

USC School of Pharmacy

RXRS 304: Mysterious Deaths: Toxicology, Poisons & Literature

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Course Weight: 4 Units

Days/Time/Location: Wednesday, 2:00- 4:50 VKC 210

Course catalogue description: The story of poisons and their deliberate use told through the prism of history and literature, as a fun way to discover forensic toxicology.

Introduction

The use of poisons is weaved into human history, from the natural substances humans learned to use for healing to criminal purposes, to the man-made chemicals of the 20th century purposely designed for biological or chemical warfare. Poisons have fascinated and inspired story tellers and writers, occupying a prominent place in historical and fictional stories, in books and in movies. Sadly, the topic of poisons has not faded in time, as we are regularly reminded through the recounting of recent poisoning events, accidental or deliberate, by the media. This course will take advantage of this rich (but sometimes shameful) heritage to introduce students to major classes of poisons, and to the basic concepts of forensic toxicology, balancing them against the

beneficial (medicinal) use of some of these substances. The goal of the course is to expose students to a serious topic in a fun and entertaining manner, and trigger their curiosity for learning more on this topic in more advanced courses.

Objectives

The course is designed for undergraduates of both scientific and non-scientific majors with an interest in understanding how poisons are an integral part of human history. This will be done through topics such as the inclusion of poisons in cultural traditions and beliefs around the world; the intentional poisoning of American citizens by the government during the Prohibition in the 1920s-1930s, leading to the emergence of forensic toxicology in USA; and many more puzzling mysteries that have inspired writers such as Agatha Christie. Chapters from the required textbook will be supplemented with a variety of source materials, including passages of mystery novels, historical documentaries, media articles and book chapters. Selected cases studies will be critically reviewed and emerging “hot” topics in poisoning incidents discussed.

Upon successful completion of this course a student should be able to:

- Understand and discuss how poisons have influenced history and literature
- Understand the major reasons behind the danger of classical and novel poisons
- Understand the basic principles of forensic toxicology
- Know the history of forensic toxicology

Assignments and Grading:

Class participation:	20 pts	(8%)
4 quizzes @ 10 pts each	40 pts	(16%)
2 midterm exams @ 40 pts each:	80 pts	(32%)
1 written report due on the day of the exam	50 pts	(20%)
1 final exam (partially cumulative):	<u>60 pts</u>	<u>(24%)</u>
Total:	250 pts.	

Class Participation and Attendance (20 pts): On a scale of 20, 0-indicating no participation, 20-indicating best participation. You can therefore increase the probability of getting a higher mark by being proactive in terms of asking (relevant) questions in class and/or contributing to discussions.

Attendance at all classes is expected. Participation will include asking and answering questions and being actively involved in the discussion. It is expected that the students read the assigned papers prior to the lecture and be prepared to discuss background, current understanding, treatments, and gaps in knowledge for the topic in each lecture.

Written report: The class deliverable will be a 5 page write up on one of the chapters of the required text “**The Poisoner’s Handbook**” by **D Blum**, or one of the extra class sources of information based on a toxin or poison of choice. On a scale of 50, 0-no deliverable turned in, 50-an excellent synopsis of the extracurricular source of information. It is expected that the students will engaged one of the extracurricular sources of information (one of the cited videos of 45 minutes or longer, reading of one of the recommended or suggested sources, or reading of one of

the reviewed pieces of literature [e.g. a book by Agatha Christie]) of a subject of interest.

The quizzes (10 points each) include 10 questions (multiple choice questions, T/F questions, fill-in the blank questions). One of the quizzes will consist of short student oral presentations on a topic of their choice.

The midterms (40 points each) will include multiple choice questions, and T/F questions and fill-in the blank or short answer questions.

The final exam (60 points) will be similar format as the midterms. The final exam will be cumulative, but will emphasize material covered after the 2nd midterm.

There are no make-up exams. If exceptional circumstances prevent you from attending an exam, your reason for missing it must be accompanied by a written statement from a third party (e.g. a note from a medical doctor).

Notes, books, calculators, electronic dictionaries, regular dictionaries, cell phones or any other aids are not allowed during exams.

Students will be asked to complete an anonymous critical evaluation of the course at its completion.

