Case Teaching Notes

for

"To Spray or Not to Spray: A Debate Over Malaria and DDT"

by

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Introduction / Background

This case was originally written to introduce a group of freshmen students entering Canisius College to case study teaching. It was subsequently modified (version presented here) for use in a senior honors seminar filled with both majors and non-majors that deals with the nature and impact of science and technology on society. This modified version was also used in an organic chemistry course for science majors. Prior student background includes an introduction to organic chemistry, chemical insecticides (types, structures, properties), risk/benefit analysis, and the precautionary principle.

Objectives

- To explore the controversy and uncertainty that often arise in the interaction of science and technology with society using the current debate over the use of DDT to control malaria for that purpose.
- To introduce the major concepts of risk/benefit analysis and the precautionary principle, two techniques that are used extensively when making policy decisions involving science/technology and society issues.
- To explain the strengths and weaknesses inherent in the risk/benefit and precautionary principle techniques.
- To raise awareness of the ethical and moral implications of taking or avoiding technological risks.

Classroom Management

We distribute a copy of the case in advance of the class in which it will be taught and ask students to come prepared to discuss it. The day of the class, students are put into four- or five-person teams to discuss controversial and problematic aspects of the case for about 10 minutes. We then assign one of the questions to each team for discussion within that team. After about 10 minutes of discussion, we ask each of the groups to report their conclusions to the rest of the class. Our experience indicates that it is best if the groups report on the questions beginning with question 1 and proceeding through question 5. We allow about five minutes for each presentation. The floor is then opened for a general discussion of the case. Unfailingly, we have found the discussion to be animated and insightful.

Blocks of Analysis

In this case we have raised several questions concerning DDT's use to control malaria in a manner that reflects the real-world complexity surrounding this issue. Both environmentalists who oppose all uses of DDT and advocates who favor its use for malaria control have strong and valid points. We have attempted to represent their positions in a fair and balanced manner.

When this case was being written, the United Nations Organization was still considering invoking a worldwide ban on DDT use by the year 2004. The World Health Organization, although part of the UN, was opposed to the proposed ban, and the outcome of the debate over DDT's future was uncertain. On December 10, 2000, an international committee convened by the UN to make a decision on the matter recommended that the use of DDT for the control of malaria be allowed until a more effective solution to the malaria problem is found. Both sides seem to agree that DDT is more effective controlling of malaria than the naturally occurring pyrethroids that have been extensively used as a replacement for DDT. The pyrethroids have an effective lifetime measured in months rather than years and are much more expensive than DDT. In addition, mosquitoes have developed an immunity that protects them from the effects of pyrethroids.

This case demonstrates the complex nature of the risk/benefit analysis process often used to make decisions in situations involving science and technology and society. In particular, it points out that the concepts of "risk" and

"benefit" are not as clearly etched as some may think. For example, the "benefits" of using DDT to the people who live in malaria-infested regions of the world are inextricably linked to the "risks" that environmentalists envision resulting from its spraying.

The "precautionary principle" is an important and controversial concept that students are unlikely to be familiar with. It is, however, rapidly becoming more important in the process of technological decision making. As this is being written, Sweden is considering banning any substance that persists in the environment and accumulates in living organisms. This proposed legislation is based on the precautionary principle and argues that a substance need not be proven toxic to be removed as an item of commerce. The precautionary principle arose in Europe and is widely used there in cases involving economic and environmental policy. It has become the focal point of a heated controversy raging between environmentalists and technology advocates.

In summary, this case intends to give students a critical look at a complex contemporary issue that has major scientific, technological, and social importance. It seeks to illustrate the difficulties that arise when scientific/technological choices must be made and there is no clearly "right" choice. Introducing students to the two controversial methods used to help make these decisions, risk/benefit analysis and the precautionary principle, is designed to make them aware of some of the strengths and weaknesses of these methods. The accompanying questions require students to look at both sides of this complex question and to realize that there is no single course of action that will be "right" for everyone. We wish to have our students realize that, when dealing with real-world questions such as those raised in this case study, an imperfect decision often must be made and its consequences accepted.

Answer Key

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to **the key**. You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online** or write to **answerkey@sciencecases.org**.

References

Carson, R. 1962. *Silent Spring*. New York: Houghton-Mifflin Company.

Curtis, C.F. 2000. Should DDT be banned by International Treaty? *Parasitol. Today* 13:119-121.

Foster, K.R., P. Vecchia, and M.H. Repacholl. 2000. Science and the precautionary principle. *Science* 288:979-981.

Fredholm, L. 2000. Sweden to get tough on lingering compounds. *Science* 290:1663.

Grieco, et.al. 2000. A comparison study of the house entering and exiting behavior of Anopheles vestitipennis using experimental huts sprayed with DDT or deltamethrin in the Southern district of Toledo, Belize. *J. Vector Ecol.* 25:119-121.

Mack, A. 1997. Collaborative efforts underway to fight malaria. *The Scientist* 11:1-5.

Raloff, J. 2000. The case for DDT. *Science News* (12 July) 158:12-14.

Roberts, D.R., S. Manguin, and J. Mouchet. 2000. DDT house spraying and re-emerging malaria. *The Lancet* 356:330-332.

Satchell, M. 2000. DDT: Dangerous Scourge or last resort? *U.S. News & World Report* (Dec. 11) 64-65.

Slovic, P. 1987. Perception of risk. *Science* 236 (April 17) 280-285.

VanderZwaag, D. 1999. The precautionary principle in environmental law and policy: elusive rhetoric and first embraces. *J. Environ. Law and Practice* 8:355-358.

WHO Expert Committee on Malaria. Use in vector control. Available at http://mosquito.who.int/docs/ecr20_annex1.htm.

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