



INSTITUTE OF HUMAN VIROLOGY

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# **Human Metapneumovirus New Perspectives and Pandemic Potential**

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**January 8, 2025**

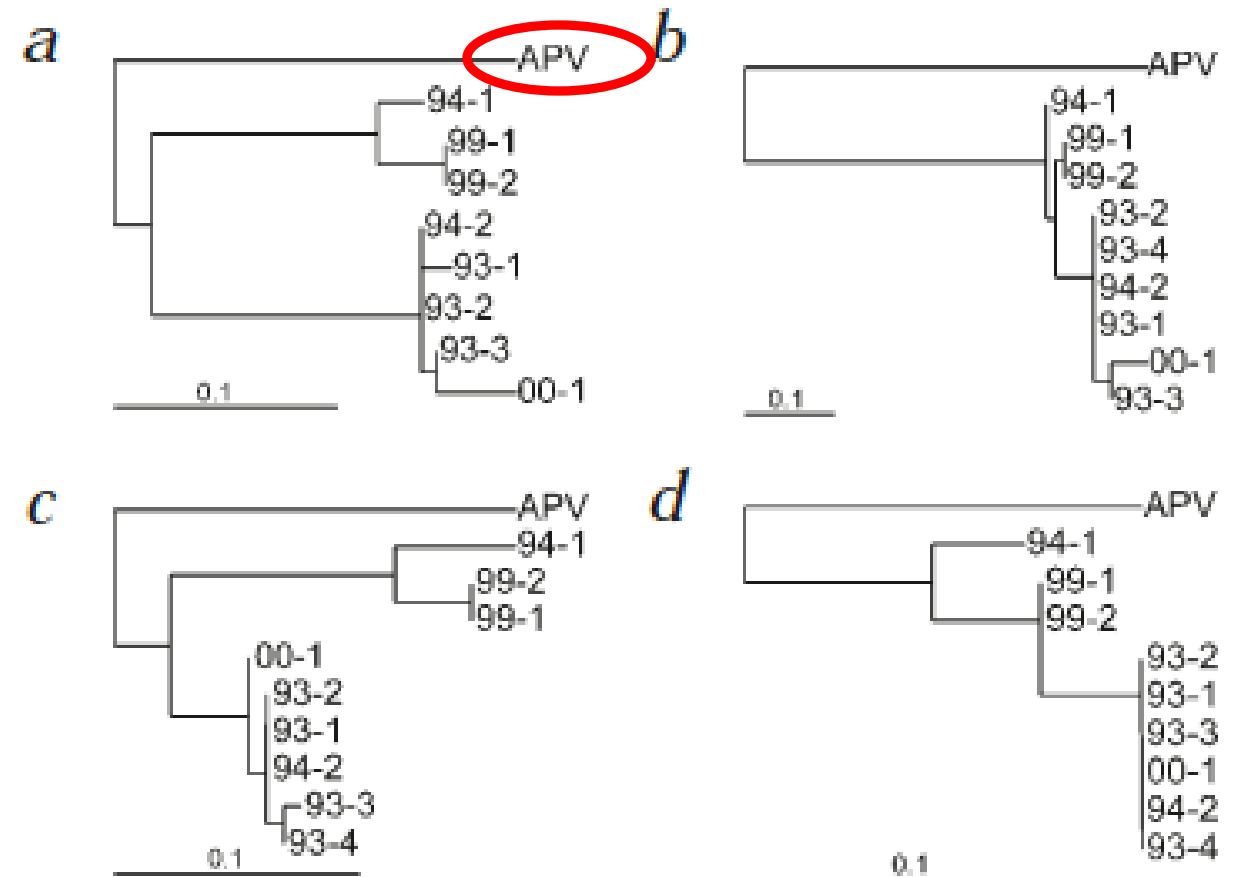
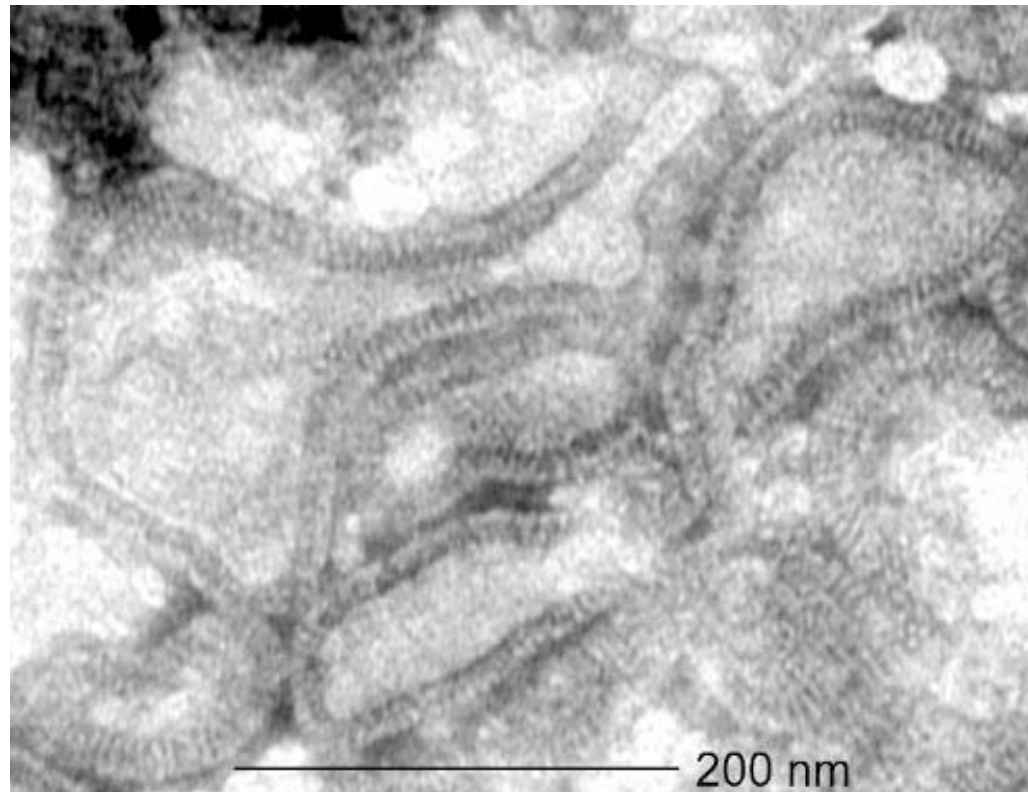
# Questions

