

Bi426/526 Genetics of Cancer, Winter 2022

Instructor

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(she, her, hers)

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Office hours: Monday, 3:30-4:30 PM

144 HED (HEDCO Education Building)

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 being 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 prerequisites for Bi426 are a passing grade in either Bi214 or Bi282H, and in either Bi320 (*Molecular Genetics*) or Bi322 (*Cell Biology*).

Class format

We meet twice each week for 1 hour and 20 minutes; Monday/Wednesday 2:00-3:20 PM in HED 220.. 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 primarily be background material, and the content on Wednesdays will be from research articles. The presentations/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:

<https://www.vitalsource.com/textbooks?utf8=%E2%9C%93&sort=&term=The+Biology+of+Cancer>

The other reading source is from primary literature in the form of research papers and reviews. These articles (as pdf files) will be available through Canvas under *Modules>Week # articles*. In many cases supplemental articles will be provided for additional background (they will be indented

in the article list); there is no requirement that students read these but are included if you wish to explore a topic further or get a deeper understanding of some of the technical aspects of the work. In addition, a “techniques” page will be provided that describes some of the experimental techniques used in the main article, as well as defines some terms.

Assignments and Grading

- **Attendance (50 pts; 5%).** 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. Thoughtful questions and good efforts are more important than correct answers.
- **Homework (480 pts; 48%).** 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 (in blue in the course schedule). Each assignment will be posted as a Word document on Canvas under *Modules>Homework* by 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 in 12 point font and, if more than one page (and they should be 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 during the Wednesday classes; some time at the beginning of class will be provided for students to discuss their answers with each other, and modifications to answers will be allowed for possible partial credit. Students presenting that week (see course schedule) will have a deadline for homework submission of 5:00 PM on the Friday following their presentation (email the document to mjud@uoregon.edu). Late homework will not be accepted.
- **Lecture Quizzes (150 ps; 15%).** A brief quiz will be given at the end of most Monday classes via canvas to test your grasp of the main concepts of the background reading in *The Biology of Cancer* for that week. You may use the notes that you have taken from the text reading and from the lectures, but you are strongly recommended NOT to use the internet (many sites will disagree on specific topics, so it's best to stick with the lecture/text-book material; in other words, you may not use an internet source as an argument to gain back points for a wrong quiz answer). Lecture quizzes will be open directly after lecture and open for 46 hours. Besides lecture quizzes 1 and 2 which do not have a time limit, all other lecture quizzes must be completed in 15 minutes once you begin it.
- **Class discussion and presentation (160; 16%).** On one Wednesday during the term, you will be one of 4 students who will be discussion leaders for that session. Each leader will guide a small group of peers in a discussion of a portion of a research paper, and then **present their portion of the paper** to the class (**100 pts; 10%**). The primary articles for discussion and presentation are listed in green in the course schedule, and are related to the topic of that week.

Before the small group discussions begin, the group leaders should present a brief overview to the entire class so that essential background information is provided. Any style of presentation will be acceptable (projected slides, document camera figures, whiteboard drawings).

In the small group discussions, each leader will focus on 1-3 experiments (and the figures accompanying them) from the article. Leaders should provide background information that

explains the context in which the specific experimental question is placed, and also describe the techniques in enough detail to allow the group members to follow the experiments. Leaders are encouraged to formulate original questions for their groups to stimulate discussion.

Following the discussion, the group leaders will summarize their sections to the entire class. Again, any style of presentation will be acceptable.

All students in the class will be expected to have read the abstract and the introduction of the paper. A brief (~5 minute) in-person **discussion quiz** with three to five questions on the introduction will be administered at the beginning of these discussion sessions (**60 pts; 6%**). The lowest score of these discussion quizzes will be dropped. Students are expected to bring a copy of the paper to class that day.

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 do not contest topic assignments once I make them. All students will be assigned to a “discussion group” of 7 members; these same groups will form each Wednesday for that week’s discussion.

The group leaders must arrange to meet with me on the Thursday or Monday before their presentation.

- **Analysis paper (150 pts; 15%).** You will submit a short paper summarizing two or three current (published within the last four years) research (not review) papers on the same topic. You are encouraged to use additional articles, including reviews, for background information. The topic may be related to your class presentation, but need not be. Focus on molecular genetic phenomena rather than clinical work, tests of inhibitors, or therapeutic trials. The “previews” that accompany many of the papers we cover in class provide good examples of the type of paper that I want you to write.
 - Papers must be double-spaced, 12 pt font, and five to seven pages in length. Do not include figures of data (gels, histological sections, etc.), but you may include one diagram as a summary of the phenomenon under study (see those in the *Cancer Cell Previews*). In your text, do not refer to specific figures in papers. A title must be included; if relevant, section headings may be used.
 - 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.
 - As smart as this audience is, they need to have new acronyms defined, unfamiliar experimental techniques described, relevant genetic backgrounds of cell lines and organisms explained, etc.
 - If you include a conclusions section, make it short and direct. Do not restate all of the findings or go on at length about myriad therapeutic applications.
 - Avoid directly quoting 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 may 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. If the article has *more than* two authors, cite *only* the last name of the first author followed with “et al.” and the year of the 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 (this section is in addition to the 5-7 pages of text you will write, not counted as part of the 5-7 pages). References must follow this format (pay attention to periods, commas, parentheses, italics, and bolded parts; in other words, follow the format below *EXACTLY*):

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 of your intended topic will be due during the 7th week. It is simply an overview of the main idea that you are investigating, and includes one or two references that will likely be featured in the final paper.

