



## Virology for 2<sup>nd</sup> Year MD Students

# **(13) RNA Viruses: *Togaviridae*, *Filoviridae*, *Rhabdoviridae*, arboviruses and RNA viruses that cause gastroenteritis**

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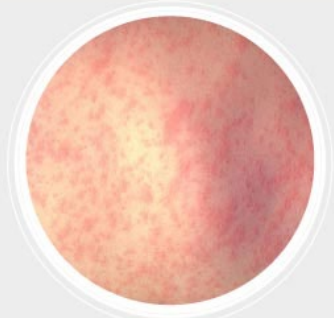
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# *Togaviridae*


- Positive sense, single-stranded RNA, enveloped viruses that replicate in the cytoplasm.
- Rubella virus: the causative agent of German measles (rubella)
- The mildest form of viral infections that cause skin rash.
- Rubella is a three-day rash (morbilliform rash) with low-grade fever.

## MEASLES VS. RUBELLA



**MEASLES**

- Measles, or rubeola, is a viral infection of the respiratory system. Measles is a very contagious disease that can spread through contact with infected mucus and saliva.



**RUBELLA**

- Rubella is a contagious disease that mostly affects children. It causes symptoms like a rash, fever, and eye redness. It's usually mild in kids, but it can be more serious in pregnant women.

