Bacterial Growth/Nutrition

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Mechanisms of Human Disease

BACTERIAL GROWTH AND NUTRITION AND ORGANELLES OF VIRULENCE

Date: Wednesday, August 15, 2018 – 9:30 am
Reading Assignment: Medical Microbiology, 8th Ed., Murray, Rosenthal, & Pfaller.

KEY CONCEPTS AND LEARNING OBJECTIVES:

A. EDUCATIONAL GOAL

After completing the assigned readings and attending the lecture, you will be able to describe the roles of exotoxins and the type III secretory system in pathogenesis and the various metabolic and regulatory processes that allow rapid bacterial cell growth. You will be able to list some of the ways that each of these systems contribute to pathogenesis. Further, you will see how some of these processes can be inhibited by antibiotics. Often, to be successful pathogens, bacteria must modify these processes when they first encounter the host, thereby going from a non-pathogenic to a pathogenic state. You will be able to describe the general mechanisms by which these modifications occur.

B. EDUCATIONAL OBJECTIVES

1. Students will be able to describe three very general mechanisms of toxin action, and the general role of the type III secretory apparatus in Gram negative bacterial pathogenesis.
2. Students will be able to identify antibiotics that inhibit the major cellular targets: DNA, proteins, peptidoglycan and membranes.
3. Students will be able to describe the major steps of bacterial growth.
4. Students will be able to list the major steps in metabolism, and identify how knowledge of metabolism is useful to an understanding of bacterial pathogenesis and treatment.
5. The students should understand what intracellular bacterial replication is.
6. Students will be able to describe the siderophore system.
7. Students will be able to state the definitions of, and differences between, fermentation and respiration. Students will know the relevance of each of these two types of metabolism for pathogenesis and diagnosis.
8. Students will understand, in general terms, that when bacteria encounter specific environments, they can direct the synthesis of a potentially large number of proteins and/or direct protein synthesis to occur in a specific temporal sequence, as needed to facilitate pathogenesis. Students will further understand that these capabilities derive from elaborate hierarchical programs of gene expression.
CONTENT SUMMARY:

I. Exotoxins

II. Type III secretory system

III. Cell growth in culture
   A. Pure culture technique
   B. Dynamics of growth in culture
   C. Cell division
   D. The major cellular targets of antibiotics

VI. Biochemistry of energy production (metabolism)
   A. Entry of nutrient molecules
      1. Passive transport
      2. Active transport
   B. Central metabolism
      1. Respiration
      2. Fermentation

V. Adaptive responses
   A. Generic responses to environment
   B. Adaptive responses to infection (host environment)