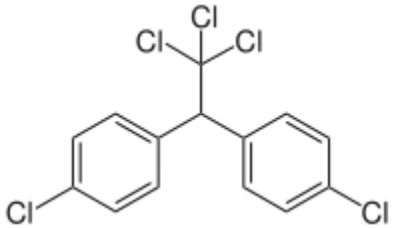
A STUDY ON DDT

Overview



Recognized as an insecticide by the Swiss scientistPaul Hermann Muller, DDT helped 1 billion people live malaria-free for thirty years after its discovery, thus saving millions of lives. But, according to a study in*Environmental Health Perspectives*, its "stability, ubiquitous presence, and persistence in the environment, its accumulation in adipose tissues, and its estrogenic properties" make its long-term effects on both humans and wildlife disastrous. The discovery of its toxicity to birds by biologist Rachel Carson in her book*Silent Spring* led to the banning of DDT in 1972. The book also gave birth to the modern environmental movement.

Chemical Description

DDT (dichlorodiphenyltrichloroethane) is a colorless crystalline substance which is nearly insoluble in water but highly soluble in fats and most organic solvents.

DDT is created by the reaction of trichloroethanol with chlorobenzene (C6H5Cl). Trade or other names for DDT include Anofex, Cesarex, Chlorophenothane, Dedelo, p,p-DDT, Dichlorodiphenyltrichloroethane, Dinocide, Didimac, Digmar, ENT 1506, Genitox, Guesapon, Guesarol, Gexarex, Gyron, Hildit, Ixodex, Kopsol, Neocid, OMS 16, Micro DDT 75, Pentachlorin, Rukseam, R50 and Zerdane.

It kills insects by opening sodium ion channels in insects' neurons, causing the neurons to fire spontaneously. This leads to spasms and eventual death. Insects with certain mutations in their sodium channel gene may be resistant to DDT and other similar insecticides.

History

DDT was first synthesized by Othmar Zeidler in 1874 but its insecticidal qualities were not discovered until 1939 by the Swiss chemist Paul Muller. The American military began testing it in 1942 and it quickly became the cardinal weapon used by the military to protect troops in areas laden with vector-borne diseases such as typhus and malaria. It was so effective at halting the spread of these diseases that it was hailed as "the wonder insecticide of World War II." (Bailey)

After the war was over, farmers adopted the use of the pesticide. It was both cheaper - as low as $0.25 per pound - and less damaging than previousarsenic-based insecticides which had absolutely disastrous consequences. Testing by the U.S. Public Health Service and the US Food and Drug AdministrationDivision of Pharmacology found no serious human toxicity problems. This is because DDT is an organochloride insecticide, which by nature is not acutely toxic. However, organochlorine insecticides are very persistent, biodegrade slowly, and build up in the food chain, causing negative side effects in the long term (see Persistent Environmental Contaminants).

Only small amounts of DDT were used in World War II, but with the experts' blessing and a cheap price, its use was ubiquitous. In the 1960s, 400,000 tons where applied annually worldwide (about 70% was for agricultural use). Malariawas cut from over 8 million cases in Argentina in 1943 to 800 fifteen years later, and in India the number dropped from 10 million cases to around 285,000 in a similar time period. Malaria was entirely eradicated in the southern U.S. DDT also had a significant effect on increasing agricultural output. Some believe it directly decreased the number of farmers in the country because it increased output so greatly.

However, DDT is indeed toxic. It has a disastrous effect on a variety of freshwater and marine beings. It was found to cause eggshell thinning in birds, especially eagles and hawks, which caused decreased reproductive rates. Sweden banned DDT in 1970, and the U.S. banned it in 1972, after months of hearings, because of environmental concerns. Though its negative effects on wildlife are axiomatic, its effects on humans are not as clear. DDT is linked with cancer, endocrine disruption, and reproductive and developmental effects. For details of various agencies' evaluations of DDT's chronic toxicity, please visit the Pesticide Action Network's page on DDT.

DDT continues to be used as an insecticide in some developing countries for "essential public health purposes" but is no longer used in agriculture. A few countries, including the U.S., still produce DDT today. Some still question the decision to ban it because of its effectiveness in cheaply combating vector-borne diseases.

Uses

DDT was used from 1942-mid 1970s as an insecticide. It had a significant effect on agricultural output and in mitigating vector-borne diseases. It is still used in some developing countries to combat typhus and malaria.

The World Health Organization has now fully endorsed the use of DDT to fight malaria (see PBS article here).

Environmental and Health Effects

As mentioned above, DDT is an organochloride insecticide. It is a persistent environmental contaminant and its widespread use has resulted in worldwide contamination.
DDT can be stored in all tissue but is found most prominently in fats. With its long half-life - 10 years - and its widespread use, no living organism may be considered DDT free (#Turoslav, et al, 2002). DDT has been found in all birds and fish tested from the most arid deserts to the deepest seas. It is estimated that it would take 10 to 20 years for an individual to become DDT free, even if all DDT exposures could be avoided during that time.
In fish-eating birds, such as falcons and eagles, DDT causes eggshell thinning, which leads to difficulties in hatching and lower birth rates. High levels of DDT also cause reproductive problems in fish.

Health effects of DDT exposure are much more contentious than the environmental effects. Carson's study relied heavily on the carcinogenic effects of DDT but to this day they remain highly speculative. A group convened by the International Agency for Research on Cancer concluded in 1991 that prior studies are inadequate evidence for carcinogenicity in humans. Reports since have focused on DDT's effect on liver and pancreatic Cancer but have yet to conclusively prove its carcinogenic effects. For details of various agencies' evaluations of DDT's chronic toxicity, please visit the Pesticide Action Network's page on DDT.

Source : http://www.toxipedia.org/display/toxipedia/DDT