History of DDT in North America to 1997

Canada

DDT was first registered in 1946 and used in Canada to control insect pests in crops as well as in domestic and industrial applications. DDT was never manufactured in Canada. In response to environmental and safety concerns, most uses of DDT were phased out by the mid-1970s. Registration of all remaining uses of DDT was discontinued in 1985 with the understanding that existing stocks would be sold, used or disposed of by 31 December 1990. After this date, any sale or use of DDT in Canada represents a violation of the *Pest Control Products Act*.
The gradual restriction of the range of permitted uses of DDT was facilitated by the availability of effective alternatives. The phased reduction was also important in that it helped to avoid the creation of a large-scale disposal problem.

Provincial legislation provides additional regulatory powers to control the transportation, storage, disposal and use of pest control products, taking into account regional conditions and concerns. Municipalities may also control aspects of pesticide use and disposal. Some of the earliest pesticide collection programs at the municipal-level were set up in the 1960s and 1970s to collect and dispose of DDT. These programs were developed to manage unused stocks of certain formulations of DDT, resulting from the regulatory decisions to limit the permitted uses.

Pesticides that are not legally registered in Canada are refused entry and returned to the exporter. The Importation for Manufacturing and Export Programme for Pest Control Products does not allow for the importation of DDT for the purposes of reformulation and subsequent exportation. In addition, exports of DDT would be subject to notification according to the Canadian Environmental Protection Act, and no such notifications have been received.
Since the mid-1980s, programs have been set up at the provincial and municipal level across Canada to collect hazardous wastes. These programs generally include pesticides that are no longer used, have been discontinued, or were banned. Hazardous waste management facilities handle the products in accordance with federal and provincial guidelines.

In most provinces, rural collection programs have been established at different times specifically to collect pesticides that were no longer being used. One example is the Ontario Ministry of Agriculture and Food and Rural Affairs which in 1991-92 conducted the Ontario Waste Agricultural Pesticide Collection Programme. This program was widely publicized and collected approximately 1,180 kilograms of DDT. A subsequent pilot project, the Pesticide Disposal Pilot Project to dispose of waste registered and unregistered pesticide products, was initiated in August 1995. As of August 1996 no DDT had been brought forward for disposal. Limited quantities (e.g., 300 grams) of DDT have been reported in municipal collections of Household Hazardous Waste Collection programs, though information on specific chemicals is not available from all sites.

There are no maximum residue levels for DDT in Canada. Action levels for residues of DDT and its metabolites in foods have been established, ranging from 0.5-1.0 ppm in eggs, fresh

vegetables, dairy products, meat and meat byproducts to 5 ppm in fish. These levels have been established based upon monitoring information collected on domestic and imported foods and are periodically revised as new information becomes available.

The United States

In 1969, the US Department of Agriculture (USDA) cancelled the registration of certain uses of DDT (on shade trees, on tobacco, in the home, and in aquatic environments) after studying the persistence of DDT residues in the environment. Applications on crops, commercial plants, wood products, and for building purposes were cancelled by the USDA in 1970. Under the authority of the EPA, the registrations of the remaining DDT products and DDT-metabolites were cancelled on 4 January 1973, with the following exemptions: public health use for control of vector-borne diseases, USDA or military use for health quarantine, and use in prescription drugs for controlling body lice. All of these remaining uses were voluntarily cancelled (due to failure to pay maintenance fees) by October 1989. The fact that there are no registrations means that DDT cannot be used in the United States, nor can it be imported for use as a pesticide product. At present, the United States does not have the legislative authority to prohibit production of DDT if a manufacturer wanted to initiate such production in the future.

However, DDT is not currently manufactured in the United States. There have been recent reports of DDT exports and imports entering or leaving the United States. The EPA believes that the exports are actually small quantities of reference standards being shipped between laboratories and as such, they are subject to the export notification requirements of the Toxic Substances Control Act (TSCA), which has no *de minimis* cut-off for notification. The imports may also have occurred when the Department of Defense (DOD) recalled its existing stocks for destruction. The DOD no longer uses DDT in any of its operations abroad and does not maintain a stockpile. No maximum residue levels are in effect, although there are numerous action levels for a wide variety of crops, ranging from 0.05 ppm to 5 ppm.