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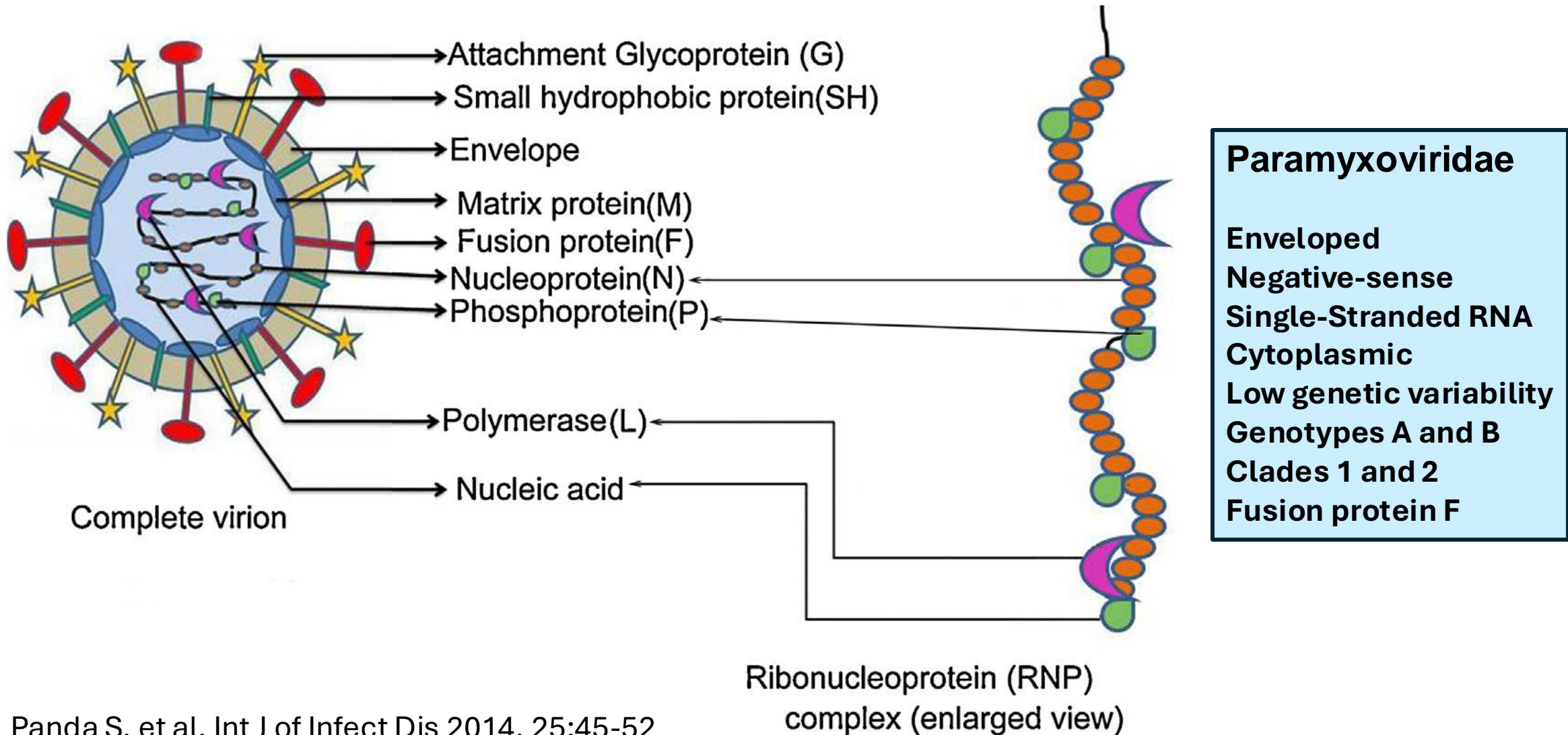
- **What is human metapneumovirus (HMPV)?**
- **What do we know about the epidemiology?**
- **Should we worry about recent surges in cases?**
- **Are there any good news?**
- **Can this lead to a pandemic?**

