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A previous FDA pesticide surveillance program for FY 71 and 1st quarter of FY 72 showed the following levels of PCBs in various feeds and feed components:

Product	No. Samples[1/]	Percent Positive	Range of Positive (ppm)
Hays, natural	104	1	-
Hays, dehydrated	46	0	-
Silage	81	2.7	0.15-1.12
Grain, whole	105	0	-
Grain, ground	50	4.0	T-0.32
Cereal byproducts	43	0	-
Oilseed byproducts	41	0	-
Animal byproducts	25	8	1.08-1.32
Fish byproducts	23	35	0.2 -5.0

1/ Includes imports.

2. PCB-Containing Paints and Sealants

This problem was identified originally when the Ohio State Department of Agriculture detected PCB residues in milk samples from the Cincinnati milkshed. They traced the contamination to the walls of concrete stave silos which had been painted with PCB-containing paint. PCBs have also been used in silo sealants. [redacted] have [redacted] in [redacted]y, Tennessee, North Carolina, West Virginia and Pennsylvania; but information about the number of contaminated silos on a national basis is lacking.

Prior to 1968, one of the paints used to coat the interior of concrete-stave silos contained Aroclor 1254. [redacted] centered in Ohio and [redacted] in Tennessee, the material was only used to seal the joints between the staves.

Field studies by the Animal Science Research Division (ASRD), ARS, and the regulatory [illegible] Ohio and Kentucky suggest [illegible] with the silo wall coated [illegible] in the [illegible] is fed. The FDA-proposed guideline for PCB residues in milk is 2.5 ppm in milk fat. Invariably, a dairyman with PCB-contaminated silos will produce milk exceeding the guideline for at least that part of the year when silage is fed. Milk from four farms in Tennessee where only the silo joints were coated with PCB-containing paint has been examined by ASRD. The residue levels were about 5 ppm in milk fat when silage was being fed.

The Aroclor 1254 residues in silage occur mainly within 2 or 3 inches of the silo wall. As one progresses down the silo, it is possible to detect small amounts of PCB several feet from the wall. The levels of PCBs found in silage have ranged from 3.4 to 31 ppm within 4 inches and from 0.1 to 0.27 ppm from 6 to 24 inches from the wall (Skrentny et al. 1971).

In addition to paints and sealants for silos, PCB-containing paints, putties, and water-proofing compounds have been used on animal feed troughs and other surfaces. In one instance where a feed trough for swine was coated with a sealant containing Aroclor 1254, chips from the bottom contained 8000 ppm PCBs. Similarly finished feed transported in a newly painted hopper car contained 6.5 ppm of Aroclor 1248.

3. Plastic Materials

The PCB contamination of eggs from laying hens in New York State, which led to the incrimination of a bakery byproduct meal used in the laying mash, is an example of PCB contamination from plastic wrappings. It appears that the amounts of those materials ground up with the bakery byproducts were sufficient to explain the PCB contamination.

4. Heat Transfer Exchanger Fluids

PCBs have been used extensively as heat transfer exchanger fluids because of their high flash points. Leaks on a hot surface or into a furnace present a fire hazard with

B. Effect of PCBs on Animals and Transfer to Animal Food Products

1. Dairy

Fries (1971) has found that cows fed 200 mgs of Aroclor 1254 daily for 60 days produced milk containing 50 ppm of PCBs in the fat. When PCB feeding was stopped, the level in the milk fat dropped from 50 to 24 ppm in 10 days. Thereafter, the concentration decline was approximately 1% per day. Concentration of PCBs in the milk fat was not related to stage of lactation or level of milk production. Milk from cows fed uncontaminated silage can contain 1 to 2 ppm of PCBs in the milk fat.

Routine surveillance methods in the past have not been adequate to detect PCB levels exceeding the guideline in the individual dairyman's herd. Recently, FDA ordered sampling of all fluid milk for PCBs at the "farm pickup point" in the 50 states. Based on the results of FDA surveys, the overall milk supply does not present a significant health hazard to the general public. There may be a possible hazard, however, to the individual farm family if they consume milk produced on the farm. Assuming consumption of one quart of milk per person per day with an average contamination of 7.5 ppm in the fat, an individual could consume as much as 10 mg of PCB per year. Whether or not this level of intake over several years would constitute a health hazard is not known, but a total intake equal to 1/10 of the minimum short-term dose known to produce clinical defects in the Japanese experience could occur in a 5-year period at this rate.

Field and laboratory studies by ASRD indicate that the rate of dynamics of Aroclor 1254 milk secretion is identical to the residue behavior of the DDT metabolite, DDE. Aroclor 1254 is resistant to metabolic degradation, and it is transferred efficiently to milk fat or to body fat. It requires about 6 to 8 weeks to reduce milk residues by one-half after the cow is placed on clean feed. No practical method has been found for speeding up the decontamination of the animal. Charcoal appears to be somewhat effective in the prevention of absorption when fed with PCB-containing silage but has no value in removing body stores.

Cull dairy animals from farms with contaminated silos could be expected to have tissue residue levels of PCB exceeding 5 ppm in the fat. In general, the tissue residue levels would be similar in magnitude to the milk residue levels. Silage is not a significant feed for fattening cattle; therefore, it is probable that no other class of meat would be contaminated from this source.

Practical methods for handling the contaminated silos short of complete abandonment have not been developed. A feasible method would have to cost significantly less than the price of a new silo.

