GENERAL BIOLOGY

Lec. 8 & 9

1st. Stage 2nd. course

VIRUSES AND PARASITES

BY

DR. MOHAMMED AL-MURIB

Definition :

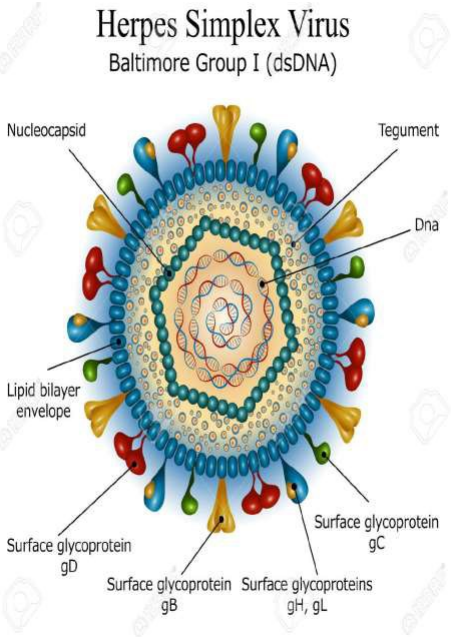
Viruses are submicroscopic, obligate intracellular parasites, they are too small to be seen by optical microscopes, and they have no choice but to replicate inside host cells.

1. Viruses do not have a cellular organization.
2. contain only one type of nucleic acid, either DNA or RNA.
3. lack the enzymes necessary for protein and nucleic acid synthesis
4. dependent for replication on the synthetic machinery of host cells.

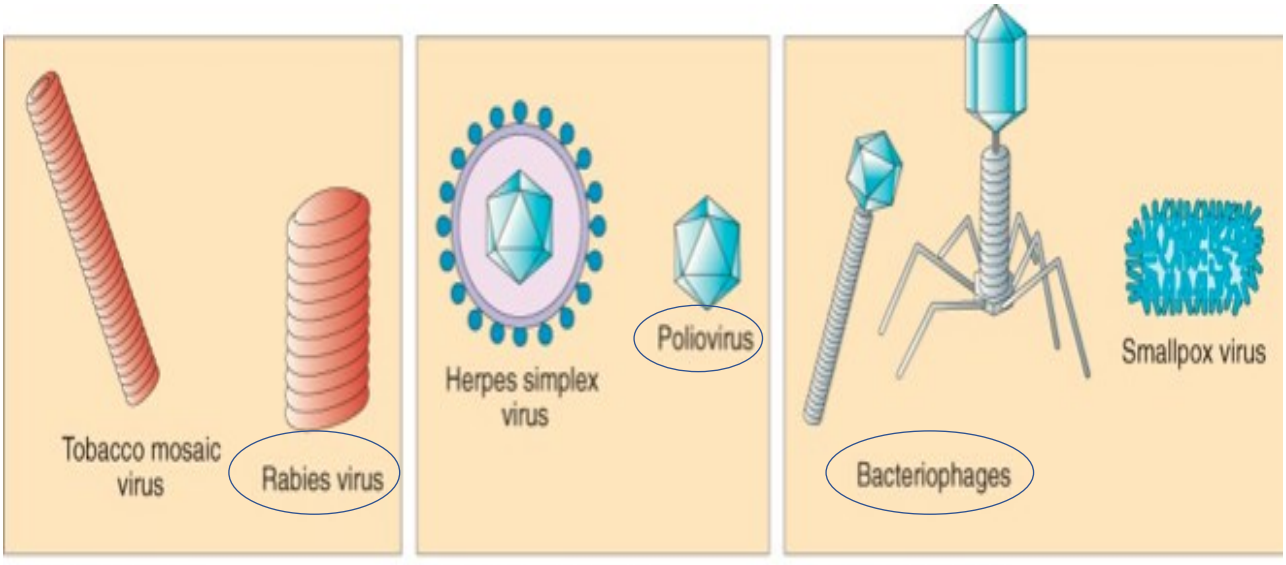
- **Structure and chemical composition of the viruses**
- Viral Capsid
- Virus Symmetry
- Viral Envelope
- Viral Nucleic Acids

Viral Capsid

- Viruses consist of nucleic acid core surrounded by a protein coat called **capsid.**
- The capsid with the enclosed nucleic acid is known as **nucleocapsid.**

