Bi426 Genetics of Cancer

Instructor
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Course overview and learning outcomes
This course will focus on selected topics in modern cancer biology that illustrate some of the fundamental mechanisms of cancer initiation and progression. The complexity of the genetic interactions that take place in all aspects of cancer biology is daunting; hundreds of genes have been identified, and most have multiple interconnections; furthermore, new associations and cancer-related genes are continually discovered. We will examine in detail only a few genes and their interactions in several broad areas of cancer biology. However, even such a limited scope will provide students with an understanding of important genetic systems in cancer cells, the tools and techniques of cancer research, and how those methods are applied to elucidate the genetic and biochemical phenomena behind the aberrant behavior of cancer cells. The course relies heavily upon information provided in primary research papers. Students will thus develop or hone skills in critically evaluating experimental design, data analysis and interpretation. The base of knowledge acquired in this course will enable students to further their studies in many areas of cancer biology should they so choose.

The prerequisite for Bi426 is a passing grade in either Bi320 (*Molecular Genetics*) or Bi322 (*Cell Biology*).

Class format
We meet twice each week for 1 hour and 20 minutes. My goal is to make class sessions mixtures of lecture and discussion. With such a small class size we can fashion our meetings as more dialogue than monologue. For most weeks the content on Mondays will be primarily background material, and on Wednesdays we will focus on the week's research article. The images I will use for each class will be available (as pdf files) on Canvas under *Modules>Lecture Slides* the day before each class session.

Reading materials
Readings will be come from two sources. The background material is largely from *The Biology of Cancer*, 2nd edition (Garland Science), by Robert Weinberg. It is available for purchase at the UO Bookstore and the usual on-line outlets. It is available also as an e-book for purchase or rental through Amazon:
http://www.amazon.com/Biology-Cancer-Second-ebook/dp/B00D2J17GW/ref=sr_1_1?ie=UTF8&qid=1370442159&sr=8-1&keywords=the+biology+of+cancer+2nd+edition

and through VitalSource:
http://store.vitalsource.com/show/9781317963462

The other reading source is from the primary literature in the form of research papers and reviews. These articles (as pdf files) will be available through Canvas under *Modules>Week N articles*. Supplemental articles will be provided for some topics (they will be indented in the article list). In addition, a "techniques" page will be provided that describes some of the experimental techniques used in the main article, as well as defining some terms. Please bring printed copies of the relevant papers to class meetings. It is essential that you do the reading BEFORE each class. You will not be able to engage in a discussion without having read the material, nor will you be prepared for the weekly quizzes and homework assignments.

Assignments and Grading

- Attendance and participation (15%). Active participation in class is a vital component of your learning, and of the success of this course, so attendance is mandatory. If you arrive more than 10 minutes late you will be considered absent (this does not mean that 5 minutes late is acceptable!). You are expected to come to class having read and thought about the assigned materials. Do your best to read the papers critically and follow the authors' logic in deriving their conclusions. Classroom participation expected of you, and is a great opportunity to share your thoughts with others, fill in gaps in your understanding and knowledge, and get feedback from the instructor and classmates. Thoughtful questions and good efforts are more important than are correct answers.

- Homework (45%). The homework sets are intended to guide you through the assigned readings. The format for these assignments will be as short-answer types of questions, usually 2-3 pages worth, based upon the background material and the research articles. Each assignment will be posted as a Word document on Canvas under *Modules>Homework* on the Friday preceding the week in which it is due. You are encouraged to discuss the articles and questions with your peers, but all responses must be your original work. Answers must be written with correct syntax, grammar, and punctuation, and should be concise but complete. Assignments must be typed and, if more than one page, stapled. You may include the questions on your assignments, but make clear separations between the questions and your answers. Homework is due at the end of Wednesday classes, but do not correct your answers during the Wednesday discussions of the articles. Late homework will not be accepted.

- Quizzes (15%). A brief quiz will be given at the beginning of most Monday classes to test your grasp of the main concepts of the background reading in *The Biology of Cancer* for that week. The low score will be dropped.

- Class presentation (10%). You will be a member of a group of up to 6 students who will present a research article on one Wednesday during the term. The primary article is listed in blue in the course schedule; note that these presentations will require that students do research in the literature beyond the paper that is being presented. Each student must contribute equally to the content and the oral presentation (this translates to about 10-12 minutes of speaking per person in each group). Presentations must include:

    - Background material that explains the context in which the specific research question is placed; relevant research that preceded the current article; and the contribution made by the current experiments to the understanding of the phenomenon under examination.

- An explanation of the hypothesis proposed in each experiment, and brief but accurate explanations of the techniques used in each experiment. You should be intimately familiar with all aspects of any experiments you describe, including the unique or important characteristics of any cells/genes/proteins used.

- Explanations of results and how those results answer the experimental question or hypothesis.

- Thought-provoking questions for the audience. This may include challenges to the data or conclusions offered by the authors of the papers, suggestions for clarifying experiments, or additional experiments to further the understanding of the phenomenon being examined.

Groups may adopt any presentation configuration that they find useful to the group. For example, one student each presents one experiment; or, several students present single experiments, but divide the rationale/techniques/results/conclusions among them. A PowerPoint or similar presentation format is desired. Though the figures in most of the papers will not enlarge with sufficient resolution to project, high resolution figures are often available from the on-line version of the paper, and you are encouraged to make your own figures if they will clarify concepts or experiments.

During the second week I will ask each student to rank their topic preferences (see the "Group presentations" in the lecture schedule); I will do my best to match students with their first or second choices, but I cannot guarantee everyone will be so matched. Please don't contest topic assignments once I make them.

