Virology for 2nd Year MD Students

(04) Principles of Treatment & Prevention of Virus Infections

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How to treat virus infections?

Antibiotics won't help viruses.

- Usually **supportive care** (treat the symptoms)
- Fever → antipyretic.
- Pain → analgesic.
- Dehydration → fluids.
- Cough → antitussive.
  ↳ cough suppressant
- Fluids
- Bed rest

How to treat virus infections?

targets a part of virus life cycle

- Antiviral drugs can be used for several virus infections.
- Antiviral drugs can reduce the severity of infection.
- Antiviral drugs can reduce the duration of symptoms.
- Antiviral drugs can help to control a few chronic infections.

↳ Antiretroviral therapy for HIV/AIDS

ما بيخلص عـ الفيروس بس بحطه Control وبالتالي المرضى يعيشوا أطول وحياة صحية أكثر

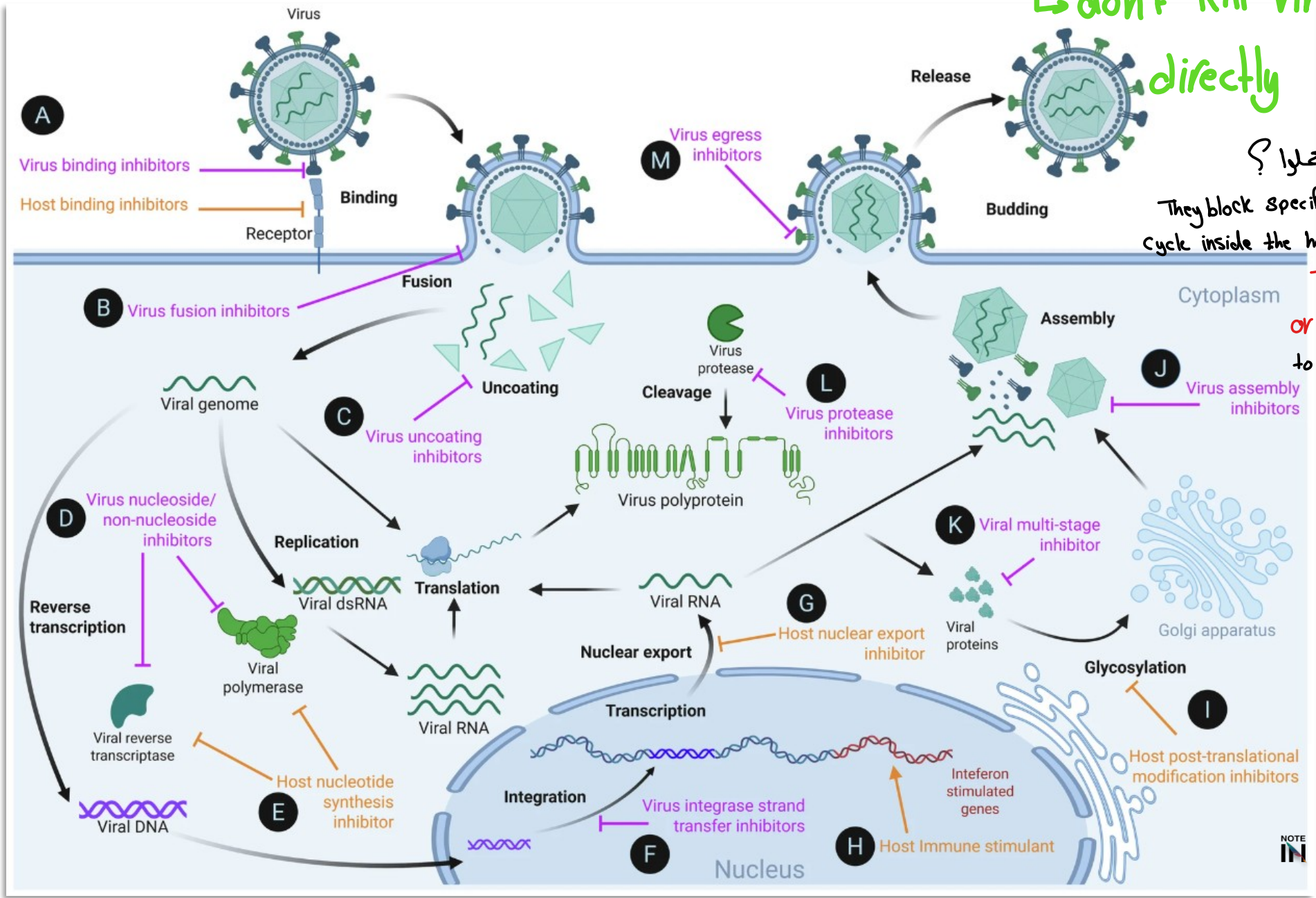
↓ severity

↓ duration

help to control chronic infections

How to treat virus infections? Antivirals

↳ don't kill viruses directly



حلو شو بيعملوا ؟

They block specific steps of the viral life cycle inside the host cells

Target viral enzymes or virus specific steps to minimize host toxicity

Source: Aw, D.Z.H., Zhang, D.X. & Vignuzzi, M. Strategies and efforts in circumventing the emergence of antiviral resistance against conventional antivirals. npj Antimicrob Resist 3, 54 (2025). https://doi.org/10.1038/s44259-025-00125-z

How to treat virus infections?

used to be lifelong infection for many but now a 8-12 week course of A.V can cure the majority.

Antiviral drugs can help to cure hepatitis C chronic infection.

↳ RNA virus

Antiviral drugs can help to manage HIV infection. (using multiple drugs)

Development of resistance, high cost and side effects are the major problems of antiviral drugs.

↳ viruses can mutate & become less susceptible to the drug

Interferons have non-specific broad-spectrum antiviral activity and can be used. Adverse effects (flu-like symptoms, hematological toxicity, elevated transaminases, nausea, fatigue, and psychiatric sequelae).

↳ proteins produced naturally by our cells in response to viral infections

INF-α INF-β

↳ to treat certain viral infections

They don't target specific virus, instead they boost the general antiviral defenses of the body's cells.

used only when the potential benefit worthy the risk

who recive interferones feel like they have bad flu, cause drops in BC blood cell Counts

Changes in emotions

elevated liver enzymes

Antibiotics can NOT help to treat virus infections.