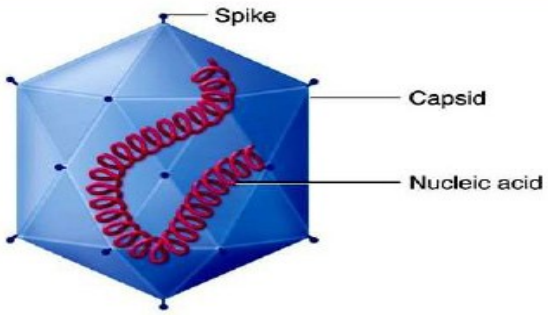


Viral symmetry

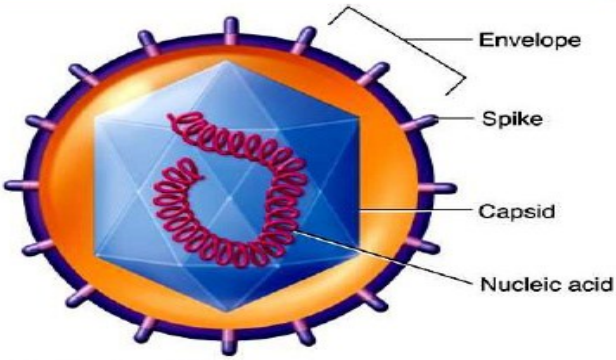


(a) Helical viruses (b) Icosahedral viruses (c) Complex viruses

Non- enveloped virus	Enveloped Virus
• Lack Lipid membrane • Resistant to heat • *Adenovirus* usually causes upper respiratory tract infections. *Poliovirus, rotavirus, and norovirus* are other examples of non-enveloped viruses.	• Enclosed in Lipid Membrane • Sensitive to heat • Influenza virus that causes seasonal flu symptoms. *The herpes simplex virus, the chickenpox virus*, and even the recent *Ebola virus*, are considered as enveloped viruses.



