United States
Environmental Protection
Agency

Office of Public Affairs
Region 5
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Mirex

Nease Chemical Superfund Site

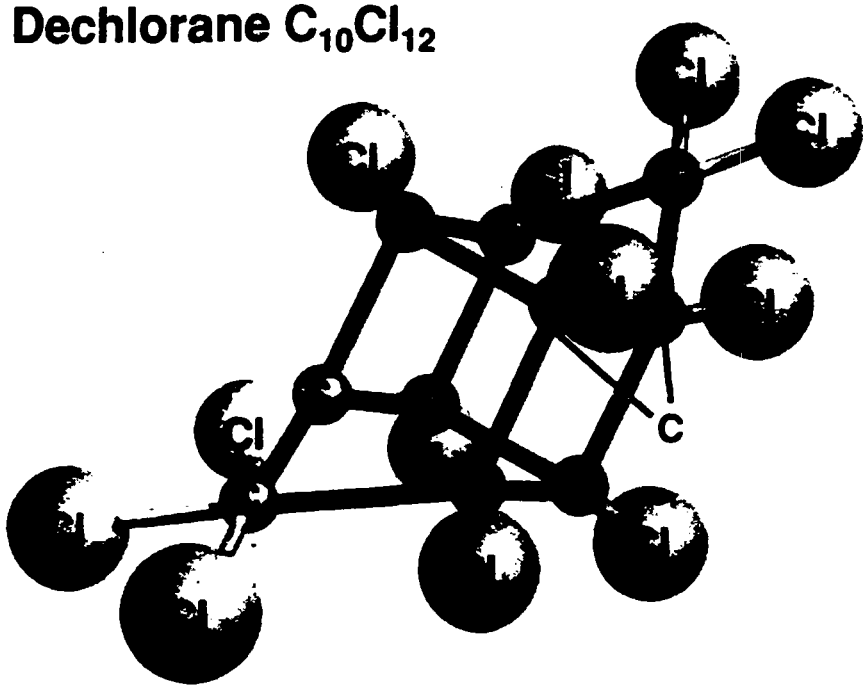
Salem, Ohio

November 1992

This fact sheet will give you...

- A brief history of the site;
- An explanation of Mirex and other site related contaminants;
- Suspected health effects from Mirex and other site related contaminants;
- Potential exposure to Mirex;
- An update on activities at the site; and
- How you can obtain more information about the site.

Mirex
Dechlorane $C_{10}Cl_{12}$



This diagram illustrates the composition of a molecule of Mirex. The number of chlorine units (12) and their arrangement makes mirex very stable in the environment and in the fat tissue of animals and humans.

WHAT IS MIREX?

Mirex is an insecticide that was produced at the Nease factory for Hooker Chemical Company until 1969. The technical name for mirex is 1,1A,2,2,3,3A,4,5,5,5A, 5B, 6-Dodecachloroctahydro-1,3,4-metheno-1H-cyclobuta (CP) pentalene. Mirex was also used as a fire retardant for plastics, rubber, paint, paper, and electrical goods. Mirex takes a long time to break down in the environment. It does not dissolve readily in water and has the tendency to attach to soil and sediment. It is, therefore, more likely to be found in sediments than in water and does not move readily in soil. Mirex accumulates in the fatty tissues of fish and mammals and bioaccumulates up the food chain (see diagram entitled "Bioaccumulation"). Photomirex and kepone, which were also found at the Nease Chemical Superfund site, are breakdown products of mirex found in the environment. They are similar to mirex and are also very stable in the environment.

In 1961 Hooker Chemical Company was granted a registration (administered first by the U.S. Department of Agriculture and subsequently by U.S. EPA) for production of mirex. This product was intended for use only in formulating pesticide products. Subsequently, ten registrations for a variety of mirex-containing pesticide formulations were granted to Allied Chemical Corporation. During the 1960s, mirex was the primary pesticide used in a Department of Agriculture program to control the imported fire ant, a pest that is prevalent in the Southeastern United States. By 1971, however, U.S. EPA issued a notice of cancellation of all mirex registrations. By the end of 1977, the Federal government banned the use of mirex because it was suspected to cause cancer in animals.