# Human Metapneumovirus: Discovery

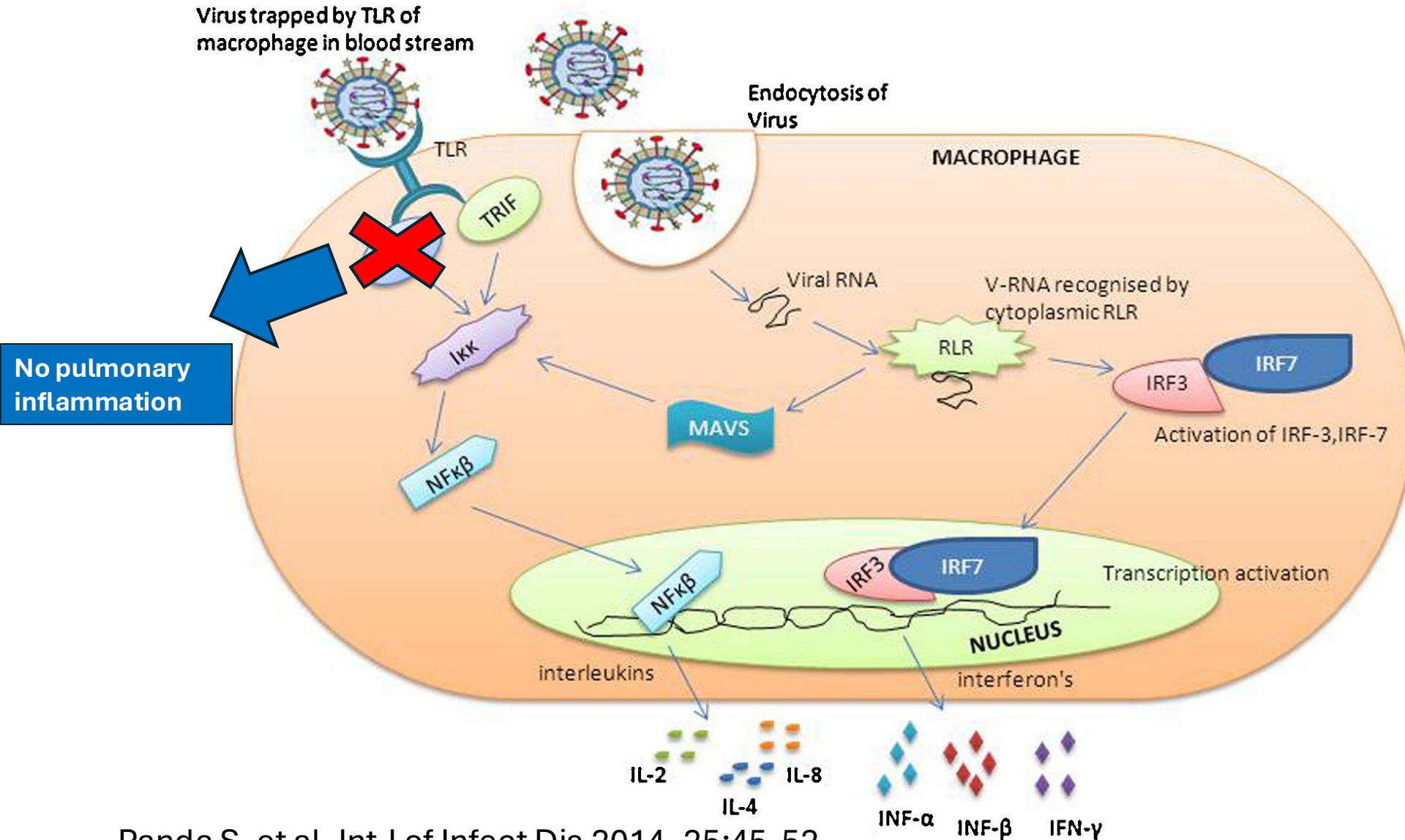
Paramyxovirus family > Pneumovirinae sub family > Metapneumovirus (genus)