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.

- **Student Experience Survey (10 pts; 1%).** At the end of the course, please fill out the student experience survey. This is an important professional courtesy that helps your instructors improve their teaching approaches and course material; the majority of your instructors truly care about receiving your constructive feedback. Take a screenshot at the end of your submission confirming you completed the survey and email the JPG image to your instructor (mjud@uoregon.edu) to earn the 10 points. Do not email any of your actual feedback/answers so as to ensure your submission remains anonymous.

Bi426/526 Class Schedule, Winter 2022

Homework will be based upon articles in blue; discussions/presentations will be based upon articles in green;
 Discussion quizzes will be given in person based on the articles in green; Lecture quizzes will be taken on canvas

Week	Date	Topic	Reading	Assignment
1	01/03	The nature of cancer	<i>The Biology of Cancer</i> . 2.1-2.5	Lect. Quiz 1
	01/05	The nature of cancer	<i>The Biology of Cancer</i> . 2.6-2.11	Lect. Quiz 2
2	01/10	Overview of cancer genes	<i>The Biology of Cancer</i> . 3.1-3.12 Vogt (2012) <i>Nature Reviews Cancer</i> 12 :639-648	Presentation choices survey
	01/12	Overview of cancer genes	<i>The Biology of Cancer</i> . 4.1-4.6	Lect. Quiz 3
3	01/17	MLK Day		
	01/19	Growth factors and Receptors	<i>The Biology of Cancer</i> . 5.1-5.6; 5.10 Perera and Bardeesy (2012) <i>Cancer Cell</i> 22 :281-282 Navas, et al. (2012) <i>Cancer Cell</i> 22 :318-330	HW 1
4	01/24	Tumor suppressor genes	<i>The Biology of Cancer</i> . 7.1-7.9	Lect. Quiz 4
	01/26	Group 1 discussion	Will and Steidl (2014) <i>Cancer Cell</i> 25 :555-557 Chen, et al. (2014) <i>Cancer Cell</i> 25 :652-665 Mello, et al. (2017) <i>Cancer Cell</i> 32 :460-473	HW 2 Disc. Quiz 1
5	01/31	Signal transduction	<i>The Biology of Cancer</i> . 6.1-6.6	Lect. Quiz 5
	02/02	Group 2 discussion	Der and Van Dyke (2007) <i>Cell</i> 129 :855-857 Gupta, et al. (2007) <i>Cell</i> 129 :957-968 Gao, et al. (2018) <i>Cancer Discovery</i> 8 :649-661	HW 3 Disc. Quiz 2
6	02/07	Tumor suppressor-mediated apoptosis	<i>The Biology of Cancer</i> . 9.1-9.8; 9.10	Lect. Quiz 6
	02/09	Group 3 discussion	Sharpless and DePinho (2007) <i>Nature</i> 445 :606-607 Martins, et al. (2006) <i>Cell</i> 127 :1323-1334 Li, et al. (2012) <i>Cell</i> 149 :1269-1283	HW 4 Disc. Quiz 3
7	02/14	Heterotypic interactions and angiogenesis	<i>The Biology of Cancer</i> . 13.1-13.8	Lect. Quiz 7 Summaries due
	02/16	Group 4 discussion	Cully (2018) <i>Nature Reviews Cancer</i> 18 :136 Huelsenken and Hanahan (2018) <i>Cell</i> 172 :643-644 Su, et al. (2018) <i>Cell</i> 172 :841-856 Ozdemir, et al. (2014) <i>Cancer Cell</i> 25 :719-734	HW 5 Disc. Quiz 4
8	02/21	The EMT and metastasis	<i>The Biology of Cancer</i> . 5.9; 14.1-14.6; 14.8-14.9	Lect. Quiz 8
	02/23	Group 5 discussion	Dart (2017) <i>Nature Reviews Cancer</i> 17 :373 Krebs, et al. (2017) <i>Nature Cell Biology</i> 19 :518-529 Fischer, et al. (2015) <i>Nature</i> 527 :472-476	HW 6 Disc. Quiz 5
9	02/28	Telomeres and genome integrity	<i>The Biology of Cancer</i> . 10.1-10.7; 10.9	Lect. Quiz 9
	03/02	Group 6 discussion	Sedivy (2007) <i>Cancer Cell</i> 11 :389-391 Feldser and Greider (2007) <i>Cancer Cell</i> 11 :461-469 Chiba, et al. (2015) <i>eLife</i> 4 :e07918	HW 7 Disc. Quiz 6
10	03/07	Targeted cancer therapies	<i>The Biology of Cancer</i> . 16.1-16.6; 16.11-16.13	Lect. Quiz 10
	03/09	Group 7 discussion	Gazdar, et al. (2004) <i>Trends in Molecular Medicine</i> 10 :481-486 Sordella, et al. (2004) <i>Science</i> 305 :1163-1167 El Kadi, et al. (2018) <i>Cancer Research</i> 78 :6728-6735 Foster, et al. (2016) <i>Cancer Cell</i> 29 :477-493	HW 8 Disc. Quiz 7 Papers due on Friday 03/11