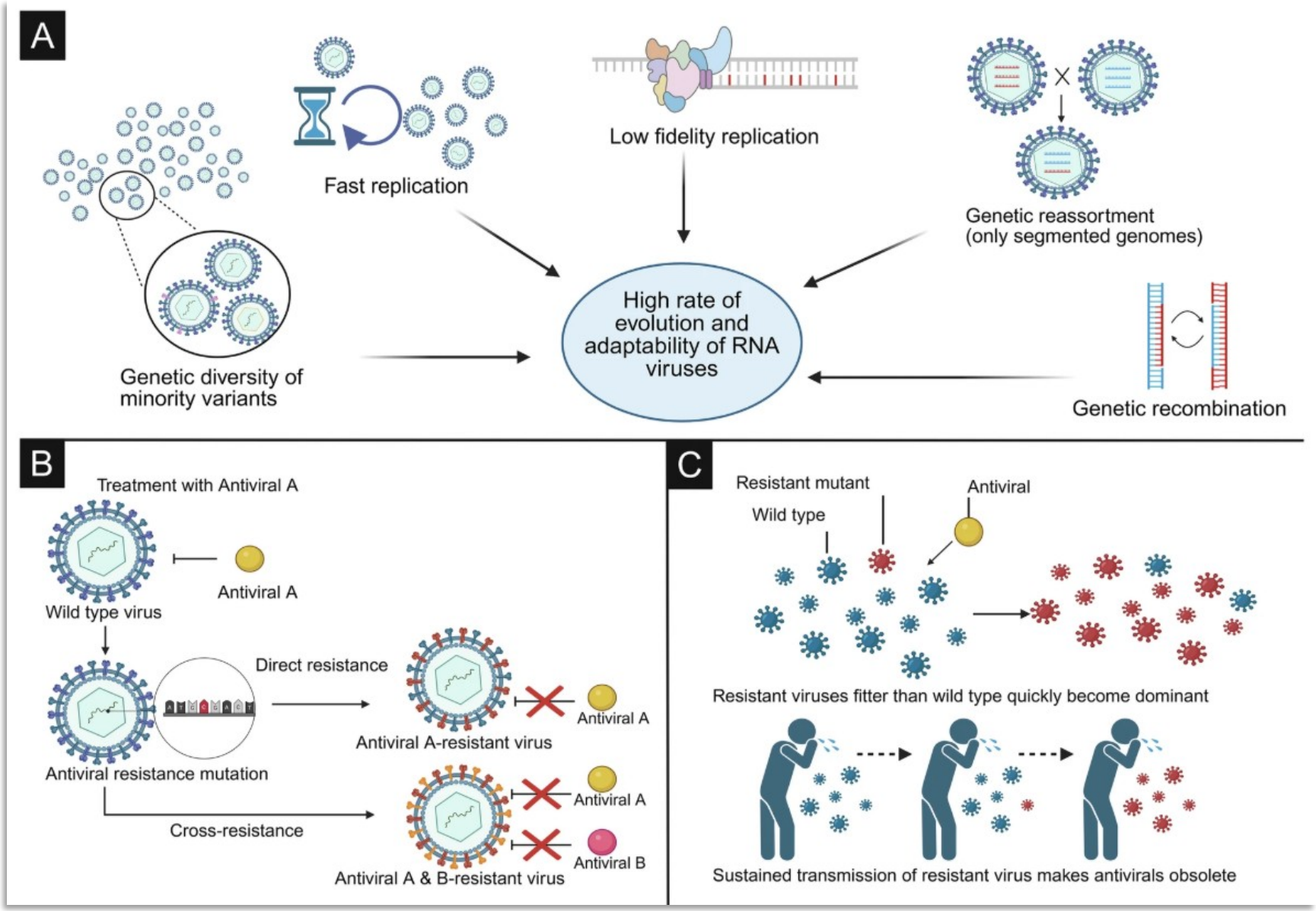
↳ highly specific to one Antigen

Antibodies CAN help to treat virus infections.

يستخدموا الفيروس ويصنعوه انه يعمل infection الخلايا

↳ proteins are made up by our immune system (B cells) that specifically recognize & binds to foreign substances (Antigens) like viral proteins.

