



Lecture Nine

Viruses of Medical Importance

2- Human Respiratory Syncytial Virus (HRSV).

By

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Learning outcomes

By the end of this lecture students should

- **Know the history of HRSV.**
- **Have the knowledge HRSV epidemiology and modes of transmission.**
- **Recognize different symptoms associated with HRSV.**
- **Be aware of different ways for prevention and control measures.**



HRSV: History

- 
- ❖ First identified >50 yrs ago.
 - ❖ Two epidemics in the **1930s & 1940s**: describing the seasonal variability and physical and pathological manifestations of the disease without identified organisms.
 - ❖ **1955**: Walter Reed researchers isolated a virus from the nasal secretions of young chimpanzees → named chimpanzee coryza agent (CCA).
 - ❖ **1956** Robert Chanock isolated CCA from 2 infants → with characteristic multinucleated giant cells within a large syncytium → renamed “respiratory syncytial virus”.

HRSV Epidemiology

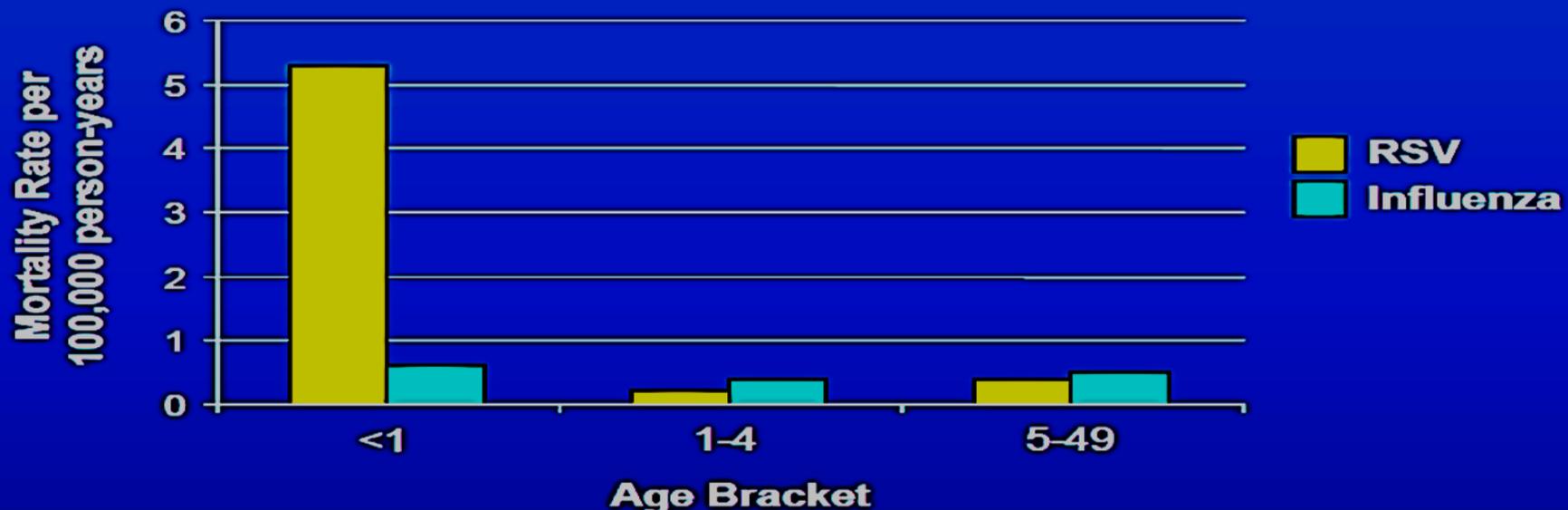
- ❖ HRSV is the primary cause of lower ARTIs in children.
- ❖ HRSV is highly contagious, nosocomial pathogen, spread by close contact with infectious secretions.
- ❖ HRSV infects 50% of children during the first year of life. All children become infected by the end of second year.
- ❖ HRSV is responsible for:
64 million cases; **100,000 hospitalization**; up to **1 million deaths** every year worldwide.
- ❖ Two major strain groups of HRSV, designated A and B, were found to circulate concurrently during epidemics.