Mexico

The introduction of DDT in Mexico in the early 1950s for its use in agriculture followed the pattern shown by Canada and the United States. In the 1970s, DDT use in agriculture production began to decline as a result of environmental concerns and the introduction of stricter limits on residues of DDT on foods.

By 1997, DDT was registered in Mexico only for use in government-sponsored public health campaigns and continued to be an important tool in the fight against malaria transmission. Mexico's malaria control program restricted the use of DDT to selective applications in dwellings. There was only one private company producing DDT in Mexico, and its production was subject to government approval. DDT requirements for malaria control have been reduced significantly in recent years because of changes in Mexico's malaria campaigns.

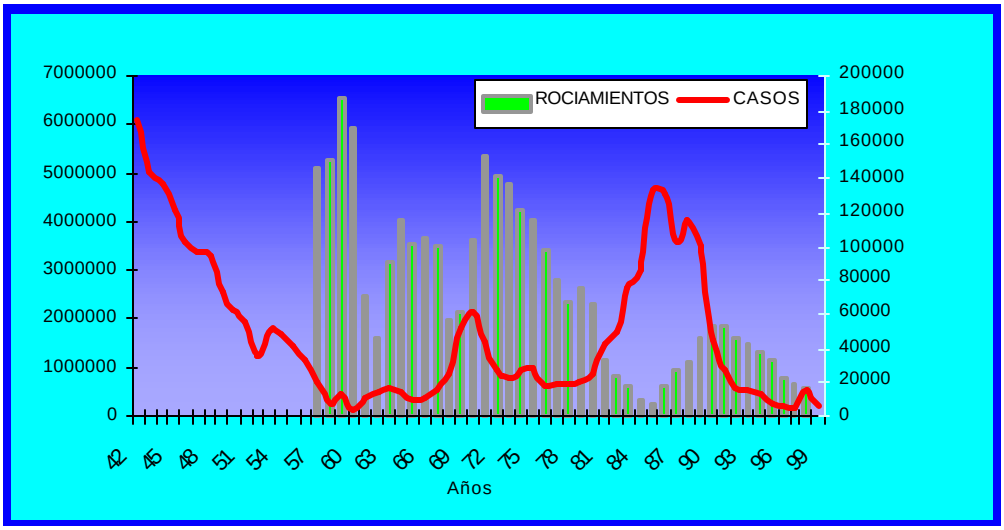
It is important to understand that malaria is a long-standing public health problem that has inhibited development in large areas of the country. Sixty percent of Mexico's territory from sea

level to 1,800 meters above sea level, presents favorable conditions for malaria transmission. This includes the Pacific coast, the Gulf of Mexico slopes, the Yucatán peninsula and interior basins of the high plateau. Some 45 million people live in these areas. In the 1940s and 1950s, malaria was one of the main causes of mortality, responsible for an average of 24,000 deaths annually and afflicting an estimated 2.4 million others. In recent years, the incidences of malaria have declined significantly, to less than 5,000 cases, indicating the success of Mexico's malaria control program. Since 1982 there have been no deaths from malaria. The Appendix provides more detailed background on malaria and DDT use in Mexico.

The creation in 1987 of an Interministerial Commission for the Control of Production and Use of Pesticides, Fertilizers, and Toxic Chemicals (Cicoplafest), formed by the Ministries of Health, Urban Development (now Environment), Agriculture, and Trade, has been instrumental for the banning of the use of six organochlorine pesticides and the restriction of DDT use. The production of DDT has declined steadily and in 1999 was less than 600 tonnes per year.

In 1995, Mexico decided that an integrated pest management approach for malaria could substitute for the heavy dependence on pesticides. Improved sanitation, surveillance and minimum use of pesticides to control mosquitoes and larvae are considered key elements in this new approach. Furthermore, in 1996, Cicoplafest implemented a new initiative to control pesticides with a life-cycle approach, and the new Health Law, published in 1997, introduced the concept of safe management of chemicals throughout the entire life cycle. In April 1997, the Ministry of Environment, Natural Resources and Fisheries, through its National Institute of Ecology, published a Program for the Environmental Management of Priority Toxic Chemicals that mentions the development of this DDT NARAP. Under all these initiatives, organochlorine pesticides have been considered priorities for regulatory action due to their persistence and tendency to bioaccumulate. Figure 1 shows the trend in number of malaria cases and the use of DDT in Mexico between 1942 and 1999.

