

SYLLABUS

COURSE: Toxicology – PATH-438

LENGTH OF COURSE: 1.5 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-217

COURSE OFFERED BY: Basic Sciences Department

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

RECOMMENDED TEXT:

- (1) Hodgson, A Textbook of Modern Toxicology, 4th ed. (J Wiley & Sons: 2010).
- (2) Molecular and Biochemical Toxicology, 4th ed., Smart and Hodgson, eds. (J Wiley & Sons: 2008).
- (3) Frank and Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 3rd ed. eBook, (J Wiley & Sons: 2011).
- (4) Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 2nd ed., (J Wiley & Sons: 1997).
- (5) A-Z Guide to Drug-Herb-Vitamin Interactions, 2nd 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, 7th ed., Klaassen ed. (McGraw Hill: 2008).

MATERIALS:

- (1) Handouts (provided by instructor and posted Canvas)
- (2) Canvas 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.

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 Canvas 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:** Take-home exam posted to the Canvas 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.

(4) **FINAL EXAM (Week 11):** It will involve fundamental concepts of pharmacology and toxicology as appropriate as well as topics from student presentations (100 pts)

Total = 400 points

GRADES:

A = 90 – 100 %

B = 80 – 89%

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 upload it on CANVAS along with your presentation no less than one week in advance of the scheduled date of your oral presentation to the class.

Grades and the Grading System Final Grades are available online through the CAMS student portal. If there are any questions on grading procedures, computation of grade point average, or the accuracy of the grade report, please contact the Registrar's Office or the Office of Academic Affairs. Grades will be reported and evaluation will be based on the Academic Policies, Procedures, & Services. Please refer to Evaluation Policy (**Policy ID: OAA.0007**)

In order to maintain **Satisfactory Academic Progress**, a student must maintain a 2.0 or better in each and every course. **Any grade less than a C must be remedied by repeating the class.** Please refer to Satisfactory Academic Progress (**Policy ID: OAA.0006**)

Attendance: Please refer to Attendance Policy (**Policy ID: OAA.0002**)

Conduct and Responsibilities: Please refer to the Personal Conduct, Responsibility and Academic Responsibility Policy (**Policy ID: OAA.0003**)

Make-up Exams: Please refer to Make-up Assessment Policy (**Policy ID: OAA.0001**)

Request for Special Testing: Please refer to Request for Special Testing (**Policy ID: OAA.0004**)

Accommodation 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 Office of Academic Affairs. Contact info: Lpino@lifewest.edu or 510-780-4500 ext. 2061. Please refer to Service for Students with Disabilities Policy (**Policy ID: OAA.0005**)

Electronic Course Management:

Canvas is LCCW's Learning Management System (LMS). Canvas will be used throughout the quarter during this course. Lectures, reminders, and messages will be posted. In addition, documents such as the course syllabus and helpful information about the class project will be posted. Students are expected to check Canvas at least once a week in order to keep updated. The website address for Canvas is <https://lifewest.instructure.com/login/canvas> Please refer to the Educational Technologies Policy (**Policy ID: OAA.0009**)

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

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 CANVAS site.

Week Five: Midterm Examination

Week Six: 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 Seven: 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 Eight: Student Presentations

Week Nine: Student Presentations

Week Ten: 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 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. (PLO: 1,2,3,4,5,6,10)
2. Discuss how the liver's cytochrome P₄₅₀ system works, including biotransformation, and how drug-drug and drug-herb interactions occur involving this detoxification system. (PLO: 3,4,6,8)
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. (PLO: 1,2,3,4,6,8)
4. Understand and identify health conditions linked to selected toxic exposures from food, lifestyle, environment, workplace and home. (PLO: 1,2,3,4,6,8)
5. Understand the role of toxicology in the development and progression of disease and to characterize its impact on patient response to chiropractic care. (PLO: 1,2,3,4,6,10)

Program Learning Outcomes (PLO): Students graduating with a Doctor of Chiropractic degree will be proficient in the following:

1. **ASSESSMENT AND DIAGNOSIS:** An assessment and diagnosis requires developed clinical reasoning skills. Clinical reasoning consists of data gathering and interpretation, hypothesis generation and testing, and critical evaluation of diagnostic strategies. It is a dynamic process that occurs before, during, and after the collection of data through history, physical examination, imaging, laboratory tests and case-related clinical services.
2. **MANAGEMENT PLAN:** Management involves the development, implementation and documentation of a patient care plan for positively impacting a patient's health and well-being, including specific therapeutic goals and prognoses. It may include case follow-up, referral, and/or collaborative care.
3. **HEALTH PROMOTION AND DISEASE PREVENTION:** Health promotion and disease prevention requires an understanding and application of epidemiological principles regarding the nature and identification of health issues in diverse populations and recognizes the impact of biological, chemical, behavioral, structural, psychosocial and environmental factors on general health.
4. **COMMUNICATION AND RECORD KEEPING:** Effective communication includes oral, written and nonverbal skills with appropriate sensitivity, clarity and control for a wide range of healthcare related activities, to include patient care, professional communication, health education, and record keeping and reporting.
5. **PROFESSIONAL ETHICS AND JURISPRUDENCE:** Professionals comply with the law and exhibit ethical behavior.
6. **INFORMATION AND TECHNOLOGY LITERACY:** Information literacy is a set of abilities, including the use of technology, to locate, evaluate and integrate research and other types of evidence to manage patient care.
7. **CHIROPRACTIC ADJUSTMENT/MANIPULATION:** Doctors of chiropractic employ the adjustment/manipulation to address joint and neurophysiologic dysfunction. The adjustment/manipulation is a precise procedure requiring the discrimination and identification of dysfunction, interpretation and application of clinical knowledge; and, the use of cognitive and psychomotor skills.
8. **INTERPROFESSIONAL EDUCATION:** Students have the knowledge, skills and values necessary to function as part of an inter-professional team to provide patient-centered collaborative care. Inter-professional teamwork may be demonstrated in didactic, clinical or simulated learning environments.
9. **BUSINESS:** Assessing personal skills and attributes, developing leadership skills, leveraging talents and strengths that provide an achievable expectation for graduate success. Adopting a systems-based approach to business operations. Networking with practitioners in associated fields with chiropractic, alternative medicine and allopathic medicine. Experiencing and acquiring the hard business skills required to open and operate an on-going business concern. Participating in practical, real time events that promote business building and quantifiable marketing research outcomes
10. **PHILOSOPHY:** Demonstrates an ability to incorporate a philosophically based Chiropractic paradigm in approach to patient care. Demonstrates an understanding of both traditional and contemporary Chiropractic philosophic concepts and principles. Demonstrates an understanding of the concepts of philosophy, science, and art in chiropractic principles and their importance to chiropractic practice.