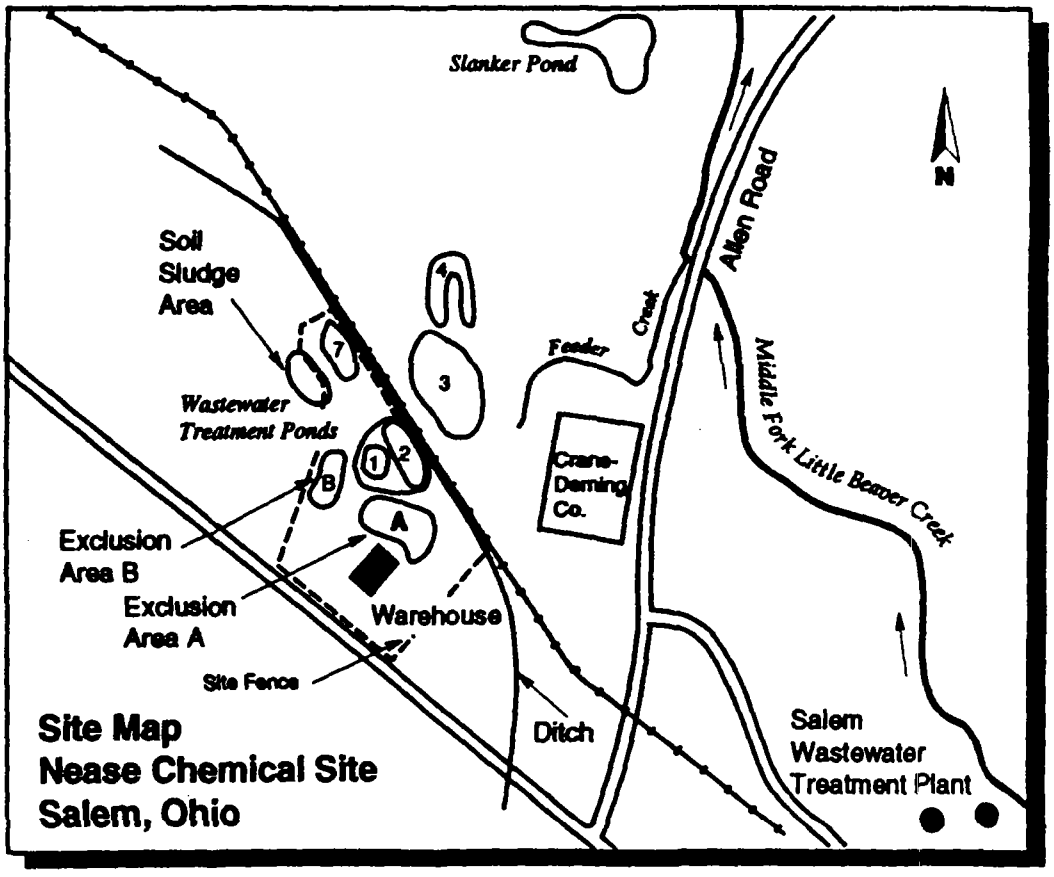
SITE BACKGROUND

The Nease Chemical Superfund site is located on the north side of State Route 14, west of Allen Road, northwest of the City of Salem, in northern Columbiana County, Ohio (see Site Map). The Ruetgers-Nease Chemical Company, Inc. (Ruetgers-Nease), in cooperation with the United States Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (Ohio EPA) is currently conducting an investigation of contamination at the Ruetgers-Nease Chemical site, Little Beaver Creek, the surrounding floodplain soils, and the ground water. The Nease Chemical Company, owner and operator of the site from 1961 to 1975, was bought by the Ruetgers Chemical Company, Inc. in 1977.

While the plant was in operation, unlined ponds were used for storage of plant wastes, drummed wastes were buried on site, and chemical spills occurred. To date, the following activities have taken place:

- most of the on-site buildings and equipment were removed;
- the ponds were drained, filled with soil and natural vegetation has since stabilized the cover;
- the liquid from the ponds was treated and discharged;
- the buried drummed wastes were identified and removed;
- some contaminated on-site soils were removed; and
- a surface water management and leachate collection/ treatment system was developed to collect and treat contaminants to prevent the movement of contamination off site in the surface water and shallow ground water.

While these activities were taking place, Ruetgers-Nease collected and tested samples of surface water, soil, sediment, and ground water at and near the site. These tests detected various contaminants including mirex, photomirex and kepone. In 1983, the site was placed on the National Priorities List (NPL). The NPL is a list of top priority hazardous waste sites in the country that are eligible for investigation and cleanup under the Superfund program. Since that time, additional sampling took place which detailed further where mirex and photomirex were found and at what levels. A **Remedial Investigation (RI)** is currently being conducted under the Superfund program (see "What is the Status of the Remedial Investigation"). (Words appearing in **boldface** type are defined in the glossary.)



HOW TOXIC IS MIREX?

The toxicity of mirex in humans is not completely known due to the lack of studies from human exposures. However, animal studies have shown that mirex exposure causes various adverse health effects in animals. To determine the toxicity of a chemical, U.S. EPA looks at both cancer and non-cancer effects.

