

**ONLINE SUPPLEMENTAL MATERIAL**  
**Shuster & Peterson**  
**Development, Implementation and Assessment of a Lecture Course on Cancer**  
**for Undergraduates.**

**Biol 385, An Introduction to Cancer**  
**First Reading Assignment: HPV**

As you know, you will need to consult primary literature for your final presentation in this course. This assignment will give you an introduction to the primary literature, as well as give you a chance to practice finding research articles using PubMed.

Some points to consider:

- Primary literature can be hard to read (at least at first). So don't get discouraged- use the reading questions to try and focus on the "big picture", without getting hung up on details.
- Primary vs. secondary/review literature. The primary literature presents the research results of the authors. Review articles summarize an entire field, and mention the results of several labs/investigators in order to tie a broad field together. The Longworth and Laimins article is a review article (notice that it references all kinds of studies, by a variety of authors), while the Villa et al. paper is a primary article (they present their own data). Review articles can be useful in familiarizing yourself with a new topic area.
- There are many scientific databases. One that I use a lot is PubMed (<http://www.ncbi.nlm.nih.gov/sites/entrez?db=PubMed>). You can search by keyword, author etc., for relevant articles. For each search, you will get the full abstract (essentially a summary) of the article. The abstract (a paragraph or two) is NOT the entire article- you may need to use ILL to request a full article (although many are free online via PubMed Central, or through institutional NMSU subscriptions).
- A FHCRC researcher will be giving a lecture via Video TeleConferencing (VTC) on Thursday, February 8. They will be talking about HPV and the new HPV vaccine, in particular relationship to cervical cancer. This reading assignment will also help you to be fully prepared for the VTC lecture on the 8<sup>th</sup> of February.
- Please hand in your TYPED assignment by the beginning of class on Thursday, February 8. There will be late penalties assessed for assignments handed in after 10:30 am on February 8<sup>th</sup> (20% per work day), and hand-written assignments will be docked 20% of their final value, even if they are handed in on-time

**Readings**

1. Villa, LL et al. 2006. High sustained efficacy of a prophylactic quadrivalent human papillomavirus types 6/11/16/18 L1 virus-like particle vaccine through 5 years of follow-up. *British Journal of Cancer* 95:1459-1466.
2. Longworth, MS and LA Laiminis. 2004. Pathogenesis of human papillomaviruses in differentiating epithelia. *Microbiology and Molecular Biology Reviews*:68(2):362-372.

**Questions to answer (IN YOUR OWN WORDS)**

1. What are the low-risk strains of HPV and what disease do they cause? (1 pt)
2. What are the high-risk strains of HPV, and what disease do they cause? (1 pt)
3. What other cancers have high-risk HPV types? (1 pt)
4. What are the two main HPV viral oncogenes, and what cellular proteins do they bind to/interact with? (2 pts)
5. Why is the U.S. incidence of cervical cancer lower than the worldwide incidence? (1 pt)
6. What HPV subtypes are present in the HPV vaccine? (1 pt)
7. In the 5 year follow-up study (involving the HPV vaccine), describe the infection rate and the rate of dysplasia between the control group and vaccine group. (2 pts)
8. Jump onto PubMed (<http://www.ncbi.nlm.nih.gov/sites/entrez?db=PubMed>) and search for and print out an abstract dealing with a societal issue (e.g. ethics, parental concern) relating to the use of the HPV vaccine in young children (prior to their becoming sexually active). (1 pt)

## **Biol 385: Introduction to Cancer**

### **Second Reading Assignment: Does SV40 Cause Human Cancer?**

**Due: Tuesday, February 20.**

#### **The paper**

Rollison et al. 2004. Case-control study of cancer among US Army veterans exposed to Simian Virus 40-contaminated adenovirus vaccine. American Journal of Epidemiology 160 (4):317-324.

