

# Medical microbiology

## Virology

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### Parvovirus B19 - Erythema Infectiosum, fifth disease



Epidemic of this virus was in 1886. People named it the fifth disease, because it was the fifth disease known to caused a rash in children: Measles ,Scarlet fever ,German measles ,Duke's disease ,Fifth disease (parvovirus B19)

It infects mainly children who are at elementary level, but it can also infect adults. It has the highest incidence between winter and spring

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- *Parvoviridae* family, *Erythrovirus* genus Small,
  - Parvovirus is a **naked**, **ssDNA** virus with an **icosahedral** capsid.
  - It's considered the **smallest** DNA virus ( 18-26nm in diameter).
  - It's the **ONLY** virus that's **totally dependent** on the cellular machinery,
  - Parvovirus B19 is pathogenic for humans and has a tropism for erythroid progenitor cells.
  - **Proteins:** One major (VP2) and one minor (VP1) there is no viral polymerase.

### Parvovirus Replication

It is difficult to culture human B19 parvovirus. Only primary erythroid progenitors are known to be permissive for B19 infection. The cellular receptor for B19 is blood group P antigen (globoside). P antigen is expressed on mature erythrocytes, erythroid progenitors, megakaryocytes, endothelial cells, placenta, and fetal liver and heart, which helps explain the narrow tissue tropism of B19 virus. The parvoviruses are highly dependent on cellular functions for replication. Viral DNA replication occurs in the nucleus. The parvoviruses do not have the ability to

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stimulate resting cells to initiate DNA synthesis, so they must infect dividing cells. One or more cellular DNA polymerases are involved. The nonstructural protein, NS1, is required for virus replication. There are two capsid proteins. Viral replication results in cell death.

### **Transmission:**

Respiratory route , Blood transfusion ,Vertically from mother to fetus ( vertical rate is more than 30 %).

### **Epidemiology:**

The B19 virus is widespread. Infections can occur throughout the year in all age groups and as outbreaks or as sporadic cases. Infections are most commonly seen as outbreaks in schools. Parvovirus infection is common in childhood; antibody most often develops between the ages of 5 and 19 years. Up to 60% of all adults and 90% of elderly people are seropositive.

### **Pathogenesis :**

Immature cells in the erythroid lineage are principal targets for human B19 parvovirus. Hence, the major sites of virus replication in patients are assumed to be the adult marrow, some blood cells, and the fetal liver. Viral replication causes cell death, interrupting red blood cell production. In immunocompromised patients, persistent B19 infections occur, resulting in chronic anemia. In cases of fetal death, chronic infections may have caused severe anemia in the fetus.

### **Diseases caused by parvovirus B19 are:**

1. Erythema infectiosum (Slapped Check syndrome, Fifth disease): red rash, fever and runny nose, also arthralgia and arthritis (The disease in children is called fifth disease).

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2.Aplastic anemia (transient aplastic crisis): especially in children with sickle cell anemia, thalassemias and acquired hemolytic anemias in adults.

3.Infection in immunodeficient patients: B19 causes chronic suppression of the bone marrow and chronic anemia in immunodeficient patients.

4.Fetal infection: congenital malformations including hydrops fetalis and fetal death due to severe anemia.

### Diagnosis:

- 1- Detect viral DNA by PCR consider most sensitive test.
- 2- serology using IgM specific antibodies against Parvovirus in recent infections .B19 IgG antibodies against VP1 and VP2 persists for years.
- 3- Antigen detection assays can identify high-titered B19 virus in clinical samples.
- 4- Immunohistochemistry can detect B19 antigens in fetal tissues and bone marrow.

### Treatment:

- 1- Fifth disease and transient aplastic crisis are treated symptomatically, may require transfusion therapy.
- 2- Commercial immunoglobulin preparations contain neutralizing antibodies to human parvovirus given for immunodeficient patients and anemic .
- 3- There is no vaccine against human parvovirus.