Paramyxoviruses (measles, mumps, parainfluenza, RSV) & Rubella

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Viral skin rashes

- Measles – measles virus
- Mumps – mumps virus
- Rubella – rubella virus
- Varicella-Zoster – HHV3 (VZV)
- 5th Disease - Parvovirus B19

Varicella rash (due to HHV-3)

Viral skin rashes – 5th disease (slapped cheek) due to Parvovirus B19

Measles

Conjuctivitis (measles)

Clinical features

- Acute childhood disease (mostly)
- 3 Cs – (a) Cough, (b) Coryza, (c) Conjunctivitis
- Koplik spots
- Four days fever (40^0c)
- Generalized, maculopapular, erythematous rash.
- Rash - Usually benign, but can be dangerous
  - Pneumonia
  - Encephalitis (SSPE)
- Immunocompromised patients
  - Giant-cell pneumonia
  - Measles inclusion body encephalitis (MIBE) may occur

Subacute sclerosing panencephalitis (SSPE)

Central nervous system manifestations:

1. Occurs several yrs after primary infection (8-10 yrs)
2. Personality, behavioral and memory changes
3. Blindness

Table 59-1 **Paramyxoviridae**

GENUS	HUMAN PATHOGEN
Morbillivirus	Measles virus
Paramyxovirus	Parainfluenza viruses 1 to 4
	Mumps virus
Pneumovirus	Respiratory syncytial virus

From Murray et. al., Medical Microbiology 5th edition, 2005, Chapter 59, published by Mosby Philadelphia,,

Measles virus

- **Family = Paramyxoviridae**

  Genus = Morbillivirus
- **(-)ssRNA genome**
- **Spikes on envelope has 2 glycoproteins**

  - Hemagluttinin (HA) – virus attachment
  - HA contains hemagluttinating activity
  - Fusion (F) protein
  - No Neuraminidase activity
- **Cytoplasmic replication**

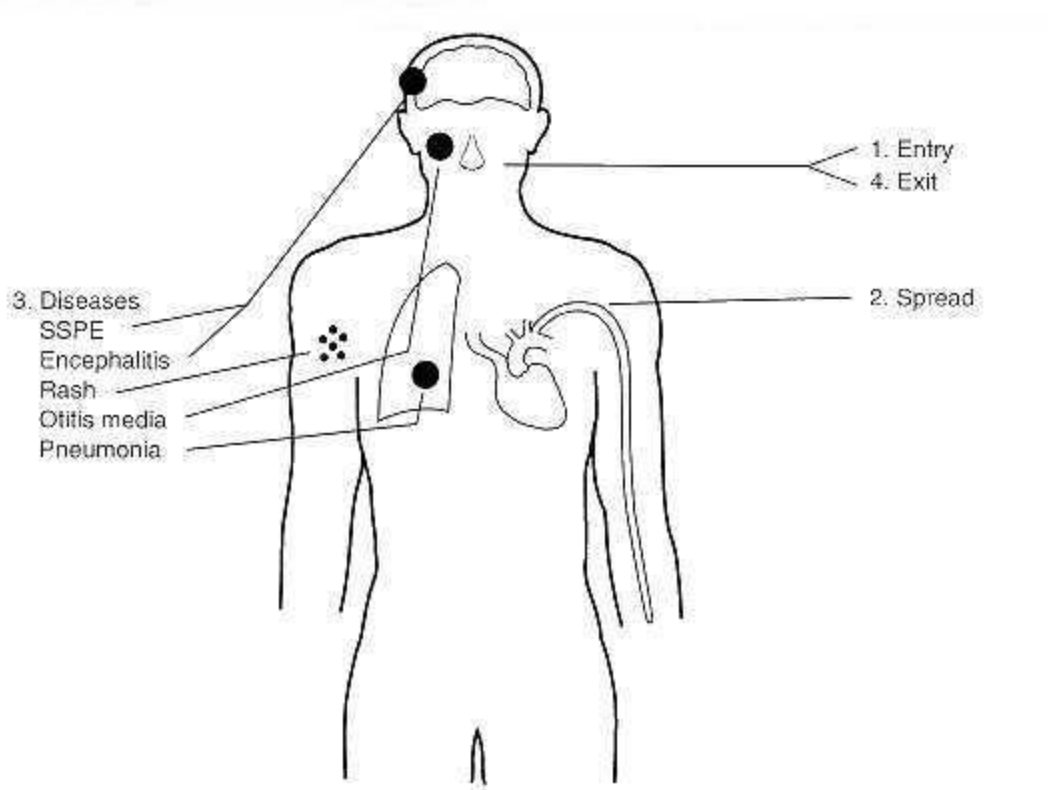
Measles virus (2)

- Source of infection-cases of measles
- One serotype
- No animal reservoir
- Infective material- Nasal secretion, Respiratory tract &Throat
- Communicability- Highly infectious
- Life-long immunity
- Virus found world-wide

Measles Pathogenesis

- Aerosol transmission
- Replication in nasopharynx and regional lymph nodes
- Primary viremia 2-3 days after exposure
- Secondary viremia 5-7 days after exposure with spread to tissues

