

Lecture – Measles and mumps viruses 18.2.2016

Prof. N.P. Sunil-Chandra, Senior Professor of Microbiology, Faculty of Medicine, University of Kelaniya

Measles and mumps belongs classified into the family Paramyxoviridae which contains viruses that induce a wide range of distinct clinical illnesses in humans.

These include :

- measles virus, which in rare instances is followed by subacute sclerosing panencephalitis (SSPE);
- mumps virus, which has symptoms of parotitis, orchitis and encephalitis
- parainfluenza viruses (1, 2, 3, 4a, 4b) which are respiratory pathogens .
- human respiratory syncytial virus (RSV) - associated with severe pulmonary infections in infants - especially Bronchiolitis
- human metapneumovirus (hMPV)

Measles virus

Classification:

Family: **Paramyxoviridae** (the paramyxoviruses)

Subfamily: **Paramyxovirinae**

Genus: **Morbillivirus** (morbilliviruses)

Human pathogens:

measles virus (rubeola)

Measles virus

- -ve sense ssRNA
- 120-250nm size, helical symmetry
- Haemagglutinate monkey RBCs
- Grows on - human embryonic lung cells
- primary monkey kidney cells

Measles virus - epidemiology

- Incubation period about 10 days.
- Transmission: inhalation of respiratory secretions (droplet infection)

Infectiousness: Measles > mumps. Highly infectious from beginning of prodromal period to rash appears.

Case fatality rate: high in <one year age, Lowest in 1 – 9 years age, Rise again with advancing age.

Measles virus – clinical features

- Acute viral illness, generally a mild disease.
- Complications are frequent.
- Severe disease in childhood

Prodromal symptoms:

- Respiratory: Nasal discharge, suffusion of eyes

Main illness:

- Fever,
- Maculopapular rash for 2-5 days
- Coryza
- Conjunctivitis
- Bronchitis
- Characteristic Koplik's spots

Measles - Complications

1. Respiratory complications

- Bronchitis, bronchiolitis
- Croup, bronchopneumonia
- Otitis media
- Giant cell pneumonia (rare) fatal form in children with immunodeficiency

2. Neurological complications

- SSPE (subacute sclerosing panencephalitis) A rare severe chronic neurological disease. Encephalitis or post infectious encephalitis follows measles in 1 in every 5000 cases.
- 50% mortality rate.
- Residual neurological defects

Complications are more common & severe in poorly nourished & chronically ill children.
Must be immunized

Measles - Diagnosis

- 1. Clinical diagnosis: Accuracy improves
 - if rash for at least 3 days
 - if fever at least for 1 day
 - if at least one of the symptoms out of cough, coryza or conjunctivitis
- 2. Serology: single or paired sera
 - CFT
 - Detection of measles IgM by IF test in SSPE & confirm by detecting Ab in CSF
 - Detection of IgM in saliva after the onset of rash

- 3. Direct antigen detection by IF test in Nasopharyngeal aspirates (NPA)
- 4. Virus isolation (done rarely): From throat washings, blood, urine

Measles virus CPE:

Very large syncytia can be formed during replication of measles virus in cell culture.
Presence of Intracytoplasmic eosinophilic inclusions.

An additional distinguishing feature of measles is the presence of distinct intranuclear eosinophilic inclusions in the infected cells.

Immunity to **Measles virus**

- Life long following natural infection
- Vaccination: MMR or measles vaccine (**Refer EPI in SL**)

Adverse Reactions:

- mild fever, rash, malaise, coryza due to measles vaccine strain
- Parotitis due to mumps strain
- Arthralgia due to rubella strain
- Mumps meningoencephalitis associated with urabe strain

Contraindications

- 1. pregnancy (avoided for one month after vaccination)
- 2. immunodeficiency, i.e. immunosuppressive therapy, leukaemia, malignancy
- 3. Hypersensitivity to eggs
- Normal immunoglobulin: for vulnerable individuals i.e. infants

Mumps virus

Classification:

Family: **Paramyxoviridae** (the paramyxoviruses)

Subfamily: **Paramyxovirinae**

Genus: **Rubulavirus** (rubulaviruses)

● *Human pathogens:*

Mumps virus

Human parainfluenza viruses 2, 4a & 4b

Simian parainfluenza virus 10

Mumps virus

- - ve sense, ssRNA genome
- 110-170nm in size, pleomorphic
- Helical nucleocapsid
- One serological type
- Haemagglutinate fowl RBCs
- Grows on
 - amniotic cavity of chick embryo
 - vero cells (monkey kidney cells)

Mumps virus - epidemiology

- Transmission: inhalation of infectious respiratory secretions
- Transmissible several days before the parotid swelling to several days after
- Age: more frequent in children aged 5-15 years.
- Infectiousness: measles > mumps.
- Incubation period: 14-21 days

Mumps – Clinical features

- Classical mumps:
 - febrile illness with parotitis
 - Characteristic swelling of parotid & submaxillary gland (unilateral or bilateral)

Mumps -Complications:

- Permanent unilateral deafness at any age (rare, ~20% of adult males will develop)
- No firm evidence that it causes sterility
- Pancreatitis
- Oophoritis (rarely)
- Aseptic meningitis:
 - may precede or follow or in the absence of parotitis
 - Important cause of viral meningitis
 - Muscular weakness & paralysis

Mumps - Immunity

- One attack leads to a solid long lasting immunity.
- Vaccine: MMR –
 - indicated in all children of 2nd year life (not in EPI of SL)
 - Consists of live attenuated virus strain (two strains; Urabe & Jeryl Lynn)
 - One dose sub cut or I/M

Mumps - diagnosis

1. serology (most useful)

- Paired sera tested.
- CFT, HAI & ELISA tests can be used.
- Increased CSF:serum antibody ratio is useful to confirm CNS disease.
- Virus has 2 detectable antigens: S (soluble) & V (viral)
- Antibody to S - antigen disappears sooner than v – antigen. Marker for recent infection
- Antibody to V antigen persists for years

2. Virus isolation (less available)

- Mainly used for isolation of mumps meningitis
- Specimens: - CSF, throat washings (8-9 days of onset 17-58% recovery)
- Inoculate : - to vero cells
- Observe : - haemadsorption of fowl RBCs
- Identification: Inhibition of haemadsorption or HAI with specific serum.

3. Mumps virus CPE is indistinguishable from that of RSV

Mumps virus CPE : haemadsorption

However, mumps virus encodes a **haemagglutinin** protein which is incorporated in the virus envelope, and appears at the cell surface from which progeny virions will bud. If erythrocytes (red blood cells) are added to infected cell sheets, they will adhere to the cell surface.

●

This process is termed **haemadsorption** and allows differentiation between

- mumps and RSV infections.