## Rubella infection routes



Transmitted via respiratory droplets



Pregnant female

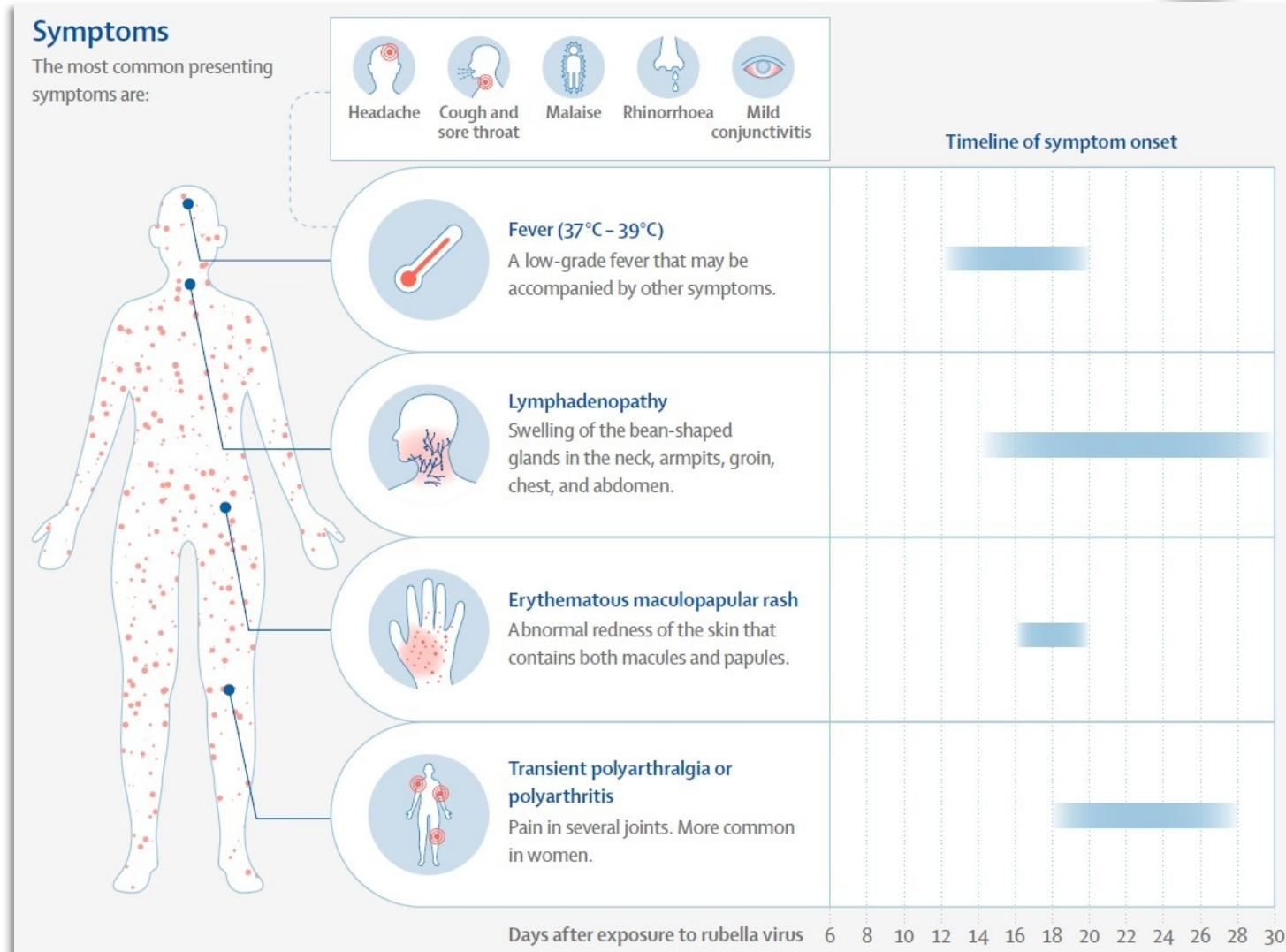
Placenta

Unborn child



# Rubella

- Risk of congenital infection. The classic triad of congenital rubella syndrome (CRS) consists of **cataracts, cardiac abnormalities, and deafness**.
- Transmission: respiratory secretions, mother-to-child
- Diagnosis: serology IgM antibodies, PCR.
- Treatment: Supportive.
- Vaccination: Live-attenuated vaccine MMR (measles mumps rubella vaccine).

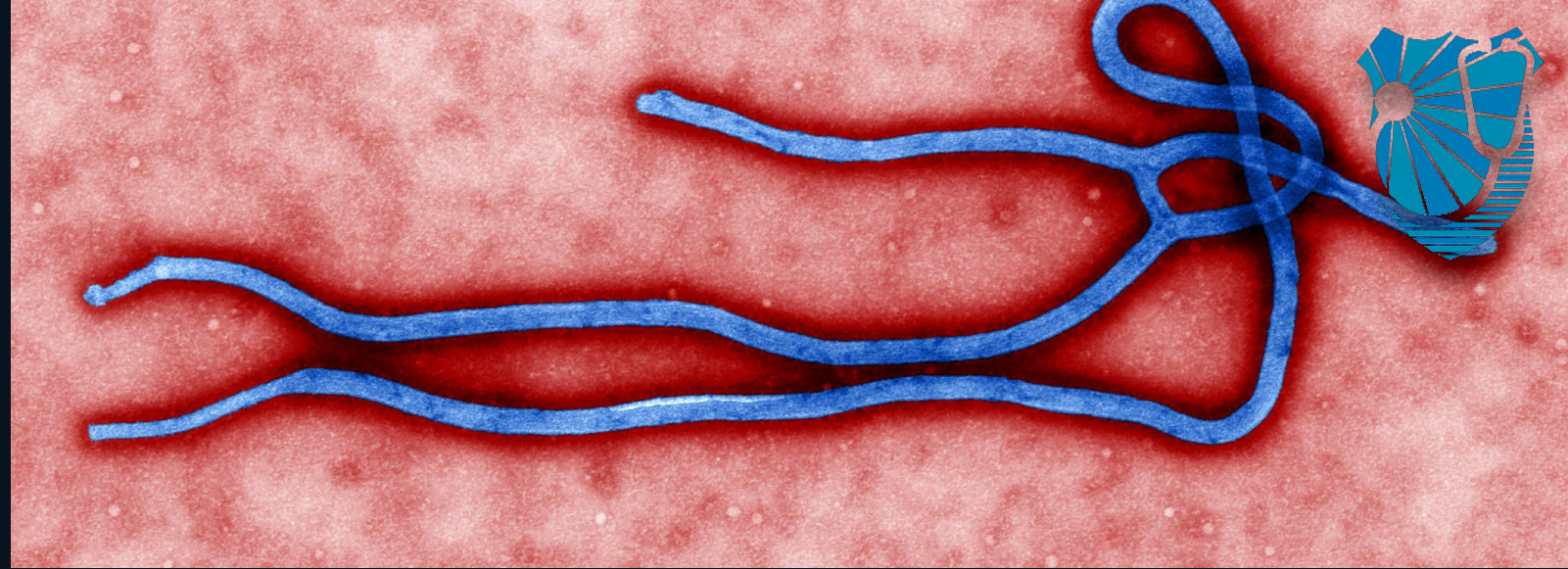


Source: <https://www.thelancet.com/infographics-do/rubella>





# *Filoviridae*



## Ethiopia confirms three Marburg deaths as outbreak sparks regional alarm

*Health authorities isolate more than 100 contacts as deadly hemorrhagic virus detected near South Sudan border.*



