WARF Institute, Inc.

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Madison, Wis. 53701

February 6, 1970

Dr. Elmer Wheeler
Monsanto Company
800 North Lindbergh Blvd.
Saint Louis, Missouri

Dear Dr. Wheeler:

Enclosed are (1) a progress report on our studies of Lake Michigan and (2) information relative to the activities of others. The next meeting of the Lake Michigan Pesticides Committee is scheduled for next Tuesday in Chicago.

We shall look forward to your comments regarding further work, publication, circulation of this report, a meeting, etc.

Meanwhile, you are free to use this information as you see fit.

Very truly yours,

John J. Birdsall

John J. Birdsall
Vice-President

JJB:vk

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WARF INSTITUTE, INC.
Madison, Wisconsin

JAN 1970

Lake Michigan Pesticide Investigations

The WARF Institute study was designed to support other monitoring work being conducted or planned by various State and Federal agencies, already described by Mr. Leuschow. It included one-time mid-summer sampling of stream water, stream sediment, stream plankton, off-shore water and off-shore plankton at over 60 sites along the Lake Michigan shorline. Fish samples were collected at 18 locations and water and sediment samples were obtained at sites of obvious municipal and industrial outfalls. In addition, 25 samples of water were collected at sites of industrial input into stream water and sewers in the cities of Racine and Kenosha. Other miscellaneous water samples were obtained and analyzed.

All samples were analyzed by the electron capture gas chromatographic method (FDA Pesticide Analytical Manual, 1968). Modifications were employed as required for each type of sample: sample size, method of preparation, method of extraction and cleanup. A number of samples were also analyzed after hydrolysis (dehydro chlorination). All injections were made into gas chromatographs with columns packed with 5% DC-200 on Cromport XXX, 80-90 mesh.

The results of the analyses of these samples will be compared to the results of fish, water, invertebrate, clam and soil analyses by the State and Federal agencies. Some conclusions can then, perhaps, be drawn

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concerning the value of each of the different types of sampling and the degree to which Lake Michigan is being or has been possibly contaminated with chlorinated hydrocarbon insecticide residues.

From the results reported to date by various agencies and our own findings, it would appear that any possible contamination consists of low levels of apparent DDT and metabolites, very low levels of apparent dieldrin and very little occurrence of any other chlorinated hydrocarbon insecticide. Of great concern to us, however, is the finding of apparent polychlorinated biphenyls in many samples of water, plankton, sediment and fish, particularly at locations in the southern end of the lake. Also of great concern to us is the occurrence in many samples of other G. C. peaks which may not be insecticides but could easily be considered to be such. These peaks, as in the case of the apparent PCB type compounds, interfere with the interpretation of results for DDT, DDD and DDE. The identity, toxic potential, and metabolic fate in fish of these interfering compounds is not yet known. We are recommending extensive analytical and biological studies to determine these facts.

John J. Birdsall
Vice President
WARF Institute, Inc.

January 5, 1970

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RESULTS OF A SURVEY OF FORMULATORS, DISTRIBUTORS, AND MANUFACTURERS OF PESTICIDES IN THE LAKE MICHIGAN WATERSHED

Introduction

The Plant Pest Control and Pesticides Regulation Divisions of the Agricultural Research Service, U.S. Department of Agriculture, in cooperation with the State Departments of Agriculture of Michigan, Wisconsin, Illinois, and Indiana, conducted a survey of pesticide formulators and manufacturers located within the Lake Michigan watershed. The purpose of the survey was to identify possible sources of pollution of Lake Michigan through observation of manufacturing, sanitation, and waste disposal practices at formulating and manufacturing plants.

The survey was initiated in Michigan on May 12, 1969, and continued in Wisconsin through May 22. The surveys in Illinois and Indiana were completed in June.

Michigan

In the State of Michigan, 34 formulators, manufacturers, and distributors were visited, 13 of which were formulating pesticides. Eight companies were either distributors or were no longer in business. The remaining 13 companies produced such items as preservatives, algacides, sanitizers, rodenticides, and a small line of household insecticides.

Nine of the formulators in Michigan disposed of solid waste materials in landfills and five burned some solid wastes. Four discharged all or part of their liquid wastes in the city sewer. One disposed of liquid waste in a deep well. Samples of water and sediment or soil were taken

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at or near two waste disposal areas suspected of contaminating the aquatic environment.

