

## SYLLABUS

**QUARTER:** WINTER 2015

**COURSE:** Toxicology - Path. 438

**LENGTH OF COURSE:** 2 units, 22 hours (2 hours lecture/week)

**COURSE DESCRIPTION:** Toxicology studies the body's response to drugs, foods, and toxic substances. Fundamentals of pharmacology and mechanisms of action are examined for acute and chronic exposure derived from environmental, dietary, occupational and pharmaceutical sources. Emphasis is placed on information literacy to support problem-based and evidence-based learning.

**PREREQUISITES:** CHEM-223, PATH-227

**COURSE OFFERED BY:** Basic Sciences Department  
Sue L. Ray, BA, MS, Chair

**COURSE INSTRUCTOR:** [Dale Johnson, PhD](#)  
Office: Room 102A  
Phone: 510-780-4500, x 2363  
[djohnson@lifewest.edu](mailto:djohnson@lifewest.edu)

**OFFICE HOURS:** Monday: 3 to 5 PM  
and by appointment, MTWThF 09:20-09:50

**REQUIRED TEXT:** Harvey, Clark, Finkel, Rey, and Whalen, Pharmacology, 5<sup>th</sup> ed. (Lippincott Williams & Wilkins: 2012).

**RECOMMENDED TEXT:** (1) Hodgson, A Textbook of Modern Toxicology, 4<sup>th</sup> ed. (J Wiley & Sons: 2010).  
(2) Molecular and Biochemical Toxicology, 4<sup>th</sup> ed., Smart and Hodgson, eds. (J Wiley & Sons: 2008).  
(3) Frank and Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 3<sup>rd</sup> ed. eBook, (J Wiley & Sons: 2011).  
(4) Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 2<sup>nd</sup> ed., (J Wiley & Sons: 1997).  
(5) A-Z Guide to Drug-Herb-Vitamin Interactions, 2<sup>nd</sup> ed., Gaby, Batz, Chester and Constantine, eds. (Three Rivers Press: 2006).  
(6) Gilbert, A Small Dose of Toxicology: The health effects of common chemicals, (CRC Press: 2004).  
(7) Gibson, Multiple Chemical Sensitivities: A survival guide, (New Harbinger Publications: 2000).

- (8) Toxicology and Clinical Pharmacology of Herbal Products, Cupp and Karch, eds. (Springer-Verlag: 2000).
- (9) Lawson, Staying Well in a Toxic World, (Lynwood Press: 2000).

**REFERENCE TEXTS:** Casarett & Doull's Toxicology, 7<sup>th</sup> ed., Klaassen ed. (McGraw Hill: 2008).

**MATERIALS:**

- (1) Handouts (provided by instructor and posted to MOODLE)
- (2) MOODLE site serves as the central, accessible site to provide the links to the student-generated and student-researched information. The instructor has privileges to upload links to the reference citations and to maintain the site for all students in the course. Students must communicate and provide accurate links for uploading to the MOODLE site. Students **MUST** create individual accounts to access material on the MOODLE site.

**METHOD OF INSTRUCTION:** Lectures and group study centered on clinical conditions; on-line and learning center (library) research; in-class reviews, reporting and assessments with instructor; access to MOODLE site for links to reference citations; in-class presentations; creation and maintenance of student portfolio of materials and resources. Each **group is limited to two students**, exceptions to work independently requires instructor approval.

**EVALUATION:**

(1) ORAL PRESENTATIONS: Final presentations are scheduled in weeks 7 and 8 and will be 8-12 minutes in length, including set-up and Q&A.

Options: Formal presentations, or interviews of a mock patient, or case reviews (provided consent from patient and Health Center has been obtained). Attendance is required on the days of student presentations. Participation by attendees in discussion following the presentations is expected. (100 pts)

(2) SUBMISSION OF PRESENTATION & CLEAN RESEARCH QUESTION: Provide electronic copy of final presentation and the clean research question to instructor within the week following the scheduled date of presentation. Write a clean, concise research question for your presentation that emphasizes the central, "take-home" theme of your work. (100 pts)

(3) MIDTERM EXAM (due at Week 5): Take-home exam posted to the MOODLE site will test the fundamentals of pharmacokinetics, pharmacodynamics, detoxification pathways, biochemistry, text book topics, and technical material of lectures. All work is that of the individual student; no collaboration is allowed for the completion of the take-home exam. (100 pts)

(4) FINAL EXAM (Week 11): Emphasis is taken from the student groups' oral presentations and from the student-generated clean research questions. It will involve fundamental concepts of pharmacology and toxicology as appropriate. (100 pts)

Total = 400 points

**GRADES:**

A = 88 – 100 %

B = 80 – 87%

C = 70 – 79%

F = 69% and below (Student must repeat the course)

All work submitted must be done independently by the student.

**STUDENT PRESENTATIONS:**

Student groups (**limited to two students** per group) will select a topic of their choice related to toxicology to present to the class. As an example, students make a presentation based upon personal care products, genetically modified organisms, processed foods, water and air quality, environmental pollution, drugs, poisons, etc. The students are required to pick a toxin for their projects and presentations. The presentations will be between 8-12 minutes. Peer-reviewed references must be provided and properly cited; if websites are cited then substantiating references for those sources from texts and the peer-reviewed literature must be provided.

