

DDT The devil you do,

Research by the CSIR and the University of Pretoria has shown that people living in areas sprayed with DDT are at risk of developing illnesses such as cancer when they consume the chicken, fish and vegetables produced in that area.

WHILE AN ESTIMATED 880 000 people – most of them young children – die each year of malaria in the developing world, we may underestimate the potential effects of continued DDT use on future generations.

In South Africa, as in several other developing countries, the use of the powerful insecticide DDT is allowed for malaria control in high-risk areas such as KwaZulu-Natal and Limpopo. However, DDT is also one of the 'dirty dozen' synthetically-produced chemicals banned by the rest of the world, as well as an endocrine disrupting chemical – meaning it can mimic or antagonise the function of hormones – giving rise to babies being born with severe genital ambiguity, or decreased semen quality in young men.

In a study funded by the Water Research Commission, researchers found disturbingly high levels of DDT and one of its byproducts, DDE, in the water, sediment, soil, vegetables, chicken and fish meat of the Vhembe District Municipality in Limpopo, on the border with Zimbabwe and Mozambique. According to the Limpopo Malaria Control Programme, this area has been sprayed with DDT annually since 1966.

Based on the results of their study, CSIR researcher Bettina Genthe, together with Drs Riana Bornman and Irene Barnhorn from the University of Pretoria, found that people living in areas sprayed with DDT, such as the Vhembe district, are at risk of developing especially cancer when they consume the chicken, fish and vegetables produced in that area.



Bettina Genthe



the devil you don't

"Endocrine-disrupting effects were also observed and can be anticipated in the exposed population with effects observed in both the human and animal population and at the cellular level," they write in their report *DDT for malaria control: Effects in indicators and health risk*.

"In general, assuming exposure as described in the main body of the report, the health risk assessment indicates that the potential for serious health effects exists if people are exposed to affected water and selected food from the test areas, as well as part of the control areas. These possible health effects include neurological, reproductive and developmental effects. In addition, DDT is known to mimic oestrogen, while DDE is anti-androgenic. People will be exposed to a risk of developing cancer as well as toxic effects if they make use of untreated dam water. Ingestion of affected chicken or fish results in the highest risk of developing cancer and toxic effects."

According to Genthe, the World Health Organization is reconsidering its recommendation for allowing DDT in certain cases after the publication of the Pine River Statement on the human health consequences of DDT use in May this year. In 2008 a group of international researchers reviewed 494 studies that investigated the human health consequences of DDT and DDE exposure. They came to the conclusion that DDT may pose a risk to human health, and recommend further research to focus on human exposure and health effects in communities where DDT is currently being sprayed for malaria control, as well as more research into the development of safe and effective alternatives to DDT.

DDT AS AN ENDOCRINE-DISRUPTING CHEMICAL

According to Genthe, DDT is not toxic to humans in the sense that you can die if you swallow it, for example. However, it is highly dangerous for the foetus of pregnant woman during certain critical stages of its development.

For example, all humans have 22 pairs of chromosomes and two sex chromosomes – the XX for females and XY for males. However,

the medical world has only recently discovered that just a very small portion of the Y-chromosome is actually responsible for the male gender. There is thus an entire continuum of possibilities (in terms of chromosomes, that is), before a female XX becomes an XY male.

"The Y chromosome might be small, but it contains a very important gene that determines the sex of a baby. We all begin life as a female in the womb. As we develop in the uterus, if the foetus is a male, the gene will cause a cascade of hormones to be switched on, which signals the female sex glands to develop into testes. It is still entirely possible, though, to have males with XX chromosomes. How? The gene responsible for switching on the male sex glands is moved to the X chromosome. It is also possible to have females that are XY with the male sex gene absent from the Y chromosome," Genthe explains.

In addition to chromosomal abnormalities, this process can also be affected by endocrine disruptors that inhibit the switching on of the male sex gene or mimic the female sex hormones. Endocrine disruptors such as DDT disrupt this process, so that you can have a person with female external genitals, but male chromosomes (Androgen insensitivity syndrome), and vice versa.

HISTORY OF DDT USE

The most powerful synthetic insecticide then known was discovered in 1939 by the Swiss chemist Dr Paul Muller. He found DDT to be fatal on contact in extremely minute quantities to an incredibly wide range of insects, with no obvious toxic effect on humans. In the middle of the Second World War doctors opted for this synthetic, mass-produced and cheap wonder-insecticide to tackle malaria, epidemic typhus (carried by body lice), and dysentery and typhoid fever (both carried by houseflies) to protect their soldiers all over the world.

After the war DDT was made available for public use and took the world by storm. According to the *American Heritage Magazine* it was estimated that "by 1950 DDT had saved five million lives over the world through destruction of malarial mosquitoes". In 1948 its inventor was awarded the Nobel Prize for Medicine.

At the same time, however, the American writer and biologist, Rachel Carson, caused a revolution with her book *Silent Spring*, in which she described a world destroyed by the genetic evolution caused by a manmade pesticide as powerful as DDT. In other words, because DDT is so persistent (it can take 6 to 10 years to degrade), it accumulates in the fatty tissue of organisms, eventually finding its way to man at the top of the food chain, in a process called bio-magnification. While DDT does not kill directly, it inhibits reproduction because of its endocrine disrupting characteristics. In her book, Carson created an apocalyptic view of the world in her final chapter where eventually neither humans nor nature are capable of reproduction. By 1963 the US recommended the reduction of the use of DDT.

In 2001, more than 100 countries signed the Stockholm Convention on Persistent Organic Pollutants (POPs), committing to eliminate the use of the twelve POPs of greatest concern to the health of the global community. By 2008, 160 countries had ratified the Stockholm Convention, including South Africa, making it one of the most successful international environmental agreements. – Wiida Basson

THE PINE RIVER STATEMENT: HUMAN HEALTH CONSEQUENCES OF DDT USE

"Current evidence on DDT exposure to human populations and on its potential health effects supports the Stockholm Convention on Persistent Organic Pollutants which emphasises that DDT should be used with caution, only when needed, and when no other effective, safe and affordable alternatives are locally available. Under the Convention, each country currently using DDT is required to provide an implementation and management plan to limit the use of DDT to disease vector control, and to reduce reliance on DDT."

"We are concerned about the health of children and adults given the persistence of DDT and its active metabolites in the environment and in the body, and we are particularly concerned about the potential effects of continued DDT use on future generations."

Source: Eskenazi, Brenda et al. 2009. The Pine River Statement: Human Health Consequences of DDT Use. Environmental Health Perspectives. Available at <http://dx.doi.org>

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