Non-Cancer

Non-cancer effects include any adverse health effects other than cancer such as liver or kidney damage, etc. How severe the effects are depends on how much mirex a person is exposed to and for how long.

Over the years, a variety of animal studies have been done using rats, mice, dogs, rabbits, monkeys, etc. The effects seen from the exposures in these studies included liver and kidney damage, and damage to the immune, reproductive, and nervous systems.

U.S. EPA uses the results of animal studies to set a **reference dose** for humans. A reference dose approximates the amount that humans can take in daily over a lifetime without risk of non-cancer health effects. A reference dose takes into account the uncertainties of using animal studies to predict effects on humans, and special sensitive populations such as newborn infants and the elderly.

The reference dose for mirex is 0.0002 milligrams per kilogram of body weight per day (0.0002 mg/kg/day). This means that an individual weighing 154 pounds (70 kg) could take in 0.0140 mg (or 0.0000004 ounces) of mirex each day for 70 years and his or her health would not be affected.

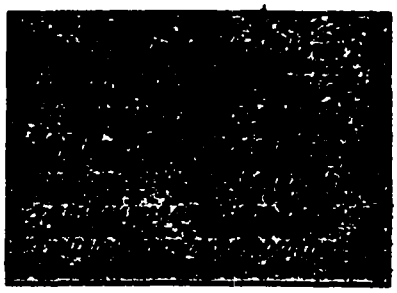
Cancer

Animal studies on rats and mice have shown various types of cancer from exposure to mirex, i.e. liver, kidney, and leukemia.

Chemicals are also classified according to their potential to cause cancer in humans. U.S. EPA uses the following classification system based on all of the available studies:

A. Known Human Carcinogen*
B. Probable Human Carcinogen
   1. Based on limited human evidence
   2. Based on sufficient evidence in animals
C. Possible Human Carcinogen
D. Not Classified as to Human Carcinogenicity
E. Evidence of Non Carcinogenicity for Humans

* ***Note: A carcinogen is a cancer-causing substance.***



Mirex is classified as a Group B2 carcinogen. This means that it is probable that mirex causes cancer in humans based on U.S. EPA's determination that sufficient evidence exists in experimental animals, but not in humans.

ARE THERE ANY HUMAN HEALTH STUDIES BEING CONDUCTED?

The Agency for Toxic Substances and Disease Registry (ATSDR) is the government agency that is mandated to conduct health assessments at Superfund sites. This includes conducting studies at sites where there is evidence that health effects are being caused by environmental contaminants. Any human health studies conducted to determine the effects of mirex on humans at this site would be conducted by the Ohio Department of Health (ODH) in coordination with and funded by ATSDR.

The only study of cancer cases in relation to exposure to mirex is of the residents of the Love Canal area in New York. In that study there was no evidence of a higher rate of cancer; however, limitations of an uncertain latency period (the time period for the disease to show up) and a small study population make the study inconclusive.

In 1989 the ODH, with assistance from the Center for Disease Control (CDC) Laboratories, sampled blood for mirex from 42 area residents most likely to be exposed. Individuals were chosen through a questionnaire process. Mirex was detected in 14 of the 42 individuals tested, with concentrations ranging from 0.25 parts per billion (ppb) to 2.2 ppb. Four of the individuals tested worked at the plant. Mirex was detected in all four of the workers.

WHAT KIND OF FOLLOW-UP WILL BE DONE ON ANY OF THE ON-GOING HEALTH STUDIES?

As mentioned, ATSDR has the responsibility for conducting health assessments at Superfund sites. This is usually accomplished through cooperative agreements with the state health agency. ATSDR will be working with ODH to conduct follow-up studies on community health resulting from exposure to mirex. ATSDR and ODH will hold a meeting to discuss these studies on Tuesday, December 1, 1992 at Kent State University, Lecture Hall, Salem Regional Campus, 2491 State Route 45 south, from 7:00 p.m. to 9:00 p.m.

Mirex has been detected in a number of areas throughout the U.S. and in foreign countries. These areas include the southeastern U.S. where mirex was used as a pesticide and in the Great Lakes region where mirex was produced. For example mirex has been found in South Carolina, Alabama, Mississippi, and Georgia. In the Great Lakes region it has been detected in New York, Ohio, Lake Michigan, and Lake Ontario.

HAS MIREX EVER BEEN TESTED FOR AND/OR DETECTED ANYWHERE ELSE?

Mirex has been detected in a number of areas through out the U.S. and Canada. These areas include the southeastern U.S. where mirex was used as a pesticide and in the Great Lakes region where mirex was produced. For example, mirex has been found in South Carolina, Alabama, Mississippi, and Georgia. In the Great Lakes region it has been detected in New York, Ohio, Lake Michigan, and Lake Ontario.

