

9:30-10:45 TR  
OLSC 224  
Spring 2003

Gary Silverman  
214 Health Center  
372-6062 (office); 823-5049 (home)  
silverma@bgnet.bgsu.edu

### **ENVH 407 - Environmental Toxicology**

Knowledge of environmental toxicology is fundamental to the education of an environmental scientist. The objective of this course is to provide students an understanding of the effects of toxic agents on health and the environment. It also is designed to provide students a basis for assessing and managing risk associated with potential toxic agents.

Desired student learning outcomes resulting from this course include:

- acquisition of fundamental knowledge about environmental toxicology.
- increased ability to understand technical issues and acquire new knowledge.
- increased ability to communicate about technical issues in writing and verbally
- increased ability to actively engage in critical thinking.
- increased independent research skills.
- increased ability to integrate technical information into a social construct.

#### **Schedule**

<b>Environmental Toxicology</b>		<u>Reading Assignment</u>
1/14	Introduction	
1/16	Biological Systems	Hughes, Chapter 1
1/21	Toxicological Concepts	Hughes, Chapter 2
1/23	Toxicological Concepts (continued)	
1/28	Dose-Response Relationships	Hughes, Chapter 3
1/30	Dose-Response Relationships (continued)	
2/04	Absorption of Toxicants	Hughes, Chapter 4
2/06	Absorption of Toxicants (continued)	
2/11	Distribution and Storage of Toxicants	Hughes, Chapter 5
2/13	Distribution and Storage of Toxicants (continued)	
2/18	Midterm 1	
2/20	Midterm Review; Current Issue Review	
2/25	Biotransformation and Elimination of Toxicants Paper Outline and Bibliography Due	Hughes, Chapter 6
2/27	Biotransformation and Elimination of Toxicants (continued) (paper bibliography and outline due)	
3/04	Target Organ Toxicity	Hughes, Chapter 7
3/06	Target Organ Toxicity (continued)	

3/11 **Spring**



**Break**

3/18 Teratogenesis, Mutagenesis, and Carcinogenesis

Hughes, Chapter 8

3/20 Teratogenesis, Mutagenesis, and Carcinogenesis (continued)

3/25 Midterm 2

3/27 Midterm Review; Current Issue Review

### **Risk Assessment and Risk Management**

4/01 Human Health Risk Assessment

Hughes, Chapter 10

4/03 Human Health Risk Assessment (continued)

4/08 Ecological Risk Assessment

Hughes, Chapter 9

4/10 Ecological Risk Assessment (continued)

Research Paper due

4/15 Community Structure as a Ecological Condition Measurement

4/17 Risk Management

4/22 Risk Management (continued)

TBA\*

4/24 Risk Communication

4/29 Risk Communication Presentations

ATSDR

5/01 Risk Communication Presentations

Toxicological Profile Paper due

5/08 Final Examination (9:30 - 11:30)

### **Course Requirements**

#### **Reading and Homework**

Required Text: Hughes W. William, *Essentials of Environmental Toxicology*. Taylor and Francis Publishers, Washington, D.C. Available at the University Bookstore.

For class on April 29, you need to have read the material on risk communication published by the Agency for Toxic Substances and Disease Registry (**ATSDR**) available on its web page at: <http://www.atsdr.cdc.gov/HEC/primer.html>

Additional handouts, websites, and reserved reading will be made available and assigned throughout the course. These materials will supplement the primary text in the first part of the course. During our work on risk assessment and management, we will primarily be using very current information, supplemented by foundational material.

You are required to complete the text reading by the beginning of class Tuesdays of the week it is scheduled to be discussed. The text has questions at the end of each chapter. Tuesdays at the beginning of class you are required to hand in answers to these questions. No late homework papers will be accepted (unless prior arrangements had been made).

\* TBA = To be announced

### **Current Event Toxicology Reviews**

On February 20 and on March 27 short reviews of a current newspaper or magazine article are due. (Please do **not** submit reviews from technical journals or from environmental literature - reviews should be from the popular press). These articles should deal with something dealing with environmental toxicology. Examples include something about pesticides being used on residential lawns, residual PCBs in Lake Michigan, and occupational exposure to organic solvents. **Please be sure not to review articles primarily focusing on medical or pharmacological toxicology.** Reviews should be no longer than two pages in length, double-spaced. They should follow the following format, **showing** the four headings as indicated below.

