

**SG3: Pathogenicity, Immunity, Bacterial Pathogens, Fungi, Protozoans (Helminths included, but will likely be on exam four)**

**Pathogenicity**

1. What's the difference between **normal flora**, **opportunistic pathogens** and **obligate pathogens**? How can opportunistic pathogens become infections? Hint: there are 3 major ways.
2. What regions of the human body are particularly hospitable to **normal flora**? Which regions have little or no normal flora? Give a few examples and state why there are or are not flora in those particular regions.
3. What are the major **portals of entry and exit** for human pathogens? Give examples of general types of pathogens/dx's that use each portal. What is **transplacental infection**? Give examples of some pathogens that are capable of this type of transmission.
4. What kinds of mechanisms do pathogens use to adhere to and invade human tissues? Explain how organisms like *C. perfringens* and *Shistosoma* use **collagenase**. Explain how *S. aureus* uses **coagulase, kinase & leukocidins**. Explain how bacteria and viruses use **cell surface receptors**.
5. How do **capsules, slime layers & mycolic acid** help pathogens avoid the immune system? Which immune system components are foiled by these defenses?
6. Describe the different types of **toxins** produced by pathogens. Distinguish between **exo-** and **endotoxins**. Which are produced by gram positive and/or gram negative organisms. What are **entero-, neuro- and cyto- toxins**? Are these exo- or endo- toxins? What is **LPS** and how is it related to endotoxin? How is it related to gram negative organisms?
7. Describe the progression of most diseases. Use the terms: **Incubation Prodrôme, Acme, Decline, Convalescence**.

**Additional vocabulary:**

Pathogenicity	Botulin toxin
Virulence	Tetanus toxin
Adhesion	Intoxications
Virulence factors	Toxemia
Pus	
Pyogenic	

**Immune System**

1. What are the basic functions of the immune system. What anatomical systems are involved in the "immune system"? Give examples of structures within these systems that act for immune system functions.

2. What are **pathogens**? List and describe the various types of pathogens that commonly infect humans. Don't worry about specific names, think of the general groups (kingdoms). What are **antigens** and how are they related to pathogens. What parts of pathogens are frequently antigens?

3. Describe the functions of each of the following non-specific defenses: **skin, mucous membranes, lysozyme, cilia, acid, bile, sebum, inflammation, histamine, fever, macrophages, complement, membrane attack complexes**. Which of the above defenses is considered **1<sup>st</sup> line** and **2<sup>nd</sup> line**? What's the difference, in general? Which ones are **physical, chemical** and **cellular defenses**?

4. What are the 5 hallmarks of **inflammation**? Describe the cause and result of each. How do **histamine & other cytokines** function in inflammation? How are **diapedesis** and **chemotaxis** related to inflammation?

5. A. Describe the functions of each of the following components of the specific defenses: **antibodies, B-lymphocytes, T-lymphocytes, perforin**.

6. What are antibodies? How are they produced? What are their functions? Describe the processes of **opsonization, viral & toxin neutralization, precipitation and agglutination** as **anti-body mediated (humoral) immune responses**. By contrast, describe the processes of **cell-mediated immune responses** using perforin and other toxic molecules.

7. Describe how **MHC** presents pieces of pathogens and what the result is of this cell-mediated response to infections.

8. What is the difference between **granulocytes** and **agranulocytes**? What's in the granules? Which **WBC's** fall into which category. For each of the types of white blood cells, describe it's general function. Which ones are most numerous? Which ones are the "first responders" to sites of bacterial infections? Which are the second to arrive? Which ones specialize in helminthic parasites? Which are phagocytic?

9. How is **fever** related to **inflammation**? Is it a first, second or third line response? Is it specific or non-specific? What happens physiologically to cause fever? What part of the brain controls body temp? What signals cause fever to occur?