Mirex has been found in human tissue in samples taken in Monroe, Louisiana, and Kingston and Ottawa, Canada. Mirex was also detected in human milk of maternity patients in Albany, Oswego, and Rochester, New York. These studies show that exposure to mirex, either agricultural or industrial, can lead to detectable levels of mirex in humans. Mirex has been detected in water, sediments, fish, and a variety of wild and domestic animals.

WHERE IN THE LOCAL ENVIRONMENT HAS MIREX BEEN FOUND?

(Refer to Sampling Map on page 5). Results presented are from the most recent sampling conducted in April - May of 1990 for Phase I of the RI.

Creek Water

Mirex and photomirex were not detected in any Little Beaver Creek water samples. Therefore, surface water does not appear to be a significant exposure or migration pathway for mirex and photomirex. Since mirex and photomirex do not easily dissolve in water and tend to attach to soil and sediment, they are more likely to be found in sediments than water. No kepone was detected in the creek water.

Creek Sediment

The highest concentrations of mirex in sediments were found along the creek between Stations (sampling locations) 5 and 15, and 19 to 30. Detectable mirex levels in sediments range from 21.5 ppb to 2,830 ppb between Stations 5 and 30. Between Stations 31 and 52, detectable mirex levels were less than 100 ppb and decreased with distance from the site. Low concentrations of photomirex were detected in samples collected upstream of Station 23 (Millville). No kepone was detected in creek sediment samples. Detectable photomirex concentrations range from 0.479 to 7.38 ppb). No photomirex was detected in sediments below Millville. A limited number of additional creek sediment samples will also be taken.

Floodplain Soil

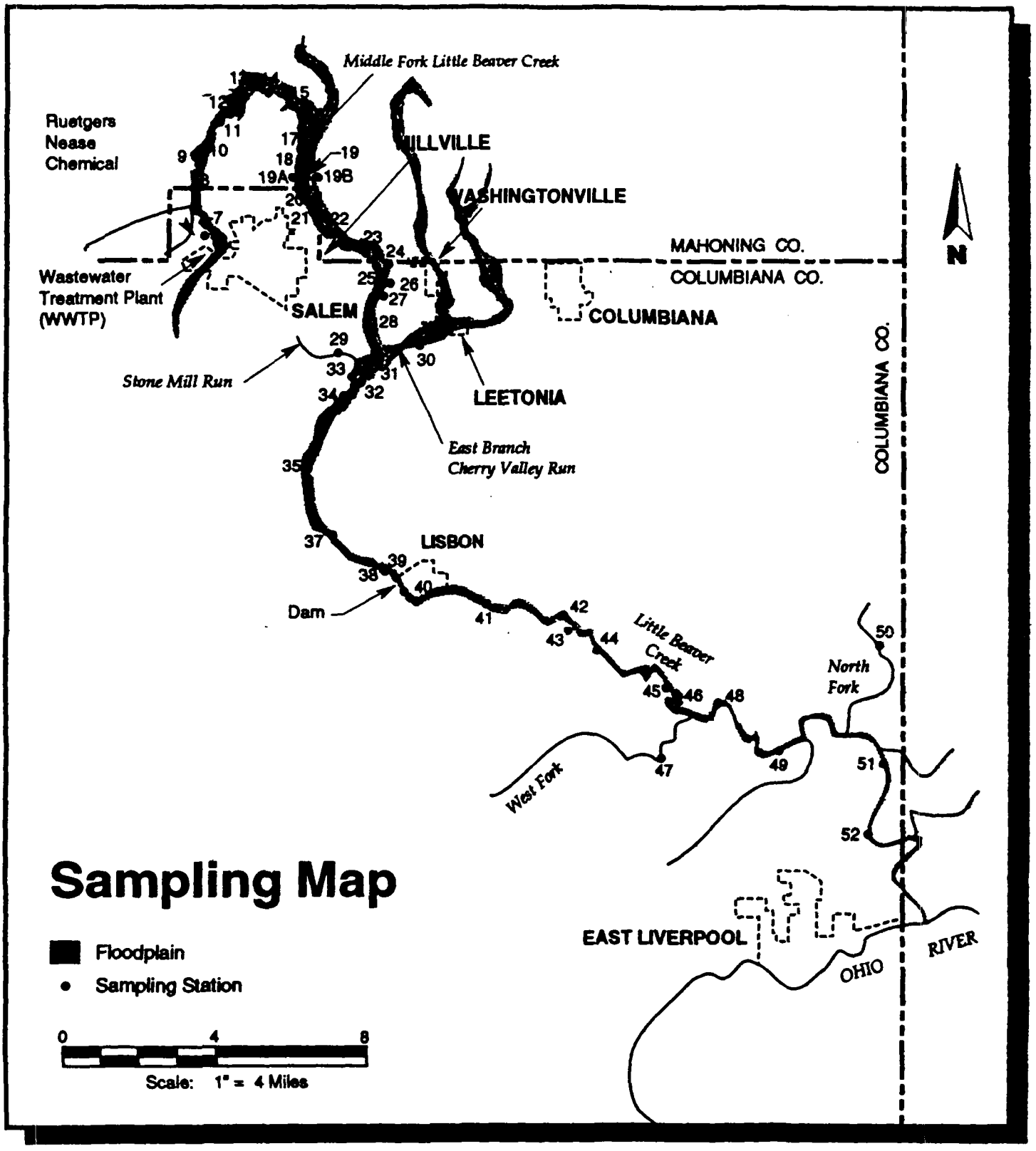
Mirex and photomirex were found in floodplain soil adjacent to Little Beaver Creek. Detectable mirex levels in floodplain soils range from 10.1 ppb to 4,540 ppb along Station 12. The highest levels were found between Stations 10 and 17 and peaking along Station 12. High levels were also detected along Station 27. Detectable photomirex levels range from 2.5 ppb to 132 ppb.