Required Text:

The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York

Deborah Blum

ISBN-13: 978-0143118824

ISBN-10: 014311882X

Available on Amazon for ~ \$9.00 - \$15.00

We will supplement the reading with segments from videos/movies on the poisons discussed in class.

Course Readings

Required Readings (selected, short, easy to read chapters)

- John Emsley. *Molecules of Murder: Criminal and Classic Cases*. (2008) RCS Publishing, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 0WF, UK
- John Emsley. *The Elements of Murder: A History of Poisons*. (2005) Oxford University Press, Great Clarendon Street, OX2 6DP
- Kathryn Harkup. *A is for Arsenic: The Poisons of Agatha Christie*. (2015) Bloomsbury Sigma, 1385 Broadway, New York, New York 10018.

Although not mandatory, it is strongly suggested that the students purchase these books for this course, as it will provide a resource to reinforce and supplement the lectures on the use of poisons

throughout literature and history. The students will be able to use identified chapters in the text to support their learning process throughout the semester.

Suggested articles to read:

- Acocella, J. Murder by Poison. The New Yorker, October 14, 2013.
- Alizadeh et al. Black henbane and its toxicity – a descriptive review. Avicenna J of Phytomedicine, 4:297-311, 2014.
- Chidiac, EJ, et al. Mandragora: Anesthetic of the Ancients. Anesth Analg 115:1437-41, 2012.
- Holzman, RS. The Legacy of Atropos, the Fate Who Cut the Thread of Life. 89:241-249, 1998.
- Langman, LJ and BM Kapur. Toxicology: Then and Now, Clinical Biochemistry 39:498-510, 2006.
- Pearce, DN. Sherlock Holmes, Conan Doyle and cocaine. Journal of the History of Neurosciences 3:227-232, 1994.
- Rozman KK and J Doull. Paracelsus, Haber and Arndt. Toxicology 160:191-196, 2001.
- Bardell, EB. Literary Reflections of Pharmacy XI: Thallium as "An Untraceable Poison". Pharmacy in History 30:188-190, 1988.
- Dayon, AD. What killed Socrates? Toxicological considerations and questions. Postgrad Med J 85:34-37, 2009.
- Hughes, MF et al. Arsenic Exposure and Toxicology: A Historical Perspective. Toxicological Sciences 123:3005-332, 2011.
- Lee, MR. Solanaceae IV: Atropa belladonna, Deadly Nightshade. J R Coll Physicians Edinb 37:77-84, 2007.
- Reynolds, T. Hemlock alkaloids from Socrates to poison aloe. Phytochemistry 66:1399-1406, 2005.

Other course materials including but not limited to the syllabus, supplemental reading assignments and additional handouts will be posted on <http://blackboard.usc.edu/>. Students are encouraged to use the online discussions among students via Blackboard.

Course Outline

This course will be in the format of lectures given by instructors on specific topics. During each weekly session the instructor will engage the students with questions and draw comments or interpretations primarily based on the assigned reading. Students are expected to ask questions and participate in an interactive fashion.

Course schedule is as follows:

Week & Date	Topic	Subtopics to be Included	Assigned and Supplemental Reading
Introduction and Background			
August 28 DD	Introduction: expectations and goals of this class. General overview of toxicology	<ul style="list-style-type: none"> • Basic principles of toxicology <ul style="list-style-type: none"> - Hazard, risk and exposure - Dose response 	Website for those who want to know more about toxicology: https://tox.tutor.nlm.nih.gov/index.html
Sep 4 MEC	Milestones in Forensic Analysis of Poisons	<ul style="list-style-type: none"> • Understand the development of assays to measure poisons • Understand how forensic toxicology has progressed over time 	<ul style="list-style-type: none"> - Introductory Chapter, Emsley, 2008 - Langman and Kapur, 2006 - Norris & Gettler, NY Coroner's Office, 1918
Sep 11 DD Quiz 1	History of the Use of Poisons: Overview	<ul style="list-style-type: none"> • Learn about famous poison victims • Understand poison use in politics • Understand how chemicals can be used as both medicines and poisons 	https://toxlearn.nlm.nih.gov/Module1.htm
Sep 18 MC	Ricin	<ul style="list-style-type: none"> • Understand the use of ricin in history and literature • Learn how ricin works and its use in political poisonings 	Chapter 1, Emsley, 2008 Chapter R, Harkup, 2015 The Umbrella Assassin https://www.youtube.com/watch?v=b2Qpwo8Utis
Sep 25	MIDTERM 1 (first hour)		
Sep 25 MC (Midterm1)	Cyanide: Nazi Regime, Tylenol, Jonestown Massacre and others	<ul style="list-style-type: none"> • Understand the historical uses of cyanide • Learn about natural cyanides • Understand how cyanide works 	Chapter 8, Emsley, 2008 Chapter C, Harkup, 2015 Cyanides in Excedrin https://www.youtube.com/watch?v=0FQrGvAUs18 Hermann Goring https://www.youtube.com/watch?v=B6yn2cBsb2A
Oct 2 MEC Quiz 2	Arsenic	<ul style="list-style-type: none"> • Learn about the use of arsenic as a medicine and a poison in history and literature • Learn about natural forms & industrial use of arsenic 	Chapters 2-4; 12-14, Emsley, 2005 Chapter A, Harkup, 2015 Kinter Lecture Arsenic https://www.youtube.com/watch?v=eISqUjkmWFU
Oct 9	Environmental poisoning, Mercury and Lead	<ul style="list-style-type: none"> • Learn about what can poison you in the environment • Learn about the history, medicinal use and toxicity of mercury and lead • Learn about historical toxic accidents that affected humans 	Chapters 2-4; 12-14, Emsley, 2005 One Man's Experience with Methyl Mercury Poisoning https://www.youtube.com/watch?feature=player_embedded&v=e2Nsy0c22R8 Website: http://www.environmentalhealthnews.org/ Reference Movie: a civil action
Oct 16 MC	Morphine and Morphine Like Compounds	<ul style="list-style-type: none"> • Understand the historical uses of opiates • Review the use of opiates in literature • Understand the medicinal uses and abuses of opiates 	Chapter 4 Emsley, 2008 Chapter O, Harkup, 2015 Opioid Nation: The Making of an Epidemic https://www.youtube.com/watch?v=ygqalpOT3Tw
Oct 23 MEC Quiz 3	Methanol poisoning	<ul style="list-style-type: none"> • Understand the use of methanol in improper alcoholic drink production • Understand how methanol and ethanol toxicities differ 	Methanol poisoning https://www.youtube.com/watch?v=PsVwJBSfBAY
MIDTERM 2 – Oct 30 (first hour)			
Oct 30 MC (Midterm2)	Hemlock	<ul style="list-style-type: none"> • Learn about the use of hemlock in history and literature • Understand how hemlock works 	Chapter H, Harkup, 2015 Five Little Pigs; Agatha Christie (trailer)

Nov 6 MC & TC	Belladonna, Henbane and Mandrake	<ul style="list-style-type: none"> • Understand the historical and cultural uses of plant alkaloids • Understand the medicinal uses of materials derived from these plants • Understand how they work 	Chapter 2, 3, Emsley, 2008; Chapter B, Harkup, 2015 The use of sacred weeds https://www.youtube.com/watch?v=uLZiKBdMEIc
Nov 13 MEC	Polonium and Thallium	<ul style="list-style-type: none"> • Understand the use of polonium and thallium in history and literature • Understand how polonium and thallium kill 	Chapter 10, Emsley, 2008 Chapter T, Harkup, 2015 The polonium plot https://www.youtube.com/watch?v=1FqcFaJEnh8
Nov 20 MC Quiz 4	Carbon Monoxide	<ul style="list-style-type: none"> • Understand the toxicity of carbon monoxide • Understand sources of carbon monoxide • Understand how CO works 	Chapter 7, Emsley, 2008 Poisoner's Guide to Communicating Chemistry https://www.youtube.com/watch?v=QPDwzcpgG0o
Dec 4 MC	Botulinum toxin and BOTOX	<ul style="list-style-type: none"> • Understand how botulinum toxin works and historical poisonings • Learn about the history and cosmetic and therapeutic uses of Botox 	https://www.bloomberg.com/news/features/2017-10-26/inside-fort-botox-where-a-deadly-toxin-yields-2-8-billion-drug
RXRS 304-FINAL Final Exam: Friday Dec 13, 2019 from 2:00 – 4:00 pm in VKC 210			

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.