Dichlorodiphenyltrichloroethane (DDT)

Risks, Benefits and Public Perception

Emma Bassein
Cassandra Roth
Overview

• History
• Public Perception
• Science: Risks and Uncertainty
• Governmental, Intergovernmental, and Non-governmental Organizations
• Policy
DDT: History

- First discovered in 1873
- Rediscovered in 1939 as an insecticide
- Used during WWII to combat typhus and Malaria
- Used post-war for agricultural insecticide

• Apparently benign to humans

Source: http://markc1.typepad.com/relishlesslyoptimistic/images/ddt2.jpeg
DDT is Good for Me!

Source: http://www.mindfully.org/Pesticide/DDT-Household-Pests-USDA-Mar47.htm
Silent Spring: 1962

• Single most influential published piece about DDT
  
  Because it caught the public’s attention

• Compiled an enormous amount of anecdotal evidence about the toxicity of pesticides

Source: http://www.mindfully.org/Pesticide/Rachel-Carson-Silent-Spring.htm
Ubiquity and Persistence

- Every creature on earth contains detectable levels of DDT in their body
- DDT and its metabolites persist for decades

Courtesy of US Fish and Wildlife Service.
Evidence for toxicity: non-humans

- Fish Kills
- Reproduction inhibited in birds and other animals
- Feminization and other reproductive dysfunctions

The number of juvenile alligators per kilometer of shore line fell drastically in Lake Apopka (purple) when it was contaminated by DDT.

Source: Guillete et al. (200?)
Evidence of toxicity: humans

- Long term DDT exposure is potentially linked to:
  - Cancer
  - Genetic Mutations
  - Preterm birth
  - Underweight at birth
  - Reduced lactation period
  - Spontaneous abortion/miscarriage
  - Increased rate of hermaphrodites
- Studies lack controls and reproducibility
DDT: Banned by Developed Nations

First banned in 1969: Denmark, Sweden, Hungary, and the state of Michigan

1972: United States bans the use of DDT, but not the export of it

“DDT posed unacceptable risks to the environment and potential harm to human health.”

-EPA Press Release, 12/31/1972
Pressure on Developing Nations

• Reduction of aid for countries using DDT programs
• No importation of goods with DDT residues into developed countries
• Reduction in suppliers for malaria programs
International Malaria Epidemic

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Effectiveness against Malaria

Reduction in DDT directly correlated to increase in Malaria

Source: Roberts et al. (1997)

http://www.cdc.gov/ncidod/EID/vol3no3/roberts.htm

Annual Parasite Indexes (Y-axis one) and House Spraying Rates (Y-axis two) in American countries plotted against time show an inverse relationship between DDT use and parasite exposure
Alternative Malaria Control Options

• Insecticide treated bed nets
• House spraying with alternative pesticides
• Land use modification
• Vaccines, fast diagnosis and treatment
• General health care improvements and education
Indoor Residue Spraying

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Please see: Figure 1 in Walker, K. “Cost Comparison of DDT and alternative insecticides for malaria control.” *Medical and Veterinary Entomology* 14 (2000): 345-354.
Scientific Conclusion:

• Wide spread use of DDT is harmful to the environment
• No clear evidence of human health risk
• DDT is the single most effective prevention method for malaria
• DDT is the most cost effective method of preventing malaria
Public Policy & DDT

1. Public perception of DDT: misinformed
2. Stockholm Convention: balancing perception
3. National organizations: USAID & bed nets
4. WHO abandons DDT in favor of bed nets

Action controlled by public perception
Public Perception of DDT
Environment v Humans

Developed Nations

- Eradicating bird and fish species
- Cancer and endocrine disruption in humans

Developing Nations

“Unite against malaria” www.unicef.org

- 3000 children / day, dead
- 300-600 million / yr, sick
- Lost growth in economy
Real Risks

DDT Use: 1 unit of agriculture vs. 1 unit of house spraying

All houses in Guyana (800 thousand people) = 4 km$^2$ cotton field
Eradication to Reduction: Past funding failures

Necessary for Malaria eradication:
• Reducing malaria prevalence below critical level → requires DDT
• Stop DDT use for agriculture
• Funding from developed nations
Comparison of Methods

Malaria Eradication Program

- Attack: house spraying and treatment
- Consolidation: increased treatment, limited spraying
- Maintainence: vigil against return

Goal: Global elimination

Roll Back Malaria Program

- 60% use of bednets
- 60% preventative treatment of pregnant women
- Maximum 2 weeks to outbreak detection

Goal: Halve the malaria burden
Repeating the Past: The Stockholm Convention, 2001

Countries that have signed in green and those that have ratified in red
USAID Says…

“USAID and others have not seen DDT as a high priority component of malaria programs for practical reasons…

It has been judged more cost-effective and appropriate to put US government funds into preventing malaria through insecticide-treated nets.”
Case Study: USAID & Funding

Driessen, Paul. “USAID could stop this epidemic.” The Hill. November 2, 2005

$80 million spent by USAID
Case Study: USAID & Policy

- DDT as weapon of last resort
- Capitalist approach: private sale of bednets
- Lack of infrastructure inhibiting
World Health Organization

- Staunch supporter of DDT
- Stockholm Convention provides an opportunity to eliminate agricultural use
- Developed countries withhold funding
- Situation in developing countries worsens

WHO creates Roll Back Malaria program
Conclusions:

Public perception, not science, dictates the action of malaria control

DDT should remain an integral part of malaria control programs