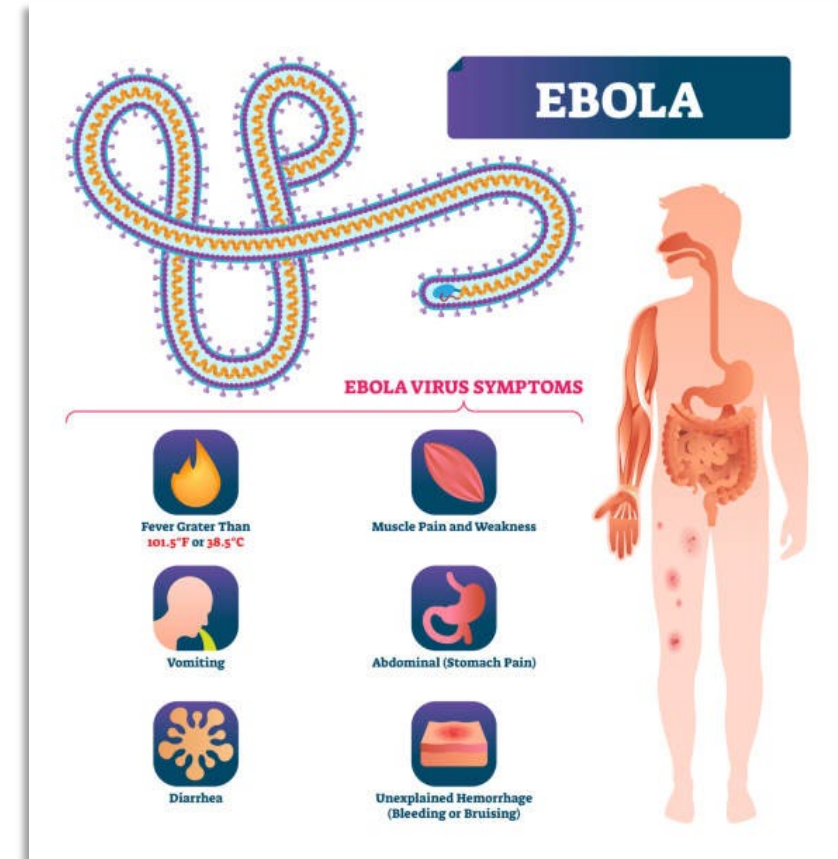
Health workers in Ethiopia mobilise to contain a Marburg virus outbreak. [Al Jazeera]

- Negative sense, single-stranded RNA, enveloped viruses that replicate in the cytoplasm. Filamentous in shape.
- Examples include Ebola virus and Marburg virus
- The average case fatality rate is around 50%.
- Tropism is in hepatocytes, endothelial cells, dendritic cells, monocytes, and macrophages, and infection of these cells is important for hemorrhagic manifestation and immune disorders



# Ebola disease

- Ebola virus: causes severe hemorrhagic fever. It is spread through direct physical contact with the body fluids of an infected person.
- The symptoms include fever, fatigue, malaise, muscle pain, headache and sore throat. These are followed by vomiting, diarrhea, abdominal pain, rash, and symptoms of impaired kidney and liver functions. Some patients may develop internal and external bleeding. The impact on the CNS can result in confusion, irritability and aggression. Management is by optimized supportive care.
- Two vaccines are approved: Ervebo (Merck & Co.) and Zabdeno and Mvabea (Janssen Pharmaceutica).
- Diagnosis by PCR. Must be handled in high-biosafety laboratories (BSL-4).