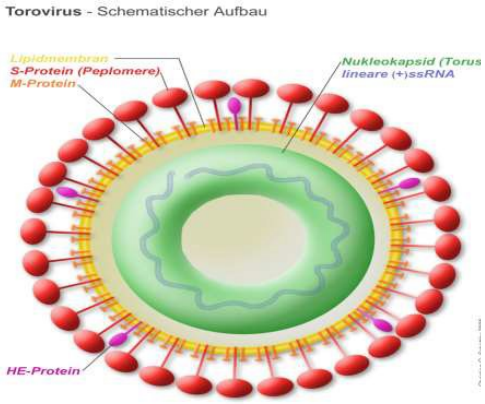
(a) Naked Nucleocapsid Virus



(b) Enveloped Virus

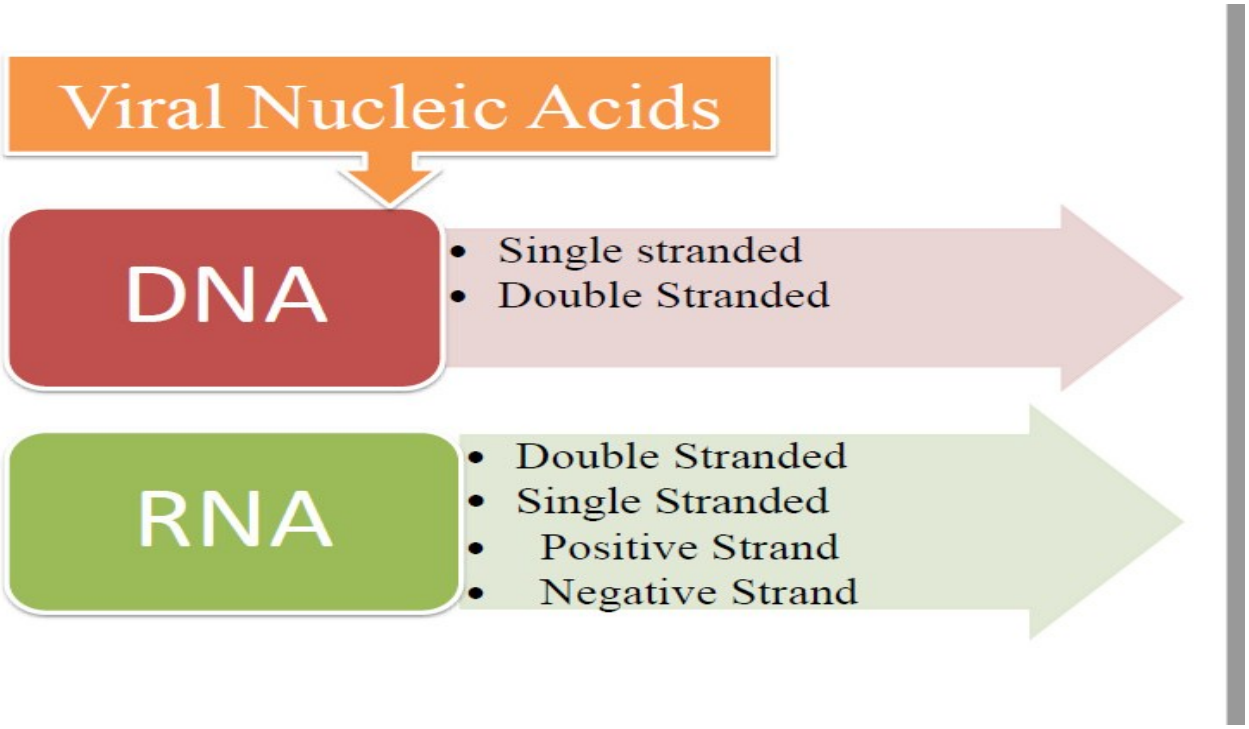
Peplomers

A **peplomer is a glycoprotein spike on a viral capsid or viral envelope.**
will only bind to certain receptors on the host cell; they are
essential for both host specificity and viral infectivity



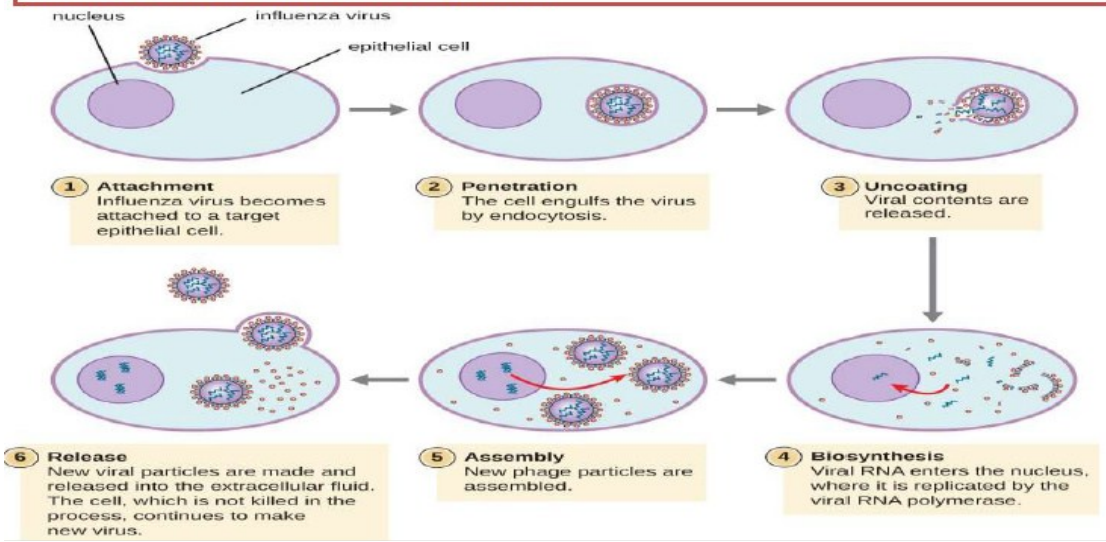
Functions of Peplomer

1. Attach to receptors
2. Enzymatic activity
3. Major antigens



VIRAL REPLICATION

The genetic information necessary for viral replication is contained in the viral nucleic acid but lacking biosynthetic enzymes, the virus depends on the synthetic machinery of the host cell for replication



Classification based on host

Animal viruses

- viruses of animal host
- *Rabies* , *polio, mumps, chicken pox, small pox, & influenza*

