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PCB Residues in Indiana's Milk Supply—An Emerging Problem

During the last four months, the Indiana State Board of Health has been reporting the presence of polychlorinated biphenyls (PCBs) in some Indiana milk supplies. The initial question is, "How did the PCBs get into the milk in the first place?"

To answer the above question, I would like to share some of my experiences involving PCBs with you. During my tenure with the Ohio Department of Agriculture, I did become involved with the PCBs problem relative to Ohio's raw milk supply and can convey to you some background information concerning this milk contaminant problem.

Most of you are aware that PCBs are commercially produced and are used primarily as heat transferring media in capacitors and electrical transformers. However, other uses for PCBs are as plasticizers, sealers, surface coatings and hydraulic lubricants.

Of importance, PCBs, when ingested, can be accumulated in the body fat. PCBs have been shown to cause live cell damage[1] and to induce liver enzymes which degrade oestradiol, a steroid involved in calcium physiology [2]. Therefore, the presence of a PCB in a raw milk sample at or above the 0.2 mg/l (whole milk basis) or 2.5 mg/kg ((fat basis) level is considered justification to eliminate that milk from the marketing channels.

The major PCB contamination pathway involved is as follows:

Epoxy (containing PCB) coated silo → fermenting silage → cow → adulterated milk

The sequence of events begins with the fermenting silage producing the leaching agent(s), acetic acid. The leached PCB collects at the bottom of the silo, thus contaminating the silage at that location site. The contaminated silage is fed to the dairy herd and metabolized by the individual cows. Principle accumulation of the PCB occurs in the body fat. However, during the milk synthesizing process, the PCB becomes translocated with the fat-like materials used in the fabrication of the fat globule and ultimately is excreted in the milk with some modifications of the PCB molecule.

An experience with one Ohio dairy herd provides some useful guidelines for natural elimination of PCBs from the cow's system. After the Ohio herd was identified as being contaminated with PCBs, immediate steps were taken to eliminate all contaminated feed and for the sequential 12 months the cows were fed uncontaminated feed. No aids or stimulants were used to increase the elimination of the PCB from the cow's system.

Initial individual cow PCB concentration levels were in the range of 0.3 up to 1.85 mg/l of milk. Approximately 60 to 90 days were required after contaminated feed withdrawal to return 70% of the lactating cows to producing milk for marketing purposes. At the end of 270 days another 20% was added to commercial production. Eight cows continued to show PCB concentrations above the actionable level near the end of the 12-month study. Thus, body residual PCB can be eliminated from the cow, naturally. The rate of PCB elimination is dependent upon the cow's dietary intake, individual metabolism and milk fat excretion rate.

Literature Cited:

1. American Industrial Hygiene Association, 1965. Amer. Industr. Hyg. Assn. J. 26:92-94.
2. Risebrough, R. W. *et al.*, 1968. Nature 220:1098-1102.

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