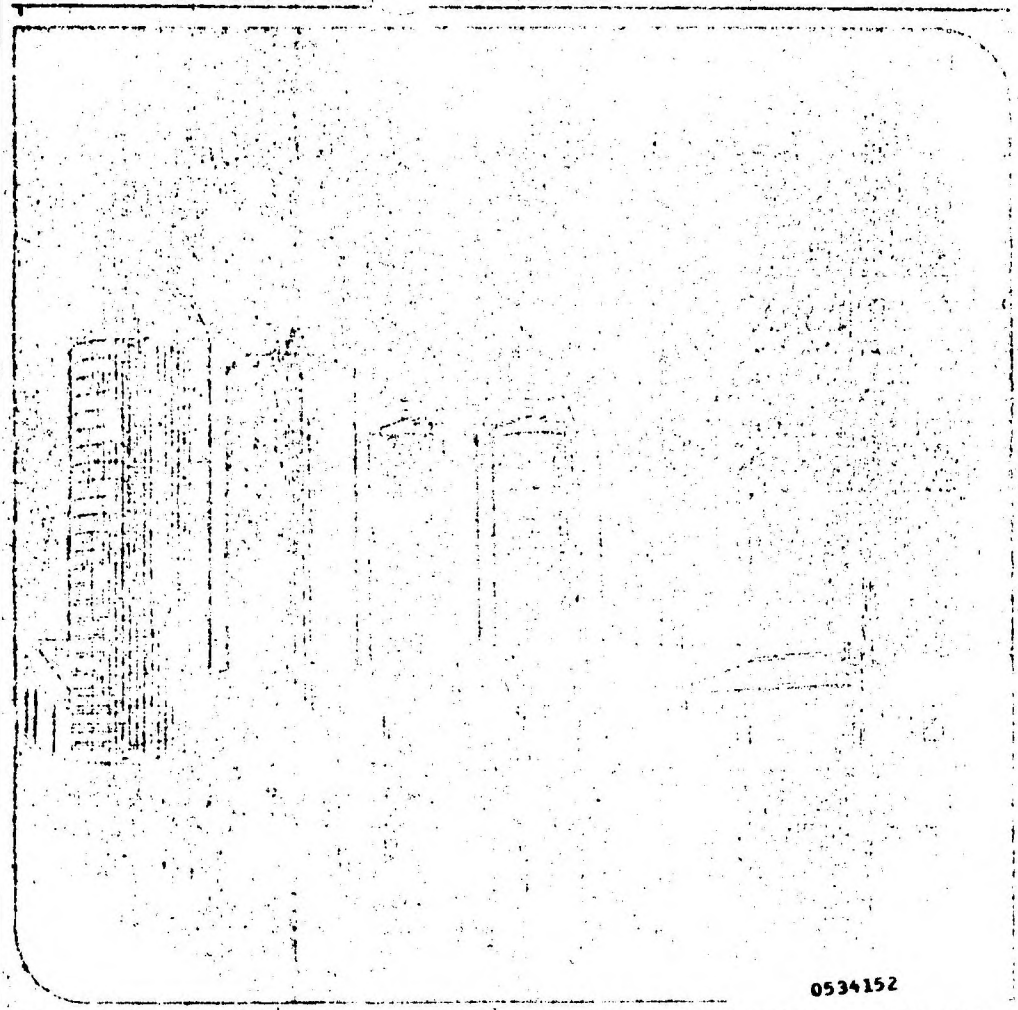
MILK RECORD

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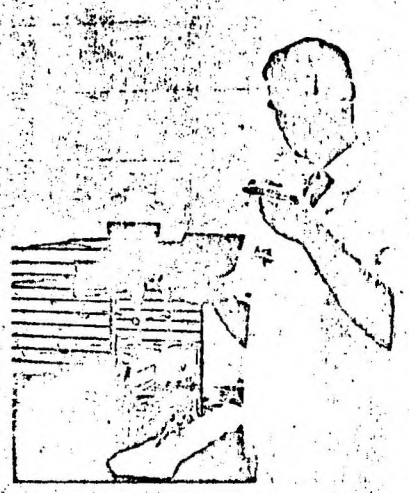


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PCB-ARCH0744958

BY DR. L. B. WILLETT
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Labatory pictures show Dr. L. B. Willett extracting the PCB residues from silage (at right) and preparing the extracted PCB residues for analysis by gas chromatography, with the help of Claudia Stellwagon, lab assistant.

A PROGRESS REPORT...

THERE'S great progress to report.

The results of the research program at the Ohio Agricultural Research and Development Center (OARDC) indicate that polychlorinated biphenyl (PCB) residues can be reduced in contaminated silos. These results have been achieved by carefully cleaning and re-coating the silo with materials that form a barrier between the silage and the silo wall.

This research is now being continued to determine if silage from these re-coated silos can be safely fed without contaminating the milk and also to determine if the coating continues to be an effective barrier when the silo is used continually.

In 1970, PCB residues were detected in the milk produced on a number of dairy farms in Ohio. The source of this residue was found to be a particular coating which has been used extensively to protect the silo walls from erosion and to prevent leakage. Authorities have estimated that 200 or more silos in Ohio, plus a number in other states, have been coated with this PCB-containing material.

