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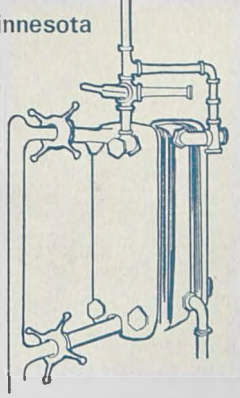
MINNESOTA DAIRY PRODUCTS PROCESSOR



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A number of contaminants are creeping into the food we eat, and it is very easy to be confused about them. The use of initial abbreviations for these compounds -- PBB, PCP, PVC, etc., adds to this confusion. Perhaps some background may help sort them out and, at the same time, help avoid similar problems in the future. Dairy products often figure strongly in this scene, but are far from the only foods involved.

Polybrominated biphenyls (PBB's)

PBB's have become one of the most tragic of food contamination problems ever to strike the U.S. In one catastrophe they have now accounted for the need to destroy 23,000 head of dairy and beef animals, 36,000 hogs, 500 sheep, and 1¼ million chickens. In food products the tally rises: 2,600 pounds of butter, 34,000 pounds of dry milk products, 1,500 cases of evaporated milk, 18,000 pounds of cheese, 5 million eggs! On top of all that 865 tons of feed had to be destroyed.

What happened?

The story seems to be an unlikely series of minor events followed by an accidental contamination of giant proportions. It took an accidental finding to discover what went wrong. Truth is stranger than fiction, so it seems. The sequence of events goes about like this:

1. A chemical company is producing a feed supplement for cattle. Its trade name: Nutrimaster. It is a white, granular chemical, magnesium dioxide.

2. The same company is also producing a fire retardant made up of PBB's. It goes by the trade name Firemaster (note the similarity in names). Usually Firemaster is a coarse brown substance. During some experimental work, several batches of Firemaster are ground into a fine white powder.

3. Usually the two compounds (PBB and magnesium oxide) are packaged in bags of distinctively different color combinations. This time a paper shortage causes the company to package both products in identical brown paper bags.

4. The PBB's are mistakenly shipped to a feed mill. No one discovers the error. The white powder is mixed into a number of animal and poultry feeds and sold to Michigan farmers. That was probably sometime in early 1973.

5. About March of 1974, one dairy farmer, concerned over the poor health and production of his dairy animals, determines to find out what's wrong. After one or two false starts, he sends feed samples to the National Animal Disease Center in Ames, Iowa for testing. There a technician places samples in a testing device and, during lunch break, leaves the equipment running. Returning, the technician discovers a strange new peak on the analysis graph. It turns out to be PBB.

In the animal and human body PBB tends to collect in the fat. There it is shed very, very slowly. Some experts say that the chemical will never be completely eliminated from the exposed Michigan herds. As to its toxicity, much is not known. Nonetheless one gauge of poisonousness is the amount needed to kill 50 percent of a group of test animals, usually rats. The test is given the name LD_{50} (lethal dose, 50 percent). By this method PBB comes off very well. Look at the LD_{50}'s of a number of chemicals. Keep in mind that the lower the number, the more toxic the compound.

Compound	LD_{50}
Caffeine (coffee)	200
DDT (insecticide)	285
2, 4-D (Weed killer)	500
Malathion (insecticide)	1,156
Table salt	3,000
PBB	21,500

In this test consider any value less than 5 as extremely toxic, 5-49 very toxic, 50-499 moderately toxic, 500-4,999 slightly toxic, 500-15,000 almost nontoxic. And there sits PBB at 21,500, almost nontoxic, far safer than salt or caffeine. But that's not good enough, of course, as the Michigan tragedy reveals. Aside from animal and poultry products, fish have also been found contaminated with this chemical.

Polychlorinated biphyenls (PCB's)

Close cousins of PBB's are PCB's. But close in chemical terms can mean a world of difference. For example, PBB's may be five times as toxic as PCB's, though the latter has been incriminated as a possible cause of cancer and birth defects. PCB's are also closely related to the insecticide DDT. No matter, polychlorinated biphenyls (PCB's) were first discovered as a contaminant of milk. It's easy to see how it happened. Prior to 1971, 40 percent of all PCB use was in products lost to the environment: as a plasticizer in plastics, as extenders in pesticides, in carbonless copy paper, hydraulic fluids, inks, adhesives, and...sealants. One such sealant ended up as a coating in silos. And so, after 40 years of use (and accumulation in the environment) a contamination problem was exposed.