No photomirex was found in samples taken south of Station 27. Contaminant concentrations tended to be lower in samples taken further from the creek. No kepone was detected in the floodplain soil samples. A limited number of additional floodplain samples will also be taken to further characterize floodplain contamination.

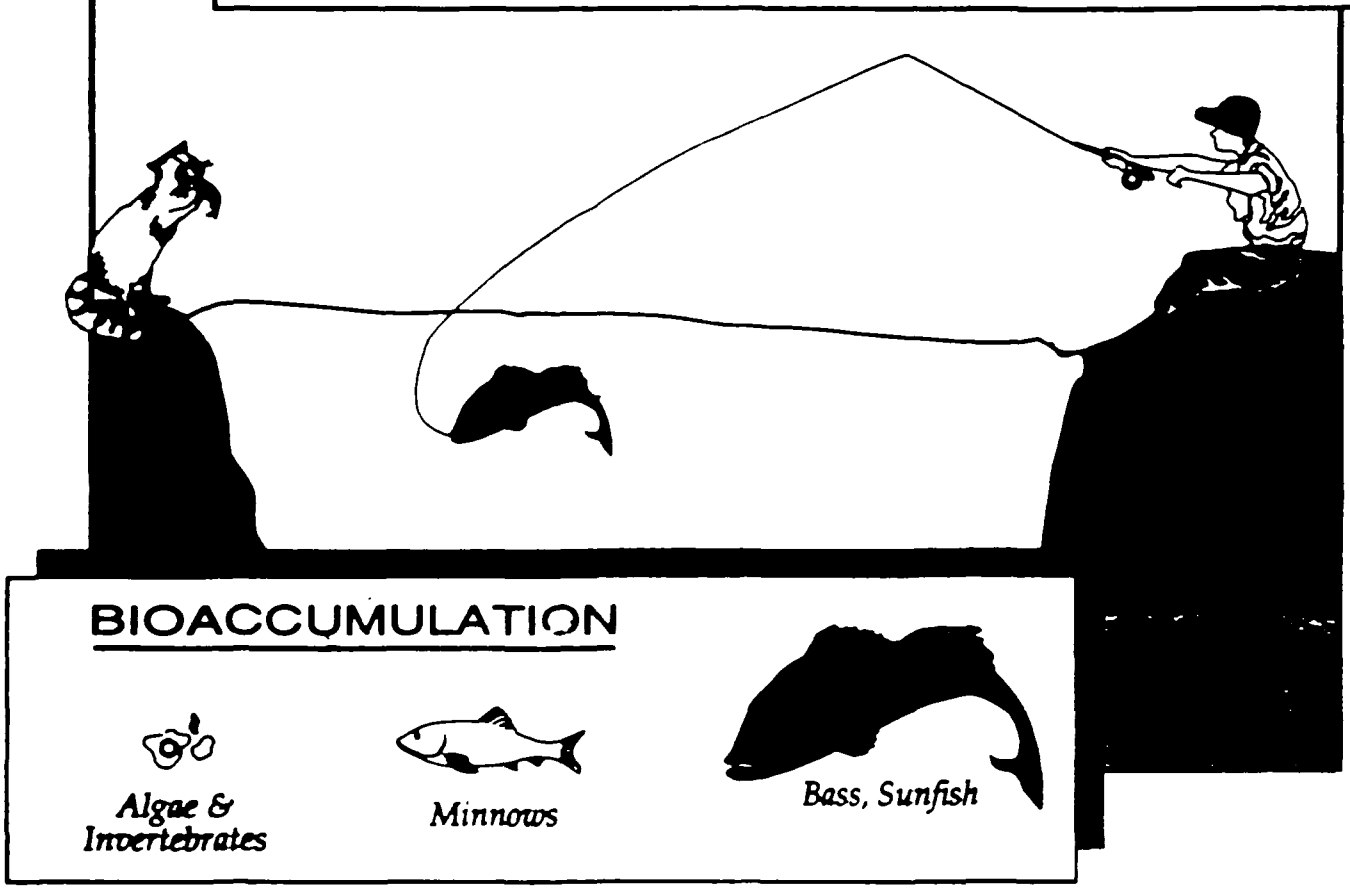
Fish Tissue

Of the 62 fish tissue samples collected, 28 samples were of upper trophic fish (such as bass and sunfish) while the remaining 34 were of lower trophic fish (such as carp and suckers). Detectable concentrations of mirex in fish range from 5.2 ppb at Station 30 to 6,150 ppb at Station 23 with the highest concentrations found from Station 8 to Station 35 and peaking around Station 23. Detectable concentrations of photomirex range from 0.35 ppb at Station 48 to 390 ppb at Station 13 with the highest

(continued on page 6)


Middle Fork Little Beaver Creek
Ruetgers
Nease
Chemical
ILLVILLE
WASHINGTONVILLE
MAHONING CO.
COLUMBIANA CO.
N
Wastewater
Treatment Plant
(WWTP)
SALEM
COLUMBIANA
Stone Mill Run
LEETONIA
East Branch
Cherry Valley Run
COLUMBIANA CO.
LISBON
Dam
Little Beaver
Creek
North
Fork
West Fork
EAST LIVERPOOL
OHIO
RIVER
Sampling Map
Floodplain
Sampling Station
0
4
8
Scale: 1" = 4 Miles

Bioaccumulation is a process where small levels of a chemical are transferred to and concentrated into higher levels in the tissue of animals through the food chain. For example, small fish eat many tiny plants, algae and invertebrates, each of which contains a small amount of a contaminant. Because the contaminant is stored in the tissue of the fish, the level of contaminant becomes much higher in the small fish than in any one of the tiny plants. The same process is repeated when the s mall fish are eaten by large fish. By the time a person consumes a contaminated fish, the chemical may be highly concentrated within the tissues of the fish. Mirex is known to accumulate in the fat tissue of fish, humans and other mammals.