Antiviral resistance



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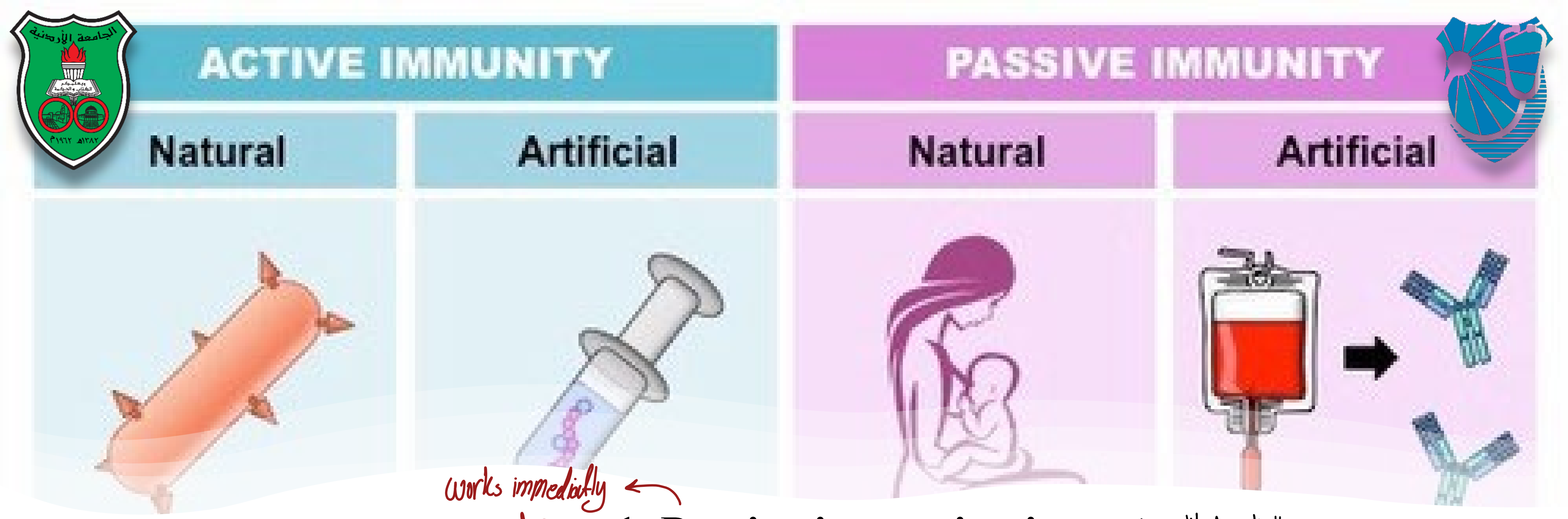


How to prevent virus infections?

1. Passive immunization

give antibodies directly

works immediately — good for emergency cases.

From mother:

- Mother to child through the placenta. (IgG) The only antibody class that significantly cross the placenta
- Mother to child through breast milk. IgA mainly

Six months فترة الحماية — half life to the IgG (3 weeks) Limited (لا يوجد مناعة مدى الحياة)

Artificial → Specific antibodies taken from persons immune to the disease and given to a person at risk of infection.

injection من خلال

How to prevent virus infections?

