

# Cytomegalovirus

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# Cytomegalovirus (CMV)

- It is largest virus in the Herpesviridae family.
- It causes massive enlargement of infected host cells.

# Morphology

- Large (150-200 nm size), spherical in shape with icosahedral symmetry.
- Nucleocapsid: dsDNA is the largest among herpes viruses, which consist of 240kbp nucleotide.
- Envelope is lipoprotein nature
- Tegument is lies between capsid and envelop.
- Cytomegaloviruses are strictly species-specific.

## **Cell type specificity:**

- In vivo: CMV infects kidney and salivary glands; where it undergoes latency.
- In vitro: Replicate only human fibroblast cell line and produces a characteristic cytopathic effect (CPE) described as **Owl's eye** appearance.

**Cell to cell spread:** closely associated with cells but very little virus may be cell-free.

# Clinical manifestations

- Congenital infections
- Perinatal infections.
- CMV mononucleosis in adult
- Severe infection in immunocompromized and transplant recipients.

# Epidemiology

## Transmission:

- Close person-to-person contact.
- Oral and respiratory spread is the predominant mode.
- Transplacental route (transmission from mother to fetus).
- Blood transfusion: about 0.1-10 %.
- Organ transplantation
- Sexual contact
- **Reservoir:** Humans are the only known host for CMV.
- **Source:** **urine, saliva, semen**, breast milk, and cervical secretions, and is carried in circulating white blood cells.
- **Endemic:** Worldwide present throughout the year without any seasonal variation.
- **Risk factors:** Low socioeconomic status and poor personal hygiene facilitate the infection.
- **Prevalence** is high in underdeveloped countries with 90% of people being seropositive in contrast to 40-70% sero-positivity in developed countries.

# Laboratory diagnosis

## ***Detection of Inclusion Bodies:***

- **In urine:** Produce characteristic perinuclear cytoplasmic inclusions in addition to the usual intranuclear inclusions seen (**Owl's eye appearance**).

## **Virus isolation:**

- **Isolated from throat and urine.**
- **Human fibroblasts are the most ideal cell lines, specific for CMV.**
- **Cytopathic effect: After 2-3 weeks of incubation, the following CPE observed,**
  - **Typical CMV inclusions.**
  - **Multinucleated giant cells are seen.**
- **Enlargement of infected host cells. Shell vial technique can be followed for early growth detection (1-2 days).**
  - **Very useful in CMV mononucleosis where viral load is low and CPE takes several weeks to appear.**



Owl's eye inclusion

❑ Antibody detection:

- ELISA
- Rapid test formats.

❑ Antigen detection: pp65 antigen.

❑ Molecular methods: PCR and real-time PCR.

# Treatment

- It does not respond to Acyclovir.
- Ganciclovir(IV routes).
- Valganciclovir: Prodrug of ganciclovir given orally.
- Foscarnet: effective against ganciclovir resistant.
- Cidofovir: alternate to ganciclovir.
- CMV immunoglobulin: given with ganciclovir for treatment of CMV infections in bone marrow transplant recipients.

# Prophylaxis

- Both ganciclovir and valganciclovir have been used successfully for prophylaxis and pre-emptive therapy in transplant recipients.
- CMV immunoglobulin has shown to be effective in preventing congenital infection when given to mother during pregnancy.