

Biotechnology– BISC 406L
Fall 2015

Lectures: TTh 1:00-1:50 p.m., ZHS472
Lab: Th 2:00-5:00 p.m., ZHS472

Instructor:

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Office hours: TTh, 11:00-12:00 p.m.
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Laboratory Director:

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Teaching Assistant:

Prerequisites: BISC 320

Recommended Preparation: BISC 313 or BISC 325

Course Objectives: BISC406L is the capstone course for the Minor in Biotechnology offered by the College of Letters, Arts and Sciences and the Marshall School of Business. The course will focus on the impact of the biotechnology revolution on health care in this age of molecular medicine. Topics to be covered include: (1) Recombinant DNA technology; (2) Genomics and Proteomics; (3) Manipulating Prokaryotic and Eukaryotic gene expression; (4) Molecular Diagnostics and Therapeutics; (5) Vaccines and Gene Therapy; (6) Genetic Engineering of Plants and Animals and; (7) Biotechnology regulation. We will address the ethical, legal and social implications of advances in biotechnology and will discuss governmental regulation of food, drugs and biotechnology itself. The laboratory exercises will focus on recombinant DNA and other DNA techniques, which have played a fundamental role in the “new” biotechnology revolution.

Textbook: Glick, Pasternack, and Patten, Molecular Biotechnology: Principles and Applications of Recombinant DNA (2009, 4th edition). Extra reading assignments may also be posted on Blackboard to supplement material in the textbook.

Course Grades:

The course grade will be based upon **605** possible points:

100 pts. Midterm 1
100 pts. Midterm 2
100 pts. Final Exam
50 pts. Classroom participation
255 pts. Laboratory

Wk	Lecture	Date	Lecture Topic	Reading
1	1	Aug 25	Intro to Biotechnology	Ch. 1
	2	Aug 27	Recombinant DNA Technology I	Ch. 2 and 3
2	3	Sept 1	Review of DNA, RNA and Protein Synthesis	Ch. 2 and 3
	4	Sept 3	Recombinant DNA Technology II	Ch. 2 and 3
3	5	Sept 8	PCR and DNA Synthesis Techniques	Ch. 4
	6	Sept 10	Discussion: DNA techniques in forensics	Reading 1
4	7	Sept 15	Discussion: DNA techniques in diagnostics	Reading 2
	8	Sept 17	Bioinformatics, Genomics and Proteomics	Ch. 5
5		Sept 22	Midterm 1	
	9	Sept 24	Manipulation of Prokaryotic Gene Expression	Ch. 6
6	10	Sept 29	Introduction to Immunology	Reading 3
	11	Oct 1	Molecular Diagnostics –Abs and ELISA	Reading 3 and Ch. 9 (pp.333-340)
7	12	Oct 6	Protein and Antibody Therapeutics	Reading 4 and Ch. 10 (pp.399-421)
		Oct 8	No lecture, Lab Only	
8	13	Oct 13	Discussion: Monoclonal Abs as Drugs	Readings 5 and 6
	14	Oct 15	Discussion and Lecture: Vaccines	Reading 7 and Ch. 12 (pp.459-486)
9	15	Oct 20	Cancer Vaccines and Adjuvants	Reading 8 and 9
	16	Oct 22	Drug Development	Reading 10 and 11
10	17	Oct 27	Discussion: Cancer Drugs	Reading 12 and 13
	18	Oct 29	Nucleic Acid Therapeutics: Gene Therapy I	Reading 14, 15 and Ch. 11
11		Nov 3	Midterm 2	
	19	Nov 5	Nucleic Acid Therapeutics: Gene Therapy II	Reading 16, 17 and Ch. 11
12	20	Nov 10	Discussion: siRNA antiviral therapy	Reading 18
	21	Nov 12	Cell Therapy	Readings 19, 20 and 21(ref.)
13	22	Nov 17	Transgenic and Cloned Animals	Ch. 21
	23	Nov 19	Discussion: Cell Therapy	Reading 22
14	24	Nov 24	Transgenic Plants I	Ch. 18
		Nov 26	Thanksgiving	
15	25	Dec 1	Transgenic Plants II	Ch. 19 and 20

	26	Dec 3	Discussion: Regulating Biotechnology and Societal Issues	Ch. 22 and 23
17		Dec 15	FINAL EXAM: 11 a.m. to 1 p.m.	

Readings:

