

EnvH 405 - Toxic Chemicals and Human Health

Spring quarter, 2009

MWF 11:30 - 12:20, T625 HSB

Optional Review Session: to be arranged

Instructors: Dr. Terry Kavanagh; 685-8479 (tjkav@u.washington.edu)

Dr. Evan Gallagher; 616-4739 (evang3@u.washington.edu)

Teaching Assistants: Chad Weldy (weldyc@u.washington.edu)

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TA Office hrs: Appointments by arrangement.

Appointments with Drs. Kavanagh and Gallagher also by arrangement.

<u>Date</u>	<u>Topic</u>	<u>Reading Assignment</u>
March 30	Introduction/History of Toxicology (Gallagher)	Chapter 1
April 1	Basic Principles of Toxicology (Gallagher)	Chapter 1
April 3	Biological Disposition I-absorption, distribution (Gallagher)	Chapter 2
April 6	Biological Disposition II - excretion (Kavanagh)	Chapter 2
April 8	Biological Disposition III - biotransformation (Kavanagh)	Chapter 3
April 10	Factors that Modify Toxic Responses (Kavanagh)	Chapter 3
April 13	Testing Procedures/Types and Routes of Exposure (Kavanagh)	Chapters 4&12
April 15	Toxicity in the Liver and Kidney (Kavanagh)	Chapter 4
April 17	Developmental & Reproductive Toxicology (Weldy)	Chapter 4
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April 20	Toxicity in the Nervous System (Port)	Chapter 4
April 22	Basic Processes of Carcinogenesis (Gallagher)	Handout
<u>April 24</u>	<i>Exam 1 (covers material through April 17)</i>	
April 27	Genetic Toxicology (Kavanagh)	Chapter 4
April 29	Industrial Chemicals (Kavanagh)	Chapter 6
May 1	Pesticides I (Gallagher)	Chapter 8
May 4	Pesticides II (Gallagher)	Chapter 8
May 6	Toxic metals- I (Kavanagh)	Chapter 9
May 8	Toxic metals- II (Kavanagh)	Chapter 9

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May 11	Household Products (Gallagher)	Chapter 11
May 13	Food Additives and Contaminants (Kavanagh)	Chapter 7
<u>May 15</u>	<i>Exam 2 - (Covers April 20 through May 8)</i>	
May 18	Air and Water Pollution (Kavanagh)	Chapter 9
May 20	Drugs as Toxic Substances (Kavanagh)	Chapter 5
May 22	Plant and Animal Toxins (Kavanagh)	Chapter 10
May 25	Memorial Day, no class	
May 27	Ecotoxicology (Gallagher)	Handout
May 29	Risk Assessment / Risk Management I (Gallagher)	Chapter 12
June 1	Risk Assessment / Risk Management II (Kavanagh)	Handout
June 3	Regulation of Toxic Chemicals (Kavanagh)	Chapter 12
June 5	Review, summary, course evaluation (Kavanagh)	
June 10	<i>Exam 3 and Optional Final Exam*; 2:30 - 4:20 p.m.</i>	

**(3rd exam covers material presented from May 11- June 5; There will also be an optional comprehensive final exam. Note that if you turn in the final exam, it will replace the lowest score of your previous three exams, even if it is lower! Thus, turn in the final exam only if you feel confident that you did better on it than your previous worst exam).*

Required Textbook: *Introduction to Toxicology, 3rd Edition* by John Timbrell, published by Taylor & Francis, 2002

ENVH 405 Website: <http://courses.washington.edu/introtox/>

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Course Description:

Basic principles governing the behavior and effects of toxic chemicals on biological systems, including: toxicity testing; the disposition of chemicals in the body; modifiers of toxic response; fate and effects of chemicals in the environment; chemicals and cancer; chemicals and birth defects; toxicity risk assessment and government regulation of chemical hazards in the home, the workplace and the general environment. Focus is on human health impacts of chemicals as it relates to public health.

Learning objectives for ENV H 405:

The learning objectives for this course are based on fundamental concepts in the science and practice of toxicology. After having taken this course students will be able to:

- Identify significant figures and seminal events important in the history of toxicology, and the professional disciplines, job classifications and scientific fields occupied by toxicologists.
- Explain the principles of chemical dose-response, including quantal vs. continuous measures of response and the descriptors used to define individual susceptibility to toxicants.
- Discuss the different types of testing paradigms used to evaluate the toxicity of chemicals, including tests for acute, subacute and chronic toxicity; the various biochemical assays used to investigate mechanisms by which chemicals cause injury; and the ethical principles surrounding *in vitro* and *in vivo* testing.
- Explain the concepts of absorption, distribution, metabolism and excretion, and their integral roles as determinants of toxicity.
- Explain the biochemical basis of toxicant biotransformation including the key enzymes systems involved, the phases of metabolism, and their consequences for toxicant disposition.
- Discuss the impact of genetic variation, diet, age, gender, and infectious disease status on toxicant disposition and dose-response relationships.
- Discuss the consequences of toxicant exposure for different organs, especially the liver, the kidneys, the brain, and the lungs, and why some toxicants target these organs.
- Identify susceptible periods of embryonic/fetal development that predispose to various kinds of chemically-induced birth defects, and explain the value of comparative animal approaches for understanding mechanism of action for developmental toxicants.
- Describe the basic processes of chemical carcinogenesis, including initiation, promotion and progression, and the types of chemically-induced genetic, molecular and cellular changes that lead to cancer.
- Discuss occupational practices and regulations designed to limit chemical exposures and toxicity in the workplace, biomonitoring and the roles of occupational health professionals in workplace safety.
- Categorize toxicants with respect to chemical class, mode of action, and potency, including pesticides, heavy metals, solvents, gases, halogenated hydrocarbons, polycyclic aromatic hydrocarbons, drugs, food additives and contaminants, and toxins produced by bacteria, plants and animals.
- Identify toxicants commonly found in the home environment, discuss the design of consumer products that limit chemical exposures and explain how the Poison Control System works.

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- Describe the major sources of pollution in air, water and soil, the chemicals of concern in the environment, and the distribution, fate and ecological effects of various pollutants.
- Integrate the concepts of chemical exposure and hazard as they relate to risk, distinguish between risk assessment scenarios that assume threshold vs. non-threshold responses, and discuss various risk management strategies used to limit toxicant exposures.
- Define the statutory authority governmental agencies use to control toxicant releases to the environment, exposures in the workplace, and clean-up of chemical contamination; describe the means by which exposure criteria and standards are established, and discuss the economic, political, and ethical dilemmas associated with the regulation of toxicants.