# Human Metapneumovirus Structure



# Human Metapneumovirus-Life Cycle



**Antiviral**

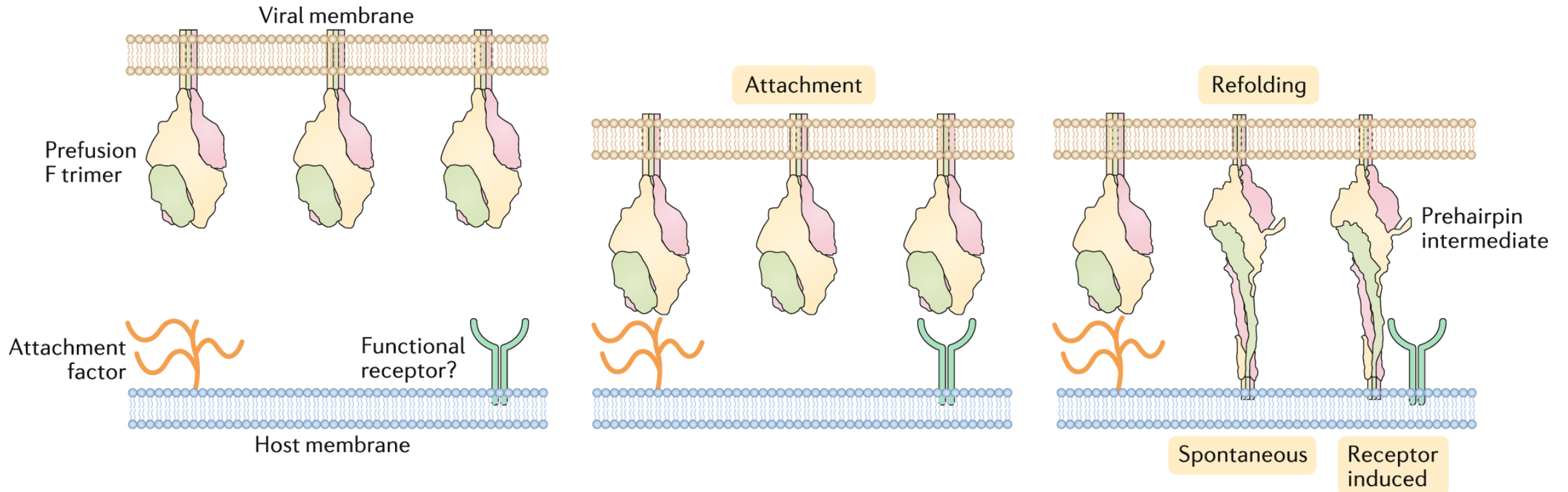
**TLR7 > IRF 3/7 > IFNs**

