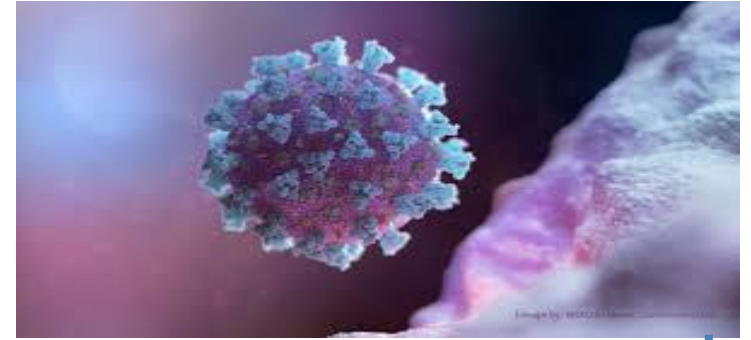




MICROBIOLOGY

SAEF DAWWAS



Viruses

Lecture #3

Pharmaceutical Microbiology

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Hashemite University

What Are Viruses?

الفيروسات لا تعبر خلايا وكمات هية كثير صغير ما بنقدر نشوفها بالميكروسكوب

- Viruses are **infectious agents** that are too small to be seen with a light microscope and that are not cells.

بتشبه البكتيريا بأنها ما بتحتوي على سيتوبلازم او مكونات الخلية

- They have no cell nucleus, organelles, or cytoplasm.

بتعتمد على ال invaded cells

- Viruses can *replicate*, or multiply, only inside a living host cell. As such they are called **obligate intracellular parasites**.

تاعت ال host وما بتقدر تتكاثر من غير استخدامهم واستخدام اجزاءهم

- Viruses **don't grow or replicate alone**, they infect host cell & program it to synthesize the components of new viruses

Components of Viruses

- **Nucleic Acids**

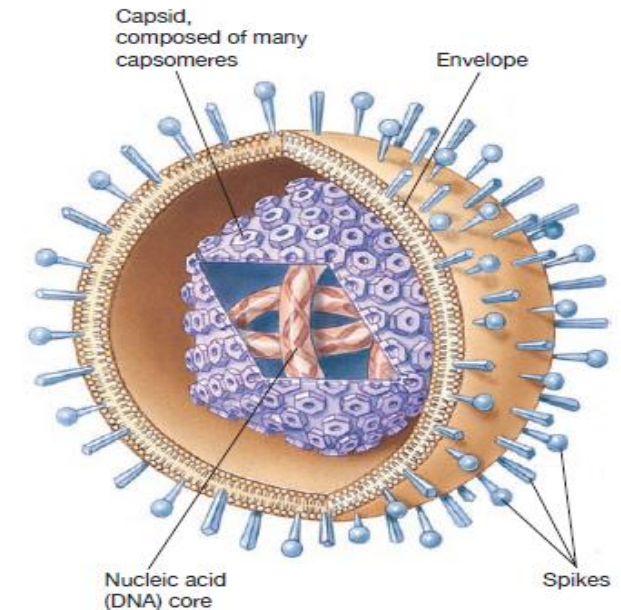
ما بتحتوي الثنتين مع بعض يعني بتكون single or

- a virus consists of molecule(s) of DNA (DNA virus) or RNA (RNA virus) but not both.

double strand

Present in several shapes

- Viral nucleic acid can be single-stranded or double-stranded, and linear, circular, or segmented (existing as several fragments).
- All genetic information in RNA viruses is carried by RNA. RNA genomes occur only in viruses and a **virus-like agent called the viroid**.