**Additional vocabulary:**

Mucociliary elevator

Phagocytosis

Pyrogenic

Epitopes

Antigen

Attenuated vaccines

Subunit vaccines

Neutrophils

Basophils

Eosinophils

Monocytes

Macrophages

Lymphocytes

B-cells

T-cells

**Bacterial Pathogens:**

**Airborne: Strep (GAS), Pertussis, Hib, Meningitis, Pneumonia, Tuberculosis**

**Food/waterborne: Cholera, Salmonellosis, Shigellosis, *S. aureus*, *E. coli*, Botulism, Typhoid, Listeriosis**

**Soil & Vectorborne: Anthrax, Bubonic plague, Tetanus, Lyme Dx, Rocky Mt. Sptd Fever**

**STD's & Misc: Chlamydia & Trachoma, Gonorrhea, Syphilis, Leprosy, *S. aureus*, TSS, Dental caries**

For each organism/disease, know:

- Causative agent(s)
- how it's transmitted (e.g. vector, oral-fecal, contact?)
- how common it is (don't memorize exact incidence, but have a general sense how common or rare it is.
- where is it endemic, epidemic, sporadic (i.e. US vs. developing countries)
- symptoms & complications
- how it's treated/cured & if there's a vaccine
- any special/memorable info discussed in lecture (for example: does it have a unique method of entry or infection?, is it an emerging or re-emerging dx?, is it on the increase or decrease for a particular reason?, is one particular group more at risk than others?)

**Fungi: *Saccharomyces cerevisiae*, *Candida albicans*, *Rhizopus*, *Aspergillus*, *Penicillium*, *Coccidioides*, *Trichophyton*, *Histoplasma capsulatum*, *Malassezia furfur*, *Amanita***

1. Describe/diagram fungal anatomy. What is a **thallus, hyphae, mycelium, fruiting bodies**? How are multicellular forms different than unicellular forms in their anatomy? What are **dimorphic** fungi?
2. How do fungi generally obtain nutrients? In other words, what part of the "food web" do they occupy? What percentage of fungi are potentially pathogenic?
3. For each fungal dx/species discussed in class: Briefly describe where it is found and what its importance is to humans (industry & disease). For diseases (**mycoses**), be sure to describe method of transmission, sx (names of dx's caused) & treatments.

**Parasites:**

**Protozoans: *Entamoeba histolytica*, *Naegleria fowleri*, *Giardia lamblia*, *Trypanosoma brucei* & *Trypanosoma cruzi*, *Leishmania*, *Plasmodium spp.*, *Toxoplasma gondii*, *Cryptosporidium parvum***

1. List and describe the four major groups of protozoans. Which protozoans discussed in class fall into each category?

2. What are the major sources of protozoan infections worldwide? In other words, how do people tend to get these parasites most often? How can these sources be ameliorated?
3. Describe the generalized life cycle of a protozoan. What are **cysts** and **trophozoites**?
4. Describe the life cycle of *Plasmodium spp.* Why the disease it causes called “**malaria**”? Which *Plasmodium* species is the deadliest and why? What are the major problems associated with the development of a malaria vaccine? What is the relationship between malaria and sickle-cell anemia?
5. Describe the process by which **Trypanosomes** change their “coats” to evade detection by the immune system.

**Helminths: *Tenia spp.*, *Echinococcus granulosus*, *Fasciolopsis buski*, *Schistosoma spp.*, *Enterobius vermicularis*, *Ascaris lumbricoides*, *Anisakis spp.*, *Ancylostoma* & *Necator spp.*, *Wuchereria spp.***

1. Describe briefly the general characteristics of **Flukes, Tapeworms & Roundworms**.
2. Why is it so difficult to develop treatments for helminthic infections?
3. Describe a couple of examples of how ecological/environmental changes can affect the infection rates of the human population with particular parasites. (E.g. dams and schisto, swamps and plasmo)
4. What are the major ways parasite infection can be dramatically decreased worldwide? What is the “parasitologist’s paradox”?

For each parasite, know:

- How it’s transmitted (e.g. vector, oral-fecal, contact?)
- how common it is (don’t memorize exact incidence, but have a general sense how common or rare it is.
- where is it endemic, epidemic, sporadic (i.e. US vs. developing countries)
- symptoms & complications
- how it’s treated/cured & if there’s a vaccine
- any special/memorable info discussed in lecture (for example: does it have a unique method of entry or vector?, is it an emerging or re-emerging dx?, is it on the increase or decrease for a particular reason?, is one particular group more at risk than others?)

**Arthropods: Ticks, scabies, head lice and pubic lice**