**Inflammatory**

**TLR3 > NFKB > IL-2, 4, 8**

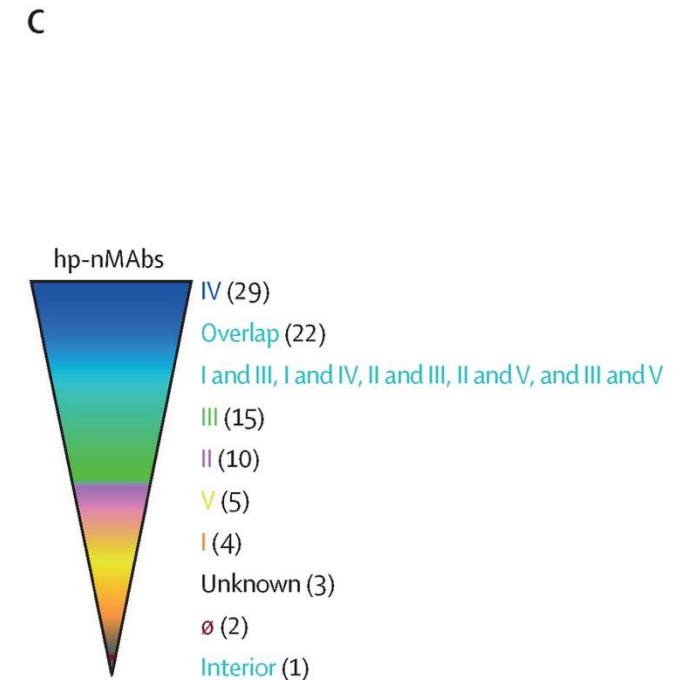
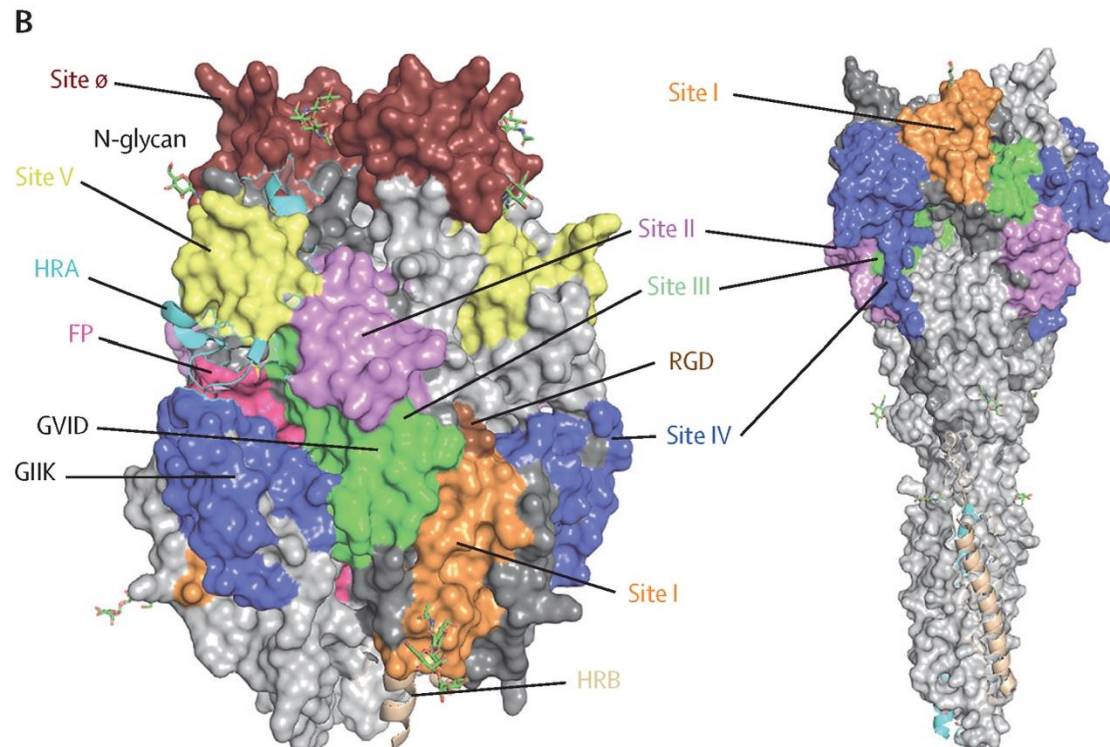
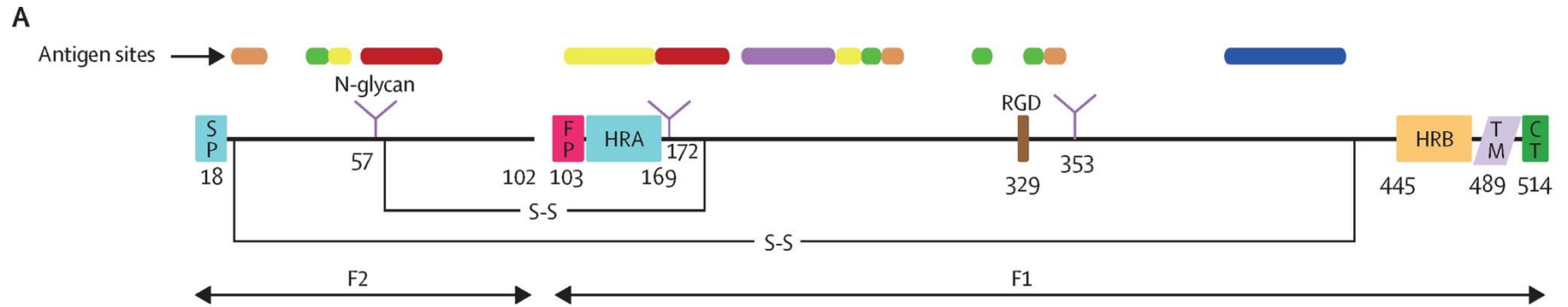


