Virus Notes

February 5, 2013
5:47 PM

Mr. Lam Name: _____ Date: _____ Block: _____

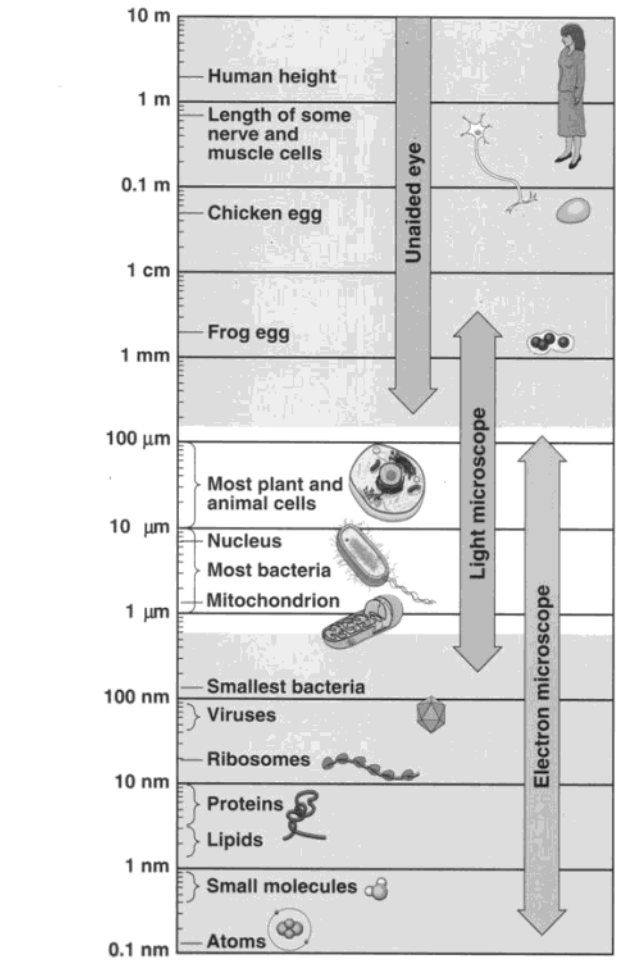
Viruses

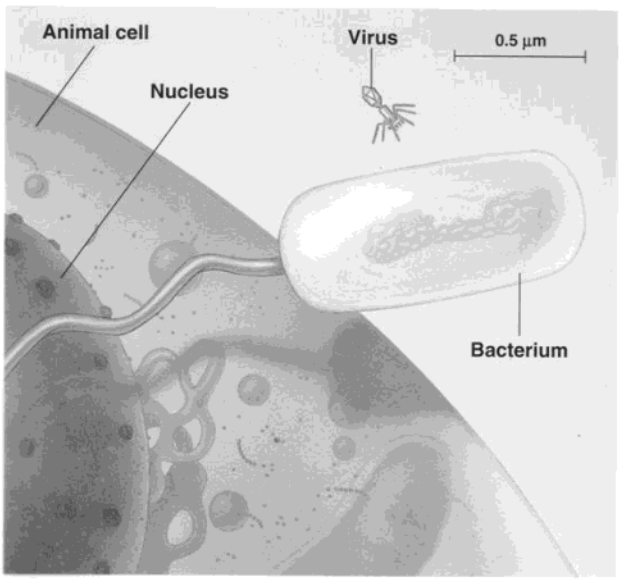
Viruses are non-cellular particles made up of genetic material (DNA or RNA) and a protein coat

Viruses are parasitic which means they require a host in order to reproduce. (they invade living cells)

Virus Size

Viruses are measured in nanometers. They are much tinier than bacteria!





Virus Structure:
Viruses come in many different shapes but all viruses have 2 main parts in common:

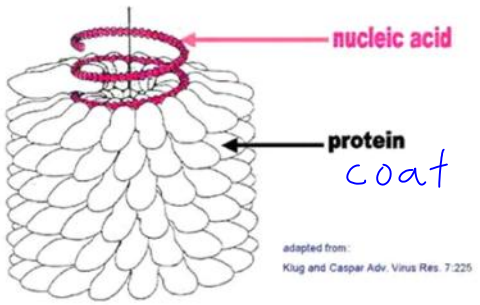
1) nucleic acid core (DNA or RNA)

2) protein coat called a capsid

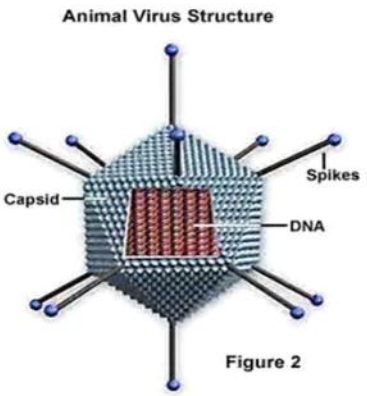
Shapes of Viruses
There are 4 main shapes of viruses you are expected to know about.

