Virology for 2nd Year MD Students

(09) Retroviruses 1

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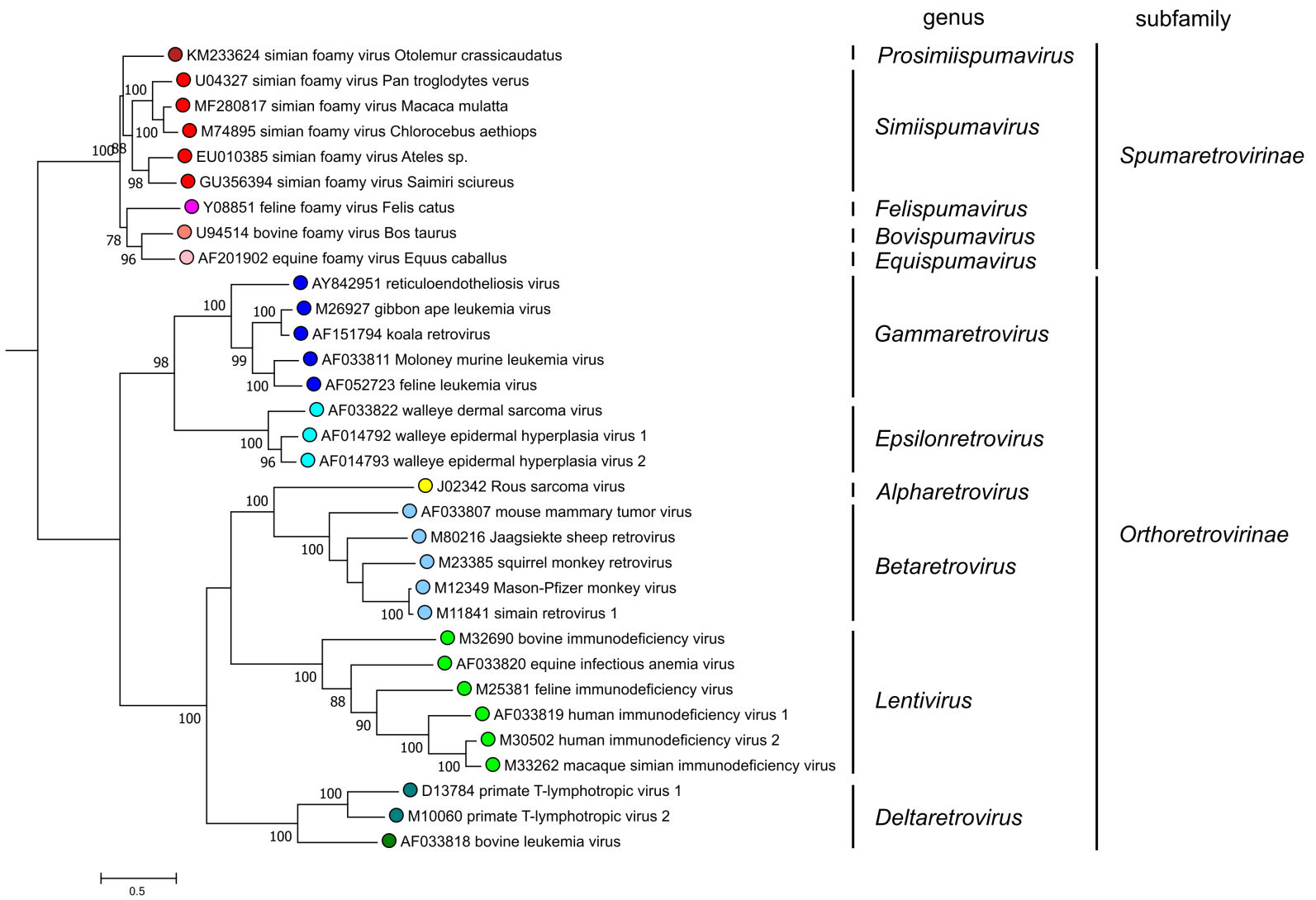
Retroviridae (retroviruses)

- 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)



