Pesticides — Changing An Image

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THE WORD "pesticides" has carried a disgusting connotation in recent years, and more often than not it causes even the most stoic person to frown. Such phrases as "chemical plow" and "weed killers" have been replaced by "biocides," "plant exterminators," and "potential baby deformers." "Toxic threshold" leaves one clutching his throat and gasping for air. Enough negative rhetoric.

Toxic threshold may well be defined as the dose level of a test material below which toxic effects are not observed. This practical concept has been seriously challenged by the opposing concept of zero tolerance. From long experience, however, a fundamental fact emerges: In large enough doses, all chemicals, natural and synthetic, are capable of causing toxic symptoms in animals. The more important aspect is how much is required to cause toxic effects and under what conditions they occur. To illustrate — ordinary oxygen is essential for life and commonly is considered non-toxic, but too much oxygen administered to a premature baby can cause blindness. Too much oxygen, therefore, is toxic. Similarly, water is essential to life, but in the lungs can cause death. Vitamin A is a necessary part of our diet, but too much (as well as too little) can cause illness. Table salt taken in large quantities can be fatal, yet we consume it every day.

The proof of zero risk is patently impossible, both logically and scientifically, and strict application would impoverish the store of chemical tools now used to control dangerous pests and improve the environment.

Any substance may be toxic at some concentration or in some volume, and laws requiring proof of absolute freedom from toxicity are pointless. Chemists are now able to detect quantities of toxic materials so minute that their findings may be of little more than academic interest. One part per billion, for example, is equivalent to one minute in 1901 years and one part per trillion to about one minute in 1,901,000 years. It was neatly said by Paracelsus at the end of the Middle Ages in a Latin phrase that may be loosely translated, "The toxicity of a substance is determined by its dosage."

The converse is also true. Chemicals normally considered toxic or poisonous have some dosage below which they cause no harmful effect. For example, the poison arsenic is used safely as a medicine.

The majority of agricultural pesticides are used correctly and safely.

TABLE 1

Characteristics of a Disposal Tank

Dimensions — 12 feet × 30 feet × 4 feet deep

Construction — 8-inch reinforced concrete walls and bottom.

- Install a raised fixed cover of opaque corregated fiberglass which slopes to prevailing sun and with sufficient overhang to prevent rain from entering. Design cover to withstand maximum wind velocities for region where located.
- Enclose the disposal tank with 1/2-inch mesh hail screen attached to cover support posts, to keep children and animals from entering and debris from collecting on the tank surface.
- Install an enclosed wash rack for equipment in an adjacent structure with drain connected through a sump pump for disposal of wash water from spray tank and equipment. Wash rack must have a cleanout trap for removal or soil and other debris from equipment.
- Install a recirculating pump with a mist system for improved evaporation in more humid climates.
- Install tile around the base, and provide adequate sampling tubes to conform to federal and state monitoring regulations.
- Design capacity to needs based on environmental conditions of the region and state and local regulations.

Orientation —

- Full south and west exposure to sun and wind, which maximizes evaporation.
- Raised above ground to prevent flooding by surface water from heavy rains.

Contents —

- Two 1-inch layers of course gravel with a 1-inch layer of field soil containing an excess of 3-percent organic matter in between.