Pathogenesis of measles (rubeola) virus infection



Measles pathogenesis

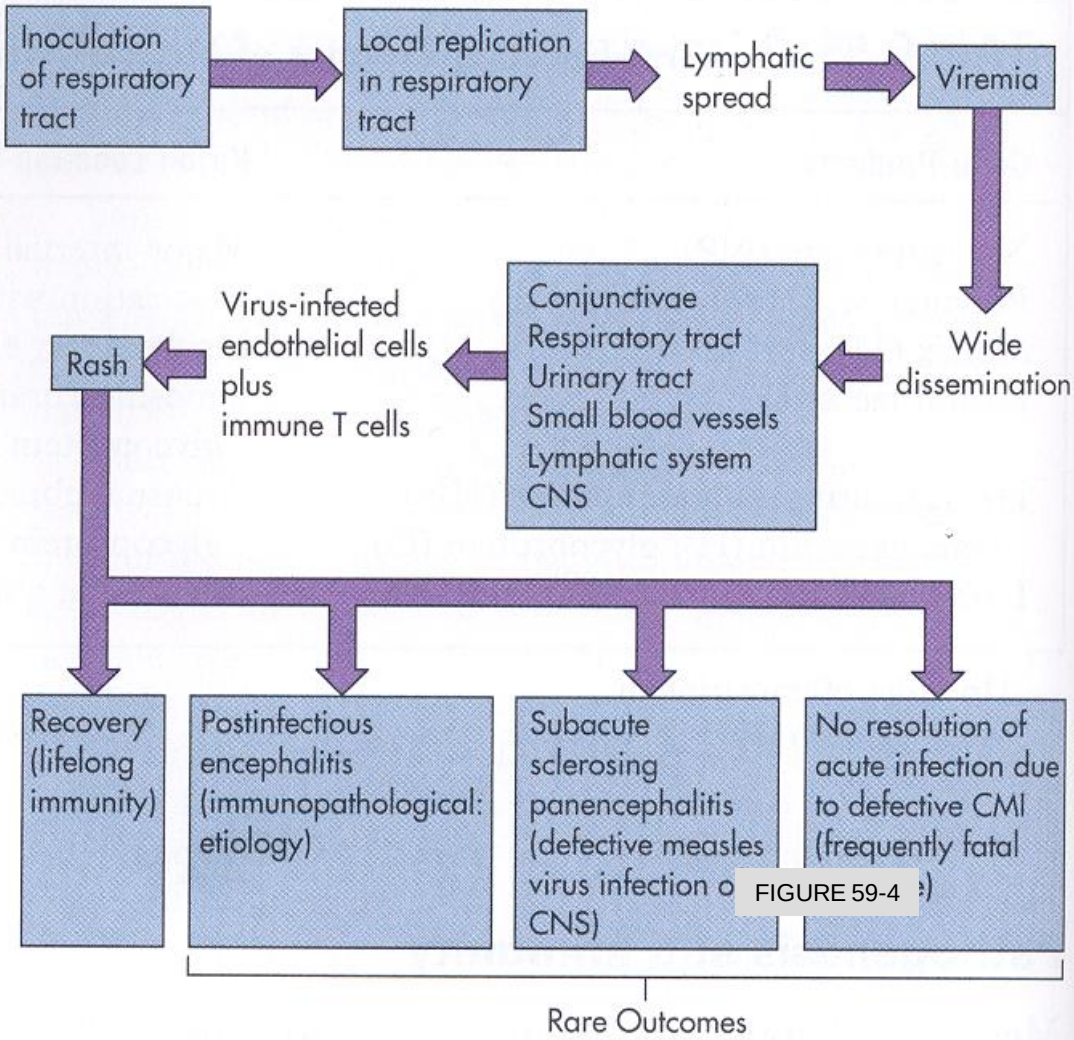
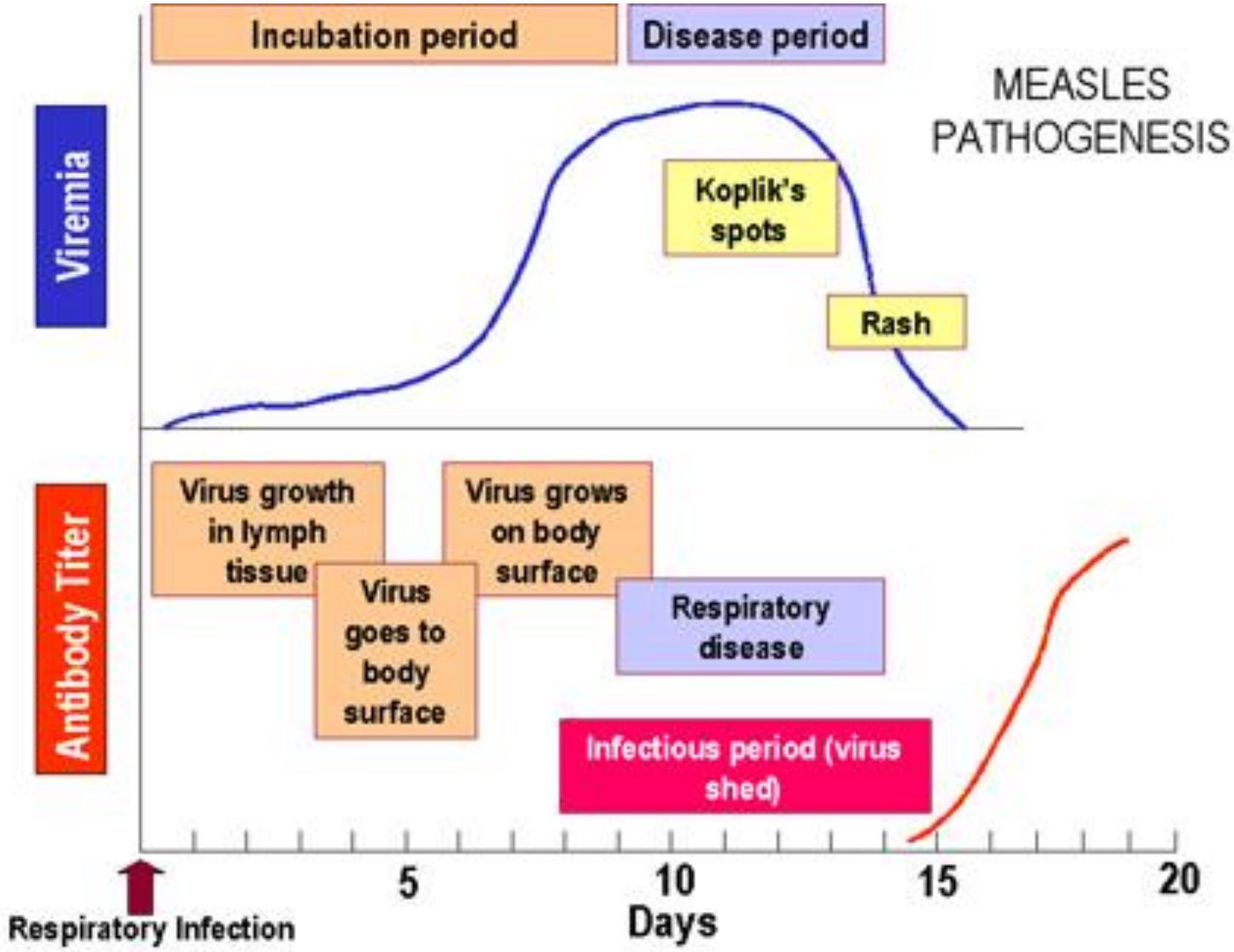


