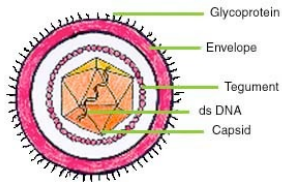


Modeling the Dynamics of Epstein-Barr Virus (EBV) Infection

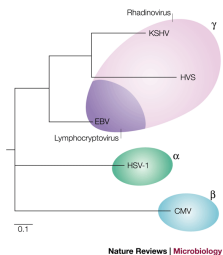
Giao Huynh

MathBio Seminar

September 10, 2008

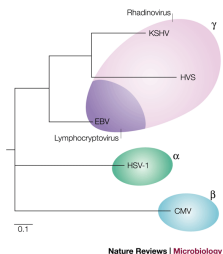


A Review of EBV Biology



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A Review of EBV Biology



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- Primary infection in children is often asymptomatic
- Primary infection in teenagers or young adults often results in infectious mononucleosis (IM) (up to 50% of the cases)
 - Symptoms of IM result from the aggressive immune response against the infection
 - Post-IM patients have increased risk of developing EBV-positive Hodgkin's lymphoma

EBV-Associated Cancers

EBV is associated with a wide range of human malignancies:

- Post-transplant lymphoproliferative disease (PTLD)
- HIV-associated lymphomas
- Burkitt's lymphoma (BL): tumor of B cells in children of Central Africa
- Hodgkin's lymphoma (HL): malignant disease of Hodgkin/Reed Sternberg cells which originate from B cells
- Nasopharyngeal carcinoma (NPC): tumor of epithelial cells, occurs mainly in Southern China and Southeast Asia (18% of all cancers)

Questions

Within a host, B cells are EBV's main target and house for its persistent infection. EBV can also infect epithelial cells.

- EBV infection in most people is asymptomatic and remains under tight control. How is the infection regulated?
 - Is the permanent infection within B cell controlled by the immune system, the virus itself, or both?
 - What is the role of epithelial cell infection?

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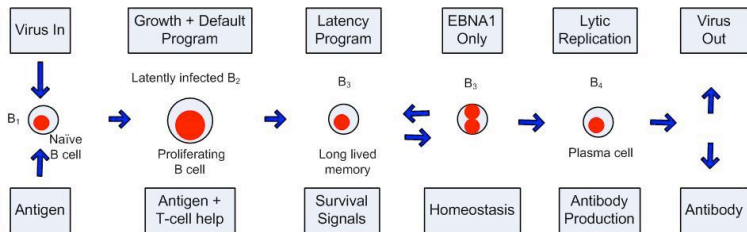
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- How might EBV infection lead to cancer?

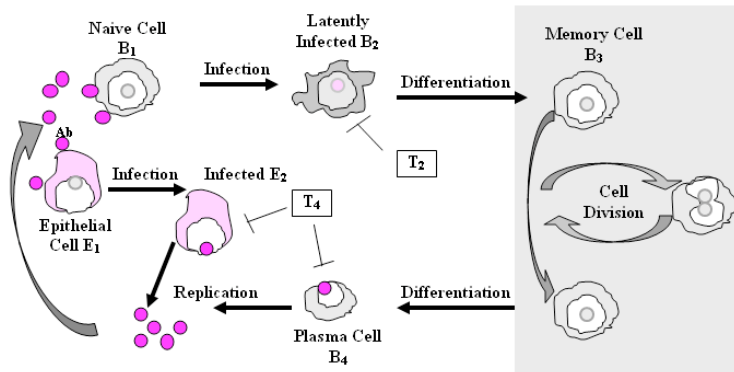
EBV Infection of B Cells

Infection of B cells can be lytic or latent

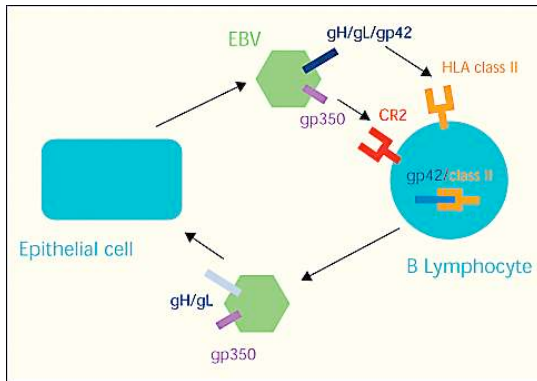


Thorley-Lawson 2005

Model

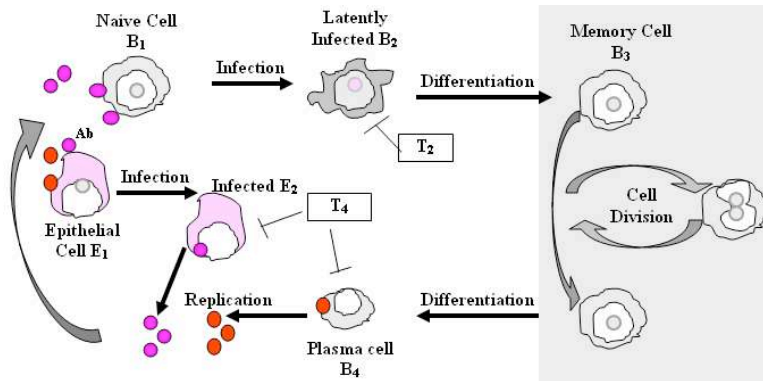


Cell Switching (Lindsey Hutt-Fletcher)



Farrell 2002

Model (Two Types of Virus)



How might EBV infection lead to cancer?

- Hodgkin's lymphoma (HL): Post-IM patients have increased risk of developing EBV-positive Hodgkin's lymphoma
- Nasopharyngeal carcinoma (NPC): Highly elevated level of antibody (IgA) response to viral antigens can be detected 2-3 years before the onset of the disease

How might EBV infection lead to cancer?

Immunoediting Model: 3 phases

- **Elimination:** can the "cancer cells" be eliminated by the immune system?
 - Yes -> Great!
 - No -> Phase 2

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- **Escape:** the balance of immune control of "cancer cells" and the cancer progression leans toward the favour of cancer progression.

The End

Thank you!