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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-199618

AUGUST 5, 1980

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The Honorable Douglas M. Costle
Administrator, Environmental
Protection Agency

Dear Mr. Costle:

SUBJECT: Need For a Formal Risk/Benefit Review of the Pesticide Chlordane (CED-80-116)

We have been reviewing the adequacy of the Environmental Protection Agency's (EPA's) regulation of pesticides used in and around the home. During our review we found that chlordane, a pesticide used for subsurface ground injection for termite control, may pose unreasonable risks to man and the environment. We believe EPA should initiate a formal risk/benefit review of chlordane's use for termite control to determine whether the pesticide's registered uses should be limited or canceled. Additionally, we believe EPA should determine whether the health of people living in certain types of homes treated with chlordane is adversely affected and work with other Federal agencies to take appropriate actions to reduce risk to public health.

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PESTICIDE REGULATION

EPA is the primary regulator of pesticides. Its authority is contained in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 136 et seq.), as amended and the Federal Food, Drug, and Cosmetic Act of 1938 (21 U.S.C. 301 et seq.), as amended. Under FIFRA, a pesticide can generally not be sold, shipped, or delivered unless EPA has registered it. FIFRA further provides that EPA can only unconditionally register a pesticide if it determines, among other things, that the pesticide will perform its intended function without, causing

> "* * *any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."

The 1972 amendments to FIFRA require EPA to insure strict human health and environmental protection from

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pesticides. In 1975 EPA began a rebuttable presumption against registration (RPAR) process to weigh the risks and benefits of pesticides suspected of causing serious health or environmental problems.

A pesticide must meet certain "risk criteria," before it enters the RPAR process. These criteria (40 CFR 162.11) include short-term and long-term risk levels (whether a pesticide causes cancer or mutation in humans or laboratory animals) and whether an antidote or emergency treatment exists for those exposed to the pesticide. If EPA determines that a pesticide meets at least one of these criteria, it publishes a RPAR notice in the Federal Register announcing a risk/benefit review. Registrants who wish to maintain registration of an existing pesticide or applicants who wish to register the pesticide can then submit evidence rebutting the presumption. Rebuttals can be based on proof that actual exposure to the pesticide does not cause the effects described or that the study(s) supporting the presumption is not valid.

If the risk presumption is rebutted, EPA terminates the process and does not take regulatory action against the pesticide. If the presumption is not rebutted, EPA develops and gathers risk and benefit evidence for the RPAR pesticide. EPA uses this information for risk and benefit analyses. From these analyses, EPA determines risks associated with specific uses. If necessary, EPA develops regulatory options, such as cancellation or restricted uses, reduction of troublesome ingredients or problem contaminants, or new or revised methods of application, to reduce risk associated with the pesticide use. EPA also analyzes the costs of the various options. One, or several, of the options becomes the RPAR decision when approved by EPA's Administrator. Affected parties may appeal the decision through EPA's administrative hearing process, and then, if not satisfied, through the Federal court system.

## CHLORDANE'S HISTORY

Chlordane was introduced in 1945 and became one of the most widely used household and garden pesticides. It kills a wide variety of pests. In 1974 about 21 million pounds of chlordane were produced, about half of which was used to control termites and the remainder used for agriculture and home uses, such as controlling insects and crabgrass.

Studies by the National Cancer Institute, Department of Health, Education, and Welfare (now the Department of Health and Human Services), 1/ and other researchers showed that chlordane caused cancer in mice. Therefore, on November 18, 1974, EPA issued a notice of intent to cancel all registered uses of chlordane, except for subsurface ground insertion for termite control, its major use, and the dipping of nonfood plants (such as ornamental shrubs), a minor use. The notice stated that the excepted uses "achieve the desired control of insects without apparent unreasonable environmental contamination." According to EPA's Office of General Counsel, the decision to continue using chlordane for subsurface termite control was not based on a risk benefit review but was an administrative decision based on available information.

On December 23, 1974, the Velsicol Chemical Corporation, chlordane's manufacturer, filed objections to the notice and requested a public hearing. After lengthy cancellation proceedings, representatives for Velsicol and other parties involved in the proceedings, signed a "settlement agreement" in early March 1978, which canceled, either immediately or over 5 years, all chlordane uses except for subsurface ground insertion for termite control and the dipping of nonfood plants.