#### **The questions (you may have to do some research beyond the paper itself to answer some of these)**

1. What is the “native” host of SV40? (1 pt)
2. The introduction notes that SV40 DNA has been detected in mesotheliomas (primary mesotheliomas). What is a mesothelioma? What is the primary risk factor for mesothelioma? (1 pt)
3. The SV40 T antigen is noted to inhibit p53 and pRB. What other specific viral proteins do you know of that interfere with p53 and/or pRB? For ONE of them, what specifically does it do to its target protein (at the molecular/biochemical level)? (1pt)
4. In your own words. What did the researchers conclude about exposure to SV40 and development of brain cancer, mesothelioma and Non-Hodgkins lymphoma? Is there a trend or difference in the Odds Ratio for the three types of cancer? (2 pts)
5. Look at the sample sizes for all three types of cancer. Which data do you feel are the strongest? Does this change how you evaluate any trends or differences that you noted in question 4 above? (2 pts)
6. OK, you’ve now read a few papers, and have had a chance to do a quick PubMed search. So its time to think about the end-of-semester presentations. We need a format (or a few compatible formats):
  - group poster presentations?
  - individual poster presentations?
  - production and presentation of an informational brochure?
  - a. What is your preferred presentation format? (1 pt)

ALL presentations MUST include some recent research (from the primary literature) (so even an informational brochure about e.g. the risk factors for a particular cancer MUST include recent research about risk factors for that cancer or how the risk factor acts at a mechanistic level to increase the risk).

b. What are some of the ideas that you have about a presentation topic? (Or what are some things about cancer/cancer research that are interesting to you that you may want to develop into a presentation)? (2 pts)

## **Biol 385: Introduction to Cancer**

### **Assignment #3: Media, Cancer and Myths**

As we noted, many people are obtaining cancer information from the internet and it is thus important that we are able to assess the accuracy and reliability of that information.

This assignment has three parts

- Reviewing an internet site about cancer using NCI- and/or Medline-based assessment criteria
- Comparing the treatment sought by a teen patient with Hodgkin's lymphoma to conventional treatments
- Deciding what you, as an expert witness, would want a judge to know about how conventional and unconventional therapies are tested (You will have to use "plain English" for the judge- you can safely assume that they are smart, but that they may not be experienced with scientific terminology).

#### **Part One (5 pts)**

There are two links posted on WebCT about assessing online sources of medical information. Read these over in order to develop a set of criteria for how to evaluate the reliability of this kind of information.

Now go to [www.cnn.com](http://www.cnn.com) and search for "cancer treatment". You should get a list of about five "Sponsored Results". Pick one of these to assess. Give me a BRIEF description of the site, then use your assessment criteria to assess the site (and give me a description of your assessment of the site).

#### **Part Two (5 points)**

I will provide you with links to news reports from ABCnews.com. The reports span the timeframe of July 2006 to January 2007 and detail the story of a teen (Abraham Cherrix) who wished to discontinue his conventional therapy for Hodgkin's Disease. A judge agreed, and let the young man pursue treatment with the Hoxsey method. If you want to get a head start, go to abcnews.com and search for Cherrix. In chronological order, read "Court Pact Says Va. Teen Can Forgo Chemo." (August 16, 2006); "Va. Teen: I'm Feeling Wonderful" (October 9, 2006) and "Va. Teen Needs More Cancer Treatment" (January 5, 2007).

Look up the Hoxsey method (hint: try PubMed and the American Cancer Society) and give a brief description of what it is (IN YOUR OWN WORDS). Then give a brief description of the type and amount of scientific evaluation of this treatment that appears to be available.

Now go to NCI or the American Cancer Society websites and look up a conventional therapy for childhood Hodgkin's Disease. Again, give me a brief description of it (IN YOUR OWN WORDS) and do a literature search to get a sense of what kinds of studies have been done on the effectiveness of the treatment. Give me a brief summary of the type and amount of scientific evaluation of this treatment that is available.

**Part Three (5 points)**

If you were an expert cancer research witness brought in to advise the judge in the Abraham Cherrix case, what are the main points that you would like the judge to understand about conventional and unconventional cancer therapies? Also keep in mind that Abraham is a teenager, so you may want to consider childhood versus adult cancers (think about how survival rates have changed over the past 50 years for each). Remember that the judge is likely to be pretty smart, but may not be familiar with technical scientific jargon, so be accurate and precise, but use "lay" (everyday) language.

## **Poster Assignment**

Students chose topics, and handed in “staged” work, to ensure that regular progress was being made. For example, the first poster prep assignment asked each group to hand in

- Their title
- The names of all group members
- A preliminary bibliography that included at least 5 references. It was also stipulated that no more than two of those five could be internet sites (so that at least three had to be peer-reviewed journal articles, and of these, at least one had to have been published in within the previous two years)

The second prep assignment asked for an outline and an annotated bibliography, and a final draft of their poster was due in time to be reviewed prior to printing.