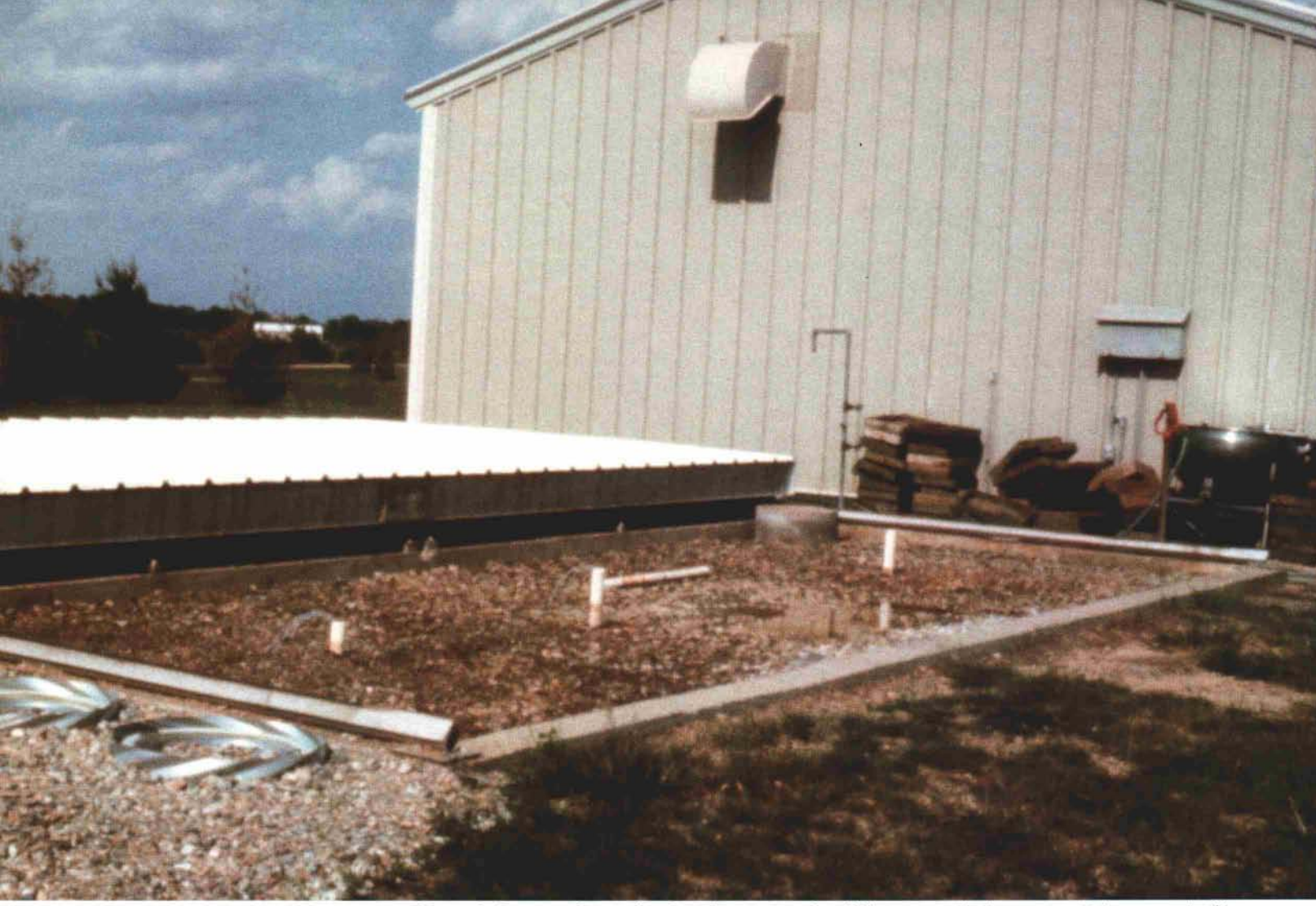


Figure 1. Concrete disposal tank with automated mobile cover and adjacent pesticide storage facility.

Poisonings and injuries from chemicals are very insignificant when compared to other industries, as pointed out by data gathered by the National Clearinghouse for Poison Control Centers.

Prepared by the Department of Health, Education and Welfare (HEW), *Table 2.* gives the number of deaths by age due to accidental poisoning by pesticides, fertilizers, and plant foods. The category "pesticides" includes rodenticides.

TABLE 2

Age	1970	1971	1972	1973
under 5	14	14	18	10
5-14	6	7	2	3
15-24	5	6	4	5
25-44	5	5	4	5
45-64	4	5	4	4
65 and over	10	6	6	5
Total	44	43	38	32

The number of deaths due to pesticide poisonings was relatively moderate even before the new generation of pesticides became available and arsenicals were still in common use. Carrying the data back to 1965, we find the total at that time was 65. In 1946 it was 77. Thus, there has been improvement, possibly from better safety education.

The hazard generally appears to be comparable to, and not more serious than that of common household poisons. The greater hazard is not to the user and not to the innocent bystander but to children, who should not be allowed access to the materials. Remember as well that the information prepared by HEW includes the agriculture industry as a whole. Similar data specifically detailed to the turfgrass industry would conjure up numbers so minute they would defy the Federal Agencies to find them. The barometer that measures fear and distrust continues to climb despite the proliferation of data that assures the general public of the integrity of the green industry, its concern for the environment and public safey, and its respect for pesticide legislation. What, then, can one individual do to help curb the unwarranted fear disseminated by doomsday alarmists? Know and understand how you are affected by state and local regulations, as well as the U.S. Environmental Protection Agency. Be certain of the principles involving pesticide use and storage. Understand the nature and handling of pesticide wastes and container disposal. Also, provide a system for safe disposal of pesticide wastes and rinsates.

