

A solution becomes a problem

**Hasty action against
phosphates leads to
a dangerous substitute**

No one denies that cleaning up the environment has become a national priority of increasing urgency. Sometimes the routes to cleanup seem to be evident. Most scientists agree, for example, that phosphates in detergents are a major contributor to eutrophication of waterways (SN: 12/27/69, p. 591). The answer to the problem seems obvious enough: Eliminate the phosphates and substitute harmless substances.

That such a program is a lot easier proclaimed than carried out became clear last week. Earlier this year, despite some uneasiness on the part of a few ecologists, detergent companies began to substitute nitrilotriacetates (NTA) for the polyphosphate builders in detergents (SN: 4/25, p. 408). The substitution was about five percent complete, with chemical companies supplying detergent manufacturers with 100 million to 125 million tons of NTA annually. Procter and Gamble and Lever Brothers have made commitments to replace, depending on the specific product, 25 to 100 percent of phosphates with NTA.

Last week Surgeon General Jesse L. Steinfeld and Environmental Protection Administrator William D. Ruckelshaus announced that studies at the National Institute of Environmental Health Sciences show that NTA, acting synergistically with cadmium or methyl mercury, causes increased mortality and teratogenic effects in rats and mice. Armed with these results, and earlier knowledge of chelating agents similar to NTA, the two men asked the detergent companies to take immediate steps to halt use of the additive. The companies agreed to do so.

What is surprising in the NTA story is that the substitution was allowed in the first place. Apparently pressures



Wide World

Ruckelshaus and Steinfeld announcing NTA's lethal synergistic effects on mice.

from environmentalist groups, and from the Federal Water Quality Administration (which now insists it asked for no specific substitute for phosphates) stampered the detergent companies into the action. But some scientists had warned against such precipitate moves and common sense should have prompted Government or the industry to go slower.

Dr. Steinfeld made this clear when he said last week that chelating agents used to treat heavy metal poisoning are "first cousins to NTA," and that the tendency of these compounds to combine selectively with metals—their chelating ability—is their very virtue in the detergents. The other half of the story, now so obvious in retrospect, is that it has been known for some time that methyl mercury (SN: 8/1, p. 96) and cadmium are common water pollutants.

What happens, according to the NIEHS report, is that NTA, itself not toxic, chemically combines with the mercury and cadmium in ambient water. Then when these new compounds are taken into organisms, the toxicity of the metals is greatly enhanced.

Cadmium chloride alone in rat tests was not lethal to fetuses at a dose of four milligrams per kilogram of body weight; combined with NTA, however, there was 55 percent fetal mortality from the same dosage. At eight milligrams per kilogram of body weight, cadmium chloride was not lethal to the female rats; with NTA, the maternal mortality was 100 percent.

Methyl mercury at six milligrams per kilogram with NTA produced 53 percent mortality in fetuses; without NTA, five percent. The latter figure is similar to the mortality rate in control rats. Dr. Steinfeld suggests that addition of the NTA apparently makes it far easier for

the metallic compounds to cross the placental barrier.

One happy aspect of the story is that NTA is biodegradable, a generally agreed upon criterion for detergent builders for some years. Thus it is changed to simpler, non-chelating, compounds at a rapid rate, especially in a good sewage plant. The degradation is carried on by aerobic bacteria, however. This produces a special menace in anaerobic situations, such as where effluents from septic tanks seep into well water. Ruckelshaus and Dr. Steinfeld strongly recommended that NTA-containing products not be used where this situation exists. Otherwise, however, they did not recommend removal of NTA-containing detergents from grocery shelves. They pointed out that at present levels of use, ambient amounts of NTA are still far under the danger level.

The problem now becomes one of finding another phosphate substitute, and nothing looms on the horizon. Organic polyelectrolytes, for example, are not normally biodegradable, and when altered to increase degradability, they lose much of their value, according to Procter and Gamble. A return to soap, with possible additives to increase efficiency, is difficult because there may not be enough tallow to make it.

Problems analogous to the detergent one face modern man in other areas. Substitution of aromatic hydrocarbons for lead to upgrade gasoline octane ratings is one example: Scientists still are uncertain about the toxicology of the aromatics. The answers may lie in changing a way of life that perhaps puts too much emphasis on nonessentials. Lower-compression engines and tell-tale gray shirts, for instance, are not lethal. □