Temporary expedients have been attempted. Since most of the contamination is adjacent to the wall, some individuals have discarded the material within 3 or 4 inches of the wall. ASRD and the University of Kentucky have examined milk from several farms where this was attempted. Residue levels were reduced but did not consistently fall below the guideline.

A plastic barrier installed as the silo is filled shows promise as an effective temporary expedient. Very little PCB penetrates through the barrier; however, as in the case of attempting to avoid the material next to the wall, this method is impractical with mechanical unloading and one cannot be certain that the barrier will be used in future years.

PCBs are quite soluble in a number of nonpolar solvents. Thus, with the appropriate selection of solvent, it should be possible to wash most of the PCBs off the walls. Several silos in Kentucky have been washed with [redacted] (very hazardous, even if lead-free). This appeared to remove about 90% of the PCBs from the walls near the top of the silos. A thorough job of washing was not done, however, on the lower parts of the silos, and some milk residue levels were nearly as high in these herds as in untreated herds. This procedure should be studied in a more thorough manner and its techniques established.

Another method of removing the PCBs from the silos would be sandblasting. The cost of sandblasting has been established at more than half the price of a new silo

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and in many cases would exceed the depreciated value of the existing silo. Sandblasting also creates a significant dust problem; thus, it is possible that one would remove the PCBs from the silo wall but spread it to the other areas around the farm.

2. Poultry

Rehfeld et al. (1971) have recently reported that the maximum tolerance of chicks to PCBs, containing 48% chlorine, is approximately 50 ppm in the diet. Symptoms observed in chicks fed PCBs included depressed weight gain, edema, gasping for breath, hyperpericardial fluid, internal hemorrhaging, depression of secondary sexual characteristics, and an increase in liver as a percent of body weight. Several of these symptoms were present when levels of more than 20 ppm of PCBs were fed.

Scott et al. (1971) fed four levels (0.5 to 20 ppm) of Aroclor 1248 to White Leghorn hens for 8 weeks and measured the effect on egg production; egg breaking strength; fertility; hatchability of fertile eggs; feed consumption, and PCB content of eggs, adipose, and other tissues. No effect was observed on feed intake, breaking strength of eggs, or fertility. Egg production was reduced 10 and 13% after 8 weeks when 10 and 20 ppm of PCBs, respectively, were fed. At these levels, the eggs contained 3 and 7 ppm, respectively.

The two lowest levels of dietary supplemental PCBs, 0.5 and 1.0 ppm, resulted in plateau levels in eggs of 0.2 and 0.45 ppm, respectively, and 3.1 and 6.6 ppm in adipose tissue after 8 weeks. The ratio of PCB in eggs compared to that in adipose tissue of the hens ranged from 1:12 to 1:15.

The effect upon hatchability was more dramatic than egg production. The lower levels of 0.5 and 1.0 ppm of PCB produced no effect, but the 10 ppm level of PCB reduced hatchability in 4 weeks to 65 percent, and the 20-ppm level almost completely eliminated hatchability of the eggs. At this higher level, the embryos in eggs died during the 21st day of incubation.

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SURVEY OF RESEARCH IN AGRICULTURE

Adams - Looking for DDT, chlorinated hydrocarbons, and PCBs in rainwater.

Bevenue - Working on analytical method to determine residues in water and sewage.

Bowman - Working on method to separate from DDT and DDE.

Britton - Studies are being conducted to determine the levels of several of the PCBs which influence hatchability when added directly to the egg or when added to the diets of laying hens. Tissue and egg residues are being analyzed.

Cox - (1) Developed a method using chromous chloride reagent to distinguish toxaphene from PCBs, singly or in mixtures, in any substrate, but primarily in water.

(2) Tables of "p-valves" in several solvent pairs were determined for all visible GC peaks from five commercial Aroclors in order to provide an additional confirmation procedure for distinguishing pesticides from PCBs. Although different "p-valves" were obtained for p,p'-DDE and the PCB peak having the same GC retention time, the standard deviation of the method permitted too much overlap for reliable confirmation.

(3) During the analysis of 111 egg product samples thought to be contaminated with PCBs, it was found that a simple hexane solution from a Florisil column would separate PCBs from naturally occurring interfering substances in the eggs.

Crosby - Study the effects of sunlight on PCB when suspended in water and hydrocarbons. Found that there is a breakdown of PCBs.

Dahm - Several mink have been collected in the Iowa area and analysis of fat, brain, and liver for PCBs and chlorinated hydrocarbons will be made. Levels will be correlated with age.

Dorough - Found PCBs (Aroclor 1254) in sealant in silos. The milk from cows eating this silage contained levels of PCBs in excess of that considered safe by FDA.

Is this ok ?

Aroclor 1242 was extensively investigated in rats and Japanese quail and caused an increase in liver weight and liver lipids and lowered liver vitamin A concentration and content.

Aroclor 1254 has been used in silo coatings. ...In a detailed study of one herd, the rate of elimination of PCB residues from milk followed approximately the same kinetics as DDE. Treatment with activated carbon and/or phenobarbital did not enhance the rate of PCB elimination from cows.

Willett - Research objective is to eliminate PCB residues from a contaminated dairy herd by (1) covering PCB coating in silo; (2) elimination of fat pools in dairy animals; and (3) centrifuging milk to remove fat-soluble PCB contaminants.

Young - Analyzed PCB levels in diets, feces, and urine samples of preadolescent girls fed diets typical of low-income families. Also checked levels in paper bags, marking tags, turkey fat, heavy fowls, eggs, and poultry feeds.

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