Handling Wastes

Often pesticide wastes, which require special disposal facilities, are in a diluted form and result from rinsates from containers, spray tanks, and equipment wash water. These may originate from the small applicator or large commercial operator. Such wastes should be sprayed on an area for which they are labeled or placed in a safe disposal facility. Fairly large volumes of diluted mixtures at rec-

ommended concentrations occasionally result from overestimating the amount needed for a spray operation, and it must be discarded. For such operations, safe facilities or procedures are essential to protect human health and environmental safety.

If a hazardous chemical such as toxaphene is used, the waste should be properly contained because it requires many years to degrade. Most organophosphates and herbicides are readily biodegradable, however, and they can be spread on land in accordance with label recommendations. In all cases, disposal must be in accordance with the Federal Resource Conservation and Recovery Act and state and local regulations.

Pesticide wastes can and should be minimized by carefully calculating the precise amount of pesticide needed and then applying that entire amount on the area of intended use. All liquid containers should be triple rinsed, punctured, and disposed of in an authorized solid waste facility or properly recycled. Paper bags, plastic containers, etc., should be properly burned or taken to an authorized solid waste facility where state and local regulations permit.

In cases where pesticides are discontinued, banned, flooded, out of date, contaminated, or fire damaged, it is necessary to dispose of concentrated or formulated compounds. These are abnormal situations, and the State Department of Environmental Quality and the U.S. Environmental Protection Agency officials provide assistance in such emergencies. They should be notified immediately as required by federal and state law. In many such cases disposal can be accomplished over a period of time by dilution, containment, biodegradation, and evaporation. Combustion may be the most satisfactory method for non-biodegradable materials.

The problem of disposal of long term residual materials is not as important as it was 10 years ago due to discontinued use, better planning, high cost of chemicals, and use of more rapidly biodegradable pesticides. Some pesticides currently in use biodegrade so fast they are limited in effectiveness. However, it is important that nonbiodegradable chemicals be properly contained in accordance with federal regulation until they can be disposed of in an approved manner.

Safe Disposal

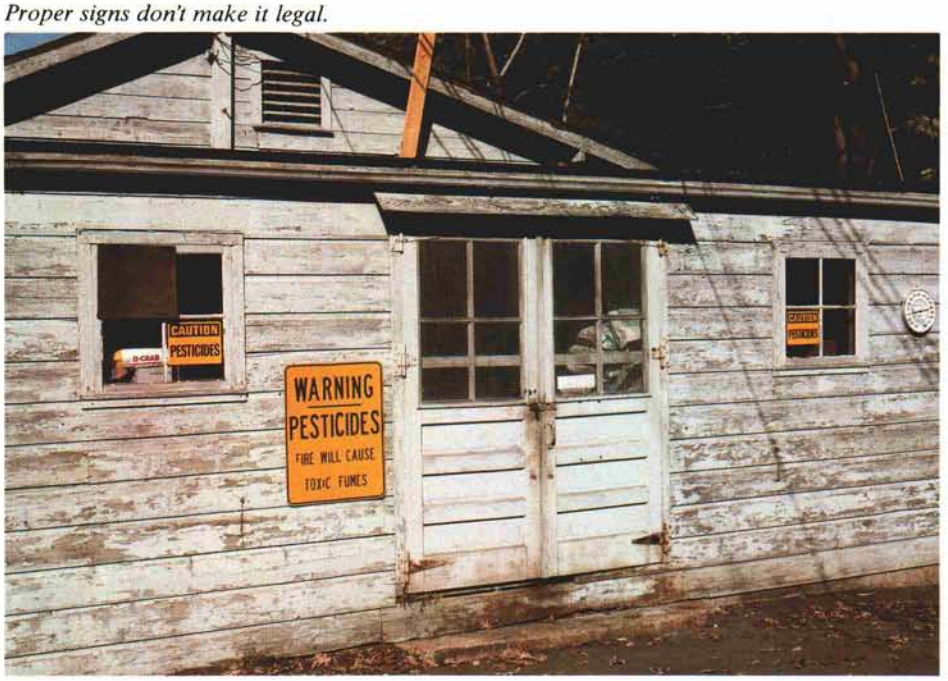
A disposal tank *(Figure 1.)* used at the Iowa State University Horticulture Station since 1970 was designed to contain surplus diluted insecticides, fungicides, herbicides, and growth regulators from spraying operations for fruit, vegetable, ornamental, and turfgrass research plantings. The farm consists of 229 acres with diversified plantings. Therefore, the operation is typical of many agricultural research and development centers located throughout the United States since it uses a wide variety of different pesticides that generate small quantities of concentrate and larger amounts of dilute pesticide mixtures. The disposal system was constructed to provide a safe and satisfactory solution to the problem of such wastes. Waste from over 45 pesticides was disposed of in the concrete tank between 1970 and 1976. Many of them, such as benomyl, bensulide, carbaryl, chorothalonil, 2, 4-D, dicamba, glyphosate, malathion, maneb, and MCPP are commonly used on golf courses.

