I. Course overview and introduction

A. Instructor
Dr. Gregory DeKrey -- gregory.dekrey@unco.edu (e-mail)

B. Catalog course description
Provide an understanding of 1) the nature and cause of disease in animals, and 2) the mechanisms of immunological resistance to disease with an emphasis on adaptive immunity.

C. The purpose of this course
You are at war at the cellular level -- a life and death struggle waged by your immune system against countless disease-causing microbes. You are exposed to these deadly pathogens every day. Infectious disease is one of the leading causes of death in the United States, and it is still the major cause of death in some parts of the world. How does your immune system protect you day to day from viruses, bacteria and parasites? Answering that question will be the focus of this class. We will explore the components of your immune system and dive deeply into the mechanisms by which they keep you alive. We will also explore how the immune system can be enhanced to your benefit as well as how your immune system can turn on you to cause disease.

II. Required materials and technology

A. Text books for this course
1. Janeway’s Immunobiology (Murphy), 9th edition
2. A good medical dictionary (e.g., Taber’s is a good one, but it doesn't matter as long as you have one)

B. Websites
1. Canvas: http://canvas.unco.edu (this is where all lecture notes and lecture videos will be posted, a calendar of activities and due dates, as well as where assignments will be submitted).
2. Garland Science: http://www.garlandscience.com (this site will only be accessible to you if you purchase the text book which you absolutely should).

C. Technology
There are certain technical competencies that are required for course completion. You must have the ability to use a common word processor, use e-mail, and work with a browser to access the online course materials.

III. Learning objectives

1. The learner should be able to recall and identify the main soluble and cellular components of the immune system, their various developmental stages, and where they are located within the body relative to pathogen exposure and/or tissue damage.

2. The learner should be able to recall and identify the categories of pathogen- and damage-associated molecular patterns that are recognized by soluble and cellular receptors of the immune system, the structure of those receptors, and the responses that are stimulated upon binding of those receptors.

3. The learner should be able to summarize, compare and contrast innate and adaptive immune mechanisms of action including the specific capabilities of each soluble factor and cell, the cooperative cellular relationships between the two immune system subcategories, the evolutionary advantages of retaining both, and how they can be manipulated clinically to the benefit of a patient.
4. The learner should be able to recall and identify the soluble and cellular regulatory factors of the immune system, construct a network of regulatory interactions between those factors and the cells being regulated, and relate the evolutionary logic of that regulation in the context of different pathogens and tissue damage.

5. The learner should be able to outline the mechanisms of immunological tolerance, predict the outcomes of a failure in tolerance, and deconstruct tolerance sufficiently to extrapolate how manipulating tolerance mechanisms can be used clinically to the benefit of patients.

6. The learner should be able to interpret a set of experimental or clinical findings, hypothesize an immunological mechanism to explain those findings, and predict the outcomes of tests to further investigate those findings.

IV. Course requirements

Successful completion of this course requires accumulation of at least 60% of the total possible points achievable from assignments (a grade of D or higher). For biology undergraduate students, in order to apply this course toward graduation, accumulation of at least 70% of total possible points must be achieved (a grade of C or higher).

Grades of A, B, C, or D will be awarded for achieving 90, 80, 70, or 60 percent of the maximum possible adjusted points from exams -- a grade of F will be given for a point accumulation of less than 60 percent. Final grades for the course may be adjusted based on the performance curve of the entire class and in keeping with historical trends for the class.

A total of 550 points are possible in this course: 100 points from each of four exams, 100 points total from quizzes, and 50 points from a written summary of a case study.

V. Graded assignments

A. Exams:

There will be four exams, each containing approximately 50 questions, and each worth approximately 100 normalized points. These exams will be proctored. Exams will be closed book, closed note, and formatted as T/F, multiple-choice, fill-in-the-blank, short answer, short essay, and full-page essay. Although each exam will focus primarily on material covered since the previous exam, each exam should be considered comprehensive of all material covered to that date. Exam dates are indicated on the class schedule. The last exam will be offered during the week of final exams.

B. Quizzes

There will be approximately 10 quizzes over the course of the semester. Quizzes will be taken via Canvas. The quizzes will be formatted as T/F, multiple-choice, fill-in-the-blank, and short answer.

C. Disease summary

The due date for this assignment is November 22, 2016.

*General information*

You will be randomly assigned an immunologically-relevant disease topic at the beginning of the semester. Please use your own words to review and interpret this disease.

Be sure to use appropriate grammar, punctuation, spelling, etc. If your summary can't be understood because it is poorly written, you will lose points. Please define all abbreviations.

*Format*

Your summary should be at least four pages in length (not including the cover sheet, references and figures). It should be printed with 11 point Times New Roman font, double-spaced, and one inch margins all around. Please number the pages. Be concise.
**Cover sheet**

The cover sheet should include your name, the course name, and the name of the disease you are summarizing.