2. Active immunization (Vaccination)

generate Antibodies

تفعيل جهاز المناعة حتى ينتج Antibodies

The gold standard prevention method.

- Several types:

A. Inactivated vaccines (Virus killed)
B. Live-attenuated vaccines (weakened virus)
C. Messenger RNA (mRNA) vaccines
D. Subunit, recombinant, polysaccharide, and conjugate vaccines
E. Viral vector vaccines

+ Natural virus more potent ليش؟ Complet Virus كامل الوجود

No live virus, No risk for disease

genetic code

expose the person to harmless form of the virus.

و بالتالي الجسم بصير يحميكم و fight ↳ The real virus

Pieces of the pathogen (Not the Whole virus)

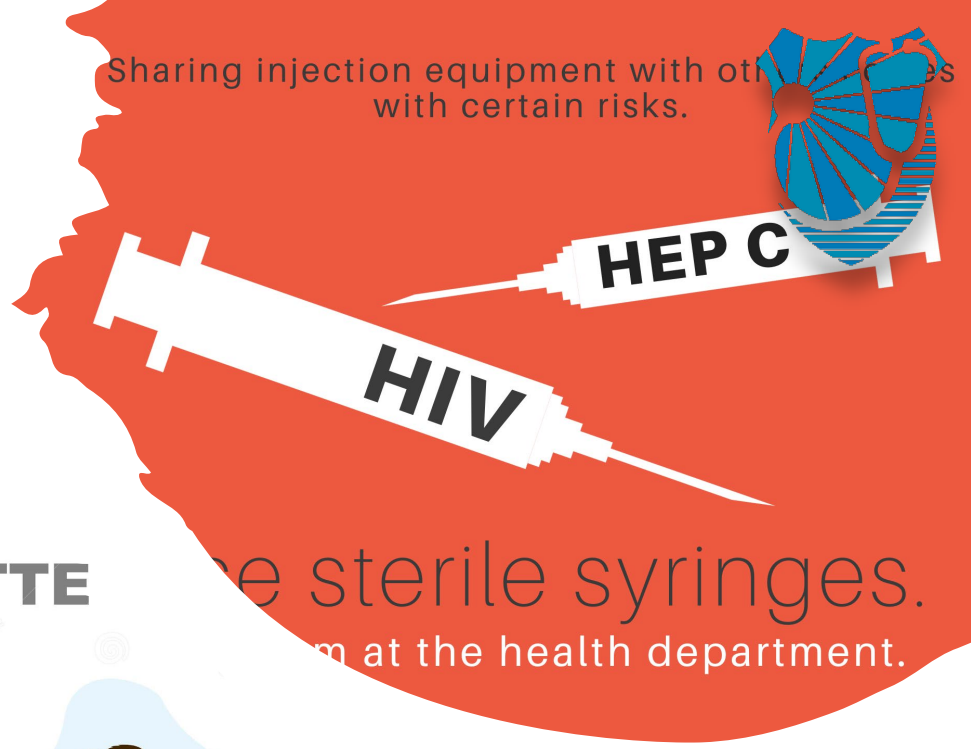
Sometimes ↳ Antigens are attatched to a carrier protein