FIGURE 59-4

FIGURE 59-3

FIGURE 55–3. Mechanisms of spread of the measles virus within the body and the pathogenesis of measles. CNS = central nervous system; CMI = cell-mediated immunity.

From Murray et. al., Medical Microbiology 5th edition, 2005, Chapter 59, published by Mosby Philadelphia,,



Courtesy : Adapted from Mims et al. Medical Microbiology, 1993, Mosby

Clinical Features

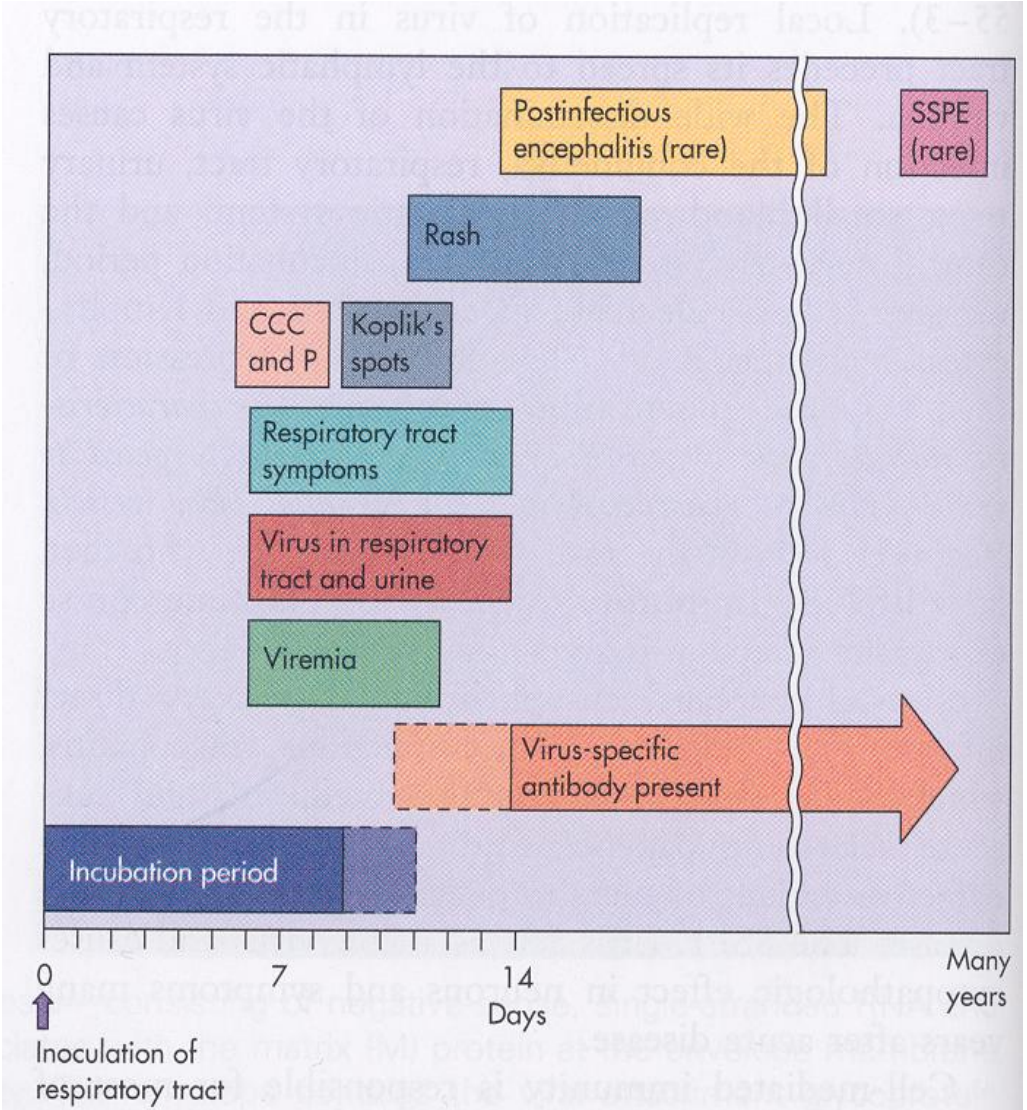


FIGURE 55–4. Time course of measles virus infection. Characteristic prodrome symptoms are cough, conjunctivitis, coryza, and photophobia (CCC and P), followed by the appearance of Koplik's spots and rash. SSPE = Subacute sclerosing panencephalitis.

Measles Clinical Features

Rash

- 2-4 days after prodrome, 14 days after exposure
- Maculopapular rash, becomes confluent
- Begins on face and head
- Persists 5-6 days
- Fades in order of appearance

Maculopapular rash

1. Macules – small flat discoloured spots on skin surface
2. Papules – small, raised bumps

Hence:-

Maculopapular rash -> flat, red area on the skin (covered with small confluent bumps

Measles rash

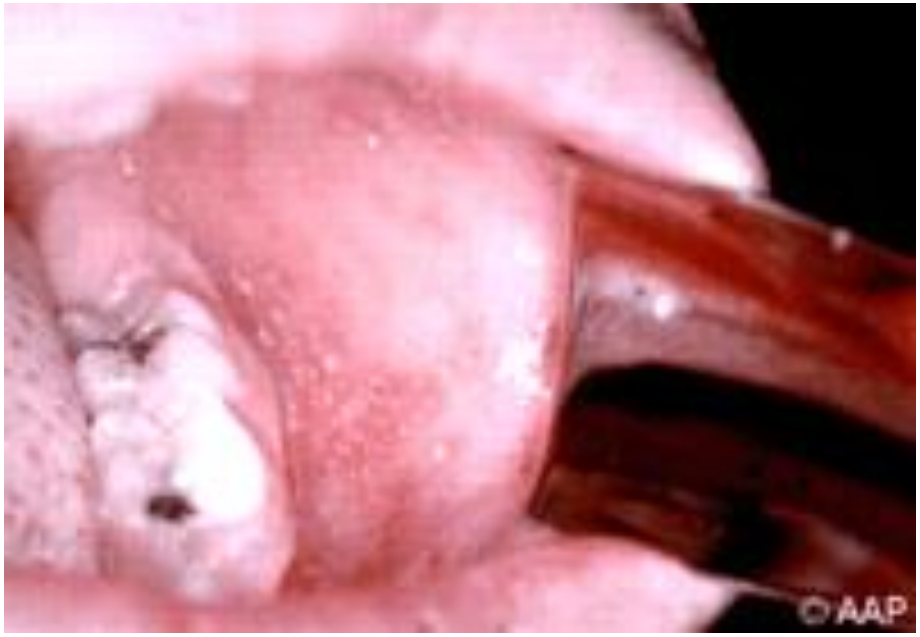
Child recovering from measles

(late 1960s – Nigeria)

Courtesy : This media comes from the Centers for Disease Control and Prevention's Public Health Image Library (PHIL), with identification number **#3168**