Plant viruses

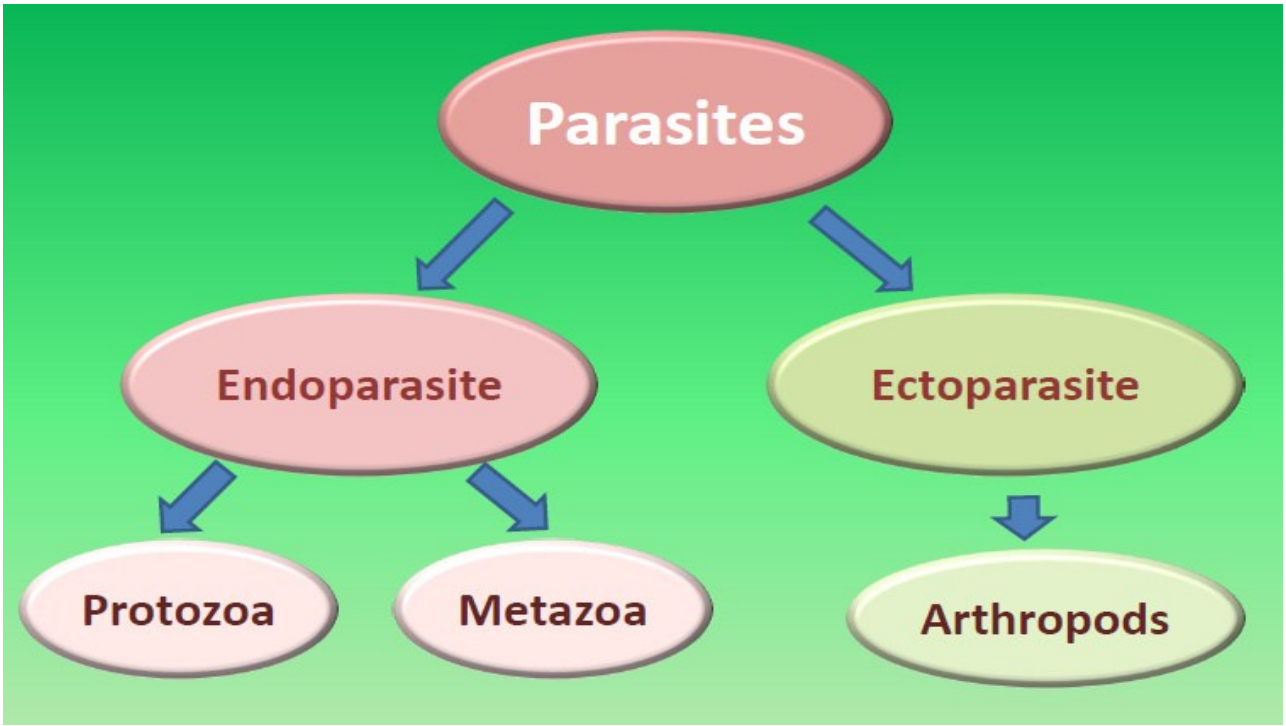
- Viruses which show their live characteristics when attached to plants.
- *Tobacco mosaic virus*, banana streak viruses,
- **Bacterial viruses**: bacteriophages T1 T2 T3 & T4

RNA virus		
dsRNA	**ssRNA(+)**	**ssRNA(-)**
Rotavirus	Norovirus	Lassa virus
Rice dwarf virus	SARS virus	Ebola virus
	Foot-and-Mouth Disease Virus	Influenza virus
	Dengue virus	
	Japanese encephalitis virus	
	Hepatitis C virus	
	Tobacco mosaic virus	

DNA virus		Retro virus
dsDNA	**ssDNA**	**RNA⇔DNA**
Herpes simplex virus	Parvo virus	Human immunodeficiency virus
Papillomavirus		Murine leukemia virus