concentrations found along Stations 9 to 35, peaking around Station 13. Concentrations of mirex and photomirex were significantly higher in samples collected upstream of Lisbon Dam compared to samples collected downstream of the dam. All fish tissue samples collected from downstream of Station 35 contained concentrations of mirex that were less than the Food and Drug Administration (FDA) mirex action level of 100 ppb. No kepone was detected in the fish tissue samples.

Ground Water

Testing of private wells occurred in 1983, 1984, 1985, 1986, and 1988 as a response to citizens' requests along Little Beaver Creek. No mirex was detected in these wells. In February and March of 1990, 12 private wells located along Little Beaver Creek were sampled for mirex, photomirex, and kepone. Mirex was not detected in any of the 12 wells. In the fall of 1991, Ohio EPA took samples from private water wells along Little Beaver Creek in Mahoning County and tested for mirex. No mirex was found.

Area Wildlife

ODH, with assistance from the Ohio Department of Natural Resources, took samples of blood and fat from raccoons and opossums along Little Beaver Creek. The samples were analyzed only for the presence of mirex. Animals were live-trapped from stations close to the Nease Chemical site and along the creek to the Beaver Creek State Park. Samples from both raccoons and opossums contained mirex. Animals from stations closest to the site contained the highest levels. In general, the fat samples had higher mirex levels than the blood samples.

Dairy Cattle

ODH, in conjunction with the Ohio Department of Agriculture, collected raw milk samples from dairy cows at local dairy farms. Samples were taken from 1987 to 1991. Although trace amounts of mirex were found in milk in 1987 and 1989, no mirex was detected in the last round of sampling in 1991. ODH also collected fat samples from animals going to slaughter from three farms. Mirex and other low levels of pesticides were detected in the meat fat of samples taken at these farms, however, only one of the farms produced meat fat exceeding the FDA action limit (see "What are the Health Advisories for Mirex?"). The meat from these animals was only eaten by the owners and their families.

HOW COULD I COME INTO CONTACT WITH MIREX?