A Resume' of Results from the Survey of Companies in Michigan

Plant No. 1

The company has been in operation 10 years. Forty-four of its products are registered with the State of Michigan; 51 of its products are registered with USDA. The principal formulations are various agricultural and household pesticides including malathion, pyrethrin, chlordane, Ciodrin, Vapona (dichlorvos), ronnel, dieldrin, and aldrin. The plant is not located near a water source. Dry and liquid waste materials are placed in 50-gallon drums and taken to a sanitary landfill.

Plant No. 2

The plant has been at the present location since 1961. Production includes 95 labeled products, including a wide variety of fungicides, insecticides, and rodenticides. Solid wastes are buried at least once each year. No liquid wastes enter a sewage system. Waste is transported to a company-owned dump about 50 miles northwest of the plant. Paper sacks are disposed of by incineration. Wastes are buried at the disposal site, in a pit 6 to 7 feet deep which is covered yearly.

Plant No. 3

The company has been in business since 1930. Five products are formulated at the facility including 2,4-D, chlordane, methoxychlor,

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and pyrethrums. Solid wastes, including sacks, etc., are burned in an incinerator. Liquid wastes are flushed into the city sewer system.

Plant No. 4

The company has been manufacturing pesticides for 48 years. A total of 15 products are now labeled; two are insecticides containing chlordane and/or DDT. Used containers are crushed and taken to a sanitary landfill. Flushings from containers go into the city sewer system.

Plant No. 5

The company has been in operation at the location since 1949. The company has 20 products labeled. There are no rivers, streams, or lakes near the plant. Solid waste is hauled to a landfill in the vicinity and liquid waste is placed in a deep well near the plant.

Plant No. 6

The company has been on the location 4 years, and formulates 22 different products (largely insecticides and fungicides). Chlorinated hydrocarbons formulated include aldrin, methoxychlor, and DDT. The plant is not located on a stream, river, or lake. Solid wastes are buried 10-feet deep on the plant grounds. Liquid waste is discarded in a limestone-lined pit on the grounds. Floor washings are flushed down the city sewer. Used containers are washed with caustic soda, crushed, and sold to a steel company for scrap.

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Plant No. 7

The company has been formulating materials for over 25 years at this location. All formulations produced are dusts (principally insecticides and fungicides). Chlorinated hydrocarbons formulated include DDT, methoxychlor, toxaphene, and chlordane. The plant is not located on a stream, river, or lake. Floor sweepings and other solid wastes are taken to the city landfill. There is no liquid waste.

Plant No. 8

The company manufactures 28 different aerosols. The plant is not located on a stream, river, or lake. Solid wastes are collected by a private sanitation company and taken to a private landfill. Liquid wastes are collected by a chemical company for reclaimation. Prior to May 1, 1969, this waste had been collected by a private sanitation company and taken to a private landfill.

Plant No. 9

The company has been formulating pesticides for approximately 20 years. A wide range of insecticides, herbicides, and fungicides are formulated. Chlorinated hydrocarbons involved include chlordane, BHC, dieldrin, methoxychlor, and DDT. Wash water from mix tanks and spillage enters the city sewer system. Most solid wastes were burned at the plant location in prior years. Now, however, solid wastes, estimated 150 cubic yards of material per annum, are taken to a city dump for burial. The dump is adjacent to a river with a dumping area extending to within 25 feet of water's edge. Cans and drums of various sizes are

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buried in low areas. Standing water was observed approximately 150 feet from the river.

Plant No. 10

The company has been at the location for 53 years. The company formulates a variety of fungicides, herbicides, insecticides, preservatives, and rodenticides. The chlorinated hydrocarbons used are chlordane, dieldrin, lindane, and methoxychlor. A total of 58 products are registered. There is no stream, lake, or river near the plant. Solid wastes are disposed of by burial or burning on the grounds and the liquid waste is carried to a reinforced septic tank. Empty containers are generally returned to the company of origin and poor barrels are sold locally for trash barrels.

Plant No. 11

The company produces one product containing Guthion (azinphosmethyl). The plant is located on a creek. Waste material is placed in a drum to which sodium hydroxide is added. Liquid waste is emptied into a creek near the plant. Empty bags and sweepings are burned.

