



Virology for 2nd Year MD Students

(09) Retroviruses 1

صح! RNA → DNA → RNA → Protein

الفيروسات التي يدخل الخلية ويحول RNA إلى DNA ويترجمه

DNA الخلية
في بعض الفيروسات

على عكس المتعارف عليه

DNA → RNA → Protein

لماذا هذا الشيء غريب؟

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لما الفيروس يحول نفسه لـ DNA

ويدخل داخل الخلية
بعض جزء منها

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Retroviridae (retroviruses)

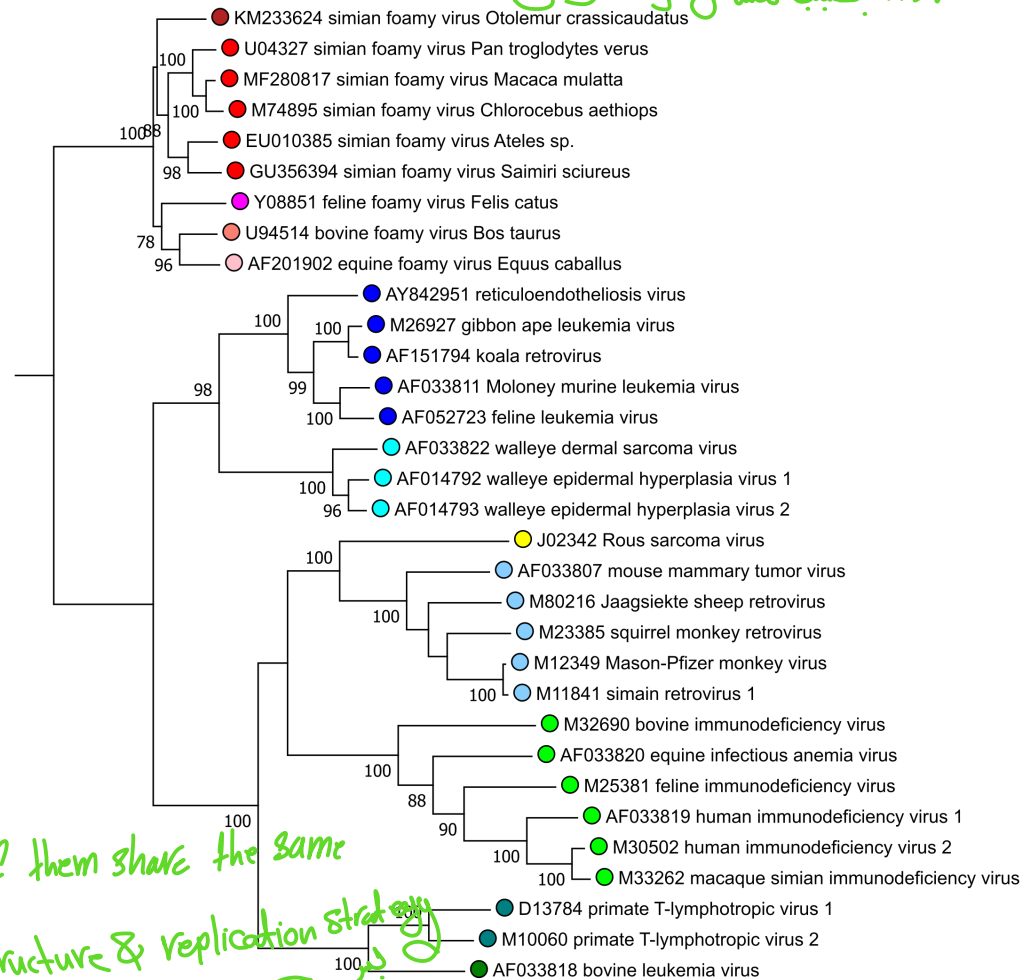
يعني الجهاز الحثاي ما يشوفها بسهولة وما عندي elimination كامل
ومن بغهم ليس



■ The virus family **Retroviridae** has four members that can cause human disease:

1. Human immunodeficiency virus type 1 (HIV-1)
2. Human immunodeficiency virus type 2 (HIV-2)
3. Human T cell lymphotropic virus type 1 (HTLV-1)
4. Human T cell lymphotropic virus type 2 (HTLV-2)

All of them share the same basic structure & replication strategy cause different diseases.