**References**

Include full references in a separate section at the end. There is no limit to the number of references that you can use. Please cite them in the text of your review by number in square brackets. For example: The earth revolves around the sun [1]. The number of the reference should be the same as the order of citation. Provide all full citations using the following examples. Web sites will be accepted as references, but they may not number more than 10% of all the references cited.


**Figures**

Figures, if included, should be contained within a separate section preceding the reference section. All figures should be accompanied by a title that includes the figure number (to be referenced in the text of your summary [e.g., Figure 1]) and a description of the figure sufficient to stand alone as an explanation of its significance without requiring the rest of the summary.

**Organization**

**Section I: Background**

1. What is the disease called -- explain what the name means if necessary? When was the disease first described?
2. How does this disease present in a clinical setting -- what would an MD observe upon examination, what tests would be run to aid with the diagnosis, and what would those tests reveal if the results are positive?
3. Who gets this disease -- what is the rate in the general population, are there differential incidence rates based on gender, geographic location, economic status, educational status, or other variables?
4. What is the prognosis upon diagnosis -- the expected duration, and a description of the disease course throughout the rest of the life of the patient. For example, will there be progressive decline, intermittent crisis, or sudden, unpredictable crisis? Is the disease likely to kill the patient, or will they more likely die of something else? Base the prognosis on statistical evidence if it is available.

**Section II: Explain the immunology**

1. What pathogens are involved, if any?
   a. What is the life cycle of the pathogen
   b. How does the pathogen cause the symptoms described above, if at all?
2. What deficiencies are involved, if any?
   a. Are the deficiencies acquired or inherited?
   b. How does the deficiency lead to the symptoms described above, if at all?
3. What host cells are involved, in any?
   a. What is the normal function of these cells?
   b. What is the function of these cells with regard to the disease?
   c. How does the function of these cells relate to the symptoms described above, if at all?
d. Are these cells beneficial to the patient, or are these cells causing the disease?

4. What secreted factors are involved, if any?
   a. What is the normal function of these factors?
   b. What is the function of these factors with regard to the disease?
   c. How does the function of these factors relate to the symptoms described above, if at all?
   d. Are these factors beneficial to the patient, or are these factors causing the disease?

Section III: Disease treatment

1. What are the standard treatments used to alleviate suffering and extend the life of patients afflicted with your disease? Do not present experimental treatments -- if they are still experimental, that means that they have not been shown to be sufficiently effective for general use.

2. Explain the rationale for each treatment -- this will require explaining the mechanism of action. For example, if bone marrow is replaced, explain the benefit that is provided to the patient by this treatment. Indicate if the treatment(s) is curative or palliative.

VI. Ungraded assignments

There are various materials on the web site of the textbook publisher (Garland Science) that you should utilize: 1) flash cards that will test you on topics for each chapter; 2) animations that provide clarification of various concepts.

VII. Expectations and communication

A. What I expect from you

I expect that you will take ownership of your learning. While I expect this from students in a face-to-face course, this is even more important for an online course. The readings, websites and media chosen for this course are a foundation for the basis of online learning.

This is not a self-paced course. It is an online learning environment with REQUIRED assessment outcomes and due dates. Assignments and student interaction must be completed as they would be in a face-to-face course.

I expect that you will complete all readings, activities, discussion boards, and assignments for the course and that you will learn the material, not just memorize it for an exam.

I also expect that you contact me with questions or concerns as soon as they develop, so I can make sure you stay current with your assignments. Contacting me after the fact except in cases of extreme emergency will not likely result in a great deal of sympathy for your cause.

B. Communication

If you have general questions, comments or feedback please post to the General Q&A forum in the appropriate module of Canvas. If you would like to discuss a private issue with me, please e-mail and please include in the subject line the name of the course. I will respond to e-mails within 24 hours Monday - Friday and within 48 hours on the weekend or holidays.

I will try to provide timely feedback for your assignments (within 1-2 weeks). Be sure to look for the feedback in the Grades area of Canvas.

C. Time Commitment

Please realize that it will take you at least as much time, work, and dedication to complete this online course as it does for an on-campus course. Taking an online course gives you flexibility, and allowing you to attend class from any location. But because you are not made to attend at a specific time or place, it requires extra self-discipline:

1. You must determine when you attend
2. You must make sure that you attend regularly
3. You must make sure that you reserve or, better yet, actually schedule enough time to check announcements, read the Course Materials, study, and complete assignments.

In a regular semester, for a three hour class, you would be expected to spend three hours in class each week and about nine hours outside of class studying and completing assignments.

**VIII. Other considerations**

**A. Disabilities**

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Disability Support Services at 970-351-2289 as soon as possible to better ensure that such accommodations are implemented in a timely fashion.