Although 21 million pounds of chlordane were produced in 1974, current information on chlordane's uses is not available because of confidentiality restrictions on production data. However, as a result of the 1978 settlement agreement, chlordane's major use according to EPA's technical product manager is for termite control by professional exterminators. Chlordane is also available to the public. The 1978 agreement allowed the public to continue using 1.5 million pounds annually for termite control, provided that chlordane products are distributed in minimum one-half

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1/"Memorandum of Alert-The National Cancer Institute, Oct. 21, 1974." (Preliminary results showing carcinogenic activity in the livers of mice.) Final Report: "Bioassay of Chlordane For Possible Carcinogenicity," (DHEW Publication No. (NIH) 77-808, 1977).

gallon containers and labeled for termite use only. 1/ At the lowest formulation rate of 2 pounds of chlordane per half gallon, 750,000 half gallon containers could be sold to the public annually.

Although chlordane is presently the most widely used pesticide for termite control, other pesticides are also registered for this use. Additionally the Forest Service, Department of Agriculture, has developed alternative methods and pesticides for termite control which are being used on an experimental basis. We have not evaluated the relative risks of other registered or experimental pesticides. We noted, however, that three presently registered alternatives --aldrin, dieldrin, and heptachlor--are chemically related to chlordane and all three have also caused cancer in laboratory animals.

## CONCERN ABOUT CHLORDANE CONTAMINATED HOMES

Since the early 1970s, the Air Force has had problems with chlordane contamination in military housing where chlordane has been used for termite prevention or control. The housing involved homes built on concrete slabs with heating ducts in or below the slab. According to EPA's General Counsel, EPA has been aware of some of the Air Force's chlordane problems but did not consider them in reaching the 1978 settlement agreement. EPA and others have also noted similar chlordane problems with plenum housing construction.

Chlordane contamination of housing is a serious matter because chlordane has been determined to cause cancer in laboratory animals and is a suspected human carcinogen. Also, neither EPA nor the National Academy of Sciences have been able to determine a safe chlordane exposure level in houses.

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1/Chlordane in smaller containers is allowed for sale until stocks packaged before various cut-off dates are sold. After these products are sold, no new products will be allowed to be sold to the public in less than one-half gallon containers.

Air Force studies on
chlordane contaminated homes

The Air Force's first major chlordane problem surfaced in 1972. In response to an occupant's complaint of an unusual odor, the Air Force sampled four homes at the Wright-Patterson Air Force Base, Dayton, Ohio. The samples showed that chlordane was present on floors in each of the homes. Following further complaints of odors, in 1974 and 1975 the Air Force monitored chlordane levels in the indoor air of 566 homes (mostly new) at Wright-Patterson and 187 homes at six other Air Force bases. Included in the 187 were a control group of 22 homes which had not been treated with chlordane for termite control.

The Air Force took 774 air samples in the 753 houses--all homes were sampled at least once--and found more than trace amounts of chlordane in 62 percent of the air samples. Chlordane was not detected in the 22 control homes. Subsequently, the Air Force sampled the air in 800 new homes and found they all contained chlordane.

Complaints and monitoring data revealed widespread chlordane contamination at Wright-Patterson. Therefore, in October 1974, the Air Force sought comments from EPA on the toxicological significance of the chlordane levels in Wright-Patterson housing and assistance in setting standards for acceptable chlordane levels in family housing. According to an Air Force internal document describing initial contacts between Air Force and EPA personnel, EPA officials were primarily concerned with the suspected carcinogenic property of chlordane. Also, EPA officials indicated that no level of exposure could be considered safe for family housing.

At a November 1974 meeting between EPA and Air Force officials, including the EPA Assistant Administrator responsible for pesticide programs and the Surgeon General of the Air Force, EPA officials indicated they were primarily concerned with regulating future use of chlordane and not conditions resulting from past use. EPA was also concerned with the risk to the unborn baby and the nursing infant. EPA suggested mothers occupying these quarters should not breastfeed. Further, both groups agreed that the Air Force should eliminate additional and reduce existing levels of chlordane contamination. In 1979 the Air Force finished sealing air conditioning and heating ducts and installing new ducts above ground for the 800 new homes at Wright-Patterson at a cost of about $800,000.

The Air Force encountered a second chlordane problem in the fall of 1978. Residents of a housing unit at the Scott Air Force Base, Belleville, Illinois, detected objectionable odors during the start of the heating season. Subsequently, base personnel noticed a similar odor in an unoccupied unit. Both units had been chlordane treated for termites earlier that year.