Rod shaped: spiral or helical protein coat
Ex. Tobacco mosaic virus; Rabies

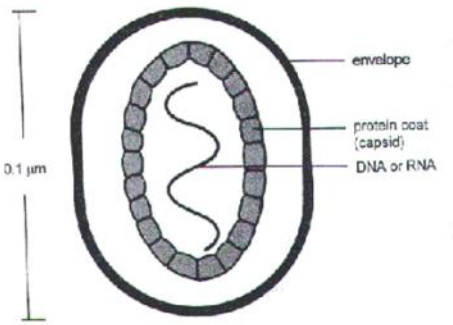
TOBACCO MOSAIC VIRUS



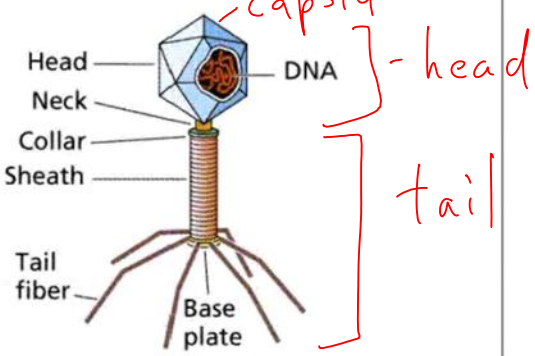
Adenovirus – an icosahedron (20 sides)
Ex. Respiratory diseases; gastrointestinal diseases;



Envelope surrounds the capsid
Ex. Influenza; HIV;



Bacteriophages only infect bacteria cells
Ex. T4 bacteriophage



know these labels

HW. Read 17-1 (p. 355-360)
Lytic + Lysogenic

Viral Specificity:
Viruses are specific as to what type of organism and what type of cell they will infect.

So a plant virus cannot infect an animal host. However, for every organism on earth there are also viruses that are capable of infecting them. Viruses are specific to 3 types of host cells: plant, animal and bacteria.

Infection and Transmission

Viruses need to infect living cells in order to reproduce.
This depends on chance contact between the virus and the host cell.

In the case of humans, the most common modes of transmitting viruses are through air and water, as well as through human contact such as shaking hands and then touching your nose or mouth.

Examples of diseases that are caused by viruses include:
HIV, measles, chicken pox, influenza, hepatitis

In most cases, the entire virus does not enter the cell.

Only the genetic (DNA or RNA) information is injected or enters the cell.

Viral Reproduction
There are two main cycles of viral infections.

1) The Lytic Cycle:
The virus uses the host cell's own enzymes and organelles to make materials to assemble more viruses. When the new viruses have been replicated, they cause the host cell to lyse / burst which releases the new copies of the virus.

This whole cycle can happen from beginning to end in about 20 minutes.

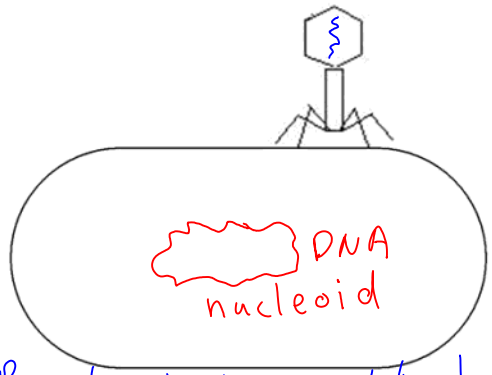
Examples: Influenza, rabies, ebola

2) The Lysogenic Cycle: The virus inserts its genetic material into the host cell. However the host cell can remain unchanged and even undergo normal cell division. Later on, changes in the environment (temperature, nutrient levels) or stress triggers the viral DNA to become active and enter the lytic cycle.

Example: herpes, HIV

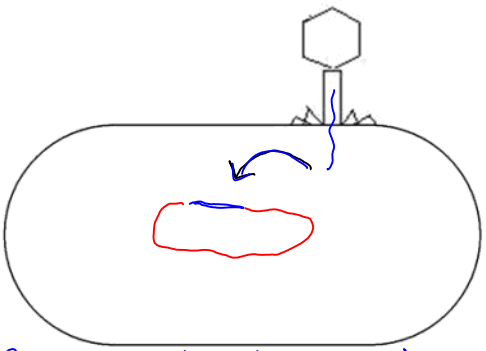
The Lytic Cycle

1. Attachment



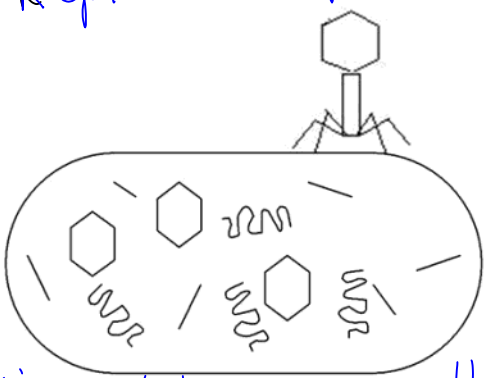
Bacteriophage attaches to bacteria cell wall

2. Injection



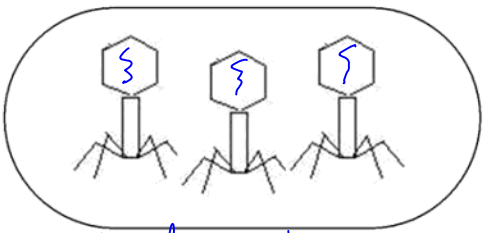
Bacteriophage injects genetic material into cell