Figure 1: **Malaria Cases and Use of DDT in Mexico**



Source: Programa de Control de Enfermedades Transmitidas por Vector, Secretaría de Salud, México.
Note: Each rociemiento contained approx 690 gr of DDT

Appendix – 1996 Presentation by the Mexican Ministry of Health

Introduction

[Note: The report upon which this edited text is based was provided by Mexico and presented (Document IFCS/EXP POPs 11) on 14 June 1996 to the Intergovernmental Forum on Chemical Safety at the opening session of the IFCS Experts Meeting on POPs, held 17-19 June in Manila, Philippines.]

For many years malaria has been a major public health problem in Mexico-one that has hindered the development of large areas of the country. In the 1940s and 1950s it was one of the main causes of death, causing an average of 24,000 mortalities annually and afflicting some 2.4 million individuals.

At the end of the 1940s, a program of selective spraying of DDT in dwellings was begun in some urban and rural areas, yielding results that supported the international eradication proposal presented by Mexico in 1955. Even though this national campaign for malaria eradication did not accomplish all its objectives, the transmission of *Plasmodium falciparum* was halted, the death rate from the disease was greatly reduced, and efficient technical and operational procedures were established which allowed other public health programs to be introduced in rural locales with difficult geographical access.

The widespread introduction of DDT in Mexico followed the pattern of many other countries. During the early 1950s, DDT was introduced throughout Mexico and extensive agricultural use followed. As much as 1,000 tonnes per year were applied to large agricultural areas, and application rates in the Laguna region in central Mexico were among the highest in the world. The success of DDT spraying in the household to reduce malaria transmission became strategic in the 1960s, and the evolution of the spraying campaign typifies the intensity placed in the campaign against the disease. From the selectively based campaign of the 1940s, the use of DDT and other newly developed organochlorine pesticides grew steadily through the 1960s. Finally, in 1968, DDT production was bought by the government for state control. This was also the time in which organochlorine production peaked in Mexico, with more than 80,000 tonnes produced annually.

The controlled production of DDT resulted in increased availability and lowered cost for its use in malaria control and agriculture. However, production was maintained at about 25,000 tonnes per year. During the early 1970s the US Food and Drug Administration (FDA) began rejecting the importation of commodities due to high residue levels, especially of DDT.

The growing concern about DDT persistence has had a significant impact on agricultural practices in Mexico. The northern area of the country, more developed and highly dependent on exports, changed to newer and even more toxic pesticides in order to comply with FDA/EPA regulations on DDT residue content. The southern area of Mexico, largely devoted to local production, continued the use of organochlorine pesticides. However, the use of DDT in agriculture started to decline. In 1987 the Ministries of Agriculture, Commerce, Urban

Development (now Environment) and Health joined efforts by forming an interministerial commission to control the use of pesticides, fertilizers and toxic substances. In 1990 this commission (Cicoplafest) banned the use in Mexico of six organochlorine pesticides and DDT use was severely restricted. Organochlorine production declined steadily and DDT was limited to campaigns addressing public sanitation (about 3,000 tonnes per year).

In the early 1980s, the economic crisis and reductions in program activities caused a significant deterioration in public health, leading to the temporary increase of malaria transmission. In 1985, 133,700 cases were registered in 14,000 localities. As a result, the malaria control program was strengthened with additional human, material and financial resources. The technical strategy was reoriented to address the simultaneous elimination of the plasmodium parasite in humans and the anopheline mosquito as disease vectors. From 1985-89, the annual average had declined to 117,000 cases. Still, in 1989, among 21 countries in the American hemisphere with active programs against malaria, Mexico reported nine percent of the cases, second only to Brazil in number. By 1994, after the reinforcement of the anti-malarial program, the number of cases had decreased to only one percent of those reported in the Americas.

In 1991, Fertimex, the national producer of DDT, was privatized and additional restrictions were placed on organochlorine production. Changes in malaria campaigns have further reduced DDT use and production.

