Bi426/526 Genetics of Cancer, Fall 2022

Instructor

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(she, her, hers)
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Office hours: Tuesday, 5:30-6:30 PM, or by appointment
199 ESS (Esslinger)

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; Tuesday/Thursday 4:00-5:20 PM in ESS 199. 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 Tuesdays will primarily be background material, and the content on Thursdays 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 morning 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 and Participation (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. Attendance and participation will include asking questions, answering questions, clicker participation on lecture days (answers do not need to be correct), and engaging with your classmates.

- **Homework Sets (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 on 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* and *in your own words*. 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 Thursday classes; some time at the beginning of class will 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 midnight (11:59PM) on the Saturday following their presentation (email the document to mjud@uoregon.edu). Late homework will not be accepted. The lowest score of the homework sets will be dropped from your final score (therefore, don't trust the total class score reported on canvas as it will not reflect your lowest score being dropped).

- **Post-lecture Quizzes (160 pts; 16%).** A brief quiz will be given at the end of most lecture periods (usually on Tuesdays) 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 textbook and notes that you have taken from the background readings and from the lectures, but you are strongly recommended NOT to use the internet. Many websites will disagree on specific topics, so it's best to stick with the lecture/textbook 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 (in **pink on the course schedule**) 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 within 40 minutes once you begin it. Therefore, it is recommended to have read the textbook and reviewed your notes before embarking on the quiz. The lowest score of the post-lecture quizzes will be dropped from your final score (therefore, don't trust the total class score reported on canvas as it will not reflect your lowest score being dropped).

- **Presentation and Discussion Quizzes (160; 16%).** On one day during the term (usually on a Thursday), you will be 1 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 on 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 abstract/introduction will be administered at the beginning of these discussion sessions **(60 pts; 6%).** The lowest score of the discussion quizzes will be dropped from your final score (therefore, don't trust the total class score reported on canvas as it will not reflect your lowest score being dropped). Students are expected to bring a hard copy of the paper to class that day, which may be used during the quiz (must be a copy printed on paper and not a digital copy).

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 Thursday for that week's discussion.

The group leaders must arrange to meet with me *before* their presentation on either Tuesday (2 days before the presentation) or Thursday (a whole week ahead of time). My office hours after class on Tuesday have been a popular option in the past and presenting groups will have priority during that time (no need to make an appointment). If your group prefers to meet on the Thursday before, please email me ahead of time to set up the appointment with me (mjud@uoregon.edu). All group members must attend the same meeting.

- **Analysis paper (140 pts; 14%).** You will submit a short paper summarizing current (published within the last five years) research (not review!) papers on the same topic. You are encouraged to use additional articles, including reviews, for background information, but these may not be the main papers you summarize. The topic may be related to your class presentation, but need not be. You may not use any article that was provided to you during this class as one of your main research articles that you summarize; however, you may cite them as extra background information. 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. If you are enrolled in Bi426, you should choose 2-3 research articles to summarize; if you are enrolled in Bi526, you need to choose 3-5 research articles to summarize.

    - Papers must be double-spaced, 12 pt font, with 1 inch margins. If you are enrolled in Bi426, your paper should be 5-7 pages in length; if you are enrolled in Bi526, your papers needs to

be 10-12 pages in length. This length refers to actual written text and nothing extra (meaning the length of your paper does not include a diagram or the reference page; see below). A title must be included; if relevant, section headings may be used.

- Do not include figures of data (gels, histological sections, etc.), but you may include one diagram/schematic as a summary of the phenomenon under study (see those in the *Cancer Cell Previews*). This diagram should be on separate page at the end of your paper and will not count towards your paper length. If you include a diagram in your paper, you must title it ("Figure 1"), write a short figure legend (make sure this includes a citation for where you found it if you did not draw it yourself), and cite the figure in your text where appropriate. In your text, do not refer to specific data figures from the papers you are summarizing.

- 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. However, DO include descriptions of things we have not covered it in class before. Therefore, 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.

- You should include a conclusions section; however, make it short and direct. Do not restate all of the findings or go on at length about myriad therapeutic applications. This could include a very brief discussion of future directions.

- 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). In the rare case when there is only one author, only one name should be listed, such as (Brenner, 1974). Citations in parentheses come at the end of the sentence to which the citation(s) refer(s). Sometimes, you may choose to refer to the paper within the sentence. This requires a different format for the citation. For example, you may also cite authors in the following way in your text: "According to Knight et al (2000), the…" Please pay close attention to the punctuation of the citations that I have demonstrated for you here. Last, if you only discuss one reference in a paragraph of your text, you only need to cite it once at the earliest relevant passage and not again with that same paragraph. If you need to cite more than one reference in a paragraph, you need to cite every relevant sentence with the appropriate citation. Paragraphs are considered autonomous, so if you continue writing about just one reference in a subsequent paragraph, you need to cite the article again in the new paragraph at least once where appropriate (a citation doesn't carry through multiple paragraphs). If you are confused about proper citation etiquette, please visit an office hour.