Human Respiratory Syncytial Virus

HRSV vs Influenza

RSV: A Leading Viral Cause of Infant Death

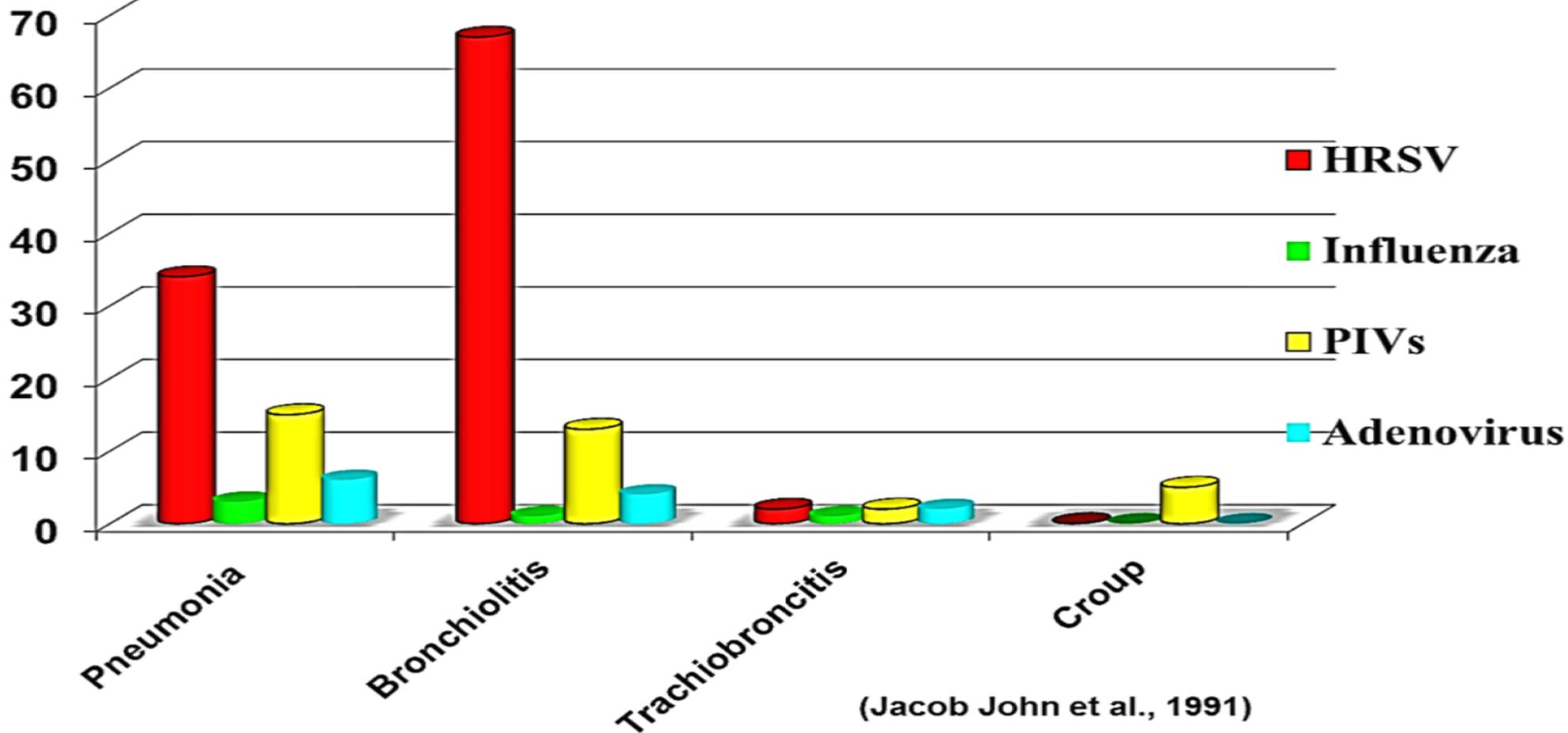
- CDC viral surveillance data and mortality data were analyzed from 1990-1999
- RSV was found to be a leading viral cause of infant death*, with nearly 9 times the mortality of influenza



*As measured by underlying respiratory and circulatory deaths, 1990 to 1999
Thompson WW, et al. *JAMA*. 2003;289:179-86.

Human Respiratory Syncytial Virus

HRSV vs other Respiratory Viruses



(Jacob John et al., 1991)

HRSV Epidemiology

Transmission

RSV is easily transmitted via large, **aerosolized respiratory particles**, or through contact with **nasal secretions**, and may even be transmitted indirectly by contact with **contaminated objects**, such as bathroom fixtures or even clothing. The most common sites of inoculation are the eyes and nose.

