

EHS 240/EHS 140
Fundamentals of Toxicology
Spring 2017

Tuesday and Thursday: 1:00 to 3:00 pm

Textbook: Casarett and Doull's Toxicology, 8th Edition, Klaassen

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Learning objectives for EHS 140 and 240:

- (1) Have a conceptual understanding of the major parameters controlling absorption, distribution, biotransformation and elimination, and how these processes can be parameterized to provide toxicokinetic models.
- (2) Have a functional knowledge of extrapolations across doses, genotypes, complex mixture interactions, developmental timings and in vitro/in vivo experimental comparisons. Be able to identify a parameter that would facilitate the accuracy of these extrapolations.
- (3) Be able to identify the primary molecular events associated with toxicodynamics and the interconnection between these events. Be able to articulate why it is so difficult to distinguish between association and causation.
- (4) Have a rudimentary understanding of the different processes of cell death.
- (5) Be able to explain how genetic differences between individuals or species has the capacity to impact each and every aspect of the kinetics or dynamics of chemical toxicants.
- (6) Be capable of using the fundamental concepts of mutagenesis, carcinogenesis or teratogenesis to address contemporary issues in toxicology.
- (7) Develop a rudimentary understanding of the physiology and pathology of the immune, pulmonary and nervous systems to characterize how these systems can be targeted by toxicants.
- (8) Have an overview knowledge of the complexities of the endocrine and reproductive systems and the nature of the connections between them in order to explain how toxicants impact these systems.

Learning objective for EHS 240 only:

- (9) Be able to read primary toxicology literature and extrapolate the essential elements in order to produce a written document on the nature of the findings.

4 April (T)	Principles of toxicology	Klaassen pp. 22-34
6 April (Th)	Absorption	Klaassen pp. 153-168
11 April (T)	Distribution	Klaassen pp. 168-174
13 April (Th)	Biotransformation: Phase I	Klaassen pp. 185-366
18 April (T)	Biotransformation: Phase II	Klaassen pp. 185-366
20 April (Th)	Transporters and Excretion	Klaassen pp. 174-180

25 April (T)	Toxicokinetics	Klaassen pp. 367-390
27 April (Th)	Toxicogenetics	
2 May (T)	Toxicodynamics	Klaassen pp. 59-117
4 May (Th)	Toxicodynamics	
9 May (T)	Midterm	
11 May (Th)	Mutagenesis	Klaassen pp. 445-480
16 May (T)	Toxicoepigenetics	Klaassen pp. 41-43
18 May (Th)	Carcinogenesis	Klaassen pp. 393-443
23 May (T)	Carcinogenesis	
25 May (Th)	Immunotoxicology	Klaassen pp. 559-638
30 May (T)	Inhalation toxicology	K: pp. 691-731, 1231-1271
1 June (Th)	Reproductive/endocrine tox.	Klaassen pp. 861-930
6 June (T)	Developmental toxicology	Klaassen pp. 481-523
8 June (Th)	Neurotoxicology	Klaassen pp. 733-766
12 June (M)	Final Exam: 8:00 – 11:00 am	

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Writing Assignment:

The writing assignment consists of choosing a topic in the recent toxicological literature (e.g. toxicology of a single environmental agent in a specific target organ, pharmacokinetics of a specific toxic agent, aspects of a common step in a pathological/toxicological mechanistic pathway, etc.) and finding at least two recent (preferentially within the previous 5 years) primary references that address this topic. The papers should be related to a single toxicological issue. In the past, students have chosen epidemiological papers as opposed to toxicological papers, and this is not the goal in this course. Explain the issue or issues that have been addressed and the experiments that have been performed in the papers. Explain how the two papers are related and what further issues or experiments need to be performed. It is optimal if you can get two papers that come up with conflicting results. Two papers from the same laboratory are not appropriate. The primary literature refers to papers that present original data as opposed to review papers. However, it may be useful to read and refer to an article or two other than the two primary articles.

The length of the assignment should be equal to or less than 3 single-spaced pages. The assignment is due on 16 May 2017. The goal of this assignment is to carefully review/analyze some papers in the primary toxicological literature and to understand how experiments are designed and performed in this area of science. Thus, please restrict the topic to one within the area of "toxicology" (which is a broad topic and therefore should not be so limiting).

Textbook:

The textbook for the course will be Casarett and Doull's Toxicology: The Basic Science of Poisons edited by C. D. Klaassen (8th ed.). This is a classic text in the field of toxicology, but it is better as a reference book than as a readable introduction to the topic.

Grading: The course grade will be determined by the following four components:

Midterm Examination:	100 points
Writing Assignment:	100 points
Final Examination:	100 points

Examinations from previous years:

The examinations from previous years will be posted on the CCLE site for the course.

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Grading:

The course grade will be determined by the following three components:

Midterm examination:	80 points
Final examination:	80 points

Examinations from previous years:

The examinations from previous years will be posted on the CCLE site for the course.

Competencies:

MPH Core Competencies:

- C1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents.
- F11. Articulate how biological, chemical and physical agents affect human health.

Discipline Specific Competencies for MPH in EHS:

- I1.1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents.
- I2.1 Explain the general mechanisms of toxicity in eliciting a toxic response to various environmental or occupational exposures.
- I2.2. Describe how chemical agents are tested for acute, sub-chronic and chronic health effects, including reproductive, developmental and carcinogenic effects, and use of “omics” methods, and interpret toxicological data in terms of relevance to human health.

EHS MS Competencies:

- A1. Retrieve and organize literature; synthesize and critically evaluate scientific literature in environmental health, public health and other relevant fields.

EHS PhD Competencies:

- A1. Judge, critique and interpret reports of individual environmental health studies; evaluate strengths and limitations of environmental health reports.