Plant No. 12

The plant has been in operation since 1958. The company produces four registered products, all of which are formulations of 2,4-D. Aldrin was formulated until 3 years ago. The facility is located on a drainage ditch which empties into a creek near the plant. Empty bags and sweepings are burned.

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Plant No. 13

The company formulates materials containing chlordane and warfarin. Solid wastes are burned on the banks of drainage ditches which run along each side of the plant. The ditches merge below the plant and the single ditch continues to a point 10 miles below the plant where it empties into a river.

Wisconsin

A total of 70 establishments including formulators, manufacturers, and distributors were visited in Wisconsin. Sixteen no longer sell or formulate pesticides, 21 produce various sanitizers only, five formulate rodenticides only, 15 are strictly retailers or jobbers, and four formulate and sell herbicides and growth regulators. Nine Wisconsin establishments within the Lake Michigan watershed area were considered to be of importance in this survey.

In addition to the formulators and manufacturers of pesticides in southeast Wisconsin, municipal waste disposal plants in two cities were visited as well as any private or municipal dump that was located near a stream. The Division of Environmental Protection, Department of Natural Resources, State of Wisconsin, assisted in locating dumps.

Six of the pesticide formulators within the Lake Michigan watershed area in Wisconsin were disposing all or part of their liquid wastes in the city sewer. All formulators used landfills to dispose of solid

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wastes and two establishments burned part of their solid wastes.

Water and sediment or soil sampling was done at disposal areas that were suspected of contaminating the aquatic environment.

A Resume' of Results from the Survey of Nine Companies in Wisconsin

Plant No. 1

The firm has been in business for 9 years. Sixteen products are registered of which two contain chlordane. The plant is not located on a stream, river, or lake. Solid wastes are collected by a sanitation company and deposited at a dump. A small amount of liquid waste goes into the sewer system.

Empty drums that are reclaimable are sold to a cooperage firm.

Plant No. 2

The company has been formulating and retailing pesticides for 20 years. The plant is about 1½ miles from a river. A total of 12 products are registered. One product contains chlordane and another contains a mixture of DDT and lindane. Solid wastes are collected by a disposal company and taken to a private dump. Liquids including wash water are flushed into the city sewer system.

Plant No. 3

The company has been in business for 25 years. The company has two products registered. Both are Vapona (dichlorovos) cattle sprays.

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No chlorinated hydrocarbons are formulated. Solid wastes are collected by a garbage disposal company and liquid waste is flushed into the city sewer system.

Plant No. 4

The company has been in business for 51 years. A total of 16 products are formulated. One product contains chlordane (a 10 percent dust). A small amount of solid wastes is picked up by a trash disposal company. Very little liquid waste is disposed of. Some waste enters the city sewer system.

Plant No. 5

The company has been formulating pesticides for 40 years. The corporation produces four products, three of which contain DDT. The fourth formulation contains methoxychlor. Solid wastes are hauled to a dump by a garbage collector. Paper bags which contain technical DDT are buried in landfill. Methoxychlor drums are picked up by a cooperage firm.

Plant No. 6

The company has been in business since 1898. It operates from November through May. Six products are formulated, one of which contains chlordane. Paper bags are picked up by a disposal service and there are no liquid wastes. Some of the solid wastes are hauled to a sanitary landfill and some are burned near the plant. The burning area of the plant is near a creek which drains into Lake Michigan.

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Plant No. 7

The company has been formulating since 1950. Six products are registered and two contain a small percentage of dieldrin. The plant is located near a creek. Solid and liquid wastes are burned in an incinerator at the plant. The area where the pesticides are formulated is washed with sodium bicarbonate and caustic soda. Some solid wastes are taken to a dump for burial. Fiber drums are punctured and empty cans are crushed prior to collection. The metal cans are taken to a steel company.

Plant No. 8

This company, in operation 12 months a year since 1952, formulates only one compound, a two percent chlordane solution for lawn and garden use. Liquid waste from the plant enters the city sewage system. Solid waste and used containers are either burned at the plant or are picked up by the city trash collectors.

Plant No. 9

The firm, established in 1950, presently produces outdoor fly traps containing 1.5 percent DDT. About 6 years ago, they formulated a material containing chlordane and 2 years ago they formulated a material containing TDE. The plant is not located on a water source but does dispose of liquid waste in the city sewage system. The small amount of solid waste from the plant is taken to the town dump and burned.

