffs by various insecticides were given by Maier - Bode (7), Cook's Commitee of Ministry of Agriculture of Great Britain, Scientific Council of the President of the USA and by other authors.

From the above mentioned, as well as from some other data it can clearly be seen that the contamination by pesticides may take place not only in the products of the plant origin, but also in the products of animal origin. With the food stuffs of animal origin these data generally refer to the accumulation of persistent insecticides, especially to the accumulation of DDT and Lindane in fat and muscle tissues. Meanwhile, the above mentioned and some other literature approachable to us, did not give us any data on changes in pesticides residues or on some eventual influence of these residues upon physical, chemical and other properties of raw and processed meat. Hamm (11) points out that studies on these problems from the scientific point of view are at the very begining. At the same time this author emphasizes that it would be very interesting to examine what is further reaction of residues with meat materials like and, the way of their reaction in certain phases of processing and storage. We have tried to give in this work, in a sense, a contribution with regard to the DDT residues in raw andprocessed tissues of pork.

Materials and methods.

For these examinations samples were taken of 12 Large White breed pigs, cca 100 body weight. During the fattening period they were all fed the same way, and only 5 days before slaughtering six separated animals were fed diets to which 0,6 g DDT daily was added. The others (6 animals) which served as controls were fed with the same food stuffs with no DDT

added.

For the investigation of pesticide residues in raw and processed meat, muscles and fat tissues (in examined and control animals) the samples were taken from the definite anatomical regions (see table 1 and 2). For examination of the physical and chemical properties (Tab. 3) M. longissimus dorsi was used - that is the part between the 10th and 12th rib and the subcutaneous fat tissue from the same anatomical region.

Determination of pesticide residues was performed by gas chromatography method as follows:

After the extraction and clean-up of samples (8.9) a quantitative determination of pesticide content in the above mentioned tissues was performed. This determination was done by using the Gas-Liquid Chromatograph, Varian Aerograph, Dual. Pestilizer. Model 1745-1, with electron capture detector (250 mc H^3) and 5 foot x 1/8 inch Pyrex column containing 3% QF-1 on 100/120 mesh Varaport 80.

The following conditions were suitable to obtain a retention time of cca 10 min for p,p´-DDT, using the gas liquid chromatograph described: temperatures . column 185°C, detector 195°C, injector 205°C, flow rate of nitrogen 20 ml/min, recorder sensitivity 1 mv fullacale, attenuator setting 64, and range setting EC/10^{-10} amps.

Packed column with commercially prepared 3% stationary phase (QF-1) on 100-120 mesh Varaport 30 was used, or with column packing prepared as follows: weight 0.6 g of QF-1 stationary phase and disolve in 50 ml methylene chloride. Add this solution to 20 g Varaport 30 and let stand 10 min with occasional gentle stirring. Dry in rotary evaporator held in 30°Cbath, or heath on steam bath with occasional gentle stirring and remove residual solvent in vacuum oven at 30°C.

Carefully plug exit of column with small tuft glass wool and add coated packing material through injection port, using funel and plastic tubing and tapping column very gently during addition. Connect exit of the column with vacuum during addition. Pack to 2.5 cm bellow injection side arm and plug with glass wool. Condition column by heating 48 hrs at 240° with 5-10 psi nitrogen flowing through column before work.

For examination of physical and chemical properties of the muscle and fat tissues post mortem standard methods were used.

Results and discussion.

This experiment was performed in order to find out the effect of oral treatment on the degree of contamination in fresh muscle and fat tissues of pork with p,p´-DDT. On the other hand we wanted to investigate the changes of these residues in processed muscle and fat tissues. Finally, we examined the effect of total DDT residues upon some physical and chemical characteristics of these tissues.

The results on investigation of residues in fresh tissues are shoun in table 1.

From the results presented in Table 1 it can be seen that the distribution of total DDT, in mentioned tissues is in agreement with the results obtained by other authors. Namely, the highest amounts of all kinds of DDT were found in the leaf fat, somewhat less in the belly fat, while the quantities found in muscle tissues are considerably lower. All the differences

established in fat tissues of experimental and control animals are statistically very significant (P 0.01). However, this finding is of no importance for muscle tissues, as the established difference between the experimental and control animals refers only to the total DDT and p,p´-DDT, while differences for other metabolites in certain cases were significant only at a level of 5% (P 0.05), or were not significant at all.

The total DDT content, as well as the content of some p,p´-DDT metabolites in processed tissues are presented in Table 2.

When comparing the data from Table 2 and Table 1 certain differences can be found out regarding the content of DDT residues in fresh and processed tissues. For instance - while the quantities of the total DDT found in the fresh leaf fat were higher than in belly fat, after the technological process as it is evident from Table 2, the quantities of residues are higher in belly fat than in leaf fat lard. It could be presumed that this differences has occured under the influence of the technological process (higher melting temperature for leaf fat than it is the smoking temperature forbelly fat). This phenomen could be also explained by remaining of certain quantity of pesticide in the connective tissue which was separated after the leaf fat melting, while the connective tissue in belly fat was not separated. The same ratio can be established for the other metabolites, except for the p,p´- DDT which content was somewhat higher in leaf fat lard than in the leaf fat, probably as a result of degradation during the processing. Statistical significance of the results for the processed tissues is similar to that in fresh tissues.