SOURCE - where the article came from

CONTENTS - what the article is about (in general)

TOXICOLOGICAL INFORMATION - the specific linkages to toxicological data or tools

CRITIQUE (the most important section) - how accurately, effectively and fairly are toxicological principles explained and used

### **Toxicological Profile Information**

Toxicological profiles are prepared under guidelines of the Agency for Toxic Substances and Disease Registry (ATSDR) and the U.S. EPA to characterize the toxicological and adverse health effects of hazardous substances. Each profile contains a review of the key literature. The Environmental Health Program is a repository of these profiles, which are currently housed in the Water Quality Laboratory (the small lab connected to the main Environmental Health Lab in Room 120 of the Health Center). To become familiar with these profiles, please choose one and provide a summary of the following information for your selected chemical or chemical group:

1. The neurological effects associated with oral exposure to your selected chemical (2.2.2.4)
2. The level of the chemical monitored or estimated in water (5.4.2)

These summaries should be short, no longer than 4 pages double spaced (no longer than 2 pages for effects and 2 pages for levels). They are due at 9:30 on May 2 (papers will have five points - from a 100 scale - deducted for each day handed in late).

### **Research Paper**

A major research paper is due at 9:30 on April 10 (papers will have five points - from a 100 point scale - deducted for each day handed in late). Topics will be selected on January 16 from the list shown below using a selection procedure to be discussed in class. You should discuss with me before January 17 what is expected on your topics of interest. A typed outline is due February 27 showing major headings and subheadings. The outline should read easily as a device to understand the topics to be covered in the paper, although the headings and subheadings should be quite brief. **Headings and sub-headings used in the outline should be used in the text of your papers.** An example of how headings and subheadings should look follows. **Please note that this is an outline - yours can look substantially different and reflect your specific topic.** If you have a topic that you are interested in exploring but is not on the list, bring your idea to me before January 16.

## [Example Outline]

### Toxicology of Lead

**Introduction** *[skip a line before your text starts]*

**Properties** *[skip a line before your text starts]*

Physical *[skip a line before your text starts]*

Chemical *[skip a line before your text starts]*

**Health Effects** *[skip a line before your text starts]*

Physiological pathways *[skip a line before your text starts]*

Vulnerable groups *[skip a line before your text starts]*

**Children.** *[do not skip a line before your text starts]*

**Elderly.** *[do not skip a line before your text starts]*

**Exposures** *[skip a line before your text starts]*

Occupational *[skip a line before your text starts]*

Environmental *[skip a line before your text starts]*

**Paint.** *[do not skip a line before your text starts]*

**Gasoline.** *[do not skip a line before your text starts]*

**Pipes.** *[do not skip a line before your text starts]*

**Conclusions** *[skip a line before your text starts]*

Also due February 27 is a bibliography showing references useful for the paper. Please keep in mind that **current** information is key to the success of this paper, and that **the majority of your information should come from journals and from agency materials** rather than from texts. You are required to cite no fewer than three refereed journal articles (it is **not** sufficient to only use sources from the Web for this paper). In the body of your paper, please use an author/date (*not author/page!*) reference system. Please see me if you have any questions about paper style, content, or any other concerns or suggestions.

Following return of your outline, bibliography, and paper, you will have one week to make recommended changes and return the material for a new grade. This will provide you the opportunity to learn how to better prepare a research paper by responding to specific suggestions. You can earn up to one-half of the points initially subtracted from a possibility of 100 points (e.g. if you initially earned a grade of 80 on your paper, you could earn 10 more points bringing it up to a final grade of 90. If you initially earned a grade of 70, you could earn up to 15 points, bringing the final grade up to a 85.)

### Paper Topics

1. Useful endpoints to measure effects of toxic agents on ecosystems.
2. Biomarkers as indicators and predictors of human toxicity.
  