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Indiana

There are no pesticide formulating or manufacturing plants in the portion of Indiana that falls within the Lake Michigan watershed. Five sewage treatment plants were contacted, however. Only one of the five has an insect problem but they do not use chlorinated pesticides in the system.

Illinois

A survey of the Chicago area did not reveal any potential contributors to the Lake Michigan pesticide burden.

Sample Collection Sites

Disposal sites where wastes from the formulators was deposited were inspected. These areas were sampled if they were suspected of contaminating nearby streams. Samples of water and sediment and/or soil were taken adjacent to the plants in drainage ditches or in rivers or streams adjacent to dumps or sewage treatment plant effluent outlets.

Water and sediment samples were collected in the following areas in June 1969:

1. The Grand River at Grand Rapids, Michigan, above and below the sewage disposal treatment plant and the city dump and above and below the Grandville city dump. These sites were sampled a second time in July 1969.

2. The Root River at Racine, Wisconsin, above and below Hunts Dump.

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3. Pike Creek at Kenosha, Wisconsin, near a formulating plant.

4. The Root River at West Allis, Wisconsin, above and below the West Allis Dump.

5. A drainage ditch near the Lawer Dump on 124th Street, Milwaukee, Wisconsin.

6. Two drainage ditches near a formulating plant at St. Johns, Michigan, were sampled for sediment only.

Areas which were sampled for soil are:

1. The site on which refuse was burned at Kenosha, Wisconsin.

2. Solid waste from the Grand Rapids sewage treatment plant, Grand Rapids, Michigan.

The Grand Rapids sewage disposal plant, Grand Rapids, Michigan, was sampled for effluent.

In addition, the Michigan Water Resources Commission and the Wisconsin Department of Natural Resources were each requested to collect samples of effluent from three formulating plants that were disposing of liquid wastes in the city sewer. One of the plants in Michigan no longer formulates pesticides but there are plans to sample effluent from the other two plants. Personnel from Wisconsin felt that sampling plant effluent would be costly. As an alternative, they chose to contact the plants and have them make other arrangements for disposal of their liquid wastes.

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Analytical Results

Analyses of water, sediment, and soil samples from rivers, streams, and drainage ditches show only very samll amounts of pesticide residues in the samples. Only five of the 32 samples collected had residues at a detectable level. One water sample from the Root River above Hunts Dump contained dieldrin at 0.05 p.p.b. A sediment sample from a drainage ditch near the Lawer Dump on 124th Street, Milwaukee, Wisconsin, contained 0.07 p.p.m. of p,p' DDE. Two samples of sediment from the Root River near the West Allis Dump in Milwaukee contained combined DDT at 0.14 p.p.m. and 0.05 p.p.m. Both of these samples also contained chlordane at 0.19 and 0.15 p.p.m. One sample of soil from drainage ditches adjacent to a laboratory at St. Johns, Michigan, contained 0.05 p.p.m. of combined DDT. No other samples contained any detectable pesticide residues. It does not appear that these residues would make a significant contribution to the contamination of the aquatic environment.

The solid wastes from the sewage treatment plants may contain more pesticides than the effluent. Where the material is used as a landfill, it may not be hazardous to the environment. However, sampling of this material may give an indication of how much pesticide residue may be in the sewage.

Conclusions

1. Solid waste disposal practices by formulators in the Lake Michigan watershed area appear to be contributing little to the pesticide burden in the aquatic environment. Water and sediment were sampled

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only once, however, in most cases. This does not supply enough information from which to draw firm conclusions.

2. Some formulators have the potential to make a significant contribution to the pesticide burden in the aquatic environment by disposing of liquid waste in city sewer systems.

Recommendations

1. Disposal of pesticide wastes in city sewers is a practice that can endanger wildlife and public health and must be stopped.

2. Additional sampling of water and sediment must be done to give data for valid conclusions about the contribution of formulating plants to the pesticide burden in the aquatic environment through waste disposal in public and private dumps.

3. Effluent from urban storm sewers within the watershed should be sampled during heavy rains.

4. Sewage treatment facilities should be visited to determine whether or not sludge is properly disposed of.

5. Effluent from sewage treatment plants should be monitored periodically for pesticide residues.

6. A survey of drycleaners and rug manufacturers should be made to determine their methods of disposing of mothproofing pesticides.

Prepared by:
Plant Pest Control Division
Agricultural Research Service

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