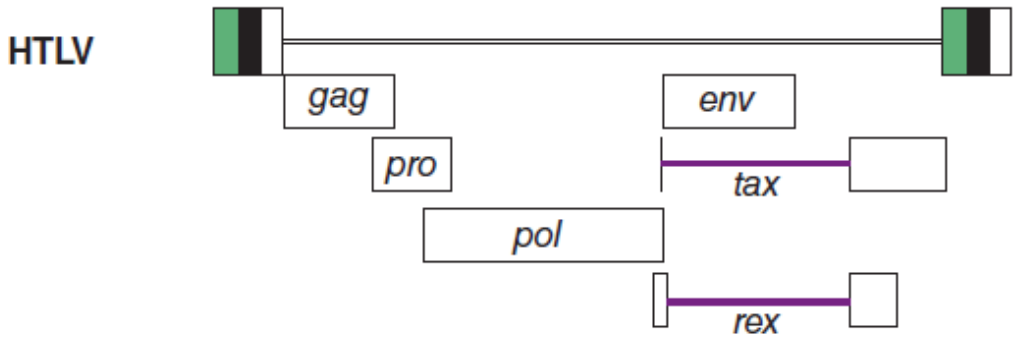
General features of retroviruses

- 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

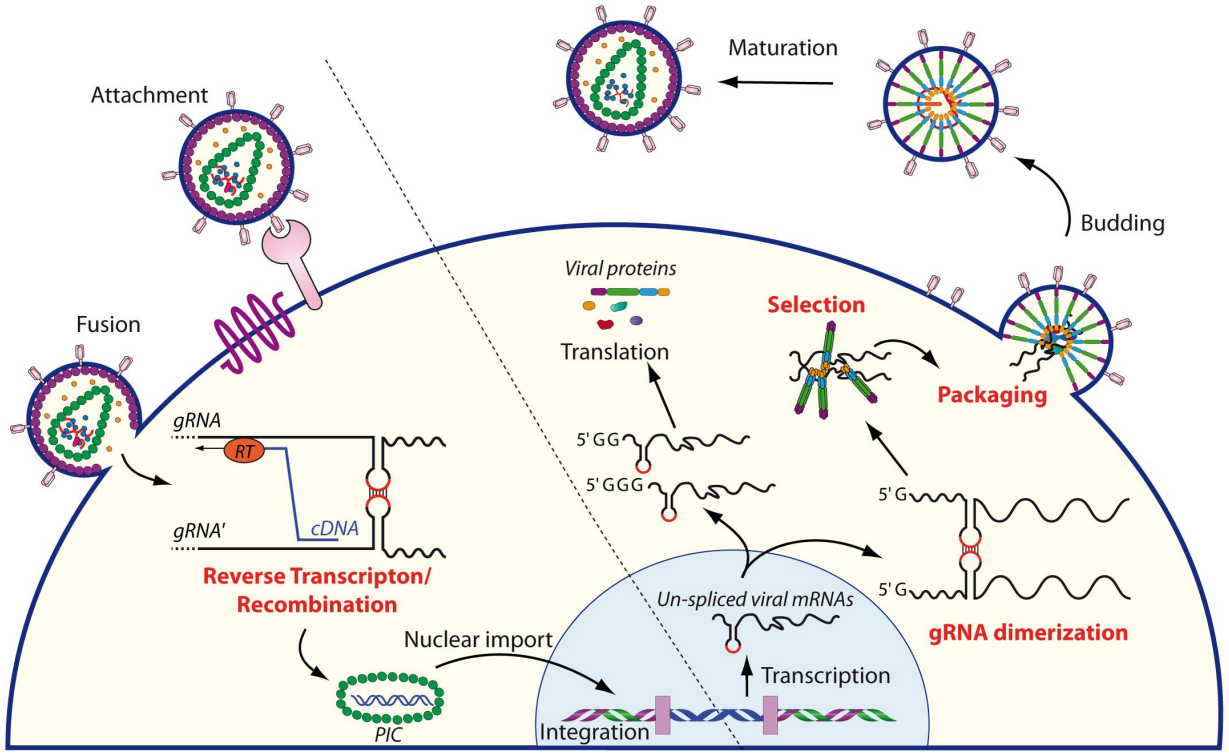
➢ *Pol*: Polymerase gene region that codes reverse transcriptase, integrase and protease