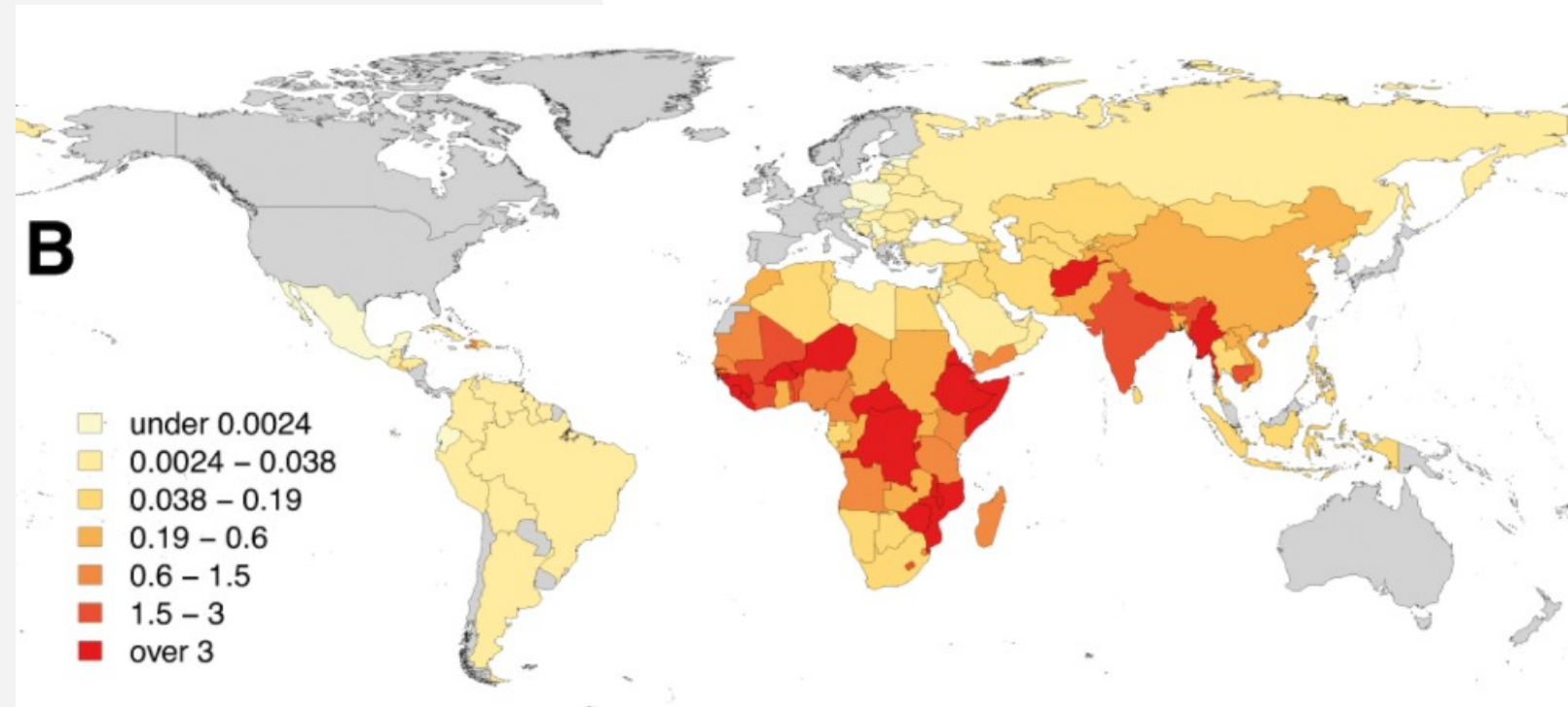
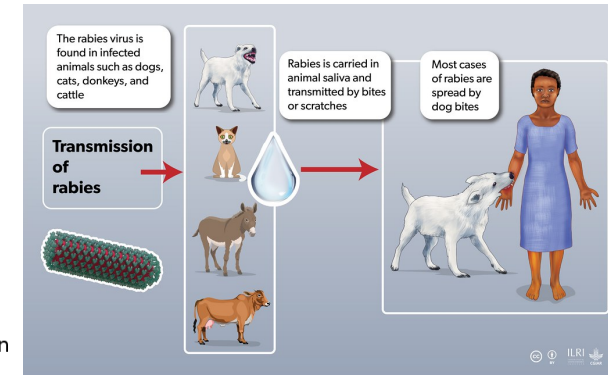
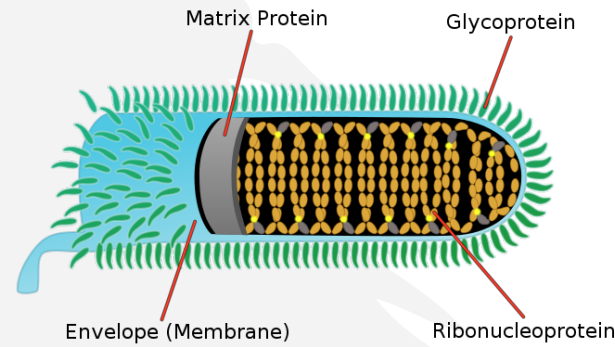






