DDT and malaria

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From miracle product to outright banned… but still important

First discovered in the 19th century, DDT's insecticide properties were identified by chance in 1939 by Paul Müller, who received the 1948 Nobel Prize for Medicine in recognition of his discovery.

DDT was the first of a new generation of organochlorine insecticides and considered to be safer than predecessors because it required very little to be effective and was considered non-toxic to animals. However, this was just the beginning of the story…

DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) is made from chloral hydrate and chlorobenzene. It is a white, crystalline solid with no odour or taste that does not occur naturally in the environment. Chemical properties of DDT include low water solubility, high stability and semi-volatility, all of which make it prone to travel long distances, particularly through the atmosphere.

DDT biodegrades very slowly and so builds up in nature and within food chains. In addition, its breakdown product DDE (1,1-dichloro-2,2-bis (chlorophenyl)ethylene), that results from the dehydrochlorination of the aliphatic part of the molecule, is present almost everywhere in the environment.

The United Nations Environment Programme (UNEP) has classified DDT as one of 12 Persistent Organic Pollutants (POPs) of "historical concern." Manufacture of DDT is often permitted but not always allowed in several countries (China, India and the Russian Federation).

Production has been banned in most other countries around the world. However, use is still permitted in malaria endemic parts of the world, particularly in tropical regions. The UN Convention on POPs (Stockholm, May 2001) only permits DDT for "disease vector control" and it can only be used with the express permission of the UN.

History

During World War II, DDT was widely used to protect troops and civilians from malaria, typhus and other vector-borne diseases. After the war, DDT was also extensively used to control insects on agricultural crops and insects that carry diseases such as malaria and typhus.

DDT spraying eradicated malaria across Southern Europe and it was commonly used in Africa until the late 1970s. Today, DDT is no longer produced or used in Europe, except for public health emergencies, and is either banned or severely restricted in 68 other countries.

The malaria carrying mosquito

Malaria is considered to be the world's number one tropical parasitic disease, killing more people than any other communicable disease (after tuberculosis). The causative agents of malaria in humans are four species of *Plasmodium* protozoa (single-celled parasites); *P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*. Of these *P. falciparum* accounts for the majority of infections and is therefore the most lethal.

Children and pregnant women most vulnerable

Malaria is a public health problem in more than 90 countries, inhabited by about 2,400 million people or 40% of the world population. The number of malaria cases each year is estimated to be 300-500 million. Mortality due to malaria is estimated at more than one million deaths each year.

However, malaria is curable if promptly diagnosed and adequately treated. The most vulnerable are children and pregnant women. In absolute numbers, malaria kills 3,000 children under five years of age every day with fatally afflicted children often dying less than 72 hours after developing symptoms.

The costs of malaria can also be measured in economic terms, placing strain on often already poorly-funded health systems with as many as 30% of hospital beds being occupied by malaria sufferers.

A single bout of the disease can cost an estimated equivalent of 10 lost working days. According to 1997 estimates, the direct and indirect costs of malaria to sub-Saharan Africa alone exceeded Euro 2,000 million.

Why is DDT still being used to combat malaria?

Malaria has been estimated to kill a million people every year with around 40% of the world's population being at risk. The costs to those countries most affected are estimated at 3-5% of their Gross Domestic Product (GDP).

Drugs and vaccines against the disease are being developed. However, treatment is becoming increasingly difficult as the resistance to the drugs increases and the range of the mosquito spreads. One of the most effective weapons in the war against malaria is still DDT insecticide.

Production and use is banned in most countries because of damage to wildlife and the potential harm to human health. However, the World Health Organisation has not opted for an all-out ban because the substance is so effective against mosquitoes.

Prevention and cure

Methods of preventing malaria consist of bite prevention and protection against the disease in infected people through drugs and vaccines. However, due to increasing drug resistance in many parts of the world, treatment of malaria is becoming harder as previously stated.

Another method of combating malaria is the prevention of infection. Measures that protect against infection are directed against the mosquito, which carries the disease and include the use of protective clothing, repellents and bed nets. In addition, DDT may be sprayed on the inside of buildings where people work and sleep. DDT is recognised as currently the most effective, low-cost mosquito repelling insecticide. Cost is particularly important for poorer nations most at risk from the disease. For example in KwaZulu-Natal (KZ-N) DDT has been used as part of an award-winning programme to combat malaria.

Greater environmental awareness has led to a more careful and targeted use of the chemical than in the past. It is sprayed on interior walls where mosquitoes sit as well as on the mosquito larvae in stagnant water. In addition to the use of DDT, the KZ-N programme includes the distribution of subsidised nets, clinics for emergency treatment and a continuing education programme. The World Health Organisation has named the KZ-N programme as the best anti-malaria programme in the southern hemisphere.

The Euro Chlor position

No Euro Chlor members manufacture or market DDT. Euro Chlor supports the inclusion of this substance on the international priority list of POPs and the use restriction approach agreed by UNEP until alternative products for DDT become available.

Euro Chlor supports efforts to minimise the impact on nature. For humanitarian reasons however, we believe it is legitimate that limited use under stringent controls should be permitted in those lesser developed countries where the threat to human health and life outweighs environmental considerations.

Much more about chlorine on www.eurochlor.org.

Chlorine chemistry applications: www.chlorinethings.eu

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