Measles - Conjuctivitis

Measles – Koplik spot



Measles – Koplik spots

Measles diagnosis

- **Clinical diagnosis usually easy**
- **Lab diagnosis:**

1. IFA

   - nasal secretions, urine, skin biopsy

2. Virus isolation difficult

   - not routinely done

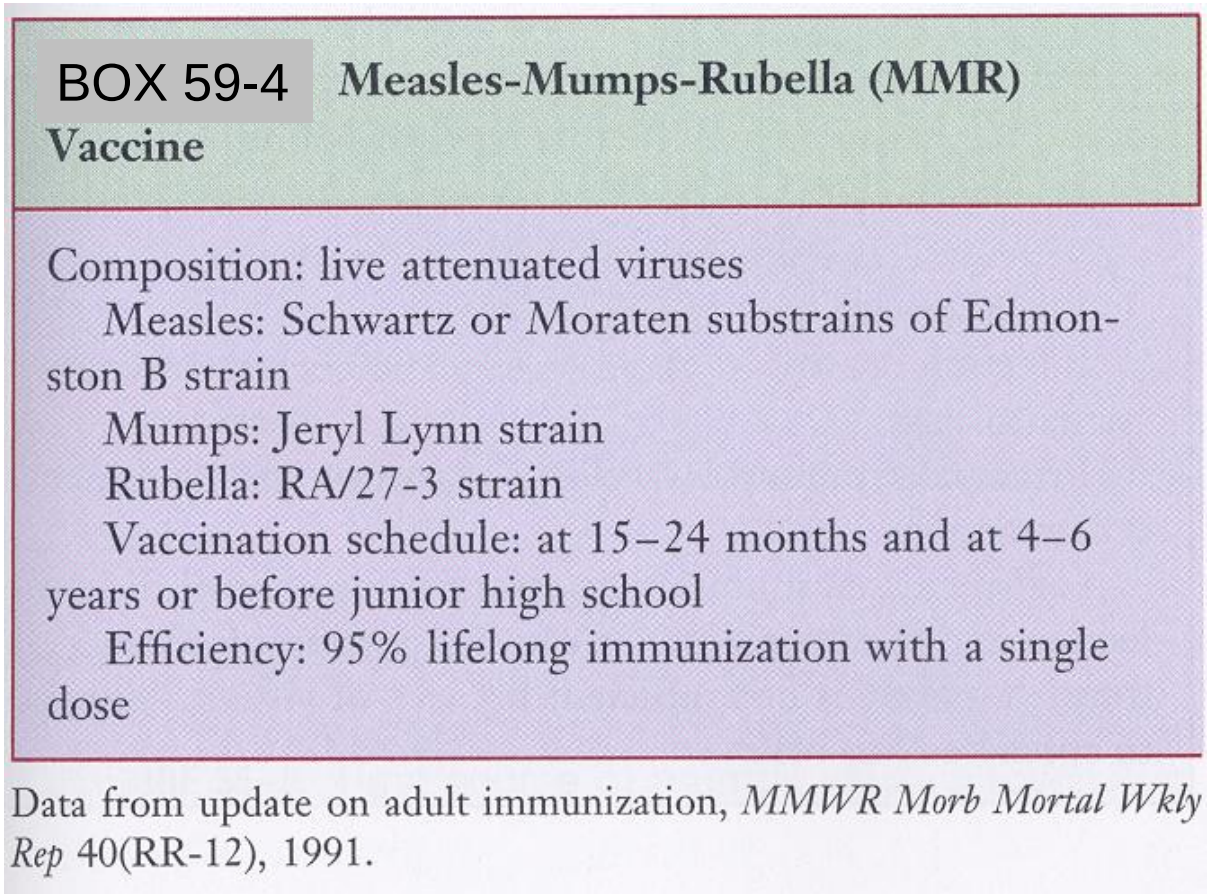
3. RT-PCR - in complicated cases
4. Serological

   - routine (IgM & IgG)

- **SSPE**

  - high IgG levels (without IgM) in serum & CSF usually diagnostic

The MMR Vaccine



BOX 59-4 **Measles-Mumps-Rubella (MMR) Vaccine**

Composition: live attenuated viruses
Measles: Schwartz or Moraten substrains of Edmonston B strain
Mumps: Jeryl Lynn strain
Rubella: RA/27-3 strain
Vaccination schedule: at 15–24 months and at 4–6 years or before junior high school
Efficiency: 95% lifelong immunization with a single dose

Data from update on adult immunization, *MMWR Morb Mortal Wkly Rep* 40(RR-12), 1991.

From Murray et. al., Medical Microbiology 5th edition, 2005, Chapter 59, published by Mosby Philadelphia,,

Complications of Measles

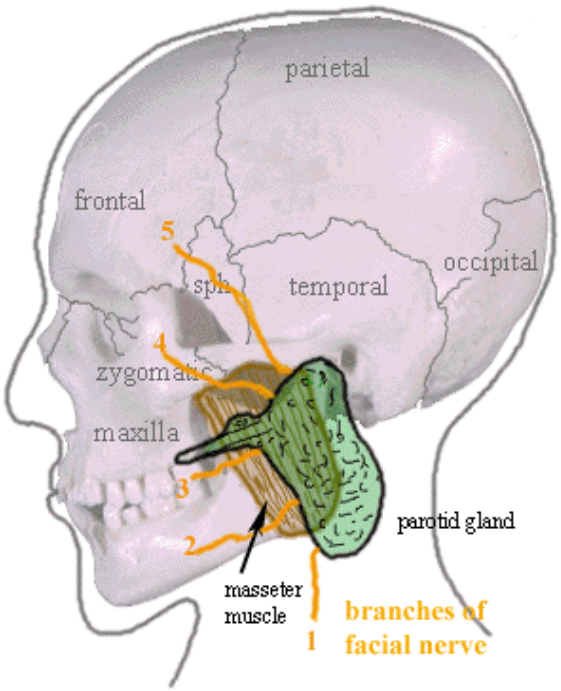
- Pneumonia
- Otitis media
- Convulsions,
- SSPE (sub acute sclerosing panencephalitis)

Mumps

Symptoms

Early symptoms can include:

