Toxicity tests: Chore only just begun

More than 60,000 chemicals are in use in the United States, and each year about 1,000 more are introduced into commerce. The National Research Council just published an extensive report confirming that relatively few of these chemicals have been extensively tested for toxicity, and most have been scarcely tested at all. "The study quantified what we strongly suspected," says the chairman of the NRC committee, James L. Whittenberger of the University of California at Irvine.

The committee compiled a list of 65,725 substances, including chemicals in industry, pesticides, drugs and inert ingredients of drug formulations, food additives and cosmetic ingredients. Available toxicity data were collected and analyzed for a subset of these substances. For about 70 percent overall, no toxicity data were available. Complete health hazard assessment was possible only for approximately 2 percent, and partial assessment for an additional 12 percent. The other categories were "minimal toxicity information available" and "some [less than minimal] toxicity information available."

Pesticides and drugs have undergone the most testing—complete health hazard assessment could be done on 10 percent of the 3,350 pesticides and 18 percent of the 1,815 drugs and inert ingredients that are mixed with them. Least is known about the almost 50,000 chemicals in commerce that are not pesticides, cosmetics, drugs or food additives. For none was enough information available for a complete health assessment. Furthermore, of 664 toxicity tests the committee examined, only 27 percent met its quality standards. The committee recommended that the National Toxicity Program employ a four-stage testing process for evaluation of chemicals, beginning with automated scanning of data banks and moving into greater reliance on expert judgment.

Doorway to oxygen binding

The convoluted structure of a myoglobin molecule gives no clues as to how oxygen approaches its well-buried binding site. Chemists have speculated that various parts of this iron-containing muscle protein change position, opening a door into a specific pocket. So investigators have searched for a molecule small enough to fit into the pocket but large enough to hold open the entry way. Such a "molecular doorstop" has recently been reported by Dagmar Ringe and Gregory A. Petsko of the Massachusetts Institute of Technology in Cambridge and David E. Kerr and Paul R. Ortiz de Montellano of the University of California at San Francisco.

The effective doorstop is phenylhydrazine, a small molecule containing a ring structure that binds to the iron in the myoglobin pocket. Insertion of phenylhydrazine forces aside four side chains in the myoglobin, say the scientists in the Jan. 3 Biochemistry. The resultant channel is large enough to allow an oxygen molecule to pass from surface to pocket. The researchers conclude, "Although this may not be the only channel to the iron atom, it seems likely that it is an important one."

The polyester look for cars and tools

A new material—twice as tough as any other polyester plastic—has been unveiled by the Du Pont Company of Wilmington, Del. Company scientists began with a resin called Rynite, which has been in use since 1978, and alloyed it with stretchable materials to increase its strength, impact resistance, temperature resistance and handling ease. The new polyester is called Rynite SST (for "stiffened super-tough"). Du Pont expects this resin to accelerate the substitution of plastic parts for metal ones in industry and in cars and other consumer goods. The weight of an automobile can be reduced 80 percent by going from metals to plastics, a company spokesman says.

Sausages—the spicy role of manganese

Lebanon bologna, pepperoni, summer sausage and the German "raw wursts" are all fermented sausages. Fermenting not only gives them their distinctive sour flavor, but also drops their pH to below 5, a level of acidity that discourages growth of disease-causing bacteria. To promote fermentation, most sausage makers now rely on a "starter culture" of lactic acid producing bacteria. In recent years, it has been observed that the efficacy of the starter culture can be tempered by the choice of spices added to meat. While some stimulate the bacteria, other spices — especially cloves and oregano — can severely inhibit the bacteria's acid production. Now two scientists at the Agriculture Department's Eastern Regional Research Center in Philadelphia explain that the key factor is manganese.

Manganese is essential to the growth of lactic acid bacteria, but its levels in meat are usually negligible. That a patent was granted in 1960 for adding it to fermentation starter cultures "shows that the importance of manganese has been reported—but somehow forgotten," observes Laura Zaika. Moreover, she says, "I don't think anybody has realized yet that spices can contribute this manganese." A paper by Zaika and John Kissinger in the January-February Journal of Food Science describes their inquiry into the role of sausage spices.

The scientists found that a spice's ability to stimulate lactic acid production was directly related to its manganese content. But oleoresins, which contribute a spice's flavor, are not stimulatory and may even sabotage acid production. They showed that one component of the oleoresins, essential oils, actually inhibits acid formation. In fact, Zaika says it's because essential oils compose such a large proportion of cloves, by weight—roughly 15 percent, versus a few percent in many of the other 20 spices they studied — that cloves can be such potent inhibitors of bacterial lactic acid production.

Zaika points out that there is a growing trend to use a spice's flavor extract whenever possible because "you can standardize your product much better with regard to flavor." Oleoresins have the added advantage of being sterile, which the commercial whole spices generally are not. "But if you're not using the whole spice in your fermented product," Zaika says, "then the manganese that would have been present in the spices may have to be replaced with a manganese salt." Not doing so could result in incomplete or slower fermentation, giving pathogenic bacteria a chance to grow.

Will Japan accept 'cold treatment'

Although the Environmental Protection Agency (EPA) has proposed phasing out the remaining uses of the carcinogenic pesticide ethylene dibromide (EDB) on food bound for U.S. consumption (see p. 151), this does not end the chemical's agricultural use within the United States. EDB fumigation of U.S. whole fruits destined for Japan will likely continue until the Japanese are willing to accept "cold treatment," EPA Administrator William Ruckelshaus told reporters last week.

Cold treatment, long established in this country, involves storing fruit for a week at 60°F, followed by 14.3 days at 33° (or somewhat longer at a slightly warmer temperature). Demonstrations of the technique on fruit bound for Japan confirm it is as effective as EDB at controlling pests, except on immature, early-season grapefruit, according to EPA's Richard Johnson. Problems with one such early-season shipment—where the fruit experienced mild skin deterioration—have left the Japanese wary, however. But that's not cold treatment's fault, says Tim Hatton, who helped refine the technique for the Agricultural Research Service in Orlando, Fla. Even without cold treatment, that shipment of fruit was just too immature and fragile to travel safely, he says, adding that the same damage occurred with *untreated* immature fruit sent to Europe.