Prevalence

- Winter months.
- Most frequently transmitted between family members and hospitals.
- The incubation period is three to five days for most patients.
- Strain A more prevalent than Strain B.

Taxonomy (ICTV, 2018)

Phylum: Negarnaviricota (2 subphyla)

Subphylum: Haploviricotina (4 classes)

Class: Monjiviricetes (2 orders)

Order: Mononegavirales

Family: Pneumoviridae

Genus: Orthopneumovirus

Human orthopneumovirus (**HRSV**)



Virus Morphology and Characteristics

Virion: Pleo-morphic (mostly Spherical) – medium to large size (150-300 nm in diameter)

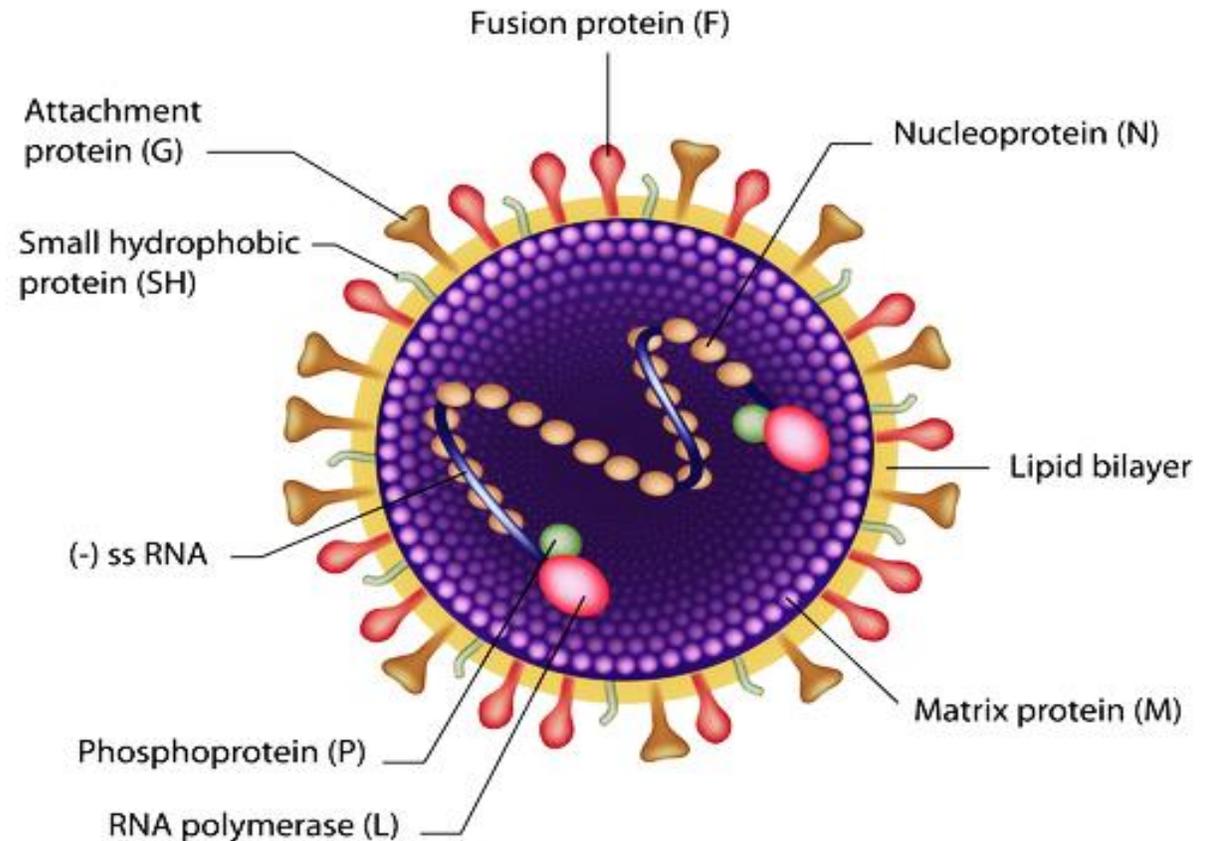
Genome: single stranded RNA – negative sense – Linear – non-segmented – 15 kb.