- Sore throat *hallmark*
  - Difficult swallowing
- Fever
- Tiredness
- Muscle and body aches
- Loss of appetite
- Chills



Alex Khimich, Wikimedia Commons

Clinical features

- Parotid gland swelling
- Ovaritis
- Pancreatitis
- Ear ache
- Orchitis

Mumps Clinical Features

- Incubation period 14-18 days
- Nonspecific prodrome of myalgia, malaise, headache, low-grade fever
- Parotitis in 30%-40%
- Up to 20% of infections asymptomatic

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GENUS	HUMAN PATHOGEN
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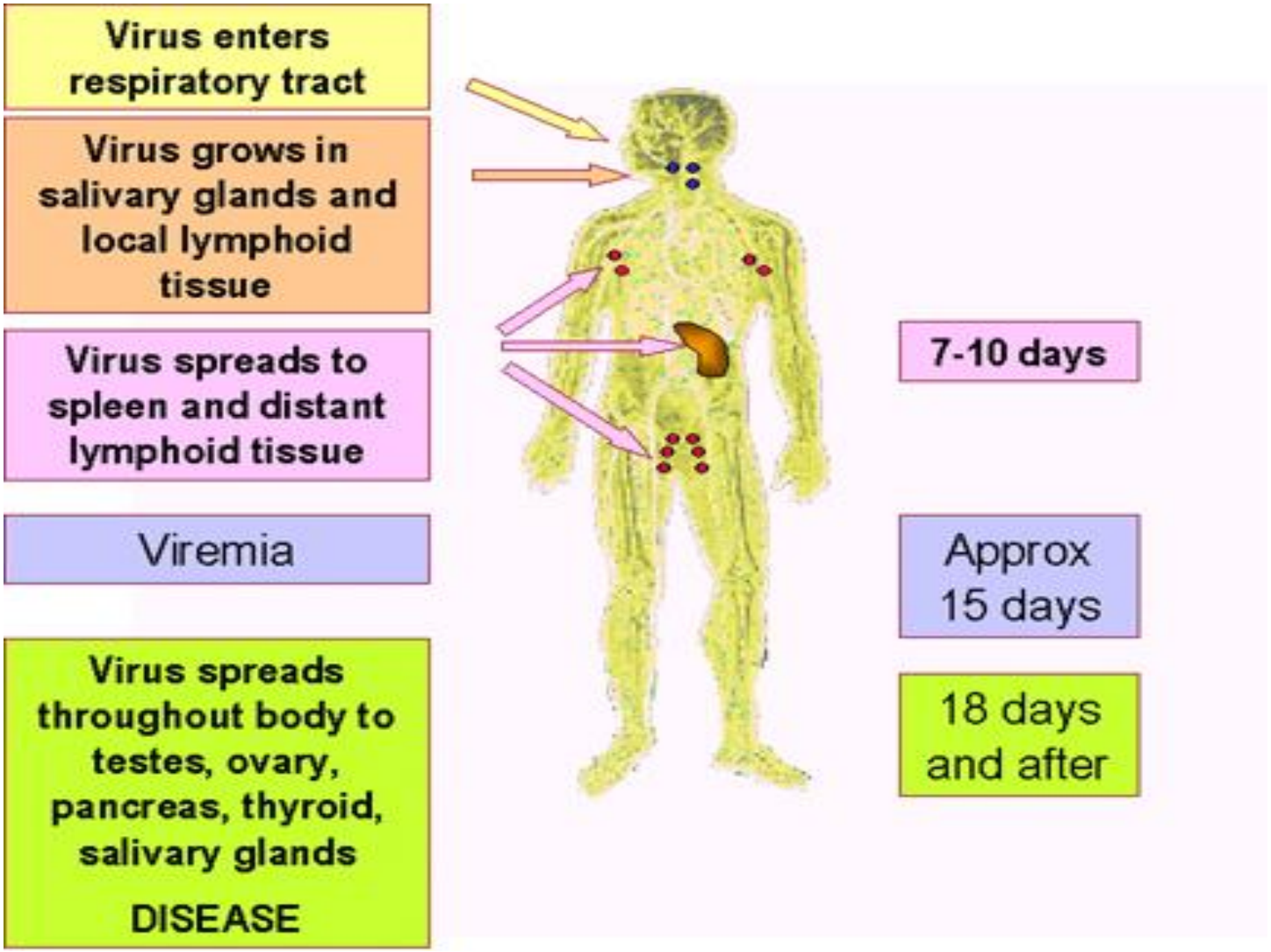
Mumps Virus

- Family = Paramyxoviridae
- ss(-)RNA virus
- Enveloped virus
- Cytoplasmic replication
- One antigenic type

Mumps Pathogenesis

- Aerosol transmission of virus
- Replication in nasopharynx and regional lymph nodes
- Viremia 12-25 days after exposure with spread to tissues
- Multiple tissues infected during viremia



Courtesy : Adapted from Mims et al. Medical Microbiology, 1993, Mosby

Complications

- Deafness
- Meningitis
- Encephalitis
- Myocarditis
- Arthritis
- Infertility – infection can spread to ovaries