With your toxins, cover the following questions:

1. What is your clean research question that motivates your study of this selected topic?
2. What is your toxin? What is its chemical structure and what natural compounds does it mimic?
3. Where is it found and how are individuals exposed to the toxin?
4. What is its mechanism of action and target organ(s) of injury? What is the dose-response for toxic action and injury?
5. How is the toxin metabolized and eliminated from the body and what is its biological half-life?
6. What is the risk of exposure and how prevalent is the exposure to the public?
7. Are there any safer alternatives?

**PRESENTATION & CLEAN RESEARCH QUESTION:** Each group will write a clean, concise research question and will e-mail your research question along with your presentation to [djohnson@lifewest.edu](mailto:djohnson@lifewest.edu) no less than one week in advance of the scheduled date of your oral presentation to the class.

**ATTENDANCE:**

College Policy applies

**MAKE-UPS:**

College Policy applies

**EXTRA CREDIT**

There will be no extra credit work accepted in this class.

## CONDUCT AND RESPONSIBILITIES

College Policy applies

## REQUEST FOR SPECIAL TESTING

College Policy applies

## ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

If you have approved accommodations, please make an appointment to meet with your instructor as soon as possible. If you believe you require an accommodation, but do not have an approved accommodation letter, please see the Academic Counselor Lori Pino in the Deans Office. Contact info: [Lpino@lifewest.edu](mailto:Lpino@lifewest.edu) or 510-780-4500 ext 2061

## INDEPENDENT STUDENT WORK

Assignments and research are to be conducted within pairs of students. Collaboration is required and allowed in the formulation of research questions of interests, research for meritorious information, and the preparation and communication of findings.

Midterm and Final exams **MUST** be the product of the student's individual efforts for this class.

## COURSE GOALS

The primary goal of the Toxicology course is to develop an understanding of how the body's biochemical and physiological mechanisms operate to manage the exposure to toxins, poisons and drugs. The secondary goal is to develop an appreciation of how exposure to toxins and the processing of metabolites can limit the patient response to chiropractic care. To achieve these goals this course seeks to develop and expand the information literacy of students and their utilization of research in the case management of patients. The course emphasizes an evidence-informed approach to the formulation of clinical decisions applied to the chiropractic management of patients.

## TOXICOLOGY COURSE SCHEDULE

**Week One: CLINIC ENTRANCE & I.C.E. EXAMS—no class meeting.**

**Week Two:** The instructor will present fundamental topics of pharmacology and toxicology—biological half-life, cytochrome-P450 system, equilibrium build-up, potency, therapeutic index. Group work: select group partners and specify their area of interest. Students will compose specific aims and also a clear, concise research question within their area of interest and submit *prior to the beginning of week 3*. Students will research references and citations in area of interest and will provide list to instructor *prior to the beginning of week 3*.

**Week Three:** The instructor will present applications of pharmacology and toxicology—acetaminophen, ethyl alcohol, polyaromatic hydrocarbons, induced deficiencies, genomic and metabolic impact. The instructor will lead a discussion in chiropractic and holistic perspective to managing toxic exposure. Group work: students will research the pharmacokinetics and mechanisms of action in area of interest.

**Week Four:** The instructor will present applications of pharmacology and toxicology—environmental toxins, metal toxicities, chelation chemistry and therapies. Group work: Students will research access to assessment protocols, laboratories and specific analyses for the management of toxic exposure as related to their area of interest and will review with instructor. Instructor will post the take-home midterm exam to the MOODLE site.

**Week Five:** *Mid-term exam is due at the beginning of class.* The instructor will present applications of pharmacology and toxicology—personal care products, phthalates, xenobiotics, interactions between drugs, herbs, vitamins and minerals, and endocrine disruptors. Group work: students will continue their research on the clinical management of toxic exposure.

**Week Six:** Practice presentations (especially check connections and computer setup as necessary.) Group work: students will complete presentations and will schedule time to present the draft presentation to the instructor at least one week ahead of scheduled date of in-class presentation.

**Week Seven:** Student Presentations

**Week Eight:** Student Presentations

**Week Nine:** Obtain specific references from student presentations and course resources. Review and discuss previously delivered student presentations; ensure clarity of research question. Study and prepare for final exam.

**Week Ten:** Study and prepare for final exam. (Obtain specific references from student presentations and course resources.)

**Week Eleven:** FINAL EXAM

### **Student Learning Outcomes**

Upon the successful conclusion of this course, the student should be able to

1. Identify routes of exposure of environmental toxins and discuss how to educate patients on avoidance.
2. Discuss how the liver's cytochrome P<sub>450</sub> system works, including biotransformation, and how drug-drug and drug-herb interactions occur involving this detoxification system.
3. Understand the physiological effects of selected drugs and environmental toxins, and be able to assess the risks v. benefits of pharmaceutical, supplemental and known toxic substances.
4. Understand and identify health conditions linked to selected toxic exposures from food, lifestyle, environment, workplace and home.
5. Understand the role of toxicology in the development and progression of disease and to characterize its impact on patient response to chiropractic care.