Capsid: helical (NP)

Envelope: Present Peplomers: (G, F, SH), Matrix protein

Viral enzymes: L and P (viral polymerases)

Replication: Cytoplasm



Pathology and Clinical Picture

Incubation Period: 4-6 days (Short)

Symptoms:

-Adult: (Cold-like symptoms)

Runny nose – Dry cough – Sore throat - Low fever – Mild headache

-Children and Elderly: (Bronchitis and pneumonia)

Fever – Severe cough – Wheezing – Difficult breathing – Cyanosis

May cause death (especially in infants with heart and lung diseases)

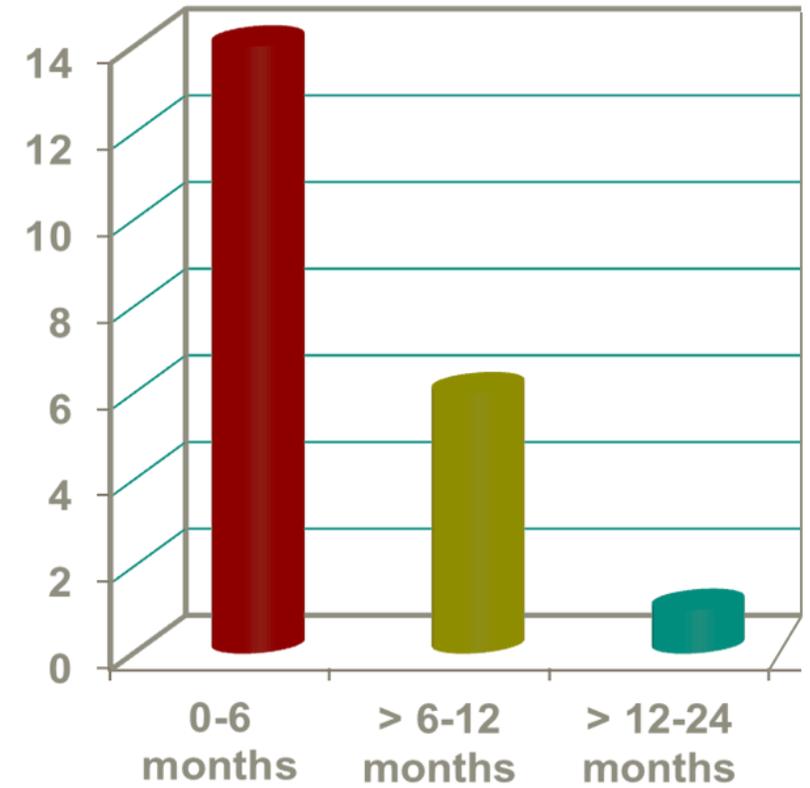


HRSV Incidence and Risk Factors

Sex



Age



Prevention and Control

A golden statue of a person is visible on the left side of the slide. In the foreground, there is a large, green, spiky virus particle, likely representing the Respiratory Syncytial Virus (RSV).

1- Treatment:

- Currently no RSV vaccine available
- 1960's- Formalin-inactivated whole-virus hRSV vaccine given to infants (no previous exposure) later infected by hRSV, suffered severe symptoms of hRSV and 2 were died.
- No treatment given in mild disease.
 - just medication to reduce fever.
- Oxygen therapy and mechanical ventilation (severe disease).
- Ribavirin aerosol (severe disease).
 - Sometimes used--IGIV (immune globulin intravenous) with RSV-IGIV (neutralizing RSV antibody) and Ribavirin. [severe disease]

Prevention and Control



1- Treatment:

■ Drug Therapies

1. HRSV IV immune globulin (RSV-IVIG)

- First approved immunoprophylactic
- released as Respigam (1996)
- made by high titre Sera (protective and neutralizing antibodies)
- administered monthly to prevent infection over 4-5 month period. (during peak season).

2. Palvizumab (Synagis)

- next generation prophylactic
- (MAb) humanized monoclonal antibody
- IM injection, not IV
- admin. During peak season.

Prevention and Control

2- Prevention:

- Frequent hand washing.
- At-Risk children can be given an injection of RSV antibodies monthly during peak season.
- Keeping school-age children away from younger siblings (anyone under 2 years of age) if cold symptoms are present.
- Minimize number of visitors with the infant
- Avoid any crowded places.
 - mall, grocery store.
- If possible, don't take child to daycare during RSV season.
- Partake in influenza vaccinations





Thank
You