Nursing Interventions

- Watch for abdominal pain, can mean involvement of the pancreas in either sex or involvement of the ovaries in girls
- In boys, watch for high fever with pain, swelling of the testicles
- Isolation until swelling subside
- Bed rest until swelling subside

Mumps Vaccine

- Composition — Live attenuated virus
- Efficacy — 95% (Range, 90%-97%)
- Duration of Immunity — Lifelong
- Schedule — ≥1 Dose
- Should be administered with measles and rubella (MMR) or with measles, rubella and varicella (MMRV)

Rubella

Clinical Features

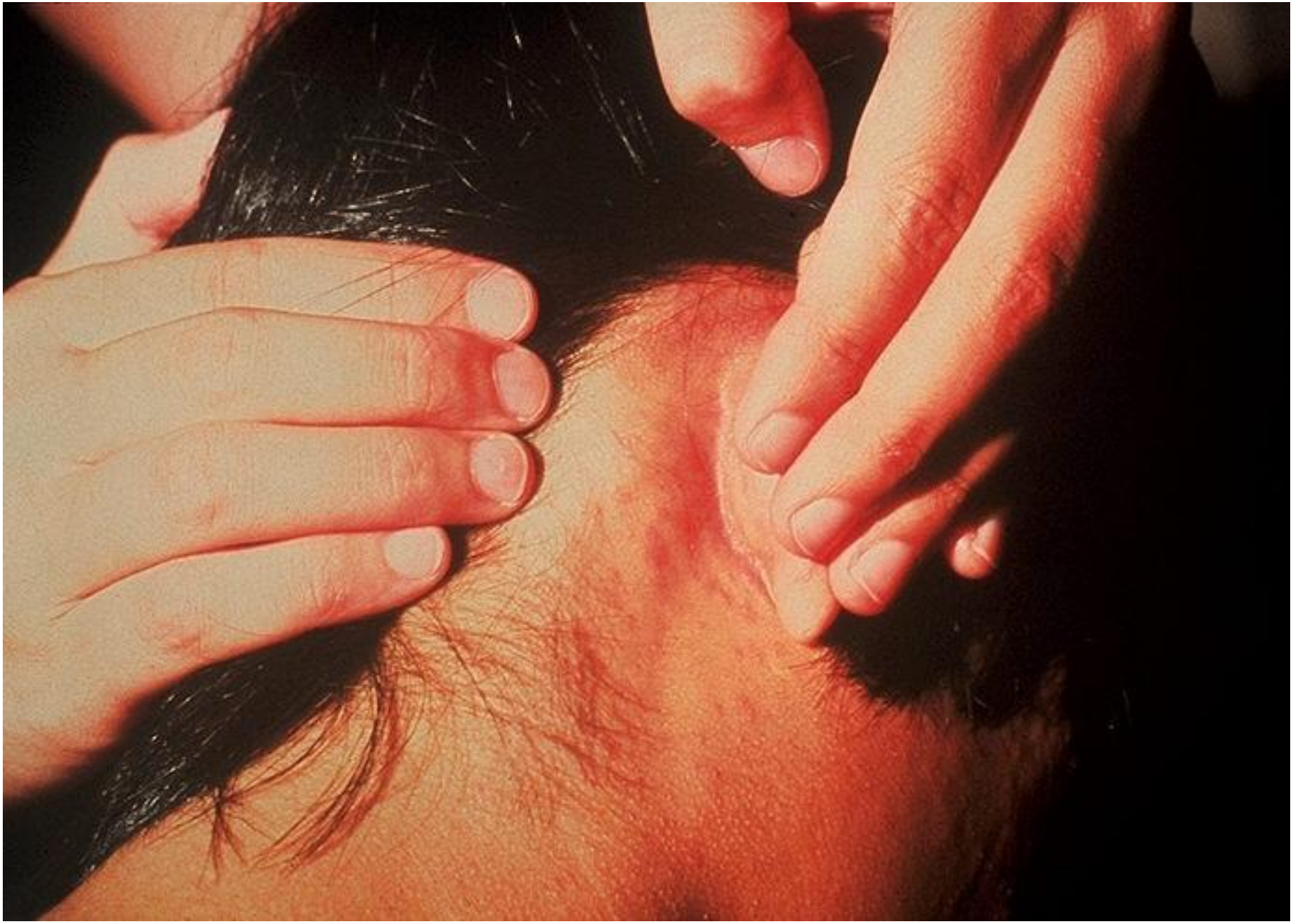
- Eye pain on lateral and upward eye movement
- Conjunctivitis
- Sore throat
- Headache
- General body aches
- Low-grade fever
- Chills
- Anorexia
- Nausea
- Tender lymphadenopathy (particularly posterior auricular and suboccipital lymph nodes)

Clinical Features (2)

- Incubation period 14 days

  (range 12-23 days)
- Prodrome of low-grade fever
- Maculopapular rash 14-17 days after exposure
- Usually quite mild

Image in a 4-year-old girl with a 4-day history of low-grade fever, symptoms of an upper respiratory tract infection, and rash. Courtesy of Pamela L. Dyne, MD.



