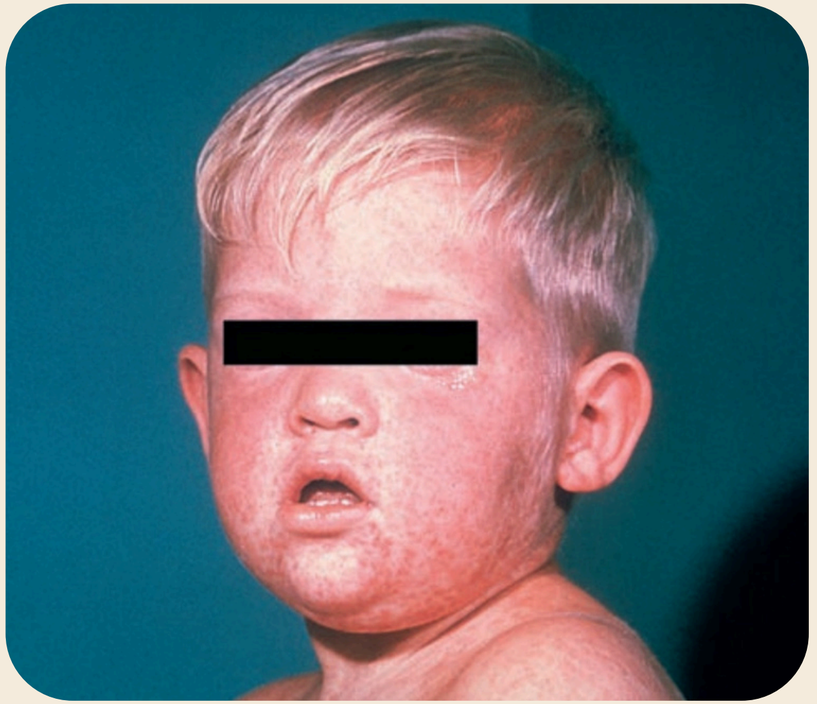
Rubella

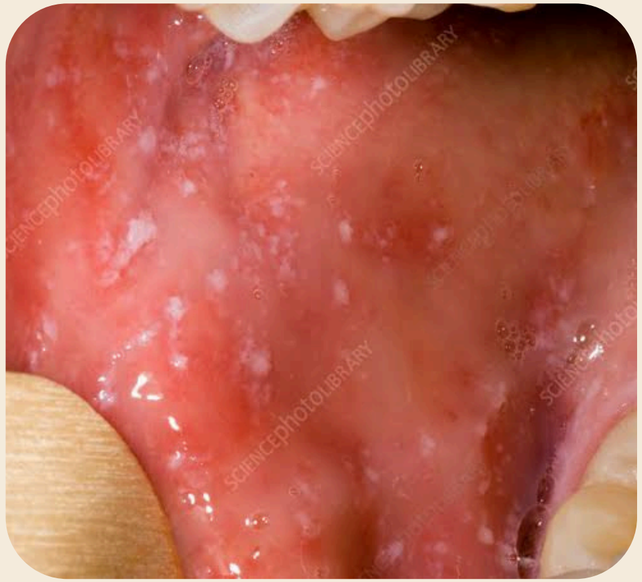
Overview

- Caused by Rubeola virus, a single-stranded RNA virus
- Belongs to Genus: Morbillivirus, Family: Paramyxoviridae
- Transmission: Highly contagious, spread through direct contact with respiratory droplets
- Infects epithelial cells in the respiratory tract, then spreads through blood to skin, lymph nodes, liver



Clinical course and symptoms

- Incubation Period: 10 to 12 days after exposure
- Prodromal Symptoms (2–4 days):
  - High fever
  - Cough
  - Coryza (runny nose)
  - Conjunctivitis (red eyes)
- Appearance of **Koplik spots**:
  - Gray-to-white lesions inside the mouth
  - Early diagnostic sign before rash



Measle rash and progression

- Rash develops about 14 days after exposure
- Erythematous, maculopapular rash:
- Begins at the hairline
- Spreads to face, neck, trunk, arms, hands, legs, feet
- Rash typically lasts 5–6 days and then fades

Complication of measles

- Common Complications:
  - Diarrhea
  - Otitis media (ear infection)
  - Croup and bronchitis
  - Pneumonia (can be severe)
- Rare but serious:
  - Encephalitis (brain inflammation)
  - SSPE (Subacute Sclerosing Panencephalitis) — fatal CNS degeneration
- Pregnancy Risks:
  - Premature labor
  - Miscarriage
  - Low birth weight

