Students in BBSG 501:

Enclosed is a brief outline along with questions that should be addressed by everyone. We want everyone to participate, not just the individuals that present. This section will be a discussion format and your grades for this section will be based on your participation, presentation, and ability to lead a discussion.

Dr. Bellone

BBSG 501 – Integrative lectures


- Antigen recognition by B cells, pages 103 – 115.
- The generation of diversity in immunoglobulins (Igs), pages 135 – 148.
- Structural variation in immunoglobulin constant regions, pages 154 – 164.
- The rearrangement of antigen-receptor gene segments controls lymphocyte development, pages 258 – 264.

Wed, Dec 10, 2008 9-10 AM: Introduction to B cells, Antibody Genes, and Antibodies – Bellone

Thurs, Dec 11, 2008 Preparation Day

Fri, Dec 12, 2008 9-10 AM: Gene structure in germline and B cells – Bellone

Questions: 1) The immune system can produce over $10^{10}$ different antibody molecules. The human genome roughly consists of ~30,000 genes. Given that fact, how does the immune system fashion that many antibodies? 2) During the course of an immune response antibodies made to a pathogen can increase in average affinity. How can the immune system produce a spectrum of different affinities from a single antibody producing cell that utilizes a single gene for each of the antibody chains? 3) B cells can switch from one class of antibody to another without changing their specificity. How?
Mon, Dec 15, 2008 9 – 10 AM: Transcription and modification of Ig RNAs - Bellone

Questions: 1) A single B cell clone produces a single antibody specificity despite the fact that the Ig locus contains two alleles, maternal and paternal, for each antibody gene. How is this accomplished?
2) A single mature B cell clone co-expresses IgM and IgD classes of antibody, both with identical binding sites. Explain how this occurs at the molecular level.
3) Each B cell clone expresses a membrane bound B cell receptor. After antigenic stimulation the clone differentiates to a plasma cell which secretes antibodies of the same type and specificity as the B cell receptor. How is this accomplished?
4) Class Switching involves distinct mechanisms from antibody gene rearrangements. How?

Tues, Dec 16, 10 – 11 AM: Dr. Green
Topic: A case of translational control: Hemoglobin biosynthesis in the reticulocyte.

1. What is meant by translational control of gene expression?
2. What are some of the mechanisms by which translational control is achieved?
3. What are the properties of a reticulocyte?
4. What are the requirements for the cell-free synthesis of hemoglobin in a reticulocyte lysate?
5. How are initiation factors for protein synthesis involved in this process?
6. Are all mRNAs created equal?

Wed, Dec 17, 9 – 11 AM: Ab structure - function - Baldassare and Bellone

Topics to be covered: 1) Overall structure – various domains and their function.

What are the structural determinants in variable region that determine diversity?

What properties determine affinity and how is it measured?

Explain three methods to isolate antibodies – explain the property of the antibody on which the isolation procedure is based.

How does binding of ligand (antigen) alter Ab effector function?

Many laboratories in this institution use antibodies to precipitate specific molecules or detect them by Western blot analysis. What properties of the antibody are essential for use in these procedures? Remember that interpretable results for each of the above procedures depend on the survival of antigen-antibody complexes after numerous washes.