

# Airborne Viruses

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# Airborne Viruses

1. Influenza Viruses (Seasonal Influenza, Highly Pathogenic Avian Influenza - H5N1, Avian Influenza A – H7N9)
2. Novel Coronavirus (SARS/MERS)
3. Measles/Rubella Virus
4. Coxsackie Virus
5. Echoviruses
6. Parainfluenza Viruses
7. Respiratory syncytial Virus

# Clinical Features

- Fever, chills, sorethroat, generalized muscular aches, malaise, headache, coughing, sneezing, running nose, pneumonia
- Rash (Measles/Rubella)

# Laboratory Diagnosis

# Clinical Specimen Sources

Be prepared to collect specimens before you leave for the field

- **Suspected cases**
  - **Symptomatic cases**
- **Contacts**
  - **Including people living or working with suspected cases**

# The Specimen Collection Kit

# Specimen Collection Kit

- **Collection vials with VTM**
- **Polyester fiber-tipped applicators**
- **Tongue depressors**
- **Secondary container**
- **Ice packs (wet ice in sealed plastic bags)**
- **Cold box**
- **Zip-locked bags**
- **Personal protective equipment**
- **Field collection forms**
- **Permanent pen or marker for labeling samples**
- **Scissors**

# Personal Protective Equipment (PPE)

- Masks (N-95 )



- Hair covers



- Gloves



- Boot or shoe covers



- Protective eye ware (goggles)



- Protective clothing (gown and apron)



# How to Manage Kits

- Store specimen collection kits in a dry, cool place
- Store specimen collection kit where it will be accessible after office hours and on weekends

# Specimen types

- Basically whether seasonal, avian, swine or pandemic, the samples for laboratory diagnosis are the same- respiratory specimens in **Viral Transport Media (VTM)**

## Upper Respiratory tract specimens:

- Nasal swab
- Nasopharyngeal swab (**specimen of choice for MERS**)
- Nasopharyngeal aspirate
- Nasal wash
- Throat swab

## Lower respiratory tract samples

- Transtracheal aspirate
- Bronchoalveolar lavage
- Lung biopsy
- Post-mortem lung or tracheal tissue

# What to Collect

Preferred specimens

From an Ambulatory patient

- Nasopharyngeal swab *and*
- Throat swab
- Can be collected into the same VTM

From an Intubated patient

- Lower respiratory aspirate

Swabs – rayon, drayon, polyester swab