Rna without protien envelop

لا تعتبر فيروس بتعتبر عامل ممرض شبيه
للفيروس

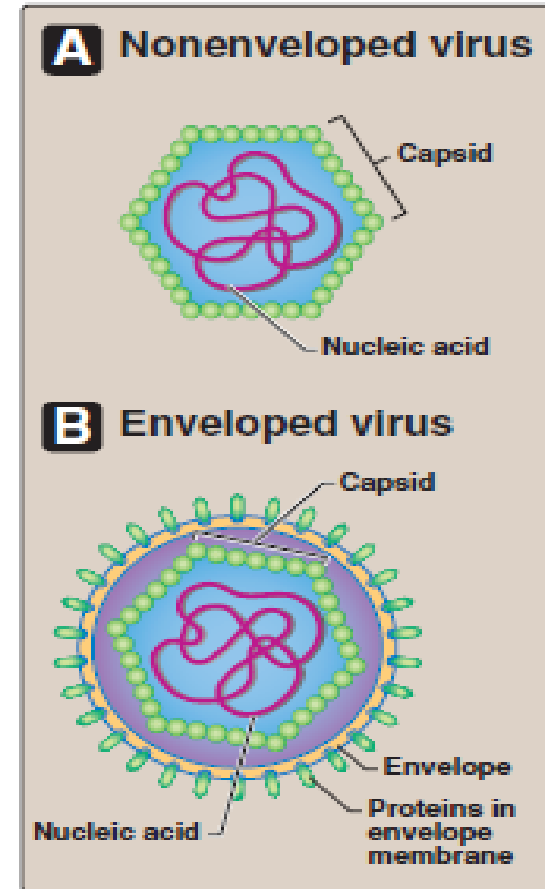
Components of Viruses

بروتين بحيط بالفيروس

- **Capsid**: a protein-containing structure (capsid) designed to:

1. protect the genome.
2. Capsids also play a key role in the attachment of some viruses to host cells.

- Each capsid is composed of protein subunits called **capsomeres**



General structure: A. nonenveloped; B. enveloped virus.

ال enveloped viruses بتحتوي على spikes
بتحيط فيها بتساعدها على تحديد الخلية الهدف
والألتصاق فيها وكمان بتحمي الفيروس من جهاز
المناعة وبخفيها عنو **بس** ما بتقدر تحميها من الظروف
المحيطة

Components of Viruses-Envelope

- Many viruses have additional structural features, for example, an **envelope** composed of a **protein-containing lipid bilayer**.

هنا حكيما بعض الفيروسات في حوالها envelop يكون بروتين للحماية الإضافية

Advantages:

- Because derived from host cell membrane, virus **can be hidden from attack by host immune system**.
- Help virus infect new cells by **fusion of envelope with host cell membrane**
البروتين (envelop) هاذ يحيط بالخلية المصابة وبصير جزأ منها

Disadvantages:

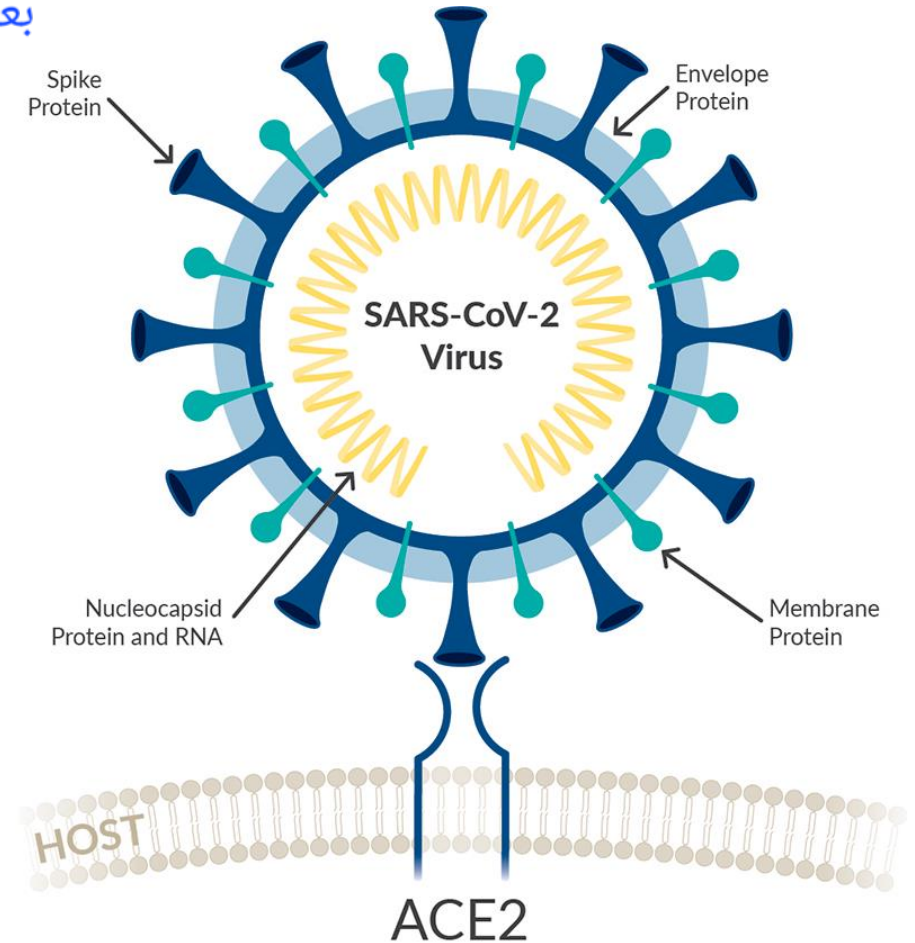
- Enveloped viruses are **damaged easily by any environmental condition that destroys biological membranes**