There are several ways in which people could come into contact with mirex. Area residents could come into contact with mirex in floodplain soils and in the creek by:

- eating fish containing mirex from Little Beaver Creek;
- swallowing water containing sediment contaminated with mirex while swimming or wading in Little Beaver Creek;
- direct contact with contaminated sediment while swimming or wading in Little Beaver Creek;
- ingesting contaminated soil;
- eating wildlife, such as racoons and opossums, contaminated with mirex;
- eating plants, particularly root crop such as carrots and potatoes, that have not been washed and have contaminated soil on them;
- inhaling soil (dust) containing mirex;
- direct skin contact with contaminated soil; and
- eating plants that have absorbed mirex. (Information is too limited to determine if this pathway is significant. Comparisons to simular chemicals indicate that the absorption of mirex by plants is not expected to be a significant exposure pathway.)

WHAT ARE THE REGULATIONS FOR MIREX?

Since mirex was banned, no regulations were ever established for its use. However, advisories have been used and are being further developed to protect people from exposure to mirex (see "What are the Health Advisories for Mirex?").

There are currently no standards or guidelines for exposure to mirex in drinking water under the Safe Drinking Water Act.

In 1976, U.S. EPA established a water-quality criterion of .001 ppb for mirex. This criterion was developed to protect both human health and aquatic life.

WHAT ARE THE HEALTH ADVISORIES FOR MIREX?

In 1973, FDA established limits for mirex in food products, which still apply nationwide. It is important to note, however, that these limits take into account that the products containing mirex would be sent to markets all over the country. For example, FDA has set the limit for meat at 100 ppb which means any animal going to market can contain up to 100 ppb of mirex. However, taking into account that the meat would be sent to various markets across the country, a person is likely to only encounter one piece of contaminated meat in their lifetime.

Following this logic, however, this limit may not be protective for individuals who regularly eat mirex-contaminated fish caught from Little Beaver Creek. The same concern applies to the limit set by the FDA for milk fat and eggs, which is also 100 ppb, and for raw agricultural products which is 10 ppb.

There are currently two local advisories in place with regard to the mirex found: a fish advisory which advises against consumption of fish with levels above 100 ppb, and an advisory against primary contact with creek sediment. These two advisories are in effect from the junction of Allen Road and State Road Alternate 14 continuing downstream to Route 11 south of Lisbon. These advisories warn against fishing or wading and swimming in the creek. Since 1987, warning signs have been posted to reinforce the advisories.

U.S. EPA also advises against using top soil containing 250 ppb or more of mirex and allowing animals to graze on soil containing 72 ppb or more of mirex. (The lower number of 72 ppb for grazing animals takes into account the bioaccumulative property of mirex. As the animal would graze, over time the mirex would build up in the fatty tissue of the animal.) Then, if an individual were to eat meat from that animal, they could be exposed to higher levels of mirex.

HOW DO YOU TEST FOR MIREX?

Over the course of the Nease site investigation, mirex has been tested for in water, sediment, soil, fat tissue and blood. The type of sample collected determines the chemical procedure used to prepare the sample for analysis. Once the samples are prepared, there is a limited amount of time (holding time) they can sit before they must be analyzed.

The samples are then analyzed for chemicals of concern, namely mirex and photomirex, using an EPA-approved analytical method for pesticides. This method uses complex instruments, such as a gas chromatograph and mass spectrometer (GC/MS) to detect mirex.

Most organic analytical laboratories can perform this method of analysis for a cost of approximately $100-$300 per sample. However, some complications can occur with analysis for mirex. The presence of other contaminants such as polychlorinated biphenyls (PCBs) in the samples can often interfere with the detection of mirex. In addition, sometimes this method is not sensitive enough to detect very low levels of mirex.

In order to prevent these complications from occurring with the RI samples, special EPA-approved changes have been made to the analytical method. These changes have improved the reliability of results for mirex, but have increased the cost of sample analysis to approximately $1,000-$1,500 per sample.

For a person to have their fat or blood tested for Mirex, he/she would have to participate in a community health study conducted by ODH and sponsored by ATSDR. Information about human health studies will be presented and discussed at an upcoming public meeting to be held by ODH and ATSDR.

WHAT IS THE STATUS OF THE REMEDIAL INVESTIGATION (RI)?

Additional Phase I sampling is estimated to be completed by December 1992. Phase II sampling has begun and is estimated to be completed in January 1993. The Surface Water Management System and Leachate Collection and Treatment System is expected to be completed by the Spring of 1993. The RI, which will include a risk assessment, is currently being conducted and is expected to be completed by late spring or early summer of 1993. When conducting the risk assessment, the presence of photomirex and kepone will also be taken into account.

