

Phil/Biol 2510, Spring 2009
Study Guide for Midterm Exam #3
Bluebook Required

For each exam you will be expected to be familiar with the assigned readings, lectures, and class discussions and be able to discuss intelligently the concepts, issues, arguments, and criticisms involved on the topics covered. The exam will consist of two parts. The first part will be a series (~10) of objective, multiple-choice questions. The second part will consist of two short essays. Below is a list of concepts and issues you are expected to understand. A list of essay questions is also included.

Concepts and Issues

GM Agriculture

Agrobacterium & gene gun
T DNA
growing a cell into a plant
pronuclear injection
knockout technology
Common transgenic plants (cotton, corn, soybeans)
herbicide resistant plants (Ht)
insect resistant plants (Bt)
Bt toxin
Green Revolution and GM Food
Safety Concerns:
 Human Health: toxins, allergies, long term
 Environmental: selection pressure, gene flow,
 biodiversity (and non-target species), Refuge areas
Substantial equivalence vs. Precautionary principle
Socio-Economic issues:
 Impact, human health and biodiversity, dependency
 Benefits and risks on a global scale, Golden rice

Infectious Disease

Xenotransplantation
Rationale and Risks
Animal welfare, immune response, zoonosis
Immune system: antibodies, antigens, B & T cells
Zoonosis, pandemics, viruses
Hemagglutinin/Neuraminidase
Spanish Flu (1918) (H1N1)
Avian Flu (H5N1), & Swine Flu (H1N1)
Dual-use dilemmas
Bioweapons & bioterrorism
Public Health & Economic Impact
Genetic Research & Biosecurity: mousepox,
 reconstructing polio & 1918 virus, Project Bioshield
B cells & T cells
Antibodies
Monoclonal antibodies
Humanized antibodies
bacteria vs. virus
antibiotics & antibiotic resistance
immunization & herd immunity
smallpox & polio
recombinant vaccines

Gene Therapy

Somatic vs. germline
stem cell
candidates for gene therapy
SCID
gene therapy vectors
integrating viruses (retroviruses)
non-integrating viruses (adenoviruses)
non-viral (DNA injection)
problems with vectors
RNA interference (RNAi)
RNAi vs. gene therapy
Risks: immune response & tumors
Therapy vs Enhancement
Erythropetin (EPO) case (Armstrong and Millar)
Pro and con for “enhancement”
 Legitimate medical use (Argument 1)
 Fairness (Argument 2)
Usefulness of therapy vs. enhancement distinction
IGF-1 case

Cloning & Stem Cells

Promise of SC research: Therapy and Research
Multipotent & pluripotent cells
Blastocyst & inner cell mass
chimera
feeder cells
candidate diseases for ES cell treatment
immune response
SCNT
therapeutic vs. reproductive cloning
problems with US cell lines
Bush 2001 vs. Obama 2009 Federal Policy
1996 Dickey-Wicker amendment
Moral status of the embryo
 Human at conception argument (and criticisms)
 Potential Person argument (and criticisms)
SCNT issues
Source of Eggs
Political/Economic Issues

Essay Questions: The following list includes eight possible essay questions for Midterm Exam #3. From this list we will pick four questions for the exam, and then you will be expected to write on two of your choice. Each answer should be given in essay form and be as complete and thorough as possible given the space and time for the exam (approximately 2/3 of the allotted time for both essays, and 1/3 for the objective questions). Some recommendations: include as much relevant detail as you can in an organized fashion. We encourage the use of examples to illustrate your points. In your essay, be sure to respond to each part of the essay question. Your goal should be to demonstrate to us that you have a competent grasp of the relevant concepts, processes, issues, arguments, and implications.

1. Suppose the scientists working down the hall from you recently isolated a single gene from a desert sage plant that provides that plant with drought resistance. Your bosses at Big Agra want you to introduce the gene for drought tolerance into corn. Describe in detail the two ways discussed in class that you could make these transgenic plants (starting with DNA and ending in a field).
2. GM Food Safety: One of the most prevalent concerns raised about GM foods is that it might be unsafe. Pick what you think is the most important safety issue and describe the particular problem. How might this problem be addressed? Would this be a satisfying solution (if implemented) or would safety problems remain? Explain your answer.
3. Vaccination has been a major factor in decreasing incidence of many diseases. Describe how vaccination works- include the cell types in the body that are affected, the molecules that they make and why our immune system can recognize any of billions of different viruses but not any of our own proteins.
4. Dual-use dilemmas: As discussed in class, scientists have published information about the materials and methods of creating highly virulent viruses (such as the mousepox) as well as how to reconstruct dangerous viruses (e.g., polio) from “off-the-shelf” genetic material. Describe the dual-use dilemma illustrated by these cases. Assuming that the benefits of this type of viral research are worth pursuing, how should this particular dilemma be resolved? For example, should such information not be published? Should it be restricted? If so, by whom and on what criterion?
5. Describe the two main types of gene therapy vectors. Describe five of the six problems with gene therapy vectors that were listed in class. Include in your description whether the problem is common to all vectors or only some, and whether there have been any cases of actual medical complications in real trial due to these problems
6. Therapy vs. Enhancement: The use of gene therapy to treat existing diseases is fairly uncontroversial, but many object to using the same technology to simply “enhance” traits of a non-diseased individual. Consider the recent discovery of IGF-1: What is IGF-1 and what is the possible enhancement application of IGF-1? Should it be used for this enhancement application – explain why or why not? Does the distinction between therapy and enhancement help answer this question of its proper use? Explain.
7. Describe specifically what ES cells and iPS cells are and how each is made. In you answer, compare how are they the same and how are they different. Are iPS cells the solution to the hESC controversy?
8. Stem Cell Ethics: The central objection to hESC research is that it destroys human embryos. Describe why this is a central issue in the public debate and recount the strongest argument against using embryos to extract stem cells. In the end do you think this argument wins the day? Why or why not? Lastly, consider whether iPS solves the moral status of the embryo issue.