

Fundamentals of Genetic Toxicology: Environmental and Molecular Mutagenesis

Syllabus

CPSC 432, ENVST 432 – Fall Semester 2006
Tuesday and Thursday from 10:00 to 11:30 AM
358 NSRC, 1101 W. Peabody Dr. Urbana, IL

Dr. Michael J. Plewa, Professor of Genetics
364 NSRC, 1101 W. Peabody Dr.
mplewa@uiuc.edu

Principal Topics:

- Introduction to the field and a historical perspective. The relationship of genetic toxicology as a subset within the field of toxicology. Description of the magnitude of the impact of radiation and chemical mutagens upon the environment and the possible effects upon the public health.
- The spectrum of genetic damage, genetic resolution and their relationship to bioassay development.
- Survey of the chemical and physical nature of nucleic acids.
- DNA repair.
- The nucleosome and induced mutation at the level of the chromosome.
- Survey of genetic assays used in genetic toxicology.
- Molecular mechanisms of base-pair substitution mutations and frameshift mutations.
- Spontaneous mutation: relationship to DNA replication, directed mutation, evolution of mutation rates.
- Mechanisms of direct-acting chemical and physical mutagens.
- Metabolic activation of promutagens and procarcinogens, mammalian and plant activation systems.
- DNA-mutagen adducts and altered DNA conformation.
- Mutant spectra analysis.
- Genomic analysis and genetic toxicology – toxicogenomics.
- Antimutagens and anticarcinogens.
- The somatic mutation theory of cancer and the environmental determinants of cancer: oncogenes, the proteins of oncogenes, tumor suppressor genes and their mutations.
- Monoclonal origin of atherosclerotic plaques and the induction of atherosclerosis.
- Genetic risk assessment: radiation equivalent chemical concept, molecular dosimetry, extrapolation of data from genetic assays to human genotoxic risk.
- Laboratory demonstration – an evening in the Plewa lab.

Reading materials: There is no assigned textbook for this class; however, a series of papers will accompany each lecture. These papers will be found as pdf files on the class Illinois Compass website. All lectures will be posted as pdf files on the class website.

Term paper: A term paper on an approved topic will be required from each student. The ungraded student term papers will be posted on the class website. The due date for the term paper is November 16, 2006.

Grading: All examinations will be in the essay and short answer format. There will be three examinations plus a term paper. Each examination will be worth 25% and the term paper will be worth 25% of the final grade.

Genetic Toxicology Term Paper Instructions

CPSC432, Fall 2006 Semester

Topic: You should check with me via e-mail, phone or after class about your term paper topic. The topic must involve an area within the field of mutagenesis or genetic toxicology. Please focus your topic so that you can write a paper with sufficient depth that you actually learn from the experience.

Try to find a topic that you have an interest in and then talk to me about focusing it. You should try to find broad ideas by using review papers in the literature and then go to the primary papers for your information gathering.

Length: The size of the term paper must be sufficient for you to cover your topic. Note that I will post your ungraded papers on the class web page. This will provide an opportunity for the members our class to read your paper.

Citations: Make sure you properly cite the literature. Use the following examples for citations.

Journal article:

Drake, J. et al., 1975. Environmental mutagenic hazards. *Science* 187:503-514.

Article within a book:

DeMarini, D.M., A.M. Richard, M.D. Shelby, M.D. Waters. 1994. Hazard identification. In D.J. Brusick (ed) *Methods for Genetic Risk Assessment*. Lewis, Boca Raton, pp 1-27.

Web page: Fully cite the URL. Web citation must be from creditable, peer-reviewed sources such as a scientific journal, scientific society or government agency.

Due Date: The term papers will be due in my office by 4:00 PM on Thursday November 16, 2006. You must submit to me an electronic copy and a paper copy of your term paper.

Grading I will read each paper and give a grade that expresses my impression of the scholarship of the writer. A maximum of 100 points will be allocated to the term paper (25% of the final grade for the course).