1. Human health risk from environmental exposure to endocrine system disrupters.
2. Health effects associated with strenuous aerobic exercise in a polluted urban air basin.
3. Statistical treatment of animal toxicological data to estimate low dose effects on humans.
4. Toxicology of water disinfection byproducts (through chlorination) on human health.

5. Toxicological assessment of chemical mixtures.
6. Diversity as a measure of community structure and health.
7. Benefits and risks associated with irradiation of food as a preservative.
8. Do chemicals have a threshold dose for human toxicity?
9. Adequacy of the U.S. EPA procedure to quantify health risks associated with chronic exposures to toxicants.
10. Ecological risk associated with growing genetically engineered food.
11. Comparison of the relative risk in the United States from using municipal drinking water to using drinking water from a rural well.
12. Occupational health risk from pesticide exposure to seasonal farm workers in Ohio.
13. Toxicity of urban runoff to receiving waters.
14. Comparative public health risk assessment of increased skin cancer from ozone layer depletion with increased skin cancer from tanning salons.
15. Human health risk associated with exposure to electromagnetic radiation.
16. Comparative risk to the U.S. population of radon and asbestos
17. Characterization of the public health risk associated with the EnviroSAFE hazardous waste landfill (located just east of Toledo in Oregon).
18. Toxicity characterization of emissions from municipal waste incinerators.
19. Toxicity associated with secondhand tobacco smoke
20. Relative risk of using herbal health supplements (e.g. Echinacea) as a regular part of the diet.
21. Relative risk of living close to a hazardous waste incinerator.
22. Relative risk of eating fish from the Great Lakes.
23. Public health impact of the Department of Agriculture's new organic food labeling system.
24. Evaluation of the threat from biological warfare agents
25. Evaluation of the threat from chemical warfare agents

### **Risk Management and Risk Communication Exercise**

The final few weeks of the course are devoted to exploration of risk management and risk communication techniques. The environmental professional must know how to translate technical materials for a lay audience, communicate effectively, and participate in decision-making reflecting societal goals in addition to risk minimization.

Working in teams of two, we will select topics of interest, prepare a risk management approach, and communicate that approach at a (simulated) public meeting. Additional details regarding this assignment will be supplied separately

<b>Grading</b>			
Midterms (2 @ 14%)	28 %	Final	25%
Written Paper	15%	Paper Outline & Bibliography	5%
Current Issue Review (2 @ 2)	4%	Homework, Quizzes & Participation	10%
Toxicological Profile Review	3%	Risk Management Presentations	10%

Although this course has been structured for the entire semester, it is subject to change to meet the needs of the class and to reflect emerging issues and events. Everyone is responsible to check their email regularly to stay current. I'll be using email addresses supported by the University "Blackboard" system. If you usually use a different email address you can go to the computer center in Hayes Hall and have the "Blackboard" address forwarded to your preferred address. **It is your responsibility to ensure that you receive email addresses sent on the Blackboard system.** In case of confusion, it is your responsibility to contact me - by email, phone (including at home!), or in person. If it a last minute issue, be sure to look for me (try both phone numbers and my email address, e.g. it is insufficient to say that you emailed just before class and didn't get an immediate response).

I'm looking forward to an interesting and productive semester in Environmental Toxicology!

*Gary Silverman*

### **Studying Environmental Health at BGSU**

This course fulfills a general education requirements for BGSU in the Social Sciences and in International Perspectives. It is offered as a service to the university because of our belief that a well-educated individual must be environmentally literate.

Our Environmental Health Program is one of only 24 programs in the United States recognized by the National Environmental Health Science and Protection Accreditation Council. Our learning outcomes for students are to:

1. think critically and creatively.
2. demonstrate knowledge and abilities useful in the professional workforce.
3. function as a member of an environmental health team in the public or private sector.
4. learn independently over a lifetime
5. fully participate in the art and science of identifying, evaluating and managing environmental factors that can adversely impact the health of humans and their environment.

If you're interested in learning more about majoring on minoring in the Program, just ask any of the program faculty.