| genus | subfamily |
|----------------------------|--------------------------|
| <i>Prosimsiispumavirus</i> | <i>Spumaretrovirinae</i> |
| <i>Simiispumavirus</i> | |
| <i>Felisipumavirus</i> | |
| <i>Bovispumavirus</i> | |
| <i>Equispumavirus</i> | |
| <i>Gammaretrovirus</i> | <i>Orthoretrovirinae</i> |
| <i>Epsilonretrovirus</i> | |
| <i>Alpharetrovirus</i> | |
| <i>Betaretrovirus</i> | |
| <i>Lentivirus</i> | |
| <i>Deltaretrovirus</i> | |



General features of retroviruses

- The genome is two copies (diploid) of positive-sense single stranded RNA

- The three major gene regions are:

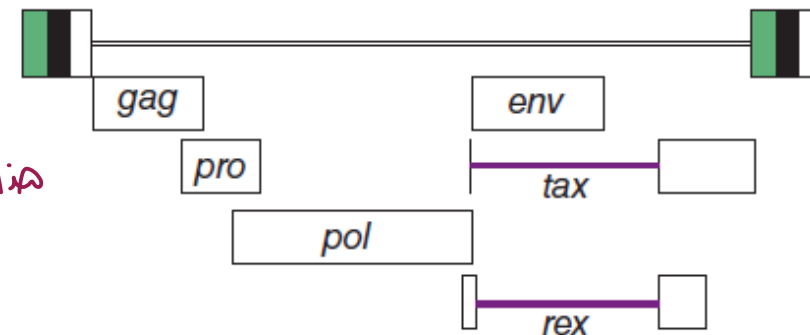
➤ Gag (Group antigen): codes the capsid proteins

➤ Pol: Polymerase gene region that codes reverse transcriptase, integrase and protease