Base personnel sampled the air in both units and found chlordane. They also sampled nine other houses which had been treated with chlordane during the previous summer and found widespread contamination.

In January 1979 Air Force Surgeon General officials expanded the air sampling at the base. The officials sampled the 11 original houses and 43 randomly selected houses which had been treated for termites in previous years, some about 14 years prior to the monitoring. The study showed that only one unit did not have detectable levels of chlordane.

In April 1979 the Air Force Deputy Surgeon General for Operations asked the National Academy of Sciences to evaluate the significance of chlordane exposure to persons living in Air Force quarters. In August 1979, the Academy said that it

> "* * *could not determine a level of exposure to chlordane below which there would be no biological effect under conditions of prolonged exposure of families in military housing."

The Academy recommended that the Air Force should, among other things, reduce chlordane exposure in contaminated housing by cleaning or sealing floors, walls, and other surfaces and modifying heating systems. The Academy also recommended that the Air Force perform an epidemiological study of the inhabitants of Air Force housing units involved in the 1974 and 1978 episodes and a smaller one in 1970. The purpose of the study would be to determine whether occupants suffered any acute or chronic health effects from their exposure to the chlordane. As of May 1980, the Air Force had begun cleaning and modifying contaminated homes and was considering the recommendation for a study.

In a May 19, 1980, memorandum to Department of Defense housing officials, the Deputy Assistant Secretary of Defense (Installations and Housing) prohibited the use of chlordane

for buildings with subslab or intraslab ducts. The prohibition applies both to pre-construction soil treatment and post-construction soil treatment.

The memorandum stated that chronic human exposure to chlordane may present a health hazard and that no sure way is available to use chlordane under buildings with subslab and intraslab ducting and prevent the entry of chlordane vapor into the interior of such buildings. In geographic locations where subterranean termite infestations are known to exist, the Deputy Assistant Secretary specifically prohibited the use of subslab or intraslab ducts in any new buildings for which construction contracts had not been let. Furthermore, he ordered that any such buildings now under design or construction be modified to remove subslab or intraslab ducts.

The Deputy Assistant Secretary also directed that where the risk and extent of possible termite damage in existing structures is considered unacceptable, because of the prohibition on the use of chlordane, studies should be undertaken to determine the feasibility of sealing subslab or intraslab ducts and renovating heating and cooling systems to use aboveground/above slab ducts.

Plenum housing construction may also allow chlordane contamination

In addition to housing constructed on slabs with air ducts encased or under the slab, another type of construction may also allow chlordane applied to the subsoil to enter the house. Commonly referred to as plenum housing or plen-wood construction, this type of construction uses the area under the subfloor (the crawl space) as a heat-cooling duct. The National Pest Control Association estimates that 12,000 plen-wood houses were built in 1978.

EPA has conducted limited monitoring (12 homes, 1 experimental house, and 1 office building) of plenum structures where the subsoil was treated for termite control. Chlordane and related chemicals were found in the indoor air. During a 1975-1976 review of the Department of Housing and Urban Development's (HUD's) Minimum Property Standards including plenum type home construction, the Forest Service also found that preconstruction soil treatment for termite control, as well as remedial treatment, could create problems. The subsequent February 1977 report noted that, where used under slab foundations with unencased ducts below the slab,

termite control chemicals "are introduced into the living quarters, sometimes in such quantities that the occupants become ill." Therefore, the Forest Service recommended to HUD that in high and moderate termite hazard zones, the heating ducts be encased in concrete. This action would restrict the use of plenum construction.

The National Pest Control Association has also recognized the problem of potential contamination of plenum constructed housing. On December 20, 1979, the association advised its members not to treat plenum housing for termite control with presently registered pesticides, including chlordane, because of evident problems with vapors entering housing areas.

## POTENTIAL NATIONWIDE HOUSING CONTAMINATION PROBLEM

In July 1975 the Air Force notified HUD that measurable airborne chlordane levels were found in housing treated for termite control. As noted previously, the Air Force traced the contamination to chlordane used under the floor slab. Because Air Force housing is constructed in accordance with HUD minimum property standards, the Air Force recommended that HUD reevaluate its minimum property standards for termite treatment.

We contacted HUD officials to determine (1) the number of civilian homes which may be susceptible to chlordane contamination because of the type of construction used and (2) the action taken in response to the Air Force's recommendation for a reevaluation of HUD's minimum property standards for termite control. A HUD official responsible for architecture and engineering standards told us that HUD had not initiated any studies or actions on the Air Force recommendation other than a general study with the Forest Service about wood protection from termites and other pests. This official and a HUD research official stated that they did not determine the number of homes nationwide which may be susceptible to chlordane contamination because of the type of construction used.