**B. Cheating, plagiarism and the honor code**

All members of the University of Northern Colorado community are entrusted with the responsibility to uphold and promote five fundamental values: Honesty, Trust, Respect, Fairness, and Responsibility. These core elements, embodied in the UNC Honor Code, foster an atmosphere, inside and outside of the classroom, which serves as a foundation and guides the UNC community's academic, professional, and personal growth. Endorsement of these core elements by students, faculty, staff, administration, and trustees strengthens the integrity and value of our academic climate. Endorsement and acceptance of this honor code by a student at UNC is implied upon enrollment. Because an understanding of plagiarism is assumed in your implied acceptance of the Honor Code, If you don't know what plagiarism is, you should talk to the instructor for clarification prior to engaging in any activity related to this course.

**IX. Tentative lecture schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Week of</th>
<th>Chapt.</th>
<th>Subject</th>
<th>Exams</th>
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<tbody>
<tr>
<td>1</td>
<td>8/22</td>
<td>1-2</td>
<td>Introduction to the immune system and pathology</td>
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<tr>
<td>2</td>
<td>8/29</td>
<td>1-2</td>
<td>PAMPs, DAMPs, antigen, and cells</td>
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<td>3*</td>
<td>9/5</td>
<td>1-2</td>
<td>Organization and tissues of the immune system</td>
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<td>4</td>
<td>9/12</td>
<td>3</td>
<td>Innate immunity</td>
<td>Wed.</td>
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<tr>
<td>5</td>
<td>9/19</td>
<td>4</td>
<td>Antigen recognition</td>
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<td>6</td>
<td>9/26</td>
<td>5</td>
<td>Generation of lymphocyte antigen receptors</td>
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<td>7</td>
<td>10/3</td>
<td>6</td>
<td>Antigen presentation</td>
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<td>8</td>
<td>10/10</td>
<td>7</td>
<td>Lymphocyte receptor signaling</td>
<td>Wed.</td>
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<td>9</td>
<td>10/17</td>
<td>8</td>
<td>B and T cell development</td>
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<td>10</td>
<td>10/24</td>
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<td>T cell-mediated immunity</td>
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<td>11</td>
<td>10/31</td>
<td>10</td>
<td>Humoral immunity</td>
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<td>12</td>
<td>11/7</td>
<td>11</td>
<td>Dynamics of innate and adaptive responses</td>
<td>Wed.</td>
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<td>13</td>
<td>11/14</td>
<td>12</td>
<td>Mucosal immunity</td>
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<td>14**</td>
<td>11/21</td>
<td>14</td>
<td>Allergy and hypersensitivities</td>
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<td>15</td>
<td>11/28</td>
<td>15</td>
<td>Autoimmunity and transplantation</td>
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*No class on 9/7: Labor day.

**No class on 11/25-11/27: Thanksgiving break.

**X. Recommended references**

The following books and other reference materials are sources that I use for assembling the lectures. This serves as a reference to those materials and a recommendation for you to seek out these materials for clarification, as needed.

1. An Introduction to Human Disease: Pathology and Pathophysiology Correlations (Crowley)
2. Basic Concepts in Cell Biology and Histology, a Student Survival Guide (McKenzie)
3. Basic Histology (Junqueira)  
4. Basic Histology, Examination and Board Review (Paulson)  
5. Cancer Biology (King)  
6. Casarett & Doull's Toxicology (Klaassen)  
7. Case Studies in Immunology (Brostoff)  
8. Case Studies in Immunology (Rosen)  
9. Cell and Molecular Biology (Karp)  
10. Cell Biology (Pollard)  
11. Cell Biology, a short course (Bolsover)  
12. Cellular and Molecular Immunology (Abbas)  
13. Clinical Laboratory Immunology (Mahon)  
14. Color Atlas of Immunology (Burmester)  
15. Core Pathology (Stevens)  
16. Functional Histology (Wheater)  
17. Fundamental Immunology (Paul)  
18. Immunity (DeFranco)  
19. Immunology (Kuby)  
20. Immunology (Goldsby)  
21. Immunology (Roitt)  
22. Immunology (Stites)  
23. Instant Pathology (Borley)  
24. Janeway's Immunobiology (Murphy)  
25. Manual of Clinical Laboratory Immunology (Rose)  
26. Medical Immunology (Stites)  
27. Membranes and their Cellular Functions (Finean)  
28. Molecular Cell Biology (Lodish)  
29. Netter's Illustrated Human Pathology (Buja)  
30. Pathology for the Health Professions (Damjanov)  
31. Pathology: The Big Picture (Kemp)  
32. Pathophysiology of Disease (McPhee)  
33. Principles of Pathobiology (Hill)  
34. Principles of Immunology and Immunodiagnosics (Lea)  
35. Robbins Basic Pathology (Kumar)  
36. Robbins and Cotran, Pathologic Basis of Disease (Kumar)  
37. Taber's Cyclopedic Medical Dictionary  
38. The Big Picture, Pathology (Kemp)  
39. The Immune System (Parham)  
40. The World of the Cell (Becker)  
41. Understanding Immunology (Wood)