Introduction

Since attending the Great Lakes Research Consortium’s Ecosystem Dynamics program, curriculum materials have been developed for use in three of my classes: Biology 315, Genetics; Biology 302, Human Genetics; and Zoology 373, Embryology. For each of these classes, additional subjects from the practicum have been incorporated into my lectures. New materials emphasize regional Great Lakes issues and incorporate examples to illustrate concepts, ideas and issues. The subject matter that I have developed these materials for pertains to mutagenesis, carcinogenesis, teratogenesis and development. These topics are covered in 1-2 lectures in each of the classes. Lecture materials include overhead transparencies, scientific reprints and popular press articles. Below are specific ways in which GLRC-NSF topics and issues have been incorporated into my instruction.

Biology 315 - Genetics

Genetics is required of all biological science majors as well as biochemistry majors. Many psychology majors also elect this course. Great Lakes issues have been incorporated in association with subject matter dealing with teratogenesis, mutagenesis and carcinogenesis. Great Lakes’ examples of human sources and inputs of teratogens, mutagens and carcinogens into the environment are now components of my lectures. The concept and principles of bioaccumulation are reviewed using Great Lakes’ examples. The known and suspected effects of various toxic substances on human health are reviewed (e.g., PCBs, dioxins, furans, DDT and its residues, and heavy metals). Special emphasis is given to the potential consequences of bioaccumulated substances on critical periods in human embryonic and fetal development. During our extensive study of the etiology of cancer (e.g., mutational effects, viral induction, oncogenes, etc.), the potential roles of bioaccumulated chemicals in carcinogenesis are discussed.

Special reference and emphasis is given to studies carried out at SUNY Oswego by Daly and her colleagues on the effects of eating Lake Ontario salmon on rats and their offspring. The health advisories regarding human ingestion of Lake Ontario fish are reviewed as well as the potential
for developmental effects on the offspring of parents who eat Lake Ontario fish. The regulatory process and the impact and effects of health advisories on human consumption patterns are also discussed in class.

Great Lakes examples of evolutionary principles also have been developed. For example, variation in water snake color patterns in island populations of the Great Lakes is used to illustrate the relationship between selection and genotypic frequencies.

As I encounter new materials in texts and articles, I update my lectures with additional notes and visual aids (mostly overhead transparencies). Additionally, I encourage students in this course and the others that I teach to bring in newspaper and magazine articles pertinent to the class for discussion. Discussions of regional and local Great Lakes' issues are often quite spirited.

Zoology 302 - Human Genetics

This course is an upper division natural science course for non-science majors. It is approved at Oswego for General Education credit in the Natural Sciences and for Human Diversity. The course has a primary focus on human reproduction. As such, the teratogenic effects of regional pollutants, toxic substances, and known mutagens and teratogens are particularly germane.

Since participating in the GLRC-ED practicum, I have incorporated Great Lakes topics and issues in much the same manner as in Biology 315- Genetics (described above). In this course, we also discuss the topic of teratogens, mutagens and carcinogens. As in Biology 315, I use Great Lakes examples to describe these concepts as well as the principles and concepts of bioaccumulation. I also address the public health issues and safety of eating fish from Lake Ontario. Risk assessment is part of the fabric of human genetics, especially for non-majors. As with Biology 315, I have added material on the known and suspected health effects of toxic pollutants and included material on their environmental sources and the various routes by which these substances are introduced to humans.

Zoology 373 - Comparative Vertebrate Embryology

This course is a lecture and laboratory course taken primarily by Zoology majors. My presentation is focused on the potential and known effects of environmental exposure to toxic chemicals on vertebrate development. The concepts associated with critical stages of invertebrate development and the impact of toxic substances on developing organ systems are enhanced by inclusion of regional Great Lakes examples. In the future we may try to look more closely at the impact of toxic chemicals on turtle development.

Research

Since attending the practicum, I have established a collaboration with Dr. Richard Roberts (a GLRC-ED instructor) at the State University of New York Research Center at Oswego (SURCO). We have collected preliminary data and have submitted grant requests to study the effects of Great Lakes pollutants on turtles, especially snapping turtles. We are especially interested in exploring the effects of pollutants on mortality and morbidity and the relationship between the level of environmental toxicants, the body burdens of adult turtles, and the effects of these burdens on the viability and development of turtle embryos. Additionally, we wish to look further into the utility of turtles as environmental bioindicators within the watersheds of the
Great Lakes. (EDITOR’S NOTE: Since 1993, Dr. Rosenbaum has been funded several times for turtle research.)