Research involving six different university departments was sponsored by the U.S. Environmental Protection Agency over a three year period to evaluate the effectiveness of current disposal methods and to develop new systems. In addition, evaporation of dilute pesticide mixtures from a holding tank was compared with water evaporation from a standard weather evaporation pan and correlated with temperature, relative humidity, sky conditions, wind direction and velocity. Evaporation models were developed for predicting evaporative disposal needs for other geographic regions. Also, checks were made for leaks and air pollution.

Research results revealed that the concrete tank at the Horticulture Station didn't leak, didn't present a hazard of air pollution, and allowed chemical and microbial degradation of the deposited materials. The concrete tank, 12 feet × 30 feet × 4 feet deep, filled with a layer of gravel, 1 foot of soil, and another layer of gravel, was effective for evaporation of approximately 6,000 gallons of liquid wastes between April 1 and October 15. The soil layer within the tank contained relatively normal aerobic bacterial activity during that period. No chemical pollution was detected in the sampling tile located beneath the tank, in the well 50 yards away, or in the lake 1,000 yards downgrade from the disposal site.

Other containment systems, such as plastic lined pits, have been very questionable. There often appears to be some leakage or fluctuation of the liquid level. There is also continual danger of rupture of such liners by mechanical injury, chemical interaction and rodents, which could result in contamination of subsurface water where the water table is high. Even several layers of plastic could be inadequate for long-term containment. The problem would be less severe for most commonly used agricultural pesticides in more arid regions, especially

Proper signs don't make it legal.

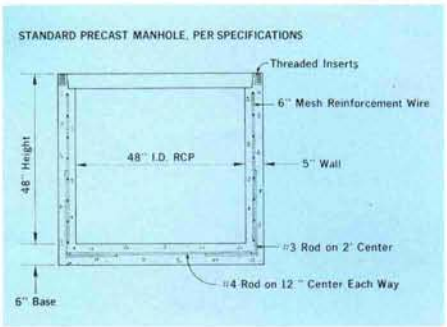


where the water table is 200 feet to 300 feet deep, with a deep clay subsoil layer between. However, local regulations must be considered in each case to ensure environmental safety.

Current Status

Based on research sponsored by the E.P.A. and long-term experiences at Iowa State University, some essential components of safe disposal of agricultural pesticide wastes were: 1) dilution, 2) containment in a structure that will not leak, overflow, flood, or otherwise pollute the environment, 3) evaporation of the water, and 4) biodegradation of most compounds.

This particular system is too large and elaborate for most golf courses, nurseries, and small parks. However, a precast concrete microtank was installed at the I.S.U. Horticulture Station in 1983 which may serve as a model for such small individual operators *(Figure 2. & 3.)*. The same functional components used in the microtank were incorporated to provide maximum evaporation, biodegradation, and environmental safety. Previous attempts to use plastic, fiberglass and other containers were unsuccessful because of freezing, thawing and rupturing problems in winter. This precast structure can withstand those conditions and incorporates the gravel-soil-gravel system used previously. The cover is similar to that suggested for the large tank and pipes are installed to permit sampling for leakage. Multiple units could easily be installed depending on evaporative needs and local evaporation rates. The same precautions should be used to avoid flooding and maximize evaporation. Also, similar precast concrete units should be available from local concrete products companies throughout the country at a rather nominal cost.



(Above) Figure 2. Structural specifications for a modified precast manhole structure. Tile for sampling should be located beneath the structure. (Top) Figure 3. A properly installed microtank at Iowa State University Horticulture Station. A reasonable approach to pesticide disposal for any golf course.

The large tank has been in use since 1970 and disposes over 6,000 gallons of pesticides wastes, rinsates and sprayer wash water each year. No contamination of surrounding soil, water or air has been detected. The system is obviously environmentally safe and could easily and inexpensively become an integral part of any golf course pesticide operation.

The alarmists have had their say. Rules and regulations will not go away. The best recourse for the green industry is to be heard and be seen. Counter the doomsday prophecy with factual information concerning the need for pesticides and their low risk to the environment when they are used correctly. Follow existing rules and regulations to the letter, and go one step further by employing a safe, environmentally sound disposal system as part of your pesticide operation.

Acknowledgement

Information from the American Chemical Society, Cornell University, Iowa State University and the Green Section files was liberally used in the preparation of this article. The author appreciates their contribution, especially that of Dr. Charles Hall, department of horticulture, Iowa State University.