➢ *Env*: Envelope gene region that codes the envelope glycoproteins



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



Human T-cell lymphotropic virus types 1 & 2

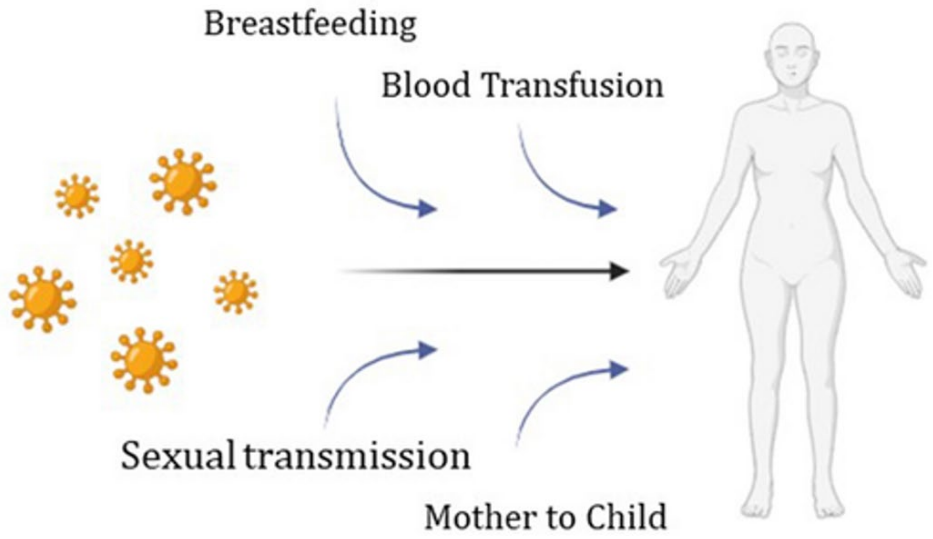
- Human T-cell lymphotropic viruses types 1 & 2 (HTLV-1 & HTLV-2) are genetically and biologically similar. However, their worldwide distribution is different.
- HTLV-1 is present throughout the world, with clusters of high endemicity (Southwestern part of Japan, sub-Saharan Africa and South America).
- 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.

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

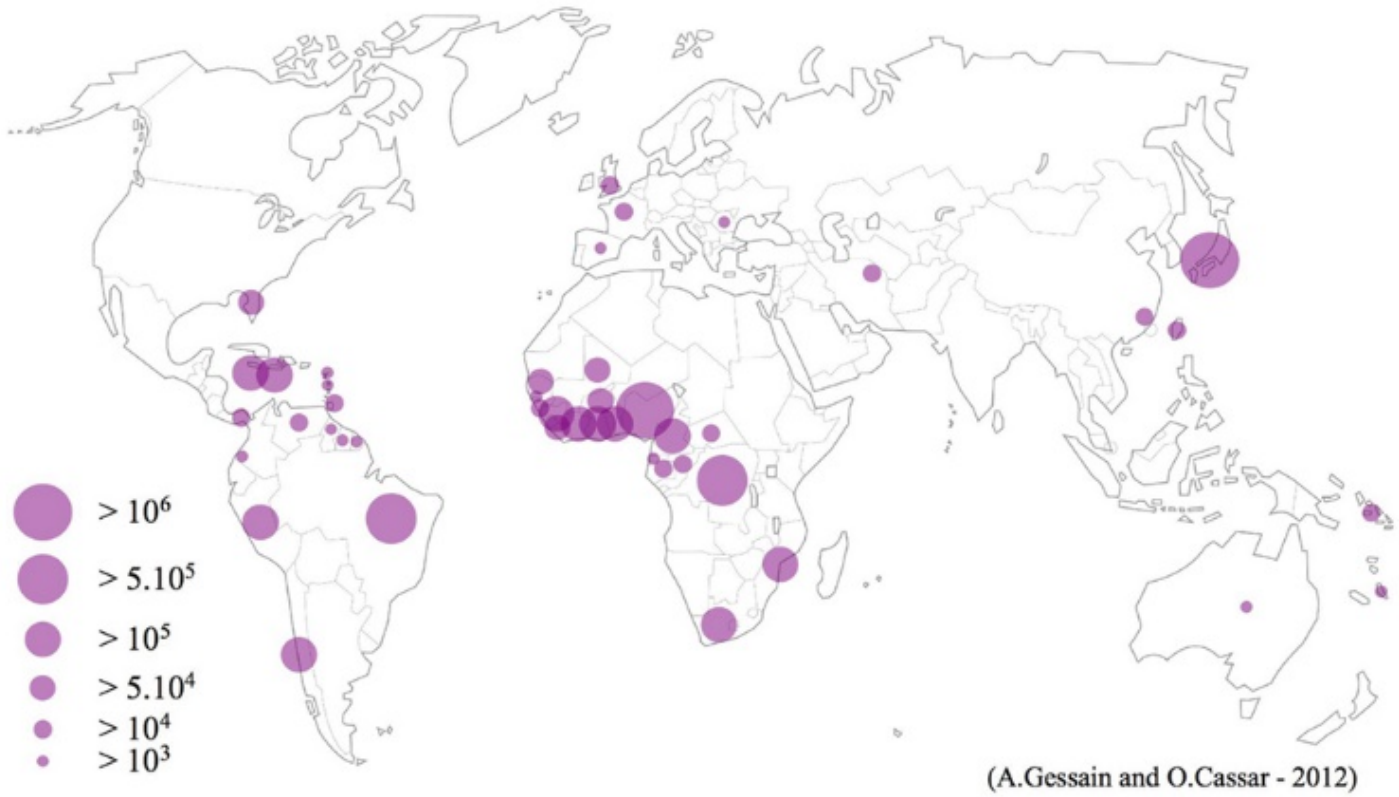
Human T-cell lymphotropic viruses types 1 & 2