- Review paper (15%). You will submit a short paper comparing of two or three current papers (published within the last three years) on same topic. The topic may be related to your class presentation, but need not be.

  - Papers must be double-spaced and five to seven pages in length. Figures are not necessary, but if they are used they are not to replace text (i.e., the text must be 5-6 pages). A title and section headings must be included.

  - The target audience comprises your peers in this course, that is, a group well educated in cancer genetics. Thus, broad or basic descriptions of genes, proteins, or phenomena that we have covered in class are not appropriate. Use some of the reviews that you have read during the term as your guide for the appropriate level of detail at which you should be writing.

  - Don't directly quote passages from papers; that indicates laziness on the part of the writer. You should be able to summarize or paraphrase in your own words.

  - References must be from peer-reviewed literature; websites are not acceptable citation resources, though you can certainly use them as starting points in your research. In the body of the paper references should be cited in parentheses as close to the relevant

passage as possible, with the last name of the first author, followed with "et al." if the article has more than two authors, followed by the year of publication. For example: (Knight, et al., 2000). If there are just two authors both names should be in the citation, such as (Bierie and Moses, 2006).

All references cited must be listed in a separate reference section at the end of the paper. References must follow this format:

Author names (year) Article title. *J. Name* **volume**:page range.

For example:
Knight B, Yeoh GCT, Husk KL, Ly T, Abraham LJ, Yu C, Rhim JA, Fausto N (2000) Impaired preneoplastic changes and liver tumor formation in tumor necrosis factor receptor type 1 knockout mice. *J. Exp. Med.* **192**:1809-1818.

Do not include web-related information, such as the doi number or on-line publication date.

A short (less than one double-spaced page) summary will be due during the 7th week. Completed papers will be submitted electronically on Canvas as Word documents (.doc or .docx) or pdf files during the last week. As with homework assignments and the oral presentation, all text must be your original work. Papers will be screened through *Vericite*; suspected cases of plagiarism (this includes uncited passages) will be forwarded to the Office of Student Conduct and Community Standards.

Tentative Class Schedule, Winter 2016

(Articles in blue will be the featured article for discussion of that week)

Week	Date	Topic	Reading	Assignment
1	Jan. 4	The nature of cancer	*The Biology of Cancer*: 2.1-2.5	
	Jan. 6	The nature of cancer	*The Biology of Cancer*: 2.6-2.12	
2	Jan. 11	Overview of cancer genes	*The Biology of Cancer*: 3.1-3.13 Vogt (2012) *Nature Rev. Cancer* **12**:639-648	Quiz 1
	Jan. 13	Overview of cancer genes	*The Biology of Cancer*: 4.1-4.7; 5.1-5.6 Optional: Witsch (2010) *Physiology* **25**:85-101 (read only 85-86; 88; 90; 96-97) Lemmon and Schlessinger (2010) *Cell* **141**:1117-1134 (read only 1117-1120)	
3	Jan. 18	MLK Day		
	Jan. 20	Growth factors and Receptors	*The Biology of Cancer*: 5.10 Perera and Bardessy (2012) *Cancer Cell* **22**:281-282 Ardito, et al. (2012) *Cancer Cell* **22**:304-317	HW1
4	Jan. 25	Tumor suppressor genes	*The Biology of Cancer*: 7.1-7.11	Quiz 2
	Jan. 27	Tumor suppressor genes	Zhu, et al. (2013) *Cancer Res.* **73**:2298-2309	HW2
5	Feb. 1	Signal transduction	*The Biology of Cancer*: 6.1-6.6	Quiz 3
	Feb. 3	Group 1 presentation	Der and Van Dyke (2007) *Cell* **129**:855-857 Gupta, et al. (2007) *Cell* **129**:957-968	HW3
6	Feb. 8	Tumor suppressor-mediated apoptosis	*The Biology of Cancer*: 9.1-9.8; 9.10; 9.17	Quiz 4
	Feb. 10	Group 2 presentation	Sharpless and DePinho (2007) *Nature* **445**:606-607 Martins, et al. (2006) *Cell* **127**:1323-1334	HW4
7	Feb. 15	Heterotypic interactions and angiogenesis	*The Biology of Cancer*: 13.1-13.9	Quiz 5 Summaries due
	Feb. 17	Group 3 presentation	Guo, et al. (2008) *J Biol. Chem.* **283**:19864-19871	HW5
8	Feb. 22	The EMT and metastasis	*The Biology of Cancer*: 5.9; 14.1-14.6; 14.8-14.10	Quiz 6
	Feb. 24	Group 4 presentation	Brabletz (2012) *Cancer Cell* **22**:699-701 Alderton (2013) *Nature Rev Cancer* **13**:3 Tsai, et al. (2012) *Cancer Cell* **22**:725-736	HW6
9	Feb. 29	Targeted cancer therapies (Dr. Christopher Corless)	*The Biology of Cancer*: 16.1-16.6; 16.11-16.13; 16.17-16.18	Quiz 7
	Mar. 2	Targeted cancer therapies	Gazdar, et al. (2004) *Trends Mol. Med.* **10**:481-486 Pao, et al. (2004) *PNAS* **101**:13306-13311	HW7
10	Mar. 7	Telomeres and genome integrity	*The Biology of Cancer*: 10.1-10.7; 10.9; 10.12	Quiz 8
	Mar. 9	Group 5 presentation	Sedivy (2007) *Cancer Cell* **11**:389-391 Feldser and Greider (2007) *Cancer Cell* **11**:461-469	HW8 Papers due