In 1996, Cicoplafest undertook a new role. Pesticide control through the life-cycle approach has been implemented and new governmental areas (transportation and labor) have been included to integrate every area of the chemical life cycle. Elimination of organochlorine pesticides is a priority, due to their persistence and tendency to bioaccumulate.

Aspects of Malaria Prevention and Control Programs in Mexico

1. The anti-malarial program is geographically oriented, since 60 percent of the territory from sea level to 1,800 m above sea level presents favorable conditions for the transmission of the disease. This includes the Pacific coast and Gulf of Mexico slopes, the Yucatán peninsula and interior basins of the high plateau. The area encompassed is inhabited by close to 45 million people. The strategy focuses on entomological and epidemiological stratification of the malarial areas, since studies have revealed that 70 percent of malaria cases were located in approximately one thousand pockets of persistence, distributed throughout five states that have high receptivity and vulnerability due to national and international migration. Thus program activities have been divided into two areas:

- For non-priority states: Intensification of epidemiological surveillance, selective application of DDT spraying to dwellings, and intensive treatment of diagnosed cases.
- For priority states the Intensified Action Plan will be applied:

2. Selection and training of personnel in epidemiological, therapeutic and entomological aspects of malaria transmission and prevention, use of pesticides and spraying equipment (personnel skills and aptitudes are taken into consideration). Thus far, 2,422 workers have been trained through 90 short courses. In addition, other program staff are updated twice a year.

3. Promotion of active community participation in the program and inculcate a public health self-care mentality in the population so people will demand health services of public medical units and notification centers headed by voluntary members of rural communities.

4. Promoting basic sanitation aimed at reducing human contact with disease vectors. This includes clearing overgrown areas; cleaning up bodies of water; improving drainage of stagnant water, and bringing about general improvements in housing conditions, including promoting the use of beds, and window and door screens.

Program activities

Entomological studies have identified 26 species of *Anopheles* mosquitoes in Mexico. The main malaria vectors are: *A. pseudopunctipennis* and *A. albimanus.* The first, widely distributed in malarial areas of the country and the primary vector in the Pacific slopes, is found from the coast up to 2,000 meters above sea level; the second is found from sea level to 800 meters above sea level and is the main vector in coastal areas along the Gulf of Mexico, in the Yucatán peninsula, and in the forests of Chiapas.

Entomological surveillance includes: a) hydro-entomological monitoring of bodies of water in areas where the anopheline mosquitoes are found; b) capture of adult mosquitoes around dwellings, including animal lodgings and natural shelters, during the period of hematophagous activity; c) determination of parity; and d) testing resistance to each insecticide used in the program, using methodologies and equipment recommended by the World Health Organization.

Disease notification is considered a crucial aspect of the epidemiological surveillance of malaria. In Mexico approximately 30,000 notification centers have been established and staffed by volunteers. Each year they draw 11 percent of the two million blood samples that are examined and notify around 43 percent of the total cases reported.

Monitoring of fever victims at home is performed on a monthly basis by specific personnel involved in the program and voluntary notifiers, giving priority to localities considered as foci of persistent transmission.

Microscopic examination of blood samples is handled by 140 local laboratories located through the malarial areas, where each year an average of two million blood samples are examined in the course of epidemiological surveillance. Cases diagnosed are identified and controlled by name in order to allow efficacy of treatment, which includes doses of chloroquine-primaquine for a period of five consecutive days.

Intensive medical treatment for humans in foci of disease persistence centers on the elimination of plasmodium parasite in the blood and liver.

Action against the mosquito vector begins, through entomological surveillance, with the identification of foci of disease persistence and those sites and hours of the day and night when

vectors concentrate to feed and rest after feeding. This information allows selective malathion fogging to be most effective.

Anti-larval activities, related to improved sanitation, involve the elimination of mosquito breeding sites through drainage or filling of low-lying areas, involving community participation. When these measures are not feasible, the larvicide, temephos, is selectively applied simultaneously with the fogging in breeding sites.

Statistics are gathered weekly by collecting epidemiological data by locality, *municipio,* and state, giving monthly operational data for each program unit and level.

Program supervision strives to correct errors and omissions through in-service training, improving skills and personnel attitudes.

