

**USC School of Pharmacy**

**Fall 2020:**

**RXRS 304: Mysterious Deaths: From Poisons in Literature and History to Forensic Toxicology**

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**Course Weight:** 4 Units

**Days/Time/Location:** Wednesday 2:00- 4:50 GFS207 (Hybrid)

**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 20<sup>th</sup> 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:**

- Discuss how poisons have influenced history and literature
- Explain the major reasons behind the danger of classical and novel poisons
- Describe the origins and basic principles of forensic toxicology
- Generate a comprehensive and compelling presentation on a poison

### **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 (24%)</u>
Total:	250 pts.

**Class Participation and Attendance** (20 pts): On a scale of 10, 0-indicating no participation, 10-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 other recommended readings and 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 oral presentations (~ 5 slides) by students on a poison 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 2<sup>nd</sup> 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.
- Deborah Blum. *The Poison Squad: One Chemist's Single-Minded Crusade for Food Safety at the Turn of the Twentieth Century*. Penguin Press. ISBN-13: 978-1594205149; ISBN-10: 1594205140

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
<b>Introduction and Background</b>			
August 19 DD	Introduction: expectations and goals of this class. General overview of toxicology	<ul style="list-style-type: none"> <li>Understand the basic principles of toxicology</li> <li>- Hazard, risk and exposure</li> <li>- Dose response</li> </ul>	Website for those who want to know more about toxicology: <a href="https://toxmentor.nlm.nih.gov/index.html">https://toxmentor.nlm.nih.gov/index.html</a>
Aug 26 MC	History of the Use of Poisons: Overview	<ul style="list-style-type: none"> <li>Learn about famous poison victims</li> <li>Learn about poison use in politics</li> <li>Understand how chemicals can be used as both medicines and poisons</li> </ul>	<a href="https://toxlearn.nlm.nih.gov/Module1.htm">https://toxlearn.nlm.nih.gov/Module1.htm</a>
Sep 2 MEC Quiz 1	Milestones in Forensic Analysis of Poisons	<ul style="list-style-type: none"> <li>Learn about the development of assays to measure poisons</li> <li>Understand how forensic toxicology has progressed over time</li> </ul>	<ul style="list-style-type: none"> <li>Introductory Chapter, Emsley, 2008</li> <li>Langman and Kapur, 2006</li> <li>Norris &amp; Gettler, NY Coroner's Office, 1918</li> </ul>
Sep 9 MC	Ricin	<ul style="list-style-type: none"> <li>Learn about the use of ricin in history, literature and political poisonings</li> <li>Understand how ricin works</li> </ul>	Chapter 1, Emsley, 2008 Chapter R, Harkup, 2015 The Umbrella Assassin <a href="https://www.youtube.com/watch?v=b2Qpwo8Utis">https://www.youtube.com/watch?v=b2Qpwo8Utis</a>
<b>Sep 16</b>	<b>MIDTERM 1 - Sep 16 (first hour)</b>		
Sep 16 MC (Midterm1)	Cyanide: Nazi Regime, Tylenol, Jonestown Massacre and others	<ul style="list-style-type: none"> <li>Understand the historical uses of cyanide</li> <li>Learn about natural cyanides</li> <li>Understand how cyanide works</li> </ul>	Chapter 8, Emsley, 2008 Chapter C, Harkup, 2015 Cyanides in Excedrin <a href="https://www.youtube.com/watch?v=0FQrGvAU18">https://www.youtube.com/watch?v=0FQrGvAU18</a> Hermann Goring <a href="https://www.youtube.com/watch?v=B6yn2cBsb2A">https://www.youtube.com/watch?v=B6yn2cBsb2A</a>
Sept 23 MC	Environmental poisoning, Mercury, Lead, POPs, pesticides, phthalates	<ul style="list-style-type: none"> <li>Learn about poisons you are exposed to from the environment</li> <li>Learn about the history and medicinal use of mercury and lead</li> <li>Understand the mechanisms of toxicity of mercury and lead</li> <li>Learn about historical toxic accidents that affected humans</li> </ul>	Chapters 2-4; 12-14, Emsley, 2005 One Man's Experience with Methyl Mercury Poisoning <a href="https://www.youtube.com/watch?feature=player_embedded&amp;v=e2Nsy0c22R8">https://www.youtube.com/watch?feature=player_embedded&amp;v=e2Nsy0c22R8</a> Website: <a href="http://www.environmentalhealthnews.org/">http://www.environmentalhealthnews.org/</a> Reference Movie: a civil action
Sep 30 MC Quiz 2	Morphine and Morphine Like Compounds	<ul style="list-style-type: none"> <li>Learn about the historical uses of opiates</li> <li>Review the use of opiates in literature</li> <li>Understand the medicinal uses and abuse-associated risks of opiates</li> </ul>	Chapter 4 Emsley, 2008 Chapter O, Harkup, 2015 Opioid Nation: The Making of an Epidemic: <a href="https://www.youtube.com/watch?v=ygqalpOT3Tw">https://www.youtube.com/watch?v=ygqalpOT3Tw</a>
Oct 7 MEC	Food as poison in the 1800-1900s; Arsenic toxicity, and the birth of the FDA	<ul style="list-style-type: none"> <li>Learn how people were exposed to toxicants via food, and how Wiley and his team of chemists fought to insure food quality in USA.</li> <li>Learn about the use of arsenic as a medicine, preservative, and poison through history and literature</li> <li>Learn about natural forms &amp; industrial use of arsenic</li> </ul>	Chapters 2-4; 12-14, Emsley, 2005 Chapter A, Harkup, 2015. "The Poison Squad" book by Deborah Blum. Talk show by D. Blum: <a href="https://www.youtube.com/watch?v=ouJRlqCibMw">https://www.youtube.com/watch?v=ouJRlqCibMw</a> Kinter Lecture Arsenic by D. Blum: <a href="https://www.youtube.com/watch?v=eISqUjkmWfU">https://www.youtube.com/watch?v=eISqUjkmWfU</a>
Oct 14 MC Quiz 3 (short presentations)	Carbon Monoxide	<ul style="list-style-type: none"> <li>Understand the toxicity of carbon monoxide, and how it works</li> <li>Learn about the sources of carbon monoxide</li> </ul>	Chapter 7, Emsley, 2008 Poisoner's Guide to Communicating Chemistry <a href="https://www.youtube.com/watch?v=QPDw">https://www.youtube.com/watch?v=QPDw</a>