↳ harmless virus as a vector or delivery System to introduce genetic material from the target virus into our cells

Vaccine safety? Vaccine efficacy?

Unvaccinated % – Vaccinated % ÷ Unvaccinated %

How to prevent virus infections?



3. Behavioral and non-pharmaceutical interventions (NPIs).

- Examples:
- Hand hygiene
- Clean needles/syringes
- Face masks
- Respiratory etiquette Covering your mouth/nose When you cough or Sneez.
- Infection control measures in hospitals
- Quarantine الحجر الصحي مثل كورونا

summary

Topic	What it means	Key points (High-yield)	Examples / Notes
Supportive care (الرعاية الداعمة)	Treat symptoms	Main approach for most viral infections	Fever → antipyretic (خافض حرارة); Pain → analgesic (مسكن); Dehydration → fluids (سوائل); Cough → antitussive (مضاد سعال); bed rest
Antiviral drugs (الأدوية المضادة للفيروسات)	Drugs that target viral life-cycle	↓ severity, ↓ duration, help control some chronic infections	Not for every virus; timing matters
What antivirals can do	Cure vs control	Can cure chronic Hep C; can manage HIV	Hep C → curable; HIV → controlled (not eradicated)
Problems of antivirals	Limits	Resistance, high cost, side effects	Always think "resistance can emerge"
Interferons (الإنترفيرونات)	Broad, non-specific antiviral activity	Can be used, but notable adverse effects	Flu-like symptoms, hematologic toxicity, ↑ transaminases, nausea, fatigue, psychiatric effects
Antibiotics (المضادات الحيوية)	ضد البكتيريا	Do NOT treat viral infections	Only if secondary bacterial infection (conceptually)
Antibodies (الأجسام المضادة)	Immune proteins used therapeutically	CAN help treat viral infections	Think "passive protection / therapy"
Passive immunization (التمنيع السلبي)	Ready-made antibodies	Mother→child via placenta & breast milk; or give specific antibodies to at-risk person	Immediate, short-term protection
Active immunization / Vaccination (التطعيم)	Stimulate your own immunity	Gold standard prevention method	Long-term protection (memory)
Vaccine types	Types mentioned	Inactivated, Live-attenuated, mRNA, Subunit/recombinant/polysaccharide/conjugate, Viral vector	Know names + general idea
Vaccine efficacy (فعالية اللقاح)	How to calculate	Formula in slide: (Unvaccinated % − Vaccinated %) ÷ Unvaccinated %	
NPIs (تدابير غير دوائية)	Behavioral prevention	Hand hygiene, clean needles/syringes, masks, respiratory etiquette, hospital infection control,	Used when vaccine/drug not enough

Thank You…
Wishing you all the best!