FOR MORE INFORMATION

U.S. EPA CONTACTS

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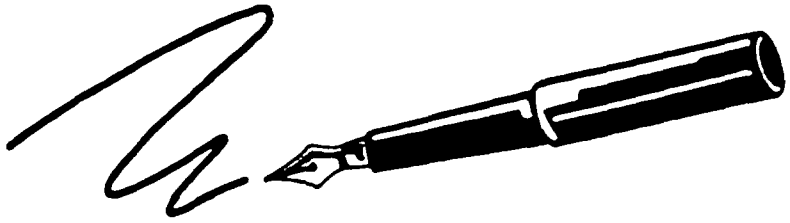

USE THIS SPACE TO WRITE YOUR QUESTIONS OR COMMENTS

Your input on the investigation of the Nease Chemical site is important to U.S. EPA. If you have any comments, questions or concerns regarding the information presented in this fact sheet or the on-going investigation, please use the space below to write them down, then fold and mail.

You may also call Cheryl Allen, U.S. EPA Community Relations Coordinator, at (312) 353-6196 or through U.S. EPA's toll-free number at (800) 621-8431.

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PUBLIC COMMENT SHEET

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Cheryl Allen (P-19J)
Community Relations Coordinator
Office of Public Affairs
U.S. EPA, Region 5
77 West Jackson Boulevard
Chicago, IL 60604

GLOSSARY

Carcinogen: Cancer-causing substance.

Center for Disease Control (CDC): Federal agency whose actions are directed toward controlling the outbreak of disease.

Food and Drug Administration (FDA): Federal agency whose actions "are directed toward protecting the health of the Nation against impure and unsafe foods, drugs and cosmetics and other potential hazards."

Gas Chromatograph: An instrument which separates volatilized compounds (gases) according to differences in the time required to pass through a medium. The compounds, after being separated, are defected and measured.

Kepone: A clorinated hydrocarbon formed when mirex breaks down. It is similar in structure to mirex and is very stable in the envirnment.

Latency Period: The time period between exposure to a substance and the on-set of a particular adverse health effect(s).

Love Canal: A suburb of Niagara Falls that was built in an area where chemical wastes, including mirex, had been disposed.

Mass Spectrometer: An instrument used to separate a stream of charged particles by atomic mass (specific to each compound), measure the atomic masses, and determine the relative abundances of the atomic masses.

Parts Per Billion (ppb): A very small unit of measurement. The term means one part in a billion parts. One ppb can be compared to one second in thirty-two years, or one silver dollar in a roll of silver dollars stretching from Detroit to Salt Lake City. Because some chemicals are very toxic even at low concentrations, ppb has become a standard unit of measurement in the hazardous waste field.

Polychlorinated biphenyls (PCBs): A family of industrial chemicals used as a heat-transfer agent from 1929 until it was banned in 1979. In addition to their use in electric transformers as insulators and coolants, PCBs have also been used in lubricants, hydraulic fluids, carbonless copy paper, adhesives, microsope emersion oils and caulking compounds.

Reference Dose: The dose of a substance above which adverse health effects may occur. A reference dose is an estimate of the daily exposure of the human population to a potential hazard that is likely to be without risk of deleterious effects during a lifetime.

Remedial Investigation (RI): An investigation at a Superfund site to examine the nature and extent of contamination problems at the site.

Sediment: The layer of soil, sand and minerals that covers the bottoms of lakes, rivers and oceans that often absorb contaminants. It consists of very small particles of clay, silt and sand.

Superfund: The commonly used term that describes the Federal legislation authorizing EPA to investigate and respond to the release or threatened release of hazardous substances into the environment from abandoned hazardous waste sites.

Trophic level: Level where energy in the form of food is transferred from one organism to another in a food chain or food web.

MAILING LIST

If you did not receive this fact sheet in the mail, then you are not on our mailing list. If you wish to be placed on the Nease Chemical Superfund site mailing list, please complete this form, detach, and mail to:

Cheryl Allen (P-19J)
U.S. Environmental Protection Agency
Region 5
Office of Public Affairs
77 West Jackson Blvd.
Chicago, Illinois 60604

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

PHONE ( ) _____

AFFILIATION _____

INFORMATION REPOSITORY

If you would like more information about the investigation or the Superfund program, there are copies of laws, reports, and other documents available for you to read in a notebook called an information *repository*. The *information repositories for the* Nease Chemical site are located at:

Lepper Library
303 E. Lincoln Way
Lisbon, Ohio 44432
(216) 424-3117

Salem Public Library
821 E. State Street
Salem, Ohio 44460
(216) 332-0042