Monthly evaluations are performed at each level (team, section, sanitation jurisdiction, state and national), comparing program goals with results obtained in each field activity.

Applied operational testing has included field and laboratory research on procedures for eliminating the plasmodidiæ parasites, including house spraying with bendiocarb and fenitrothion, which underwent testing for four years.

DDT spraying of households continues to be a successful part of the program. The number of households sprayed has diminished, though, as persistent foci have been eliminated. Currently fewer than 600,000 treatments are required nationwide.

Current Legal Status of DDT Production and Use in Mexico *(Note: current in 1996)*

Currently DDT use is severely restricted in Mexico and has been registered and approved only for anti-malarial control programs. The pesticide is classified as a persistent compound with an acute toxicity that is low for humans and but high for animals. Chronic effects, though, are a serious consideration, due to its possible link to breast cancer and reproductive abnormalities. Legally DDT production is limited to public health needs and for international trade. Two certified concentrations are available: technical grade (100 percent pure) for use in mixing formulations and 75 percent for household application. Commercial products are labeled "only for use in public health programs" and are not available for pest control management or agricultural use. Imports are banned, due to high levels of contaminants in the DDT available from other countries (especially China and India). Exports are regulated by Cicoplafest and every shipment is registered.

Technical Status of DDT in Mexico

Malaria was a major public health problem in Mexico from 1950 to 1989. The disease is endemic in more than 60 percent of the country's land area, a fact which is reflected in the high incidence and mortality statistics. The use of pesticides has markedly diminished the number of cases, from more than 120,000 per year to less than 5,000. Malaria mortality has declined

sharply: it was one of the top ten causes of death in Mexico during the 1950s, but since 1982 there have been no deaths from the disease. These results show that an integrated approach is highly effective in the control of the vectors responsible for the spread of malaria and dengue fever. The low acute toxicity for humans has also promoted the use of DDT.

Public health programs involve a large number of workers, with more than 10 percent of the Health Ministry workforce currently involved in malaria control. More than 7,000 workers have been trained and equipped for DDT household spraying. The investment is considerable, with the exception of the pesticide, substitutes for which are seven or eight times more expensive. The employment of DDT substitutes has been ineffective and sporadic. It has been stated that DDT should be replaced by another pesticide, but in fact a more integrated approach to vector control is required.

In 1995, Mexico decided that an integrated pest management for malaria could substitute for the heavy reliance on pesticides. Improved sanitation, epidemiological surveillance and a minimum use of pesticides to control adult mosquitoes and larvæ are considered key elements. When the CEC began working on limiting human exposure to toxic and persistent substances, DDT became one of the four initial targets.

Reduction of human and environmental exposure to DDT will be accomplished through a gradual organized approach that will focus on:

- Elimination of illegal uses of DDT. Information is available that DDT might be being used for agricultural applications. Cicoplafest will reinforce surveillance in the southern states to ensure that spraying of DDT in the environnment is banned.
- Gradual reduction of DDT use for malaria control. The integrated approach will focus on reducing the number of foci of persistent transmission. The CEC will work with the North American Working Group on the Sound Management of Chemicals to assist in the monitoring and assessment of this program to help ensure that adequate population protection is maintained throughout the program. The amount of DDT used will be reduced by 80 percent (by volume) over five years and its total elimination is programmed over the next ten years.
- A region-wide approach. There is a continuous migration of population from Central America to several regions in Mexico and through Mexico to the United States. Thus, a successful approach to controlling DDT use should also consider the need for regional involvement to minimize transmission.
- Community involvement. Minimizing human and environmental exposure to DDT was the subject of a meeting of experts held in Mexico City, with the participation of Canada, the United States, PAHO and Mexico. The discussion attested to the success of the malaria control program in Mexico and concluded that further activities should encourage gradual reductions in DDT use through an integrated management approach.

Sources:

CEC. 1997. North American Regional Action Plan On DDT, North American Working Group For The Sound Management Of Chemicals Task Force On DDT And Chlordane. Montreal: Commission for Environmental Cooperation, http://www.cec.org/programs_projects/pollutants_health/smoc/ddt.cfm?varlan=english

Programa de Control de Enfermedades Transmitidas por Vector, Secretaría de Salud, México. *Casos de malaria y uso de DDT en México.*