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The Tris Controversy

The manufacture of infants' and children's sleepwear from fabrics containing the flame retardant tris(2,3-dibromopropyl) phosphate ceased in January 1977. The sale of such garments was banned in April 1977. The fear had been raised that hundreds of thousands of children who have worn Tris-treated garments have sustained damage leading ultimately to cancer.

The actions that led to the large-scale use of Tris and to its subsequent banning were taken in comparative haste. Disposing of the aftermath of the affair could occupy the courts for decades. Moreover, what has happened with Tris could be a forerunner of similar troubles for other products.

The next controversial issue with respect to Tris is deciding who pays for garments (worth \$125 million) left on the shelf after the ban. Far more difficult might be the legal problems that may arise later when some individuals who, having worn Tris-treated garments, develop cancer and, blaming Tris, seek redress in the courts.

The large-scale use of flame retardants for infants' and children's sleepwear began in 1973. To meet new federal regulations for flammability, most manufacturers chose polyester into which the retardant Tris could be dissolved by a heat treatment. Tris was cheap, effective, and tests seemed to show that it was safe.

About a year ago, however, biochemist Bruce N. Ames, using his *Salmonella*/microsome test, found that Tris is mutagenic. Subsequent experiments by others with animals showed that Tris could cause kidney cancer in mice and rats. Other experiments with rabbits showed that Tris could be absorbed through the skin. In one instance, ¹⁴C-labeled Tris was painted on a shaved rabbit's skin. In the next few days, a substantial fraction of the ¹⁴C was found in the rabbit's urine. In another test, labeled Tris was placed on polyester fabric and later in contact with rabbit skin in the presence of unsterile human urine. Subsequently, the rabbit excreted ¹⁴C in its urine.

It was on the basis of this chain of evidence that Tris was banned. There was no proof that Tris would cause cancer in humans or that the chemical when baked into a fiber would migrate from polyester through the human skin. However, considering the number of infants and children involved and the misery that cancer brings, the Consumer Product Safety Commission has no alternative but to stop the sale of Tris-treated garments.

When the controversies about Tris shift to the legal arena, some of the weaknesses in the chain of evidence are likely to be spotlighted. One that surely will receive attention is the applicability to humans of animal experiments. The strains of mice and rats employed had been bred especially to be cancer-prone. The untreated male mice employed as controls had an incidence of spontaneous liver cancer of about 50 percent. However, the incidence of spontaneous kidney cancer in these control animals was zero, and with large amounts of Tris, kidney cancer was observed. It was the male rat that was most susceptible to Tris-induced kidney cancer and this at Tris levels about 1 percent of those necessary to induce cancer in the male mouse. In calculating risk to humans, the incidence in the male rat is used. Does the susceptibility of humans resemble that of rats, mice, or neither?

Another question is, How many efforts have been made to detect transfer of Tris from garments through the human skin? The answer is that at the time the Tris ban was promulgated, observations on only two humans had been attempted. In neither case was transfer detected.

On the basis of the data available in May 1977, the hazards for humans of wearing Tris-treated garments are unknown. The hazards could be quite negligible. They might be enormous. Narrowing such a gap quickly will not be easy. There are too many unknown factors, such as the carcinogenicity of Tris for humans. We may have to await the passage of years to observe whether the incidence of kidney cancer remains unchanged or increases. And if there is an increase, we could not be certain of its cause, for other agents might be responsible.—PHILIP H. ABELSON