# Attachment and Fusion



**Heparan Sulfate**  
**Beta 1 integrin**

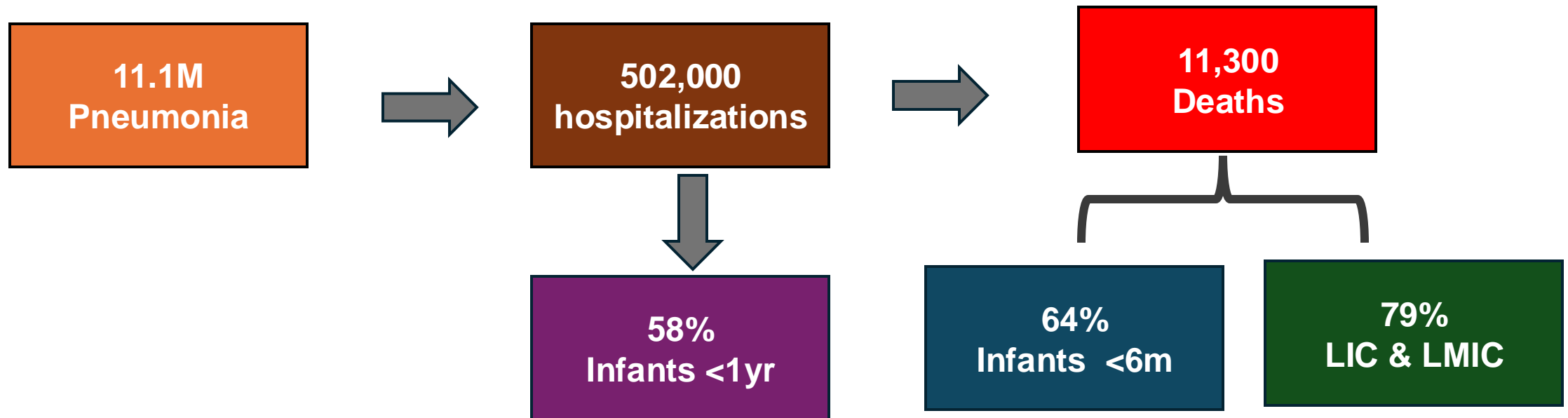
# Neutralization Sites



# What Do We Know About the Epidemiology?

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- Around for over 60 years
- Second most common respiratory infection among children
- Highest mortality among infants





# Should We Worry About Recent Surges?

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- Do we really have a surge?
- HMPV is not a new virus, it is the second common respiratory infection in children <5 years
- Milder diseases, less transmission risk as of now
- Adaptability is always a concern
- Cautious optimism and follow up

# Are There any Good News?

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- Mortality is highest for infants and immunocompromised
- No specific antiviral-Ribavirin is used, not ideal
- F protein can induce neutralizing antibodies (IVIg)
- No monoclonals yet, but can be made easily
- Fusion inhibitors, RNAi
- Vaccines are being developed
  - mRNA (PIV3/HMPV) moving to Phase 2 (Moderna)
  - VLPs

# Can this Lead to a Pandemic?

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- Existing versus new viruses
- For existing agents
  - Viruses with high rate of replication
  - RNA vs DNA
  - Replicating potential in cytoplasm versus nucleus
  - Segmental genome organization (Orthomyxoviridae)
  - Genome size (inversely related to mutations-Retroviridae)
  - Respiratory route of transmission
- Avian Flu remains the major threat today!!