- HTLV transmission occurs via one of three routes.
- 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.
- Second, infection can be transmitted **sexually** by infected lymphocytes contained in semen.
- Third, any **blood products** containing intact cells are also a potential source of infection.

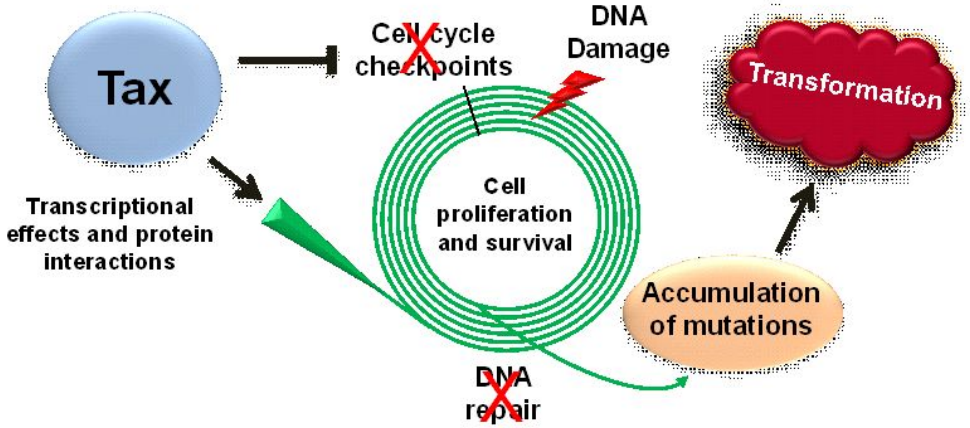
Human T-cell lymphotropic viruses types 1 & 2