1. **Hawass, Z., et al.** 2010. Ancestry and pathology in King Tutankhamun's family. *JAMA* **303**:638-647.
1a. on-line appendix: <http://jama.jamanetwork.com/>
2. **Welch, J. S., et al.** 2011. Use of whole-genome sequencing to diagnose a cryptic fusion oncogene. *JAMA* **305**:1577-1584.
3. **Clark, M.** 2001. Immunochemical applications, p. 503-530. *In* C. Ratledge and B. Kristiansen (ed.), *Basic Biotechnology*, 2nd ed. Cambridge University Press, Cambridge, U.K.
4. **Gura, T.** 2002. Magic bullets hit the target. *Nature* **417**:584-586.
5. **Esteva, F. J., and G. N. Hortobagyi.** 2008. Gaining ground on breast cancer. *Sci. Am.* **298(6)**:58-64.
6. **Stix, G.** 2006. Blockbuster dreams. *Sci. Am.* **294(5)**:60-63.
7. **Glass, R. I.** 2006. New hope for defeating rotavirus. *Sci Am.* **294(4)**:46-55.
8. **Garçon, N., and M. Goldman.** 2009. Boosting vaccine power. *Sci. Am.* **301(4)**:72-79.
9. **von Hofe, E.** 2011. *Sci. Am.* **310(5)**:66-71.
10. **Berg, J. M., J. L. Tymoczko, and L. Stryer.** 2007. *Biochemistry*, 6th ed., Chapter 35: Drug development. W. H. Freeman and Company, New York.
11. **Kenakin, T.** 2005. New bull's-eyes for drugs. *Sci. Am.* **293(4)**:50-57.
12. **Goldman, J. M., and J. V. Melo.** 2001. Targeting the BCR-ABL tyrosine kinase in chronic myeloid leukemia. *N. Engl. J. Med.* **344**:1084-1086.
13. **Drucker, B. J., et al.** 2001. Efficacy and safety of a specific inhibitor of the BCR-ABL tyrosine. *Med.* **344**:1031-1037.
14. **Limberis, M. P.** 2012. Phoenix rising: gene therapy makes a comeback. *Acta Biochim. Biophys. Sin.* **44**:632-640.
15. **Gaudet, D., et al.** 2013. Efficacy and long-term safety of alipogene tiparvovec (LPLS447X) gene therapy for lipoprotein lipase deficiency: an open-label trial. 2013. *Gene Ther.* **20**:361-369.
16. **Stix, G.** 2004. Hitting the genetic off switch. *Sci. Am.* **291(4)**:98-101.
17. **Bender, E.** (2014, Sept. 1). The Second Coming of RNAi. *The Scientist*. Retrieved from <http://www.the-scientist.com/?articles.view/articleNo/40871/title/The-Second-Coming-of-RNAi/>
18. **Bitco, V., et al.** 2005. Inhibition of respiratory viruses by nasally administered siRNA. *Nat. Med.* **11**:50-55.
19. **Lanza, R., and N. Rosenthal.** 2004. The stem cell challenge. *Sci. Am.* **290(6)**:92-99.
20. **Hochendlinger, K.** 2010. Your inner healers. *Sci. Am.* **302(5)**:46-53.
21. **Olausson, M., et al.** 2012. Transplantation of an allogeneic vein bioengineered with autologous stem cells: a proof-of-concept study. *Lancet* **380**:230-237.
22. **Zhou, Q., et al.** 2008. *In vivo* reprogramming of adult pancreatic exocrine

cells to β -cells. Nature **455**:627-632.

In case a midterm exam must be missed for legitimate reasons, discuss the situation with the course instructor **prior** to the exam, if possible. If an exam is missed for an emergency or for a valid health reason (with written documentation), the scores of the other two exams will be prorated to comprise your total point score. Rules governing exams are given in more detail in your Student Contract, which is also posted on the class website: <https://blackboard.usc.edu>.

In the event an error is made in the grading of your exam, written submittal a description of the error, using the regrade form posted on Blackboard, with the exam should be returned to Dr. Bancroft within a week after receiving your graded exam. After this time period, exams will not be regraded.

Lectures: It is important to attend all of the lectures during the course and to take good notes for study. Prior to attending each lecture, it is important to have read the appropriate portions of the textbook. However, many of the lectures will contain new and additional information that is not in the textbook. Examinations will be based mainly on information given in the lectures. In studying for examinations, complete and accurate lecture notes are of prime importance.

The lecture slides posted on the course Blackboard internet site (<https://blackboard.usc.edu>), may contain material that is not in the lectures—and the lectures may contain information that is not conveyed in the Blackboard lecture summaries. The lecture summaries, as posted on Blackboard, and the textbook are intended to be helpful, but auxiliary to the lectures. All course materials, information, announcements and grades will be posted on Blackboard until the end of the semester.

Email Communication:

To ensure privacy, only student's USC email accounts may be used for email communications. Students are responsible for understanding the content of email messages that the instructor sends to their USC accounts. Therefore, each students must check their USC email regularly and make sure their account is not over quota, so new messages can be received.

Statement on Academic Integrity:

USC depends on honesty, integrity, and ethical behavior among its members. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles.

Resources on academic integrity standards, policies, and expectations:

1. Trojan Integrity Guide: <http://www.usc.edu/student-affairs/SJACS/forms/tio.pdf>
2. Guide for Avoiding Plagiarism: <http://www.usc.edu/student-affairs/SJACS/forms/tig.pdf>

3. Overview of Academic Integrity: <http://www.usc.edu/student-affairs/SJACS/forms/AcademicIntegrityOverview.pdf>
4. Tutorial on Academic Integrity:
http://www.usc.edu/libraries/about/reference/tutorials/academic_integrity/index.php
5. SCampus (University Governance, paragraph 11): <http://web-app.usc.edu/scampus/1100-behavior-violating-university-standards-and-appropriate-sanctions/>

Statement For Students With Disabilities:

Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to Dr. Bancroft as early in the semester as possible. DSP is located in STU 301 and is open 8:30am–5:00pm, Monday through Friday. The phone number for DSP is (213) 740-0776. For more information, please visit the following link:

http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html