PCB's also found use in heat transfer liquids and packaging material. When some heat transfer fluid leaked into rice oil, 1,000 Japanese showed up at doctors' offices with swollen eyelids, skin eruptions, and skin discoloration. They named it Yusho disease. In Minnesota, the same problem (leakage of heat transfer medium) resulted in contamination of fish meal, a feed of poultry. A large turkey poisoning occurred. More recently, PCB's were found in carp taken from Lake Pepin. They have been detected in 28 kinds of fish native to Lake Superior. They've also been found in COHO salmon. The company that makes the compound may halt production by 1980 even for such useful and relatively harmless applications as in electrical transformers and capacitors.

As late as February, 1977, FDA proposed a reduction of the tolerance of PCB's in food. In milk and manufactured dairy products, the level would be reduced from 2.5 to 1.5 parts per million (ppm) on a fat basis.

Polyvinyl chloride (PVC)

Polyvinyl chloride is commonly used as a packaging material -- one kind of plastic. It is also formed into water pipes. In the process of manufacture, not all of the vinyl chloride units always end up bound to each other. These unattached chemical links are called monomers. If inhaled, they can cause cancer. Not much is known about their toxicity, if eaten. PVC, the parent compound, cannot now be used as a food packaging material except where food contact is essentially nil. FDA has proposed a limit of 50 parts per billion (ppb) of the monomer in such packaging material. Canada has halted use of packaging showing "any amount." Since the compound is soluble in fat, fatty foods usually run the greatest risk of contamination.

Phthalates

These compounds follow logically behind PVC. They are a plasticizer of PVC plastic. They have been used in milk tubing and food wrapping, and some of the chemical has been found to leach into milk and other foods. So far it is not thought to be a serious problem. Phthalates apparently have extremely low toxicity. To date some 25 different esters (chemical derivatives of the compound) are allowed use in food packaging material. Again, these compounds are more soluble in fat than water. It is fatty foods that will pick them up.

Do you like that new-car smell? That's phthalate.

Pentachlorophenols (PCP's)

Yes, you've probably used these compounds to preserve wood for an outdoor patio or deck or what have you. They are also used as slimicides (to kill slime-producing microbes), fungicides, and to reduce foaming. They are used to coat paper cartons and wrappers. You might expect to find them in food containers, and here lies one potential trouble. They have already cropped up in candy bars wrapped with a single wrapper put on by a cold seal technique. Certain derivatives are used in adhesives, also found in food

containers. You may expect to hear of problems or threats of problems as time goes by. In Michigan, recently, eight dairy herds were found contaminated, some cows to 1,000 parts per million in the blood. Both meat and milk could be affected. Barn and feed bins treated with PCP may have been the cause, but to date no one knows for certain. Milk tested thus far appears to be "almost" clean. If you see the initials KTCP, or KPCP, those aren't radio station call letters. Rather are they abbreviations for potassium derivatives of penta and trichlorophenols. There are also sodium derivatives. Two other compounds are p-chlor metacresol, and p-chlor n-xylenol; thus PCC and PCX are two more in a growing list of shortened names of chemicals that may find their way into food.

Nitrofurans

There are four or five of these chemicals -- still called by full names. One is furazolidone. Others are nitrofurazone, furaltadone, and nihydrazone. All are suspected or known to have a cancer potential. They have been used in medicated feeds and also in mastitis preparations for dairy cows. Canada has proposed to ban five such nitrofurans. Their fate in the U.S. is still up in the air. Nonetheless you can readily see how a food - such as milk -- could be contaminated with them. The routes of pollution are many.

Hexachlorobutadiene (HCBC)

This compound is an industrial waste. In 1972, 10 million pounds of it were produced as a side product and had to be disposed of (recycled or dumped in landfills or deep wells). It has been found in fish and milk. Obviously some of it gets away into the environment.

PDCB

I have purposely not put a name to this evil-looking abbreviation, just to show how confusion arises. You will perhaps be frightened to learn that USDA gave permission for its use in sausage as recently as 1974. You see, it's partially defatted chopped beef. Initials can confuse.

Teat Dips and Udder Wash

And at the annual meeting of the Minnesota Mastitis Council a dairy farmer was overheard to say that he had mistakenly applied an udder wash -- full strength -- for a teat dip. The cows had been seriously burned. That's not the first time that has happened, and it likely won't be the last. It was the dairyman's wish that we pass the word along. We do so, hoping that all of us who have a role to play will renew our efforts to prevent this kind of thing from happening.

Source: Part of the information on PBB's was adapted from an article by Annabel Hecht in FDA Consumer 11(1):22-27. 1977.

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Trade names are sometimes used in this publication to clearly describe products. The use of a trade name does not imply endorsement by the Minnesota Agricultural Extension Service, nor does omission of other trade names imply nonapproval.

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