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



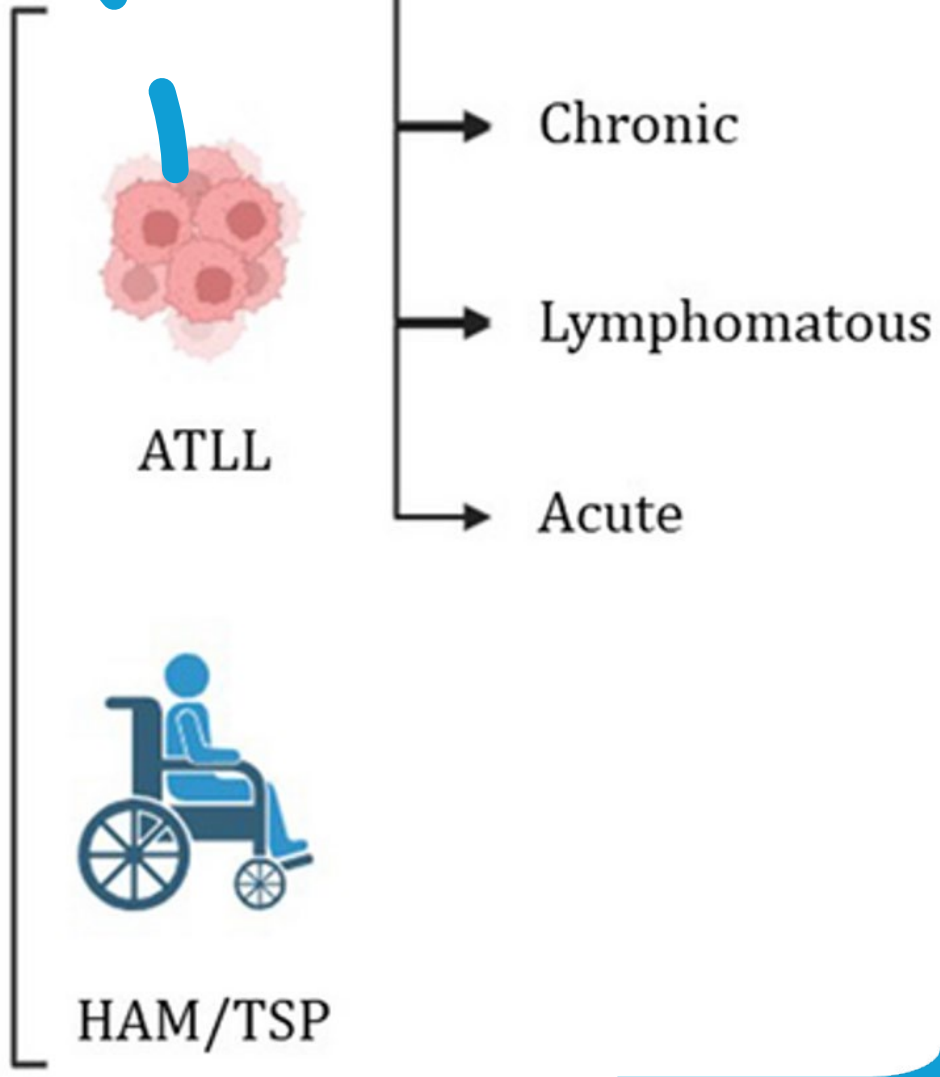
Retroviridae (retroviruses)

- 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.

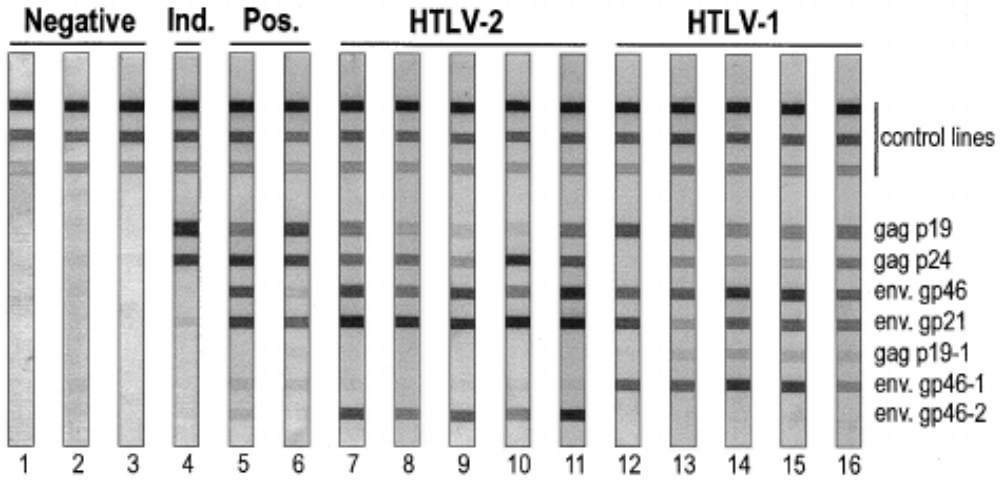


HTLVs disease

- Most individuals remain asymptomatic during their entire lives, whereas a small fraction of carriers develop HTLV-1–associated diseases:
- Adult T cell leukemia.
- Cutaneous T-cell lymphoma.
- HTLV-associated myelopathy/tropical spastic paraparesis (characterized by progressive spasticity and weakness of the extremities, urinary and fecal incontinence, hyperreflexia, and some peripheral sensory loss).



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!