# *Rhabdoviridae*

- Negative sense, single-stranded RNA, enveloped viruses that replicate in the cytoplasm. Bullet-shaped
- **Rabies virus infection:**
- After bite of a rabid animal, rabies virus multiplies in muscle or connective tissue at the site of inoculation and then enters peripheral nerves at neuromuscular junctions and spreads up the nerves to the CNS causing progressive encephalitis. Once in the CNS, rabies virus is fatal (death rate = 100%).



Source: <https://www.who.int/teams/control-of-neglected-tropical-diseases/rabies/epidemiology-and-burden>  
Death rates per capita (per 100 000 population); countries shaded in grey are free from canine rabies ( WHO Expert consultation on rabies TRS n°1012, 2017)






# Rabies

Rabies symptoms start with fever, headache, and tingling/itching at the bite site, then progress to neurological issues like anxiety, confusion, agitation, hallucinations, and muscle spasms, especially in the throat (**hydrophobia**/fear of water due to Painful pharyngeal muscle spasms) and difficulty swallowing/breathing, eventually leading to paralysis, coma, and death.

## Rabies Symptoms



 fever	 headache	 nausea	 vomiting
 anxiety	 confusion	 excessive salivation	 hyperactivity
 difficulty swallowing	 insomnia	 hallucinations	 hydrophobia





# Rabies diagnosis, prevention and management

- Post-exposure prophylaxis consists of a series of rabies vaccines (5 doses on days 0, 3, 7, 14, 28) and rabies immunoglobulin administered after a suspected exposure to rabies.
- Methods approved for diagnosing rabies in humans include direct fluorescent antibody test, immunohistochemistry, RT-qPCR, or rabies serology.
- Postmortem testing requires the collection of brainstem and cerebellum tissues. **Negri bodies** are intracytoplasmic, eosinophilic inclusions found in neurons



Source: <https://www.pathologyoutlines.com/topic/cnsrabies.html>

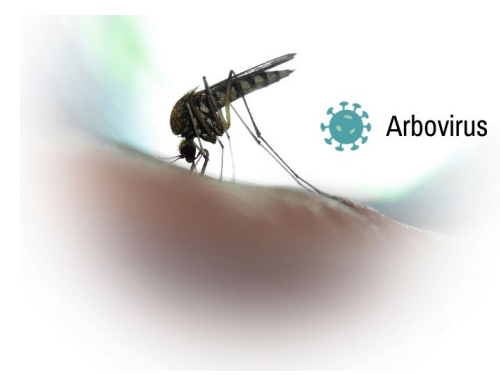
Negri body (arrows): a sharply delineated, eosinophilic inclusion in the neuronal cytoplasm.

Contributed by Kymberly A. Gyure, M.D.





# Arboviruses (arthropod-borne viruses)



## *Flaviviridae*

Positive sense, single-stranded RNA, enveloped viruses that replicate in the cytoplasm.

Dengue virus: Dengue (breakbone fever) is a mosquito-borne infection characterized by fever, severe headache, muscle and joint pain, nausea and vomiting, eye pain, and rash. It is the most common arbovirus infection worldwide. Currently, only one vaccine is available for dengue prevention.

Yellow fever: causes hepatitis and is transmitted by mosquitoes.

West Nile fever: can cause meningitis. A majority of infections are asymptomatic. It is transmitted by mosquitoes.

Zika fever: can cause microcephaly if transmitted from the mother to the child. The virus is transmitted by mosquitoes.



# Viruses that cause gastroenteritis

01

**Rotavirus:** double-stranded non-enveloped RNA virus with a segmented genome. The most common cause of gastroenteritis in infants. Live-attenuated vaccine is available.

02

**Norovirus:** single-stranded positive sense RNA non-enveloped virus. The most common cause of gastroenteritis in adults.