To determine the magnitude of this potential problem nationwide, we tried to obtain estimates on the number of homes built on slabs with heating ducts in or under the slab, as well as the number of plenum constructed homes. We also tried to determine the number of homes which would have been treated for termites. While we were not totally successful,

1976 Bureau of Census data shows that about 41.5 million of the Nation's 79.3 million housing units do not have basements and 40.1 million had warm air furnaces. Therefore, there may be millions of homes constructed on slab with air ducts in or under the slab. Also, while we could not determine the number of homes which have been treated with chlordane for termite control, a wood protection expert at the Department of Agriculture told us that he believes most of the Nation's homes would have been or could be treated for termite control because termites are active throughout the country.

In a May 1, 1980, letter to licensed termite control pesticide applicators, the Arkansas State Plant Board stated that until recently little thought has been given to termite control chemicals becoming involved in the air inside treated buildings, but that chlordane in treated housing is a problem. The letter noted that the biggest problem is with slab houses with ducts in the slab, but that high chlordane readings in the air and on the interior surfaces of plenum houses are also common. The letter recommended that the licensees give serious consideration to the possibilities of air-contamination before treating any building, especially buildings with plenum construction.

## CONCLUSIONS

Assessing the health risk of a widely used pesticide is critical when a pesticide, such as chlordane, has been found to cause cancer in a laboratory animal and where there is reason to believe that many people may be exposed to it. Based on the National Cancer Intitute's finding that chlordane causes cancer in laboratory mice, EPA should perform an RPAR on the pesticide to determine whether the potential risk outweighs its benefits. As mentioned earlier, EPA regulations require that EPA perform an RPAR if a pesticide causes cancer in humans or experimental animals.

The need to perform an RPAR is further amplified because of Air Force incidents showing that persons living in homes built on slab with air ducts in or under the slab have been exposed to chlordane. Chlordane was found in the air of homes treated for termites as much as 14 years prior to sampling, which may mean that residents are being exposed to chlordane for long periods. Collectively, the Air Force studies and other data we obtained represent new information most of which was not available to EPA when it signed the 1978 agreement with chlordane's manufacturer and others canceling most nontermite uses of chlordane.

Aside from resolving questions on chlordane's continued use for home termite control, the question of the pesticide's possible harmful effects on persons living in homes already treated with chlordane still remains. Because the RPAR program does not address this question, EPA needs to work with the Departments of Housing and Urban Development and Health and Human Services--to determine the potential for adverse effects in homes already treated with chlordane and practical methods for reducing unreasonable risk to occupants.

## RECOMMENDATIONS

We recommend that the Administrator, EPA, initiate a formal risk/benefit review of chlordane to determine whether the pesticides registered for subsurface termite uses should be limited or canceled. The Administrator also should work with the Departments of Housing and Urban Development and Health and Human Services to determine the potential for adverse effects in homes already treated with chlordane and practical methods for reducing unreasonable risk to occupants.

## AGENCY COMMENTS

We discussed these matters with the Deputy Assistant Administrator of EPA's pesticide programs. He agreed that EPA needs to look at chlordane's risk and benefit.

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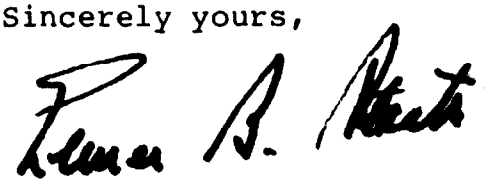
We conducted our review at EPA headquarters in Washington, D.C., where we interviewed numerous officials and examined pertinent legislation, regulations, and documents. We obtained information from officials of the Departments of Agriculture, Health and Human Services, Housing and Urban Development, and Defense and a pest control industry trade association. We also obtained and examined scientific reports and reviews from the above sources, as well as technical data.

As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than

60 days after the date of the report. We would appreciate being informed of any action you may take on matters discussed in this report.

We are sending copies of this report to the Secretaries of Agriculture, Housing and Urban Development, Health and Human Services, and the Air Force; the four committees mentioned above; the chairmen of environment- and agriculture-related committees; members of the Congress who have expressed an interest in pesticide regulation; and other interested parties.

Sincerely yours,



Comptroller General
of the United States