Vaccination of measles

- First vaccine (killed virus, 1963) — ineffective; caused atypical measles
- Live attenuated vaccine (introduced in 1968) — highly effective
- Given as part of MMR or MMRV vaccine:
  - First dose: 12–15 months of age
  - Second dose: 4–6 years
  - Two doses required for lifelong immunity
- Early vaccination (<12 months) may fail due to maternal antibodies

Global Status and Challenges

- Measles declared eliminated from U.S. in 2000, Americas in 2002
- Reemergence due to:
  - Travel and importation of cases
  - Refusal to vaccinate (religious reasons, misinformation)
- Outbreaks still occur in unvaccinated populations

Diagnosis of Measles

- Clinical Presentation: Classic symptoms plus Koplik spots and rash
- Laboratory Confirmation:
  - Serology (IgM and IgG antibody detection)
  - RT-PCR (detects viral RNA)

Serological Testing for measles

- IgM Antibody Detection (for acute infection):
  - Test Used: IgM Capture **ELISA (Enzyme-Linked Immunosorbent Assay)**
    - Highly sensitive
    - Detectable 3–4 days after rash onset
    - Persists for 1–2 months
  - Other methods (less commonly used today):
    - Indirect Immunofluorescence Assay (IFA)
    - Particle Agglutination Test
    - IgG Antibody Detection (for immunity status):
- Test Used: IgG ELISA
- Detectable 7–10 days after rash onset
- Confirms past infection or successful vaccination
- Fourfold rise in IgG titer between acute and convalescent sera indicates recent infection
- Important Notes:
  - Early collection (<72 hrs) after rash may cause false negatives → repeat testing recommended.
- SSPE cases show extremely high IgG titers.

Molecular Diagnosis

- **RT-PCR**: Detects rubeola RNA
- Used when serology is inconclusive or for epidemiologic surveillance
- Samples: nasopharyngeal aspirate, throat swab, blood, or urine
- Can detect viral RNA as early as 3 days after rash onset
- Helps identify virus genotype in outbreaks

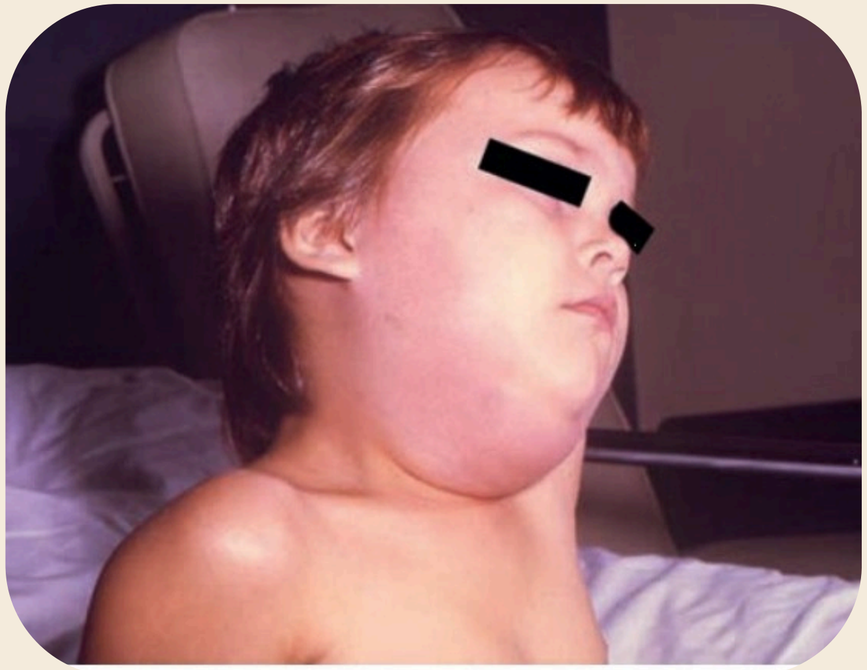
Mumps

Mumps Virus Overview

- Causative Agent: Mumps virus, single-stranded RNA virus
- Family/Genus: Paramyxoviridae family, genus Rubulavirus
- Transmission:
  - Respiratory droplets
  - Saliva
  - Fomites
- Primary Replication: Nasopharynx and lymph nodes

Pathogenesis and Clinical Features

- Incubation Period: 14–18 days
- Spread: Blood dissemination to meninges, salivary glands, pancreas, testes, ovaries
- Most Common Manifestation: Parotitis (30–40% of cases)
- Other Sites Affected: CNS, reproductive organs
- Resolution: 7–10 days with supportive treatment



Mumps in Pregnancy

- First Trimester Infection:
- Increased risk of fetal death
- Note: No associated congenital abnormalities