03

**Astrovirus:** single-stranded positive sense RNA non-enveloped virus.

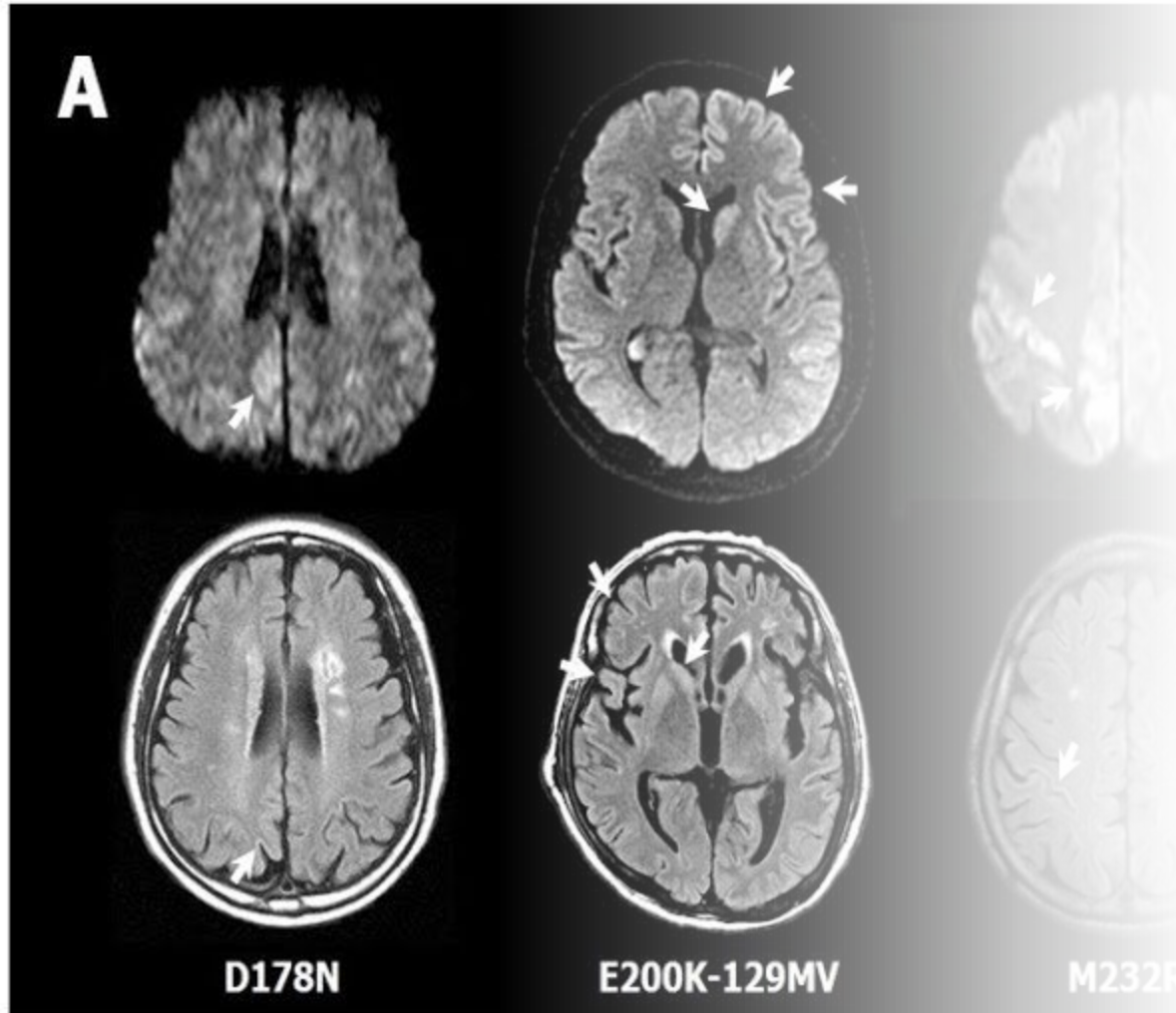
04

**Sapovirus:** single-stranded positive sense RNA non-enveloped virus.





# Mad Cow Disease



## Prion disease

The proposed cause is a proteinaceous material that does not have nucleic acid. The disease in relation of consumption of infected cows: variant Creutzfeldt Jakob disease (vCJD).



**Thank You...**  
**Wishing you all the best!**