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<b>MIDTERM 2 – Oct 21 (first hour)</b>			
Oct 21 <b>MEC</b> <b>(Midterm2)</b>	Methanol poisoning	<ul style="list-style-type: none"> <li>• Learn about the use of methanol in improper alcoholic drink production</li> <li>• Understand how methanol and ethanol toxicities differ</li> </ul>	Methanol poisoning <a href="https://www.youtube.com/watch?v=PsVwJBSfBAY">https://www.youtube.com/watch?v=PsVwJBSfBAY</a>
Oct 28 <b>MEC</b>	Polonium and Thallium	<ul style="list-style-type: none"> <li>• Learn about the use of polonium and thallium in history and literature</li> <li>• Understand how polonium and thallium kill</li> </ul>	Chapter 10, Emsley, 2008 Chapter T, Harkup, 2015 The polonium plot <a href="https://www.youtube.com/watch?v=1FqcFaJEnh8">https://www.youtube.com/watch?v=1FqcFaJEnh8</a>
Nov 4 <b>MC &amp; TC</b> <b>Quiz 4</b>	Renaissance poisons: Belladonna, Henbane and Mandrake Poison Hemlock	<ul style="list-style-type: none"> <li>• Learn about the historical and cultural uses of plant alkaloids</li> <li>• Understand the medicinal uses of materials derived from these plants</li> <li>• Understand how they work</li> </ul>	Chapter 2, 3, Emsley, 2008; Chapter B, Harkup, 2015 The use of sacred weeds Chapter H, Harkup, 2015 Five Little Pigs; Agatha Christie (trailer) <a href="https://www.youtube.com/watch?v=uLZiKBdMEIc">https://www.youtube.com/watch?v=uLZiKBdMEIc</a>
Nov 11 <b>MC</b>	Botulinum toxin and <b>BOTOX</b>	<ul style="list-style-type: none"> <li>• Understand how botulinum toxins work</li> <li>• Learn about the history and cosmetic and therapeutic uses of Botox</li> </ul>	<a href="https://www.bloomberg.com/news/features/2017-10-26/inside-fort-botox-where-a-deadly-toxin-yields-2-8-billion-drug">https://www.bloomberg.com/news/features/2017-10-26/inside-fort-botox-where-a-deadly-toxin-yields-2-8-billion-drug</a>
<b>RXRS 304 Final Exam: Friday, November 20, 2020 from 2 to 4 pm</b>			

### 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](http://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](http://policy.usc.edu/scientific-misconduct).

#### Support Systems:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](http://studenthealth.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](http://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) 740-9355(WELL), press “0” after hours – 24/7 on call*

[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

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

harm.

*Office of Equity and Diversity (OED) - (213) 740-5086 / Title IX – (213) 821-8298*  
[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*  
[usc-advocate.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs - (213) 740-0776*  
[dsp.usc.edu](http://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 Campus Support and Intervention - (213) 821-4710*

[campussupport.usc.edu](http://campussupport.usc.edu)

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](http://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](http://dps.usc.edu), [emergency.usc.edu](http://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](http://dps.usc.edu)

Non-emergency assistance or information.