ال spikes بشكل عام
بتختلف بين الفيروسات

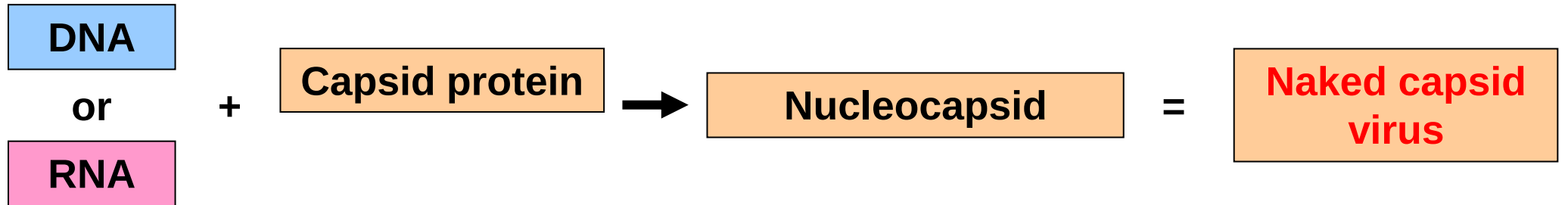
Components of Viruses

بعض الفيروسات يكون عندها spikes اضافية

- Some viruses have spikes on their envelope which are **glycoprotein** projections that may extend outside the envelope.
- Spikes help to attach the virion to host cell.
- Spikes play a role to determine antigen characteristics of the enveloped virus.



Basic virus structure



A complete virus particle, complete virus particle, including its envelope, if it has one, is called a virion → **Comple viral structure**

Examples on viruses

genetic materials

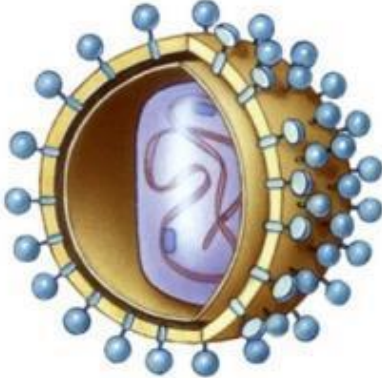
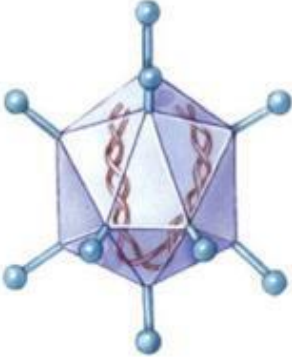
	DNA viruses	RNA viruses
Enveloped	 Herpesvirus	 Retrovirus
Naked (no envelope)	 Adenovirus	 Picornavirus