The mechanism by which PCBs from Aroclor-containing coatings (Aroclor is the Monsanto trade name for PCB's produced in the U. S.) contaminate the silage, and in turn the livestock, was originally believed to be only mechanical—caused by flaking off of contaminated chips. It is not uncommon for these chips to contain 5,000 to 10,000 p.p.m. (parts per million) of PCB.

However, recent research at the University of Kentucky has shown that the PCB in the coating materials is soluble in silage juices. The problems caused by this residue are persistent, unless an effective barrier is placed between the silage and the silo wall.

Once applied to the silo wall, the PCB's penetrate into the concrete and slowly continue to contaminate the silage many years after all traces of the original coating are gone. Silos that were last coated with a material that contained PCB's 14 to 16 years ago can still cause contamination of the silage and, in turn, the milk produced by animals that consume it.

The replacement of contaminated silos with new ones would mean sizeable financial loss to dairymen. Therefore, in 1971, an extensive research program was initiated at OARDC to determine how effective various coating materials may be in preventing further PCB contamination of silage.

Thus far, 12 coating systems have been tested. These tests were conducted in test sections of a PCB-contaminated silo; on silo stave blocks in 55-gallon drums of silage;

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Research Shows Promise of Help on

and most recently in contaminated silos on dairy farms.

These studies have provided information about some of the necessary properties of coatings if they are to be used as effective barriers to PCB residues.

First, it is not desirable to use a coating which contains a solvent in which the PCB is very soluble. The solvent in the new coating can dissolve the PCB from the silo wall and simply makes it part of the new coating system. A solvent-based coating may actually make the contamination more severe than if no coating was used at all.

Second, the new coating should provide a thick barrier between the contaminated silo wall and the silage. This means that two or more coats of the material are necessary.

Three coating systems, of the 12 tested, appear to be very promising as a means to cover the previously contaminated silo surface. These are: (1) a hydraulic cement (not a sand and cement plaster but a special cement that forms a water-tight barrier) with an acrylic bonder; (2) a water-based epoxy; and (3) a furfuryl alcohol resin coating.

Testing of these materials is continuing and hopefully one or more coatings can be recommended for use *before the spring silo filling*. Using such materials could mean a savings of between 82 and 90 percent of the cost for replacing contaminated silos.

Possibly the most important aspect of re-coating a silo is the cleaning of the silo walls prior to applying the coating. *Coatings will not be effective unless a clean and solid surface is prepared*. Sandblasting would be an ideal means to clean the silo, however, the cost makes this method impractical.

Alternatives to sandblasting are wire brushing and high-pressure water (500 psi). The wire-brush method requires a great deal of labor. When high-pressure water is used, care must be taken to control the run-off so as to not contaminate streams or other areas on your dairy farm.

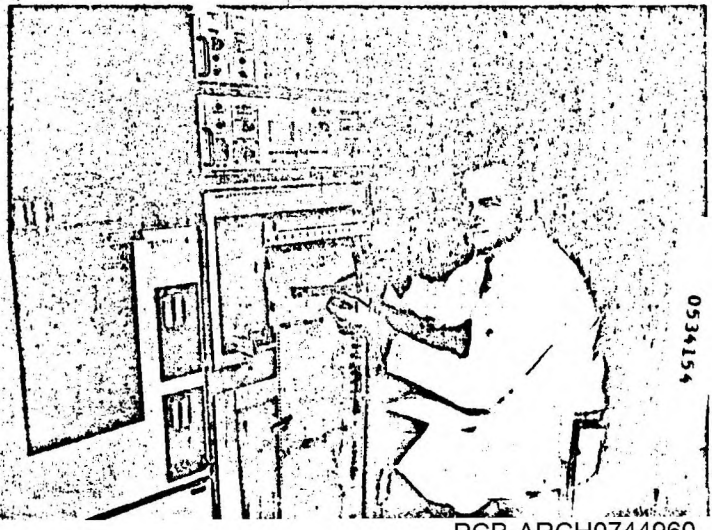
It is very important for you as a dairyman to be sure that a silo on your farm does not contain PCB residues. Recently the Food and Drug Administration *lowered the allowable tolerance for PCB in milk by 50 percent*. The new allowable tolerance or "actionable level" is 2.5 p.p.m. on a fat basis or 0.1 p.p.m. on a whole milk basis (4% fat).

If you suspect that your silo may have been PCB-contaminated—even if it was many years ago—contact your MILK, Inc. fieldman and arrange to have your silage and milk tested for PCB. The cost of these tests is fairly high, but not when you compare it with the cost of being excluded from the milk market.

If PCB residues are detected in your silage and the residue in milk is above the actionable level, stop feeding the contaminated silage immediately. Thoroughly clean the barnyard feeding area. Continue to feed the cows to maintain high production, and continue to milk the cows. When these procedures are followed, the amount of PCB in milk should decrease about 50 percent in 15 days. Thereafter, the decrease should be about 1 percent per day.

If, on the other hand, feeding is restricted in order to remove body fat from the animals, it will take much longer for the milk levels of PCB to decrease. Under restricted feeding, the body fat is metabolized (to CO_2 and water) but the PCB's are not, thus the concentration of PCB in the body actually increases.

Anyone wishing additional information about PCB's or our silo coating research should feel free to contact us at: Department of Dairy Science, OARDC, Wooster, Ohio, 44691. m



Dr. Willett studies the printout from the complicated gas chromatograph at OARDC. The Ohio dairy industry has made some direct contributions.

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