**BIOL 483 - Infection, Immunity, and Evolution of Disease**

**Spring 2022**

**Homework 3**

Review your Medical Microbiology text (Virology, sections 36-38). Write or draw your answers below.

Upload your file to Web Campus by 1:30 pm on January 27th.

**Classification (pages 358-363)**

What is the principal difference between viruses and other cellular organisms?

Viruses requires a host to replicate, not alive, and it packages its genetic material in comparison to other cellular organisms.

What types of nucleic acids do viruses have?

DNA or RNA (cannot be neither or both)

After nucleic acids, what are other main way of classifying viruses?

We classify viruses by structure (size, morphology), biochemical characteristics (mode of replication), disease (what kind of disease it causes), means of transportation (how it infects, what medium), and host cell/tissues (what it infects).

**Structure/Morphology (pages 358-363)**

What is a virion?

Entire virus particle. A fully functional complete virus

What is a viral capsid?

Protein cage (or shell); Encompasses the genetic material of the virus

What is a viral envelope?

Membrane Envelope; Packages the capsid containing the virus genetic material

What are capsids and envelopes composed of and why does it matter?

Viral capsids are composed of a protein structure and viral envelops are composed of a lipid bilayer. Both capsids and envelops help keep the virus genetic material intact inside the virus. In addition, envelops aid in the virus avoiding the host immune system as it is usually made from a portion of the host cell membrane.

What is a VAP and why is it important?

Viral Attachment Protein (VAP) serves to mediate the interaction between the virus and host cell; activates the virus and initiates replication (recognition and attachment ~ lock and key)

**Replication (pages 364-373)**

What is uncoating and where does it occur for a DNA virus?

Uncoating is when the nucleocapsid is delivered to the site of replication in the cell and the capsid/envelop is removed, leaving only the genetic information.

What are the fundamental differences between DNA virus and RNA virus replication?

For the DNA virus, the site of replication is located within the nucleus, while the RNA virus, the site of replication is located in the cytoplasm.

What is budding?

After replication, the newly formed viral capsid uses the host cell membrane to form the external envelope, which aids in avoiding the host’s immune system from attacking the enveloped virion.

How are viruses released from the cell?

Viruses are released from the cell through lysis (burst the cell membrane releasing the virions to the extracellular environment) or budding (viral capsid uses host cell membrane to form the external envelope).

**Pathogenesis (pages 374-377)**

What is tissue tropism?

Tissue tropism means the ability of a virus to infect a specific tissue (lungs, heart, brain…etc.)

What are the stages of viral infection?

The stages of viral infection:

1. Acquisition (entry into the body)
2. Initiation of infection at a primary site
3. Activation of innate protections
4. Incubation period (virus amplifies; may even spread to secondary site)
5. Replication in the target tissue (symptoms showing)
6. Host Response (Host defending against disease)
7. Contagion (Release of virus to other people ~ contagious stage)
8. Resolution (Virus settled by host immune system) or persistent infection/chronic disease (virus still within host)

What are the four potential outcomes of viral infection of a single host cell?

The four potential outcomes of viral infection of a single host cell:

1. Failed infection (abortive infection)
2. Cell death (lytic infection)
3. Replication without cell death (persistent infection)
4. Presence of virus without virus production but with potential for reactivation (latent-recurrent infection)

What is a lytic infection?

Lytic infection is when the virus replication kills the target cell (usually by lysis ~ cell membrane bursting)

What are the ways that viruses cause cell death?

Viruses causes cell death by:

1. Inhibit synthesis of cellular macromolecules
2. Produce degradative enzymes and toxic proteins
3. Virus replication and accumulation of the virion can disrupt cell function bursting the host cell (lysis)
4. Apoptosis (host cell suicide) – immune response to prevent viral infection