  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 or 10-12 pages of text you will write, and is not counted as part of the 5-7 or 10-12 pages). This is also sometimes known as a bibliography. References must follow a particular format (see below). Don't just copy references from websites or articles as they often don't use the same formatting styles. Thus, pay close

attention to periods, commas, parentheses, italics, and bolded parts; in other words, follow the format below *EXACTLY*:

Author names. (Year) Article title. *Journal Name.* **volume**(issue number if given):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 the 2-3 (Bi425) or 3-5 (Bi526) 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%).** The end of course student experience survey is available in DuckWeb from November 28 through December 2. 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 for Bi426/526 with your name visible and upload it to canvas to earn the 10 points. You may upload a JPEG, JPG or PDF file. Do not include any of your actual feedback/answers in your screenshot so as to ensure your submission remains anonymous. You will have until Tuesday December 6 at midnight (11:59 PM) to upload your screenshot for points, but make sure you complete the student experience survey on DuckWeb by Friday December 2.

Bi426/526 Class Schedule, Fall 2022

Homework sets 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; Post-lecture quizzes will be taken on canvas

Week	Date	Topic	Reading	Assignment
1	09/27	The nature of cancer	*The Biology of Cancer*: 2.1-2.5	Lect. Quiz 1
	09/29	The nature of cancer	*The Biology of Cancer*: 2.6-2.11	Lect. Quiz 2
2	10/04	Overview of cancer genes	*The Biology of Cancer*: 3.1-3.12 Vogt (2012) *Nature Reviews Cancer* **12**:639-648	Presentation choices survey
	10/06	Overview of cancer genes	*The Biology of Cancer*: 4.1-4.6	Lect. Quiz 3
3	10/11	How to attack journal articles; presentation groups assigned	None for today	
	10/13	Growth factors and Receptors	*The Biology of Cancer*: 5.1-5.6; 5.10 Perera and Bardeesy (2012) *Cancer Cell* **22**:281-282 Navas, et al. (2012) *Cancer Cell* **22**:318-330	HW 1
4	10/18	Tumor suppressor genes	*The Biology of Cancer*: 7.1-7.9	Lect. Quiz 4
	10/20	Group 1 discussion	Will and Steidl (2014) *Cancer Cell* **25**:555-557 Chen, et al. (2014) *Cancer Cell* **25**:652-665 Mello, et al. (2017) *Cancer Cell* **32**:460-473	HW 2 Disc. Quiz 1
5	10/25	Signal transduction	*The Biology of Cancer*: 6.1-6.6	Lect. Quiz 5
	10/27	Group 2 discussion	Der and Van Dyke (2007) *Cell* **129**:855-857 Gupta, et al. (2007) *Cell* **129**:957-968 Gao, et al. (2018) *Cancer Discovery* **8**:649-661	HW 3 Disc. Quiz 2
6	11/01	Tumor suppressor-mediated apoptosis	*The Biology of Cancer*: 9.1-9.8; 9.10	Lect. Quiz 6
	11/03	Group 3 discussion	Sharpless and DePinho (2007) *Nature* **445**:606-607 Martins, et al. (2006) *Cell* **127**:1323-1334 Li, et al. (2012) *Cell* **149**:1269-1283	HW 4 Disc. Quiz 3
7	11/08	Heterotypic interactions and angiogenesis	*The Biology of Cancer*: 13.1-13.8	Lect. Quiz 7 Summaries due
	11/10	Group 4 discussion	Cully (2018) *Nature Reviews Cancer* **18**:136 Huelsken and Hanahan (2018) *Cell* **172**:643-644 Su, et al. (2018) *Cell* **172**:841-856 Ozdemir, et al. (2014) *Cancer Cell* **25**:719-734	HW 5 Disc. Quiz 4
8	11/15	The EMT and metastasis	*The Biology of Cancer*: 5.9; 14.1-14.6; 14.8-14.9	Lect. Quiz 8
	11/17	Group 5 discussion	Dart (2017) *Nature Reviews Cancer* **17**:373 Krebs, et al. (2017) *Nature Cell Biology* **19**:518-529 Fischer, et al. (2015) *Nature* **527**:472-476	HW 6 Disc. Quiz 5
9	11/22	Telomeres and genome integrity	*The Biology of Cancer*: 10.1-10.7; 10.9	Lect. Quiz 9
	11/24	Thanksgiving Break		
10	11/29	Group 6 discussion	Sedivy (2007) *Cancer Cell* **11**:389-391 Feldser and Greider (2007) *Cancer Cell* **11**:461-469 Chiba, et al. (2015) *eLife* **4**:e07918	HW 7 Disc. Quiz 6
	12/01	Targeted cancer therapies Group 7 discussion	Extra : *The Biology of Cancer*: 16.1-16.6; 16.11-16.13 Foster, et al. (2016) *Cancer Cell* **29**:477-493	Disc. Quiz 7 Papers due on Sunday 12/04 at 11 :59pm

Homework sets, **discussion presentations/quizzes**, and the **paper summary** are all due on the days indicated. **Post-lecture quizzes** are listed on the day the quiz opens on canvas; once started, you will have 40 minutes to complete the quiz. The quiz will be due within 46 hours of the quiz opening.