

# VIROLOGY

## *DNA enveloped viruses*

### *HERPESVIRUSES*

The herpesvirus family contain six important human pathogens:

- Herpes simplex virus type 1
- Herpes simplex virus type 2
- Varicella- zoster virus
- Cytomegalovirus
- Epstein-Barr virus
- Human herpes virus 8 (the cause of kaposi's sarcoma).

All herpesviruses are structurally similar:

- enveloped with icosahedral symmetry.
- Linear DS-DNA.
- No virion polymerase.
- They are large in size  
second in size to pox virus.
- Replication in nucleus
- Tegument (play a role in replication) located between nucleocapsid  
and the envelop .

Herpesviruses produce latent asymptomatic infection following the primary acute infection. Some have symptoms of the latent similar to that of the primary while the other the symptoms of the latent infection are differ from that of primary one.

The herpesvirus family can be subdivided into three categories based on the type of cell most infected and the site of latency.

- Alpha herpesvirus: (HSV1,2 VZV) infect epithelial cells and cause latency in neurons.
- Beta herpesviruses: (CMV,HH6) infect and become latent in a variety of tissue.
- Gamma herpesviruses: Epstein\_Barr virus and HHV8) infect and become latent in lymphoid cells.

### **Epstein-Barr virus (EBV)**

#### **Diseases:**

EBV causes infectious mononucleosis. It is associated with Burkitt's lymphoma, other B-cell lymphomas and nasopharyngeal carcinoma.

EBV causes hairy leukoplakia.

#### **Properties**

##### **Antigens of EBV.**

- 1- viral capsid antigen (VCA) is mostly used in the diagnosis.
- 2- Early antigen (EA) are produced prior to viral DNA synthesis.
- 3- Nuclear antigen (EBNA)
- 4- Lymphocyte determined membrane antigen.
- 5- Viral membrane antigen.

Neutralizing activity is directed against the viral membrane antigen.

EBV infects mainly lymphoid cells , primarily B-lymphocytes. It also infects the epithelial cells of the pharynx.

## **Transmission and epidemiology**

- It is transmitted primarily by saliva
- Not transmitted by blood transfusion.
- Infection in the first few years of life is asymptomatic.
- The frequency of clinically apparent IM is highest in those who are exposed to the virus later in life (e.g., college students).

## **Pathogenesis**

The infection first occurs in nasopharynx and then spread to blood, where it infects B lymphocytes. Cytotoxic T cell react against the infected B cell. The T cells are the "Atypical lymphocytes" seen in bloods. The virus becomes latent within B- lymphocytes.

## **Immunity**

- 1- first Antibody response is IgM against VCA followed by IgG and persist for life.
- 2- Lifetime immunity against second episodes of IM is based on antibody to the viral membrane antigen.
- 3- Non specific heterophil antibodies are also found. Heterophil refers to antibodies that are detected by tests using antigens different from the antigens that induced them. The heterophil antibodies formed in infectious mononucleosis agglutinate sheep or horse red blood cells in laboratory.

**Note that these antibodies don't react with any components of EB!. How?**

The answer is that EBV likely modifies a cell membrane constituent such that it becomes antigenic and induces the heterophil antibody. These antibodies disappear 6 months after recovery. These antibodies are not specific for EBV infection and are also seen in individuals with hepatitis B and serum sickness.

## **Clinical findings**

Infectious mononucleosis is characterized primarily by fever, sore throat, lymphadenopathy, and splenomegaly. Anorexia and lethargy is prominent.

Hepatitis is frequent. Encephalitis could occur. Spontaneous recovery usually occurs 2-3 weeks. Splenic rupture is associated with sport activities such as football.

## **Laboratory diagnosis:**

1- Haematologic approach absolute lymphocytosis occurs as many as 30 % abnormal lymphocytes. These atypical lymphocytes are enlarged with expanded nucleus and an abundant often vacuolated cytoplasm. They are cytotoxic T-cells that are reacting against the EBV-infected B-cell.

2- Immunologic

(A) Monospot test for heterophil antibody test.

(B) The EBV –specific antibody test are user primarily in the diagnosis. (VCA,EA,and EBNA).

## **Treatments**

No antiviral test is necessary for uncomplicated IM. Acyclovir has little activity against EBV, but high doses may be useful in life threatening EBV infections.

## **Prevention**

There is no EBV vaccine.