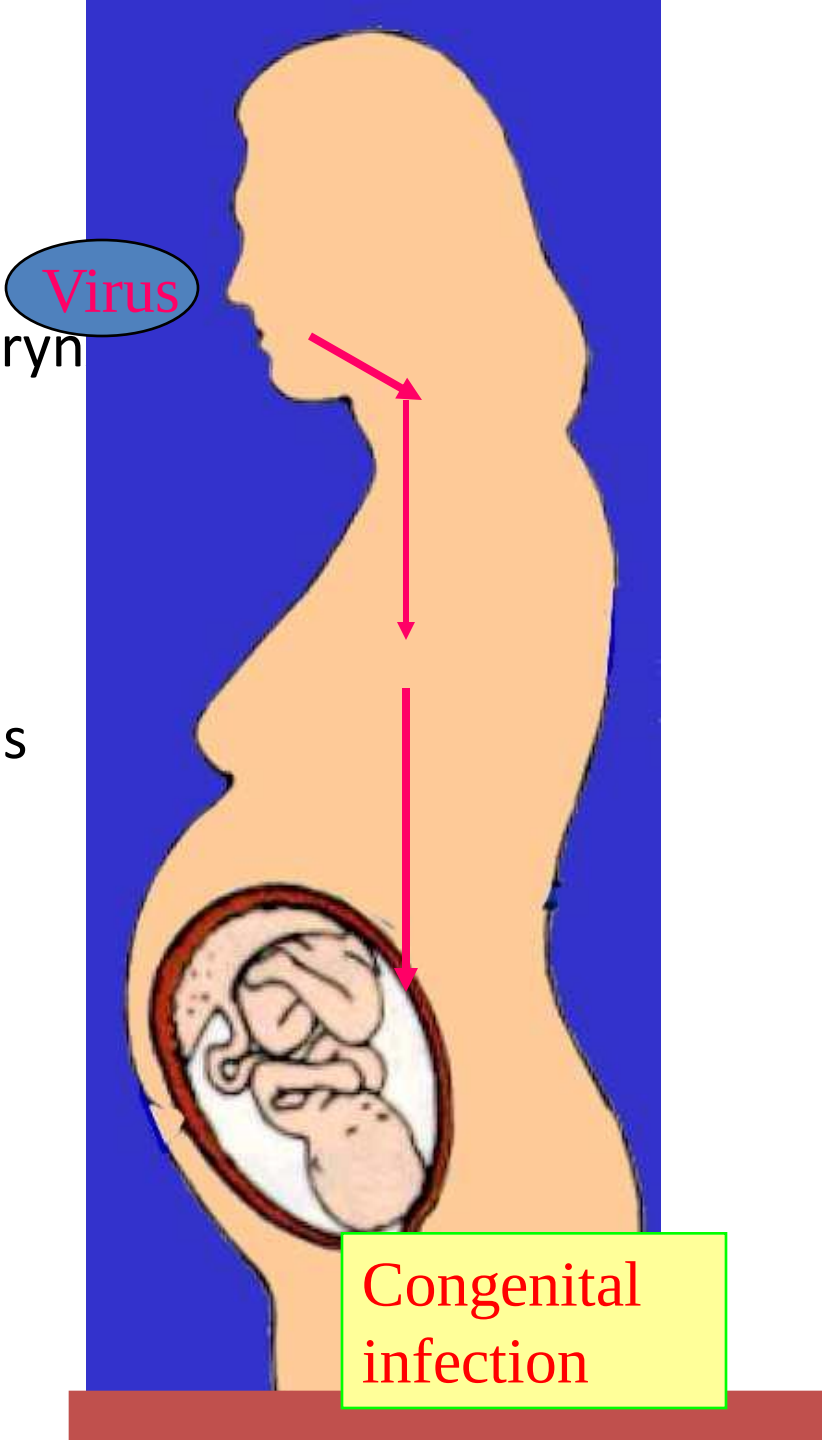
Rubella Virus

- Togaviridae family
- ss(+) RNA virus
- Enveloped
- Cytoplasmic replication
- One antigenic type
- Transmission – droplet, vertical (MTCT)
- Life-long immunity

Pathogenesis

- Rubella enters and infects the nasopharyn and lung
- Spread to lymph nodes and reticuloendothelial system.
- Viremic spread to other tissues & skin.
- Circulating antibody can neutralize virus
- Primary infection at pregnancy:

  -> virus can infect the placenta and spread to the fetus



Congenital Rubella Syndrome

- Mother->child transmission
- 1st trimester critical
- Infection may affect all organs
- May lead to fetal death or premature delivery
- Severity of damage to fetus depends on gestational age
- Up to 85% of infants affected if infected during first trimester

Congenital Rubella Syndrome

- Deafness
- Cataracts
- Heart defects
- Microcephaly
- Mental retardation
- Bone alterations
- Liver and spleen damage

Rubella Vaccine

- Composition — Live attenuated virus
- Efficacy — 95% (Range, 90%-97%)
- Duration of Immunity — Lifelong
- Schedule — At least 1 dose
- Should be administered with measles and mumps as MMR or with measles, mumps and varicella as MMRV

Treatment & Prevention

- Self limited illness
- No specific treatment or Antiviral treatment
- Clinically missed Rubella in 3-4 months of pregnancy is associated with fetal infections