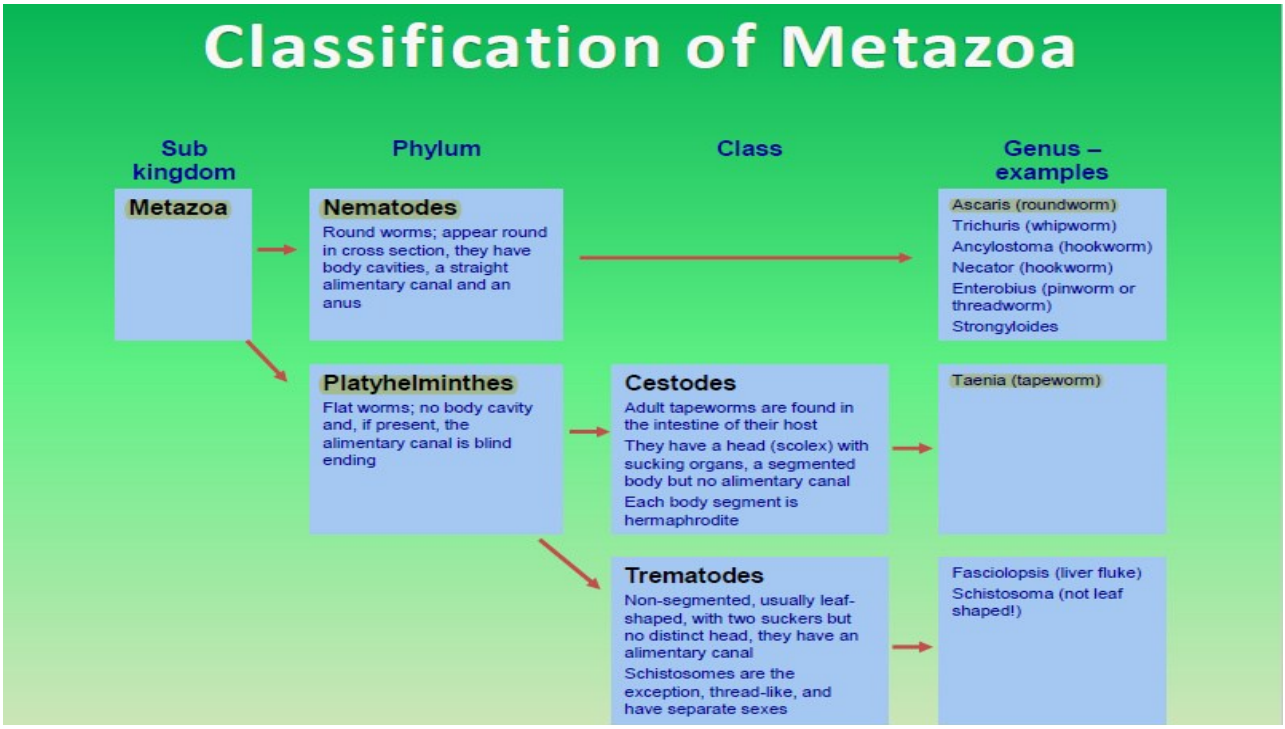
Parasites

Parasitism is a symbiotic relationship between species, where one organism, the **parasite**, lives on or inside another organism, the host, causing it some harm, and is adapted structurally to this way of life.



Protozoa

- **Intestinal**
  - Amebiasis ..... *Entamoeba histolytica*
  - Giardiasis .....*Giardia lamblia*
  - Balantidiasis ..... *Balantidium coli*
  - Crytosporidosis ..... *Cryptosporidium parvum*
  - Cyclosporiasis ..... *Cyclospora cayetanensis*
- **Genitourinary tract**
  - Trichomoniasis ..... *Trichomonas vaginalis*
- **Blood and Tissue**
  - Malaria ..... Plasmodium spp
  - Meningoencephalitis ..... *Naegleria fowleri*
  - Toxoplasmosis ..... *Toxoplasma gondii*..... **(Eye)**
- **Cardiovascular system**
  - African Sleeping Sickness ..... *Trypanosoma brucei*..... **(CNS)**
  - Chagas Disease ..... *Trypanosoma cruzi*
- **Skin and mucous membrane**
  - Visceral leishmaniasis(Kala-azar) ... *Leishmania donovani*
  - Cutaneous leishmaniasis ..... *Leishmania topica/braziliensis*



Arthropods

Arthropods that serve as vectors of human infectious diseases

Vectors	Disease(s)
Blackflies (Simulium spp.)	Onchocerciasis (River blindness) (H)
Cyclops spp.	Fish tapeworm infection (H), guinea worm infection (H)
Fleas	Dog tapeworm infection (H), endemic typhus (B), murine typhus (B), Plague (B)
Lice	Epidemic relapsing fever (B) epidemic typhus (B), trench fever (B)
Mites	Rickettsial pox (B), scrub typhus (B)
Mosquitoes	Dengue fever (V), filariasis (elephantiasis) (H), malaria (P), viral encephalitis (V), yellow fever (V)
Sandflies (Phebotomus spp.)	Leishmaniasis (P)
Tsetse flies (Glossina spp.)	African Trypanosomiasis (P)
Ticks	Babesiosis (P), Lyme disease (B), tularemia (B), Colorado tick fever (V)