Vaccination and Disease Reduction

- Vaccine Introduction: Live attenuated vaccine (1967)
- Routine Use: Since 1977 in MMR/MMRV vaccines
- Effect: Significant decline in mumps cases

Diagnosis – Clinical Features

- Primary Diagnosis:
  - Clinical symptoms (especially parotitis)
- When Laboratory Testing is Needed:
  - Absence of parotitis
  - Differentiation from other causes of parotitis

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Laboratory Diagnosis-Culture

- Gold Standard: Virus culture from clinical specimens
- Best Specimens:
  - Buccal swab or saliva (collected within 3–5 days of onset)
- Other: Urine, CSF, parotid duct swab
- Culture Details:
  - Cell lines: Primary monkey kidney cells, Vero cells
  - Shell vial culture + fluorescein-labeled monoclonal antibodies

Limitation of Culture

- Limitations of Culture
- Challenges:
  - Requires expertise and specialized reagents
  - Time-consuming
  - Current Trend: Gradual replacement by molecular methods
  -

Laboratory Diagnosis-Molecular testing

- Preferred Method: RT-PCR (standard or real-time)
- Specimens: Buccal swab, throat swab, CSF, urine
- Advantages:
  - Higher sensitivity than serology
  - Detects virus within early phase
  - Useful for virus genotyping in outbreaks
- Limitations: False-negatives if specimen collected after 1 week
  -

Laboratory Diagnosis- Serology Testing

- Method: ELISA for IgM and IgG detection
- IgM Detection:
  - Appears 3–4 days after symptoms
  - Indicates recent infection
  - May persist 8–12 weeks
  - Reduced/absent after vaccination
- IgG Detection:
  - Appears 7–10 days after onset
  - Persists for years
  - Confirms past infection or vaccination
  -

Serology Limitation

- False Negatives:
  - Early or late serum collection
- IgM Issues:
  - Low or absent in vaccinated individuals
- IgG Presence:
  - Does not always mean protective immunity

Human T-Cell Lymphotropic Viruses (HTLV-I and HTLV-III)

Introduction to HTLV-I and HTLV-II

- Closely related retroviruses
- Structural genes:
  - gag-(viral core protein)
  - pol-(viral enzymes)
  - env-(viral envelope)
- Regulatory region: pX (includes Tax)
- RNA virus with reverse transcriptase

Viral Replication Cycle

- Viral RNA → DNA via reverse transcriptase
- DNA integrates into host genome (provirus)
- Latency before activation
- Spreads through viral synapse

Target Cells and Immune Response

- Infects CD4+, CD8+ T-cells, dendritic cells, macrophages
- CD8+ CTLs limit infected cells
- Inflammatory cytokines contribute to disease
- Treg cells suppress immune response

HTLV Transmission

- Bloodborne (transfusion, IV drug use)
- Sexual contact (male to female)
- Mother-to-child (breastfeeding)

Epidemiology

- Endemic in Japan, Caribbean, Africa, Middle East, South America, Papua New Guinea
- 5–20 million infected worldwide
- HTLV-II common in Native Americans and IV drug users

Diseases Caused by HTLV-I

- Adult T-cell Leukemia/Lymphoma (ATL)
- HTLV-I-associated Myelopathy/Tropical Spastic Paraparesis (HAM/TSP)
- Possible autoimmune/inflammatory diseases
  - uveitis(intraocular of the eyes)
  - infective dermatitis, myositis(inflammation of the muscles)
  - arthropathy(inflammatroy of the joints)

Adult T-cell Leukemia/Lymphoma (ATL)

- 4 subtypes: Acute, Lymphomatous, Chronic, Smoldering
- Acute: median survival 6 months
- Flower-shaped malignant cells
- Lifetime risk 3–5%, higher if perinatally infected

HTLV-I-associated Myelopathy/Tropical Spastic Paraparesis (HAM/TSP)

- Progressive leg weakness, stiffness
- Back pain, urinary incontinence
- 4% lifetime risk
- More common with sexual transmission

HTLV-II infection

- Disease link not clear
- Possible neurological, blood, and skin diseases
- Mostly asymptomatic

Diagnosis- Serological Testing

- Antibodies appear 30–90 days post-infection
- Tests: ELISA, CLIA, Particle Agglutination
- Antibodies persist for life

Confirmatory Testing

- Confirmatory tests:
  - Western Blot
  - LIA (Line immunoassays)
  - IFA
- Positive: env and gag bands

Indeterminate Results and PCR Use

- Indeterminate if unclear bands
- PCR detects proviral DNA
- PCR monitors viral load during treatment

Thank You