➤ Env: Envelope gene region that codes the envelope glycoproteins

most RNA viruses are haploid
which makes Retrov. unique

HTLV



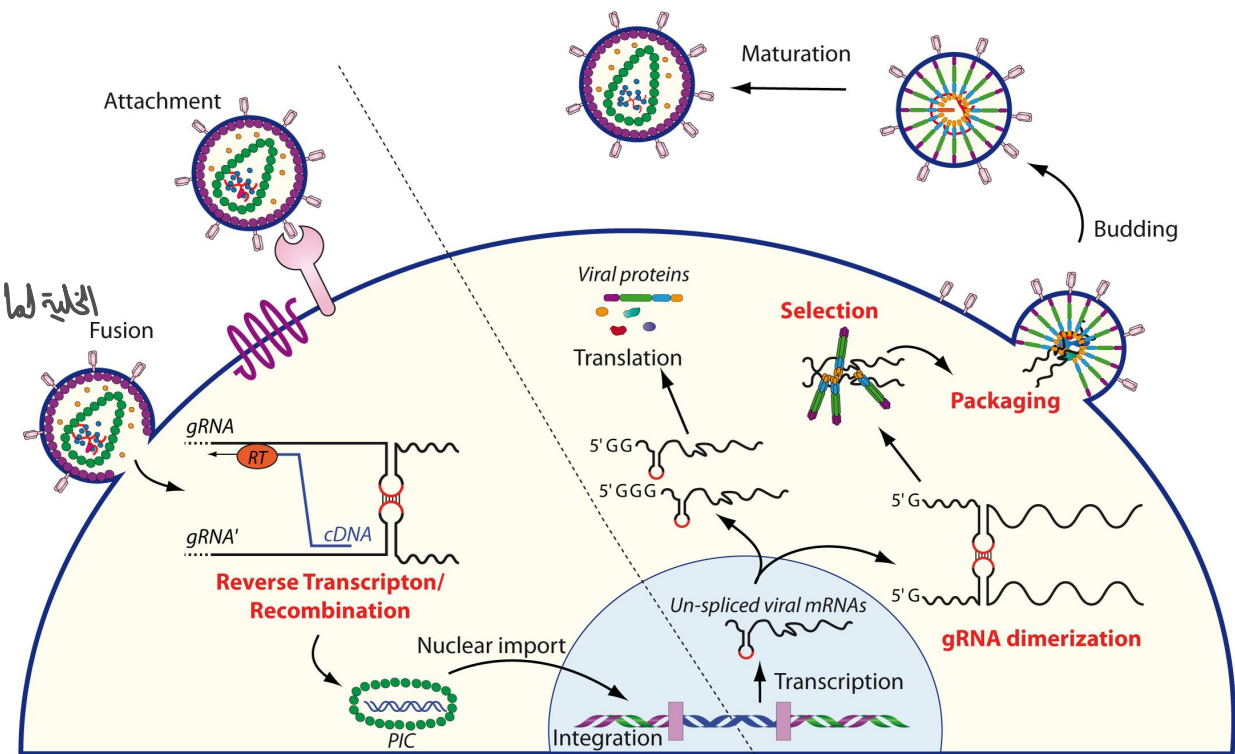
attachment + target cells Entry



General features of retroviruses

- Reverse transcriptase converts viral RNA into DNA which will be integrated in the host cell chromosomes by the viral enzyme called integrase. The integrated viral DNA is called “**provirus**”
- An **envelope** is present
- They infect cells of the **immune system** (mainly CD4+ T helper cells, monocytes)
- They remain in the body forever in the form of provirus

الحلقة لما تنقسم - بنقسم معها
اما بفرس ساكت
يستقط فيا





Human T-cell lymphotropic virus types 1 & 2

target cells

HTLV = Cancer + proliferation

Oncovirus

يؤذي

- Human T-cell lymphotropic viruses types 1 & 2 (HTLV-1 & HTLV-2) are genetically and biologically similar. However, their worldwide distribution is different.
- **HTLV-1** is present throughout the world, with clusters of high endemicity (Southwestern part of **Japan**, sub-Saharan **Africa** and South **America**).
منتشر في كل مكان
- HTLV-2 has a more restricted distribution, more prevalent among some native Americans and some Central African tribes, but is relatively common among intravenous drug users and their sex partners in Europe, North America.
قبائل وسط أفريقيا



Summary of HTLV-1/2 endemic regions, prevalence, and data collection periods

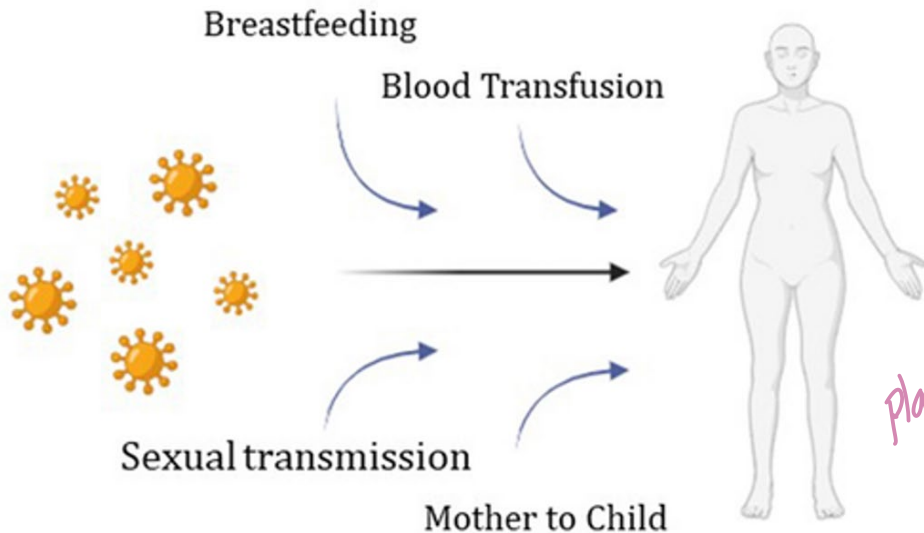


| HTLV Type | Region | Key Countries/Areas | Prevalence Range (General Population/Specific Groups) | Data Collection Period |
|-----------|--|---|---|------------------------|
| HTLV-1 | Southwestern Japan | Kyushu, Okinawa | Blood donors: 1% (Hokkaido) to >6% (Kyushu, Okinawa) | 2006–2016 |
| | Sub-Saharan Africa | Gabon, DRC, Nigeria, Ghana, Guinea-Bissau | Adults: 0.3–3%; Older women (Gabon/DRC): 10–25%; Pregnant women (West Africa): 0.2–7.7% | early 2000s–2010s |
| | South America | Peru, Colombia, French Guiana, Brazil | Blood donors (Brazil): 0.04–1% | 2000s–2010s |
| | Caribbean Area | Jamaica, Haiti | Jamaica (mean): 6.1%; Pregnant women (Haiti): 2.2–4.2% | 1990s–2000s |
| | Middle East | Iran (Mashad region) | Adults: 0.77–3% | 2003–2011 |
| | Australo-Melanesia | Central Australia, PNG, Solomon Islands | Aboriginal Australians: up to 44%; Tribes: 1.2–3% | 1990s–2000s |
| | Southeastern USA | | Prevalence in blood donors, regional variations | 2007–2015 |
| HTLV-2 | Indigenous populations of the Americas | Brazil (Amazon), Panama, USA | Kayapó: up to 41.2%; Native American tribes: up to 13%; Mexico: 0.23% | 2000s–2010s |
| | People who inject drugs (PWID) | North America, Europe | Estimated prevalence: 20% (USA) | 1990s–2010s |
| | Some Indigenous people in Africa | Cameroon, DRC (Pygmy populations) | Detected in Pygmy populations | 2000s |
| | USA | | Blood donors: HTLV-2 more common than HTLV-1; overall prevalence: 0.016% | 2007–2015 |