## Pre-Test/Embedded Post-Test Questions

The Following are the Pre-Test Questions that were successfully embedded as proper exam questions on subsequent exams in the course, and were used in the calculation of learning gains. The exam on which each question was embedded is indicated at the end of each question.

### *Biol 385: Introduction to Cancer*

#### *Pre-Test, Spring 2007*

Please make sure your name is on each page. Your name will **NOT** be included in the analysis of this assessment. This is a **VOLUNTARY** test that will allow us to assess the learning that has occurred during this course. It **DOES NOT** count for any points in this course. It is purely for informational purposes, to assess learning and teaching in the course (as explained on the Participant Informed Consent Form). The analysis will be conducted on an **anonymous** basis.

1. Just before the winter break, your grandmother called you all atwitter about a news report she had heard about falling breast cancer rates due to women stopping their hormone replacement therapy (HRT). She was very relieved that she had never taken hormone-replacement therapy, because “now I know I won’t get breast cancer”.

a. How do you respond to your grandmother about her risk for breast cancer?

b. You are intrigued by her call, so you jump on PubMed, but can’t find anything. So you jump on Medline Plus, and scroll through the News Headlines. You find the following report (from Medline Plus: a Health Day/Scout News LLC report entitled “Breast Cancer Rates Drop in U.S. Researchers say decline followed reduction in HRT Use. December 14, 2006). Based on your criteria for assessing media reports about cancer, what are the strengths and weaknesses of this particular report, and how confident do you feel in the interpretation of breast cancer incidence and numbers of women taking HRT?

c. Now that you have taken a closer look at the report, why do you suppose you had no luck in your PubMed search?

*(This question was embedded in the third exam in the class)*

2. What kinds of cell behaviors lead to “spread” (you can choose one of invasion or metastasis) of cancer? What genes/proteins are involved in the cellular behaviors contributing to invasion or metastasis?

*(This question was embedded on the final exam)*



3. (i) Name one targeted cancer treatment, (ii) the cancer it is designed to treat, (iii) what its molecular composition is (*i.e.* what is it?) and (iv) describe the mechanism of its action.

*(This question was embedded on exam 3)*

4. Cancer is predominantly a disease of the elderly. Agree or disagree with this statement and explain your answer.

*(This question was embedded on exam 1)*

5. List up to three choices/personal behaviors that influence cancer risk. For each, state what type(s) of cancer that behavior/choice is most important for, and whether the risk is increased or decreased by the behavior.

Behavior/Choice 1

Behavior/Choice 2

Behavior/Choice 3

*(This question was embedded on the final exam)*

6. Name one carcinogen and explain the mechanism of action (at the molecular level) of this carcinogen.

*(This question was embedded on the first exam)*

7. Explain the difference between an alteration in gene expression due to epigenetic mechanisms versus due to mutations.

*(This question was embedded on the first exam)*

8. Describe **two ways** in which a proto-oncogene can be activated to form an oncogene. Be as specific as you can in the molecular mechanism, and provide a specific example of an oncogene that has been activated by that mechanism.

*(This question was embedded on the first exam)*

9. The following information is summarized from a 2005 publication in the New England Journal of Medicine (The Breast International Group (BIG) 1-98 Collaborative Group. 2005. A Comparison of Letrozole and Tamoxifen in Postmenopausal Women with Early Breast Cancer. NEJM 353(26):2747-57).

The article describes a clinical trial in which postmenopausal women with hormone-receptor positive (estrogen or progesterone or both) breast cancer were randomly assigned to receive either tamoxifen or letrozole as an adjuvant treatment. The primary end point was the amount of time from randomization until the end of a period of disease-free survival (so until e.g. a recurrence, a new tumor in the other breast, a new non-breast cancer occurred). Patient eligibility criteria included being postmenopausal and having hormone receptor positive tumors (estrogen &/or progesterone). The patients must have undergone primary surgery, had clear

surgical margins, as well as be in reasonable health with respect to kidney, liver and bone marrow function.

The analysis included 8010 women, 4003 in the letrozole group and 4007 in the tamoxifen group, after 25.8 months (median) of follow-up.