TABLE 1. - The Residues of DDT in Fresh Muscle and Fat Tissue of Pork

Sample	Groups		Difference
	Experimental	Control	
I. Total DDT			
1. Eye Muscle	1.038	0.150	0.888^{++}
2. Belly Muscle	1.908	0.192	1.716^{++}
3. Belly Fat	7.370	0.218	7.152^{++}
4. Leaf Fat	11.120	0.282	10.838^{++}
II. p,p'-DDE			
1. Eye Muscle	0.125	0.025	0.100^{ns}
2. Belly Muscle	0.135	0.020	0.115^{+}
3. Belly Fat	0.670	0.032	0.638^{++}
4. Leaf Fat	0.756	0.118	0.638^{++}
III p.p'-DDD			
1. Eye Muscle	0.103	0.013	0.090^{+}
2. Belly MUscle	0.123	0.018	0.105^{ns}
3. Belly Fat	0.580	0.016	0.564^{++}
4. Leaf Fat	0.670	0.006	0.664^{++}
IV. p,p'-DDT			
1. Eye Muscle	0.810	0.112	0.698^{++}
2. Belly MUscle	1.650	0.157	1.493^{++}
3. Belly Fat	6.140	0.170	5.970^{++}
4. Leaf Fat	9.694	0.158	9.536^{++}

^{ns} - Not significant

$^{+}$ - Significant, P 0.05

$^{++}$ - Significant, P 0.01

TABLE 2 . - The Residence of DDT in Processed Muscle and Fat Tissue of Pork

Sample	Groups		Difference
	Experimental	Control	
I. Total DDT			
1. Cured-Smoucked Loin	1.496	0.720	0.776^{+}
2. Cured-Smoucked Muscle part of becon	1.670	0.585	1.085^{++}
3. Cured-Smoucked Fat part of Bacon	7.898	1.210	6.688^{++}
4. Leaf Fat Lard	6.848	ß.854	5.994^{++}
II. p, p´-DDE			
1. Cured-Smoucked Loin	0.260	0.035	0.225^{++}
2. Cured-Smoucked Muscle part of Bacon	0.174	0.065	0.109^{++}
3. Cured-Smoucked Fat part of Bacon	0.836	0.260	0.576^{++}
4. Leaf Fat Lard	0.686	0.204	0.482^{++}
III. p,p´- DDD			
1. Cured-Smoucked Loin	0.326	0.065	0.261^{++}
2. Cured-Smoucked Muscle part of Bacon	0.272	0.087	0.185^{++}
3. Cured-Smoucked Fat part of Bacon	0.662	0.145	0.517^{++}
4. Leaf Fat Lard	0.930	0.108	0.822^{++}
IV. p, p´- DDT			
1. Cured-Smoucked Loin	0.910	0.620	0.290^{ns}
2. Cured-Smoucked Muscle part of Bacon	1.220	0.432	0.788^{++}
3. Cured-Smoucked Fat part of Bacon	6.400	1.080	5.320^{++}
4. Leaf Fat Lard	5.232	0.542	4.690^{++}

ns - Not significant

+ - Significant , P 0.05

+ - Significant , P 0.01

TABLE 3. - The Effect of DDT Residues on Some Physical and Chemical Characteristics of Muscle and Fat Tissue

	Groups		Difference
	Experimental	Control	
I. Muscle Tissue			
1. Water Content (%)	72.83	73.01	0.18^{ns}
2. Fat Content (%)	2.77	2.98	0.21^{ns}
3. pH Value			
$-pH_4$	6.19	6.14	0.05^{ns}
$-pH_{16}$	5.92	5.93	0.01^{ns}
$-pH_{24}$	5.82	5.74	0.08^{ns}
$-pH_{48}$	5.74	5-68	0.06^{ns}
4. Water Holding Capacity (cm^2)			
WHC_4	7.58	7.25	0.33^{ns}
WHC_{16}	9.31	8.06	1.25^{ns}
WHC_{24}	8.81	9.46	0.65^{ns}
WHC_{48}	10.43	11.00	0.57^{ns}
II. Fat Tissue			
1. Free Faty Acid (%)	0.082	0.084	0.002^{ns}
2. Peroxide value	0.47	0.32	0.15^{ns}
3. Iodine value	46.74	45.78	0.96^{ns}

ns - Not significant

The effect of DDT residues on some physicaland chemical characteristics of mus le and fat tissues is ilustrated by data in Table 3. It is evident from these data that under conditions of our experiments, presence of the DDT residues did not influence the differences between physical and chemical characteristics in muscle and fat tissues taken from the experimental and control animals.

Conclusion.

On this basis of the results obtained the following conclusions may be drawn:

1. Significant differences are established in the content of p, p´DDT residues and its degradation products between the experimental and control animals, as well as between the fresh and processed tissues.

2. The influence of the p, p´- DDT residues and its degradation products upon

the examined physical and chemical characteristics in muscles and fat tissues has not been determined.

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