Source: Branda, F.; Romano, C.; Pavia, G.; Bilotta, V.; Locci, C.; Azzena, I.; Deplano, I.; Pascale, N.; Perra, M.; Giovanetti, M.; et al. Human T-lymphotropic Virus (HTLV): Epidemiology, Genetic, Pathogenesis, and Future Challenges. Viruses 2025, 17, 664. <https://doi.org/10.3390/v17050664>



Human T-cell lymphotropic viruses types 1 & 2



- HTLV transmission occurs via one of three routes. لا ينتقل كفيروس في
ينتقل داخل lymph cells معاملة
- First, in highly endemic regions, vertical transmission is the most common mode of transmission. This is accomplished via infected lymphocytes either transplacentally or in breast milk. الامه
ليست
الطفل يمتص لبنها
لبنه حلو
- Second, infection can be transmitted sexually by infected lymphocytes contained in semen. من خلال Placenta
من السائل نفسه بل بالخلايا
التي داخله
- Third, any blood products containing intact cells are also a potential source of infection.
IV, shared needles, Blood Transfusion
نقل الحشرات من الجلب
انها بالخلايا الليسفاوية

* و صونر
أقل كفاءة من
Sexual transmission
HIV

IV, shared needles, Blood Transfusion



Human T-cell lymphotropic viruses types 1 & 2

- It is estimated that 10 million to 20 million people live with HTLV-1 worldwide.



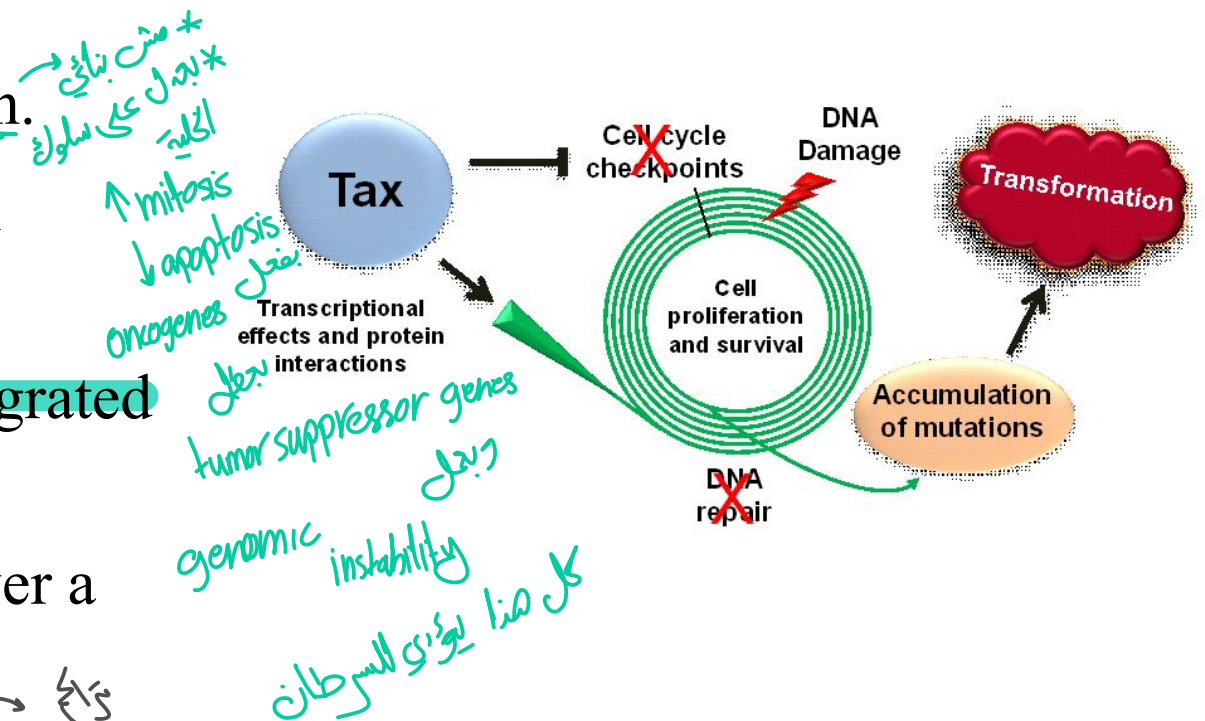
(A.Gessain and O.Cassar - 2012)