This figure shows the data for disease-free survival (Figure 1, BIG 1-98 Collaborative Group, 2005)

This figure shows the data for breast cancer recurrence: (Figure 2A, BIG 1-98 Collaborative Group, 2005)

Based on the information provided, answer the following questions:

- a. What phase/type of clinical trial is this study, and how do you know?
- b. Would you expect that this trial was blinded in some way, and if so, what is the strongest blinding protocol?
- c. What do you predict about the age, estrogen levels and estrogen sources in the participants in this trial? (3 points)
- d. If the participants had been treated with surgery and had clear surgical margins, why is there a need to investigate additional treatments? (i.e. why is this trial important?)
- e. Based on the data, was there a significant difference in disease-free survival with either drug? What information (specifically) did you use to make your conclusion? If there is a difference, which drug is "better"?
- f. Based on the data, was there a significant difference in breast cancer recurrence with either drug? What information (specifically) did you use to make your conclusion? If there is a difference, which drug is "better"?  
(This question was embedded on exam 2)

## **Course-Specific / Student Attitude Questions from the End-of-Semester Student Evaluations**

### Course-specific questions.

16. Reading primary articles/papers helped me understand better understand the topic (compared to just lecture or reading the textbook)

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

17. Reading primary articles/papers has made me feel more confident about my ability to interpret results and understand data presented in the scientific literature.

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

18. Reading the papers gave me experience and skills that I can use in future classes.

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

19. Working on my poster project was a valuable learning experience

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

20. This semester the class voted for poster presentations. Having completed my/our poster, I feel that this was a good format to use

- a. strongly agree

- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

21. The VTC sessions with scientists from the FHCRC were interesting

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

22. The VTC sessions with scientists from the FHCRC helped me learn more about a specific cancer topic

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

23. I would prefer face-to-face lectures with cancer researchers over VTC lectures

- a. strongly agree
- b. agree
- c. neutral/ no opinion
- d. disagree
- e. strongly disagree

Comments:

24. *Redacted, as it references scientists/instructors by name.*

25. Compared to when I started this class, I feel much more knowledgeable about cancer and cancer research

- a. strongly agree
- b. agree
- c. neutral/no opinion
- d. disagree
- e. strongly disagree

26. Compared to when I started this class, my interest in cancer research is

- a. much higher
- b. somewhat higher
- c. about the same
- d. somewhat lower
- e. much lower

Comments:

In designing this course, three main content areas of cancer research were decided upon: (i) basic cancer biology, (ii) cancer epidemiology and (iii) clinical cancer research.

For each, please indicate how successful the course was, by answering the following question: "My understanding of this content area has improved as a result of having taken this course" using the scale

- a. strongly agree: my understanding has improved a great deal
- b. agree: my understanding has improved somewhat
- c. neutral/no opinion
- d. disagree: I do not feel any more knowledgeable about this area compared to when I started this course
- e. strongly disagree: I am even more confused about this topic area compared to when I started this course

27. My understanding of basic cancer biology has improved as a result of having taken this course  
(please use the scale above)

Comments:

28. My understanding of cancer epidemiology has improved as a result of having taken this course  
(please use the scale above)

Comments:

29. My understanding of clinical cancer research has improved as a result of having taken this course  
(please use the scale above)

Comments:

30. I feel more knowledgeable about some of the experimental methods that are used in cancer research.

- a. strongly agree
- b. agree

- c. neutral/no opinion
- d. disagree
- e. strongly disagree

Comments:

31. I would consider applying to graduate school in a field related to cancer research
- a. yes, in fact I already have
  - b. yes
  - c. no, because I am going to professional school rather than graduate school
  - d. no, because I am not that interested in cancer research

Comments:

32. I have already had the opportunity (or have lined up an opportunity for this summer) to carry out research in a field related to cancer
- a. yes, here at NMSU
  - b. yes, during a summer internship experience
  - c. no

Comments:

33. I am planning to seek out a research opportunity in a field related to cancer research
- a. yes
  - b. no, not in cancer research, but maybe in another field
  - c. no, I am not that interested in research

Comments:

34. Please comment on the instructor as a lecturer. Include any strengths or weaknesses.

35. Did you use the lecture outlines or review questions from the course website? If so, did you find them helpful? If they were not, please provide specific suggestions to improve them.

36. Did you use the textbook? If so, was it helpful to your understanding of the course material? Too detailed? Too boring? Very helpful? Good figures? Please explain your answers, so that I can use this information when looking at texts in the future. (for example, this text had pretty simple diagrams and no photographs- would you prefer a more extensive art program in a text?)

37. What has been the best aspect of the lecture course?

38. What is an aspect of the lecture course that should be changed or improved? (and what suggestions do you have for its improvement?)

39. Please feel free to add any additional comments. Thanks!