3. Replication of virus



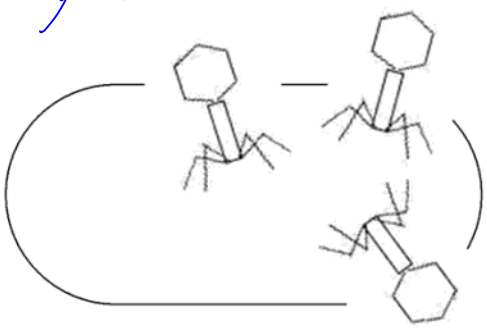
Virus takes over cell's metabolism and makes new virus proteins & nucleic acid.

4. Assembly



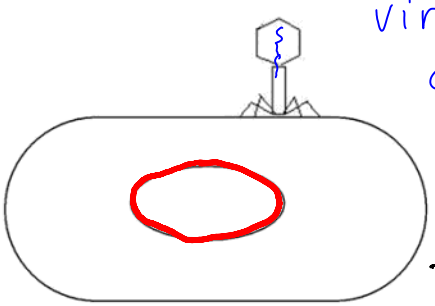
Viral proteins and nucleic acids are assembled into whole new viruses

5. Lysis

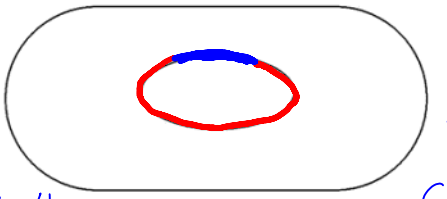


The bacteria cell lyses or bursts and new viruses are released.

The Lysogenic Cycle

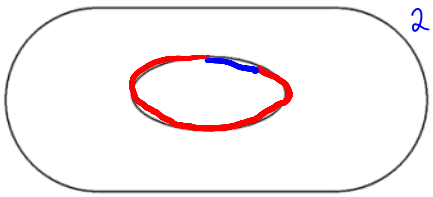


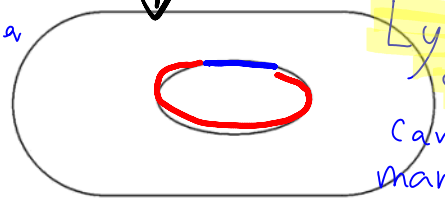
virus attaches to the cell and injects genetic material



viral DNA is integrated into the cell's DNA The viral DNA is called a prophage

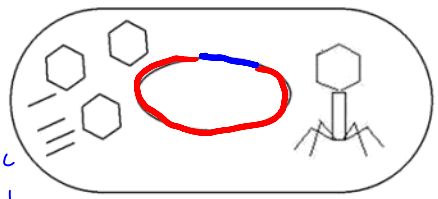
Cell division occurs and produces 2 daughter cells





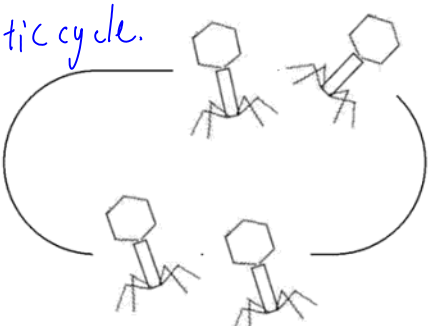
Lysogenic cycle can repeat many times

Conditions cause the viral DNA to become active and enter the lytic cycle.



Lytic cycle

Viral DNA and proteins are synthesized.



The cell lyses and the new viruses can infect other cells.

Are viruses living things? Consider the following…..

Living Characteristics	Non-living characteristics
1. Viruses contain genetic material (DNA or RNA)	1. Viruses are non-cellular. They cannot live independently.
2. Viruses contain proteins	2. Viruses do not respire. (don't use or obtain energy)
3. Viruses contain small amounts of enzymes	3. Viruses do not respond to stimuli.
4. There is diversity amongst viruses (ex. shapes + sizes)	4. Viruses do not grow independently
5. Viruses can control gene expression in cells.	5. Viruses reproduce only within living cells.
6. Viruses can reproduce in cells	6. Viruses can solidify into crystals. They become active again when placed into a solution environment.

Viruses and the Human Immune System

1. white blood cells - identify the presence of viruses. They engulf the viruses by the process of phagocytosis and destroy the viruses.

2. Antibodies - proteins that are made by the B cells; your body has the ability to make a variety of antibodies which are specific to whatever virus is detected in your body. As long as the virus does not mutate and has the same outter shape, you will have immunity against that virus for the rest of your life.

3. Interferons - non-specific proteins made by body cells that help delay the

4. Vaccines are made from weakened or harmless viruses. These are injected into the body to cause the body to produce antibodies without causing the actual illness. This confers immunity against that particular virus should the body come in contact with the real virus later.

*****Good sanitation habits, a healthy diet, adequate exercise and rest, all contribute to strong immune system that can respond to infections more effectively.******