Retroviridae (retroviruses)



- HTLV is considered an **oncovirus**.
- The **viral Tax** is the critical viral **oncoprotein**.
- HTLV infection both stimulates **mitosis** and **immortalizes T lymphocytes**.
- Following infection, the virus **becomes integrated in the host cell as a provirus**.
- In the course of continued multiplication over a period of many years, **the infected T cells accumulate many chromosomal aberrations**, leading to appearance of **malignant phenotypes**.



لـ طبعاً موكل الحمايه بوملوا لهون !



HTLVs disease

Most individuals remain asymptomatic during their entire lives, whereas a small fraction of carriers develop HTLV-1-associated diseases:

Adult T cell leukemia.

سرطان خلايا T
عدواني جداً
ال prognosis سيء

Cutaneous T-cell lymphoma.

يظهر بالجلد
chronic + progressive

HTLV-associated myelopathy/tropical spastic

ضعف / تشنج بالساقين

paraparesis (characterized by progressive

spasticity and weakness of the extremities,

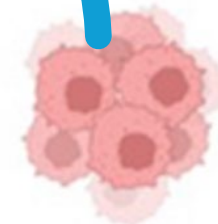
involuntary loss of urin or stool. (سلس البول و stool)

[urinary and fecal incontinence], hyperreflexia,

and some peripheral sensory loss).

بال بسبب
immune mediated
damage

الحرف ما بسبب تفاعل الفيروس



ATLL



HAM/TSP

Smoldering

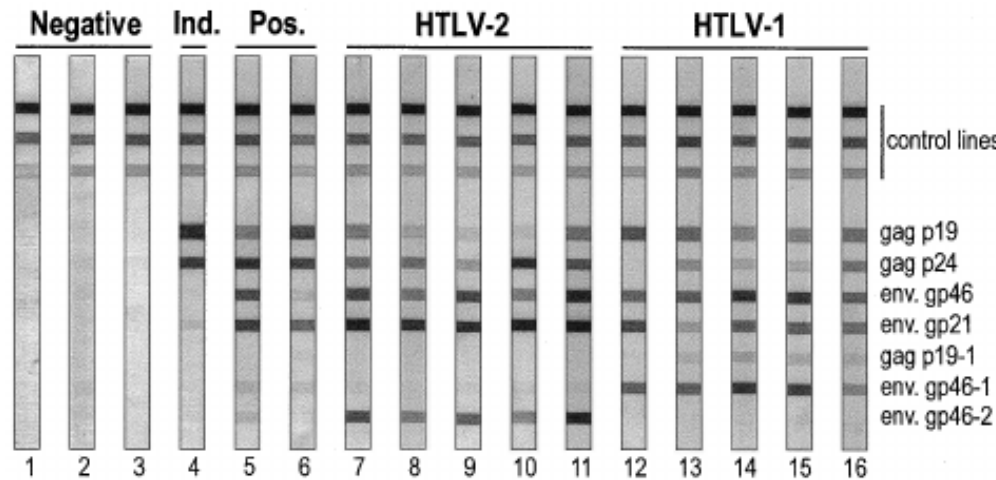
Chronic

Lymphomatous

Acute



HTLV diagnosis, treatment, and prevention



- HTLV infection can be diagnosed by the presence of antibody to HTLV-1 (usually by ELISA), confirmed by Western blot or molecular detection by PCR.
- ATL is treated with aggressive chemotherapy.
- Attempts to treat HAM have been unsuccessful.
- For prevention, screening of blood units can be done, experimental vaccines are tested.



HIV Infection/AIDS- Background

Where did HIV come from?





Thank You...
Wishing you all the best!