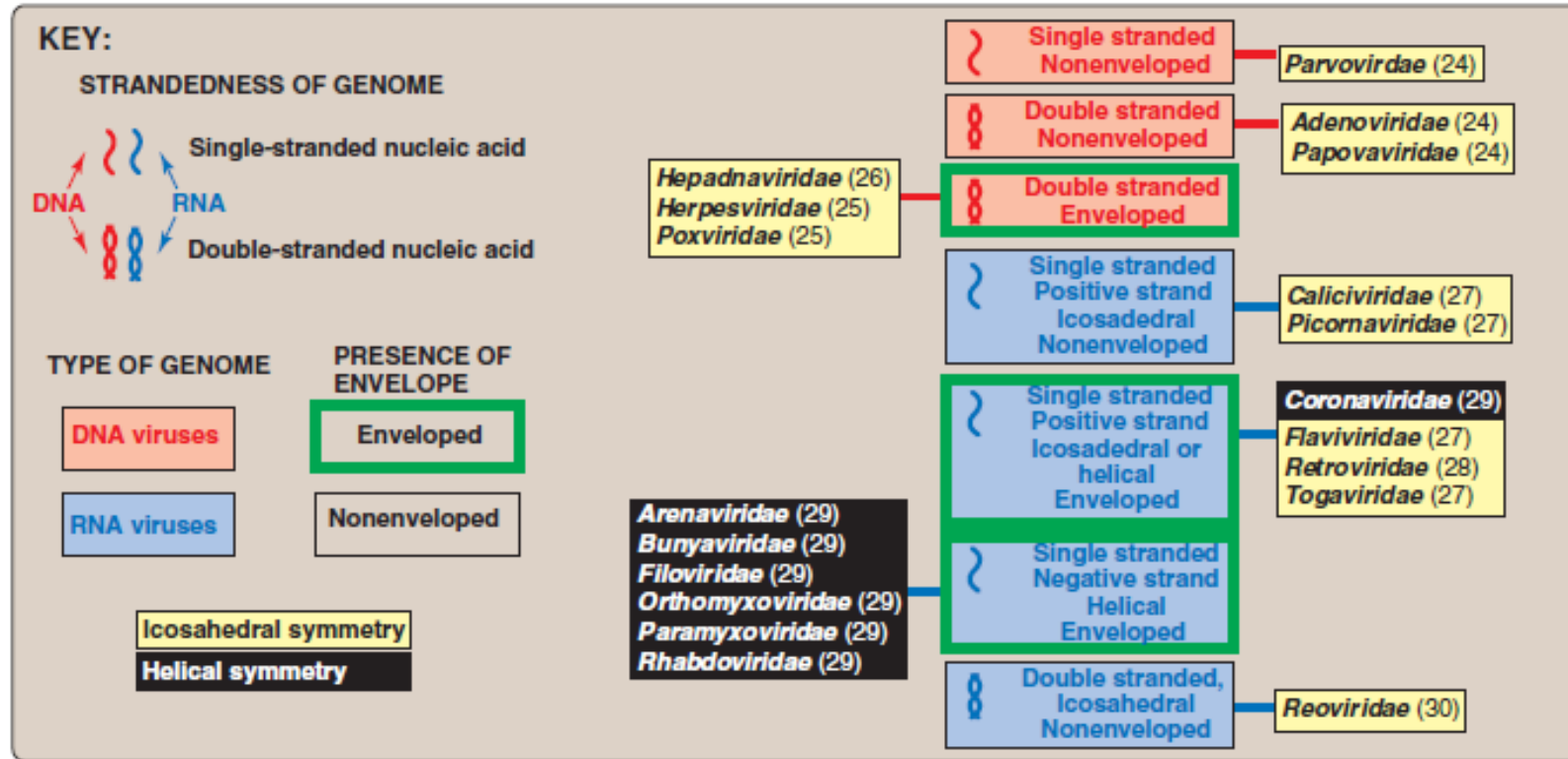
Figure 9-16 Microbiology, 7/e
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Classification of viruses

- on the basis of: اختلافات التصنيف
- 1. ***nucleic acid*** they contain (DNA or RNA), **may be single stranded or double stranded**
- 2. The size, shape and structure of the virus
- 3. The tissue or organ they infect.

Viral Classification

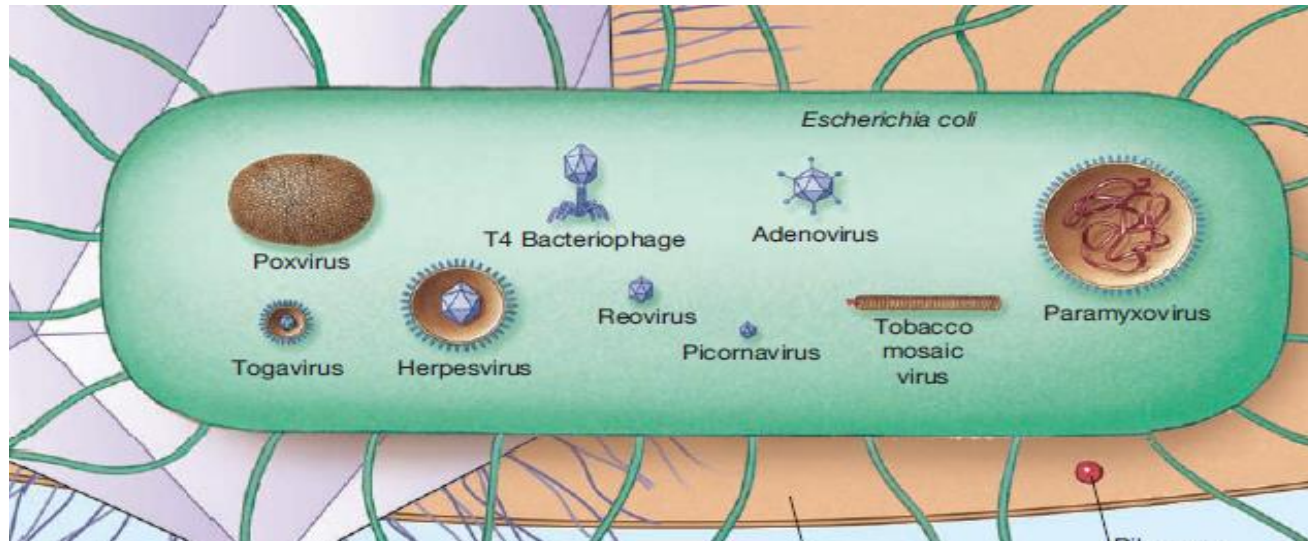
مش مطلوب



Viral families classified according to type of genome, capsid symmetry, and presence or absence of an envelope. RNA is shown in blue, DNA in red, and viral envelope in green.

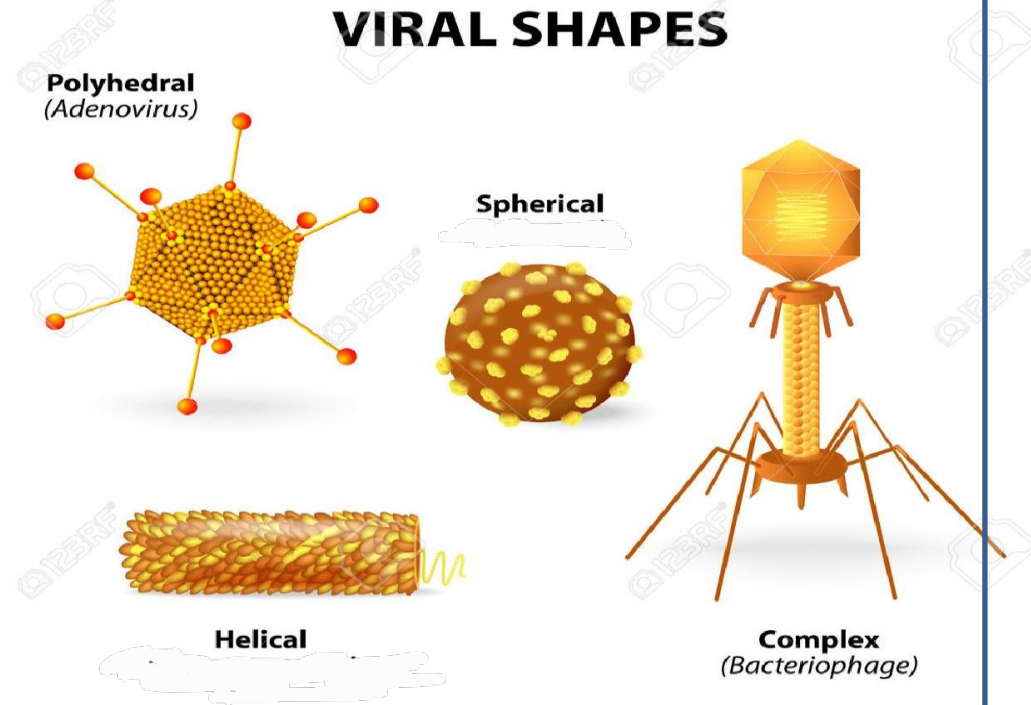
The size, shape and structure

- they have a range of sizes. The largest are ones between 1,200 nm and 1,500 nm.
- Among the **smallest viruses** known are the **enteroviruses**, which are less than 30 nm in diameter.



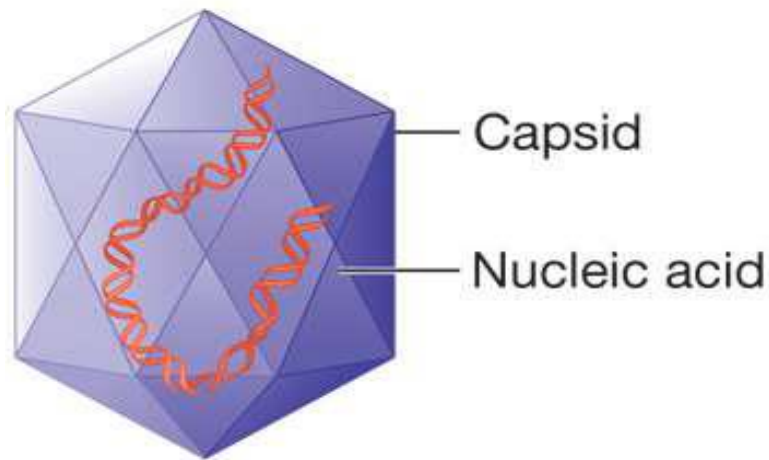
Based on Shape

1. Polyhedral viruses --Herpes simplex virus
2. Helical Viruses--influenza virus
3. Spherical-----HIV
4. Complex viruses---**Bacteriophages**

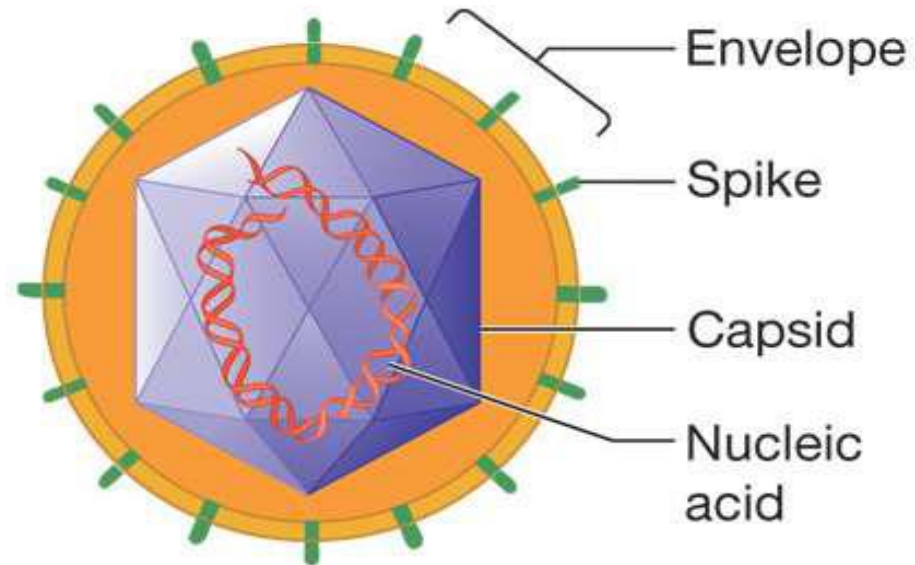


Based on structure

- a) Non-enveloped viruses/ Naked Viruses = viruses whose capsids are not covered by an envelope
- b) Sometimes, Capsid covered with envelope
- **SPIKES** that project from the envelope and can be used to attach to host cell



(a) Naked virus



(b) Enveloped virus

Host Range and Specificity of Viruses

قد يش فصائل كائنات حية بقدر يصيبها الفيروس

Host Range: Spectrum of hosts a virus can infect.

— Bacteria (Bacteriophages), Animals, Plants, Fungi, Protists

e.g. polio virus causes infection to humans only.

سعار: بصير من عضة الكلاب (بقدر يصيب حيوانات أخرى)

e.g. Rabies virus causes infection to many warm blooded animals

اي جزأ من ال host بهاجموا الفيروس

- **Viral specificity:** refers to the specific kinds of cells a virus can infect. For example, certain papilloma viruses infect only skin cells. While cytomegalovirus can attack different organs.

- So: “one virus, one disease” concept is not necessarily true

مش شرط الفيروس الواحد

يسبب مرض واحد لأنو هاذ الأشي بعتمد على قد يش اماكن بقدر يهاجمها الفيروس

Viral replication

- Replication cycles to produce more virions:

1. Adsorption, the attachment of viruses to host cells. يتربط مع الخلية وبتلتصق فيها وبتصير زي كأنها جزأ منها

2. Penetration, the entry of virions (or their genome) into host cells. بتتحكم بالخلية وبوظائفها

3. Synthesis, the synthesis of new nucleic acid molecules, capsid proteins, and other viral components within host cells while using the metabolic machinery of those cells. بتستخدم ال metabolic تاع الخلية عشان تعمل فيروسات جديدة

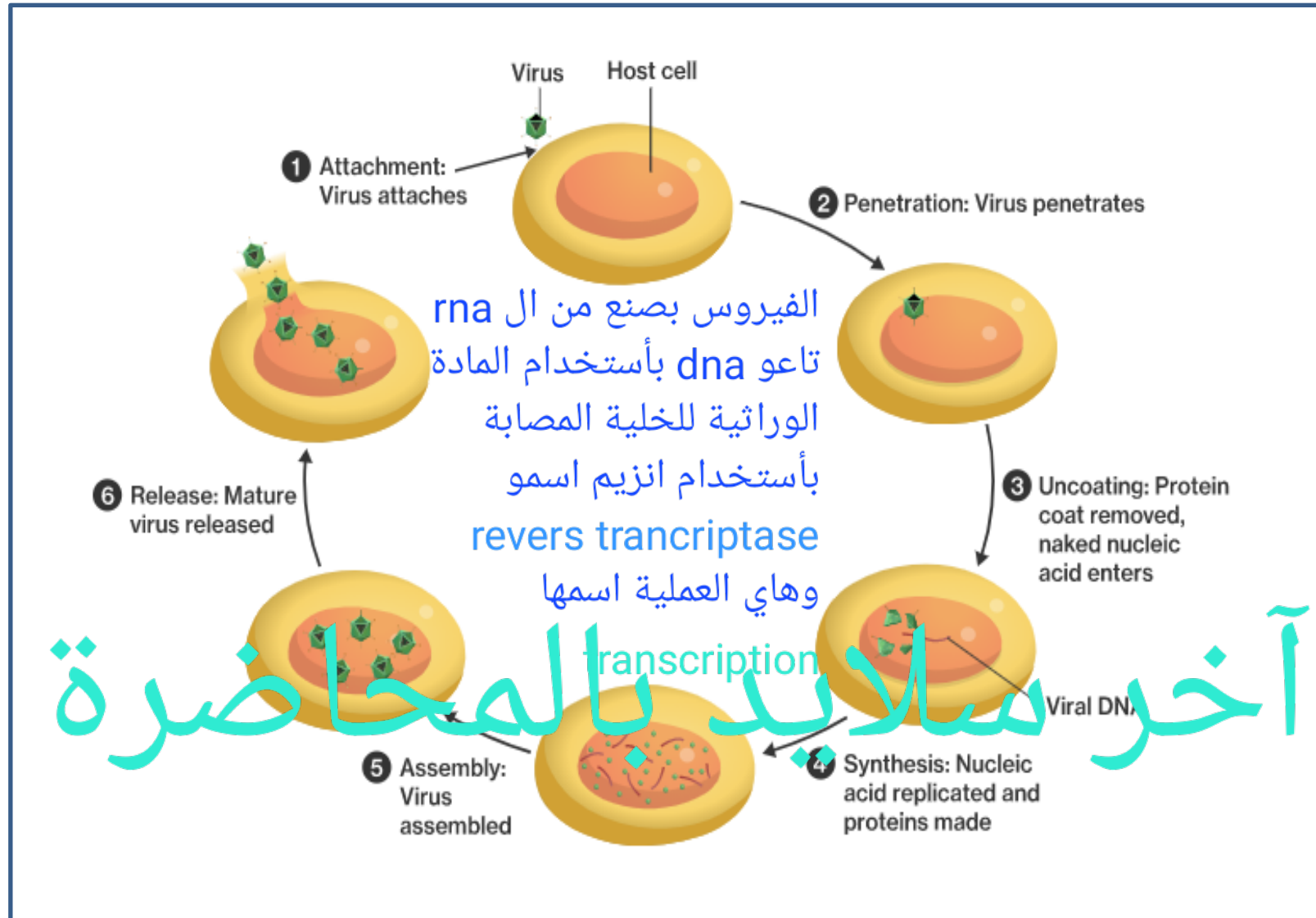
4. Maturation, the assembly of newly synthesized viral components into complete virions.

5. Release, the departure of new virions from host cells. (Rapture it)

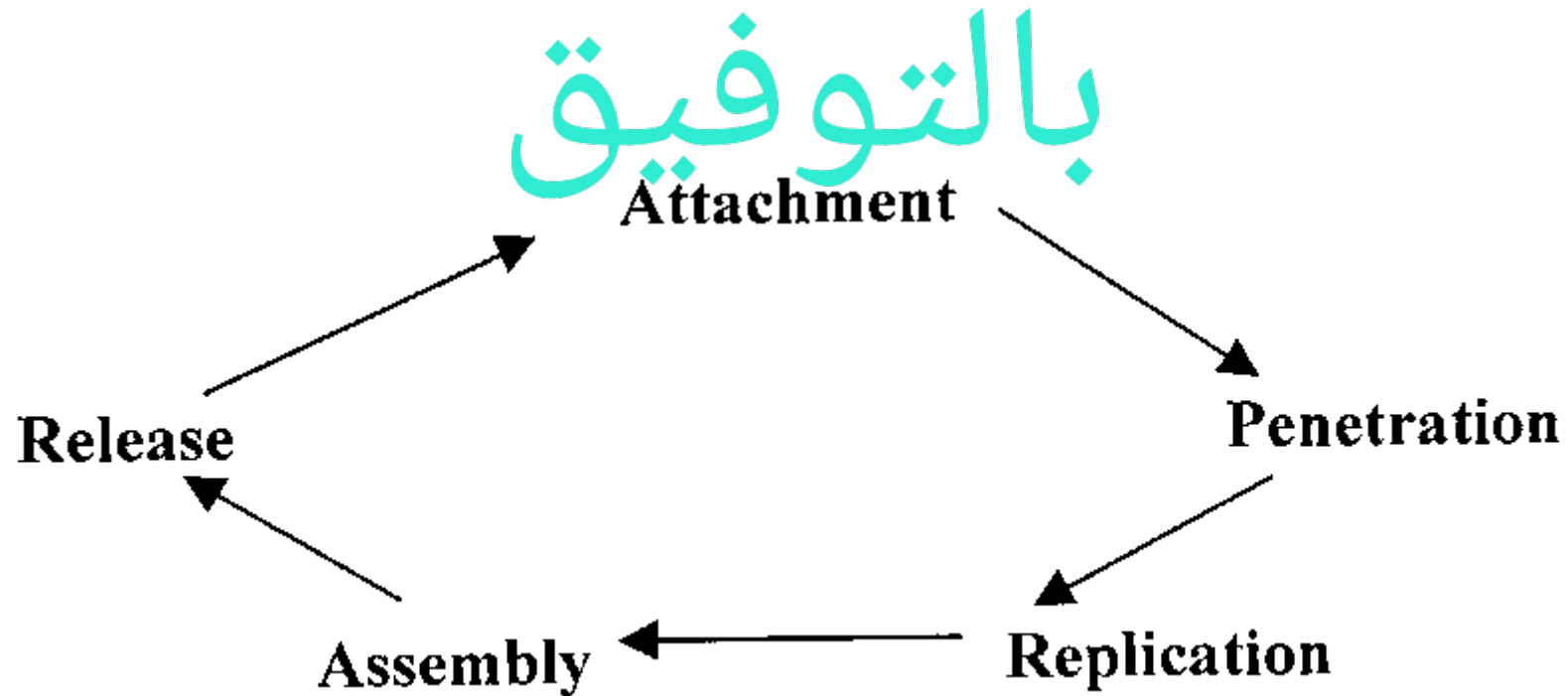
Release generally, but not always, kills (lyses) host cells

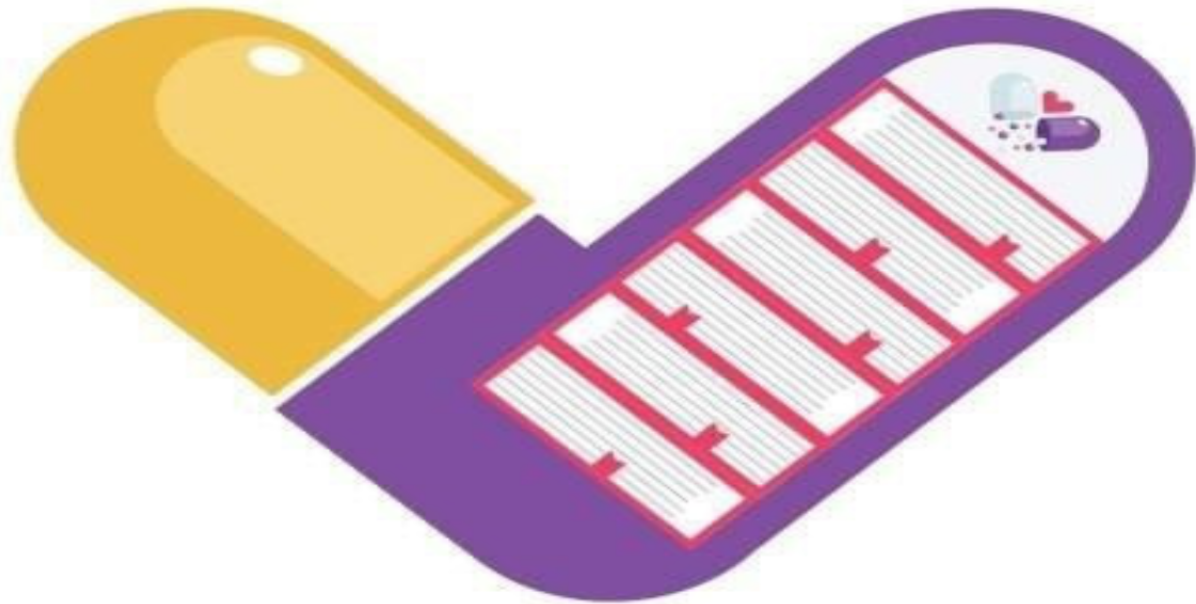
عملية التصنيع للفيروس بتتكرر بس هاي العملية بتعتمد على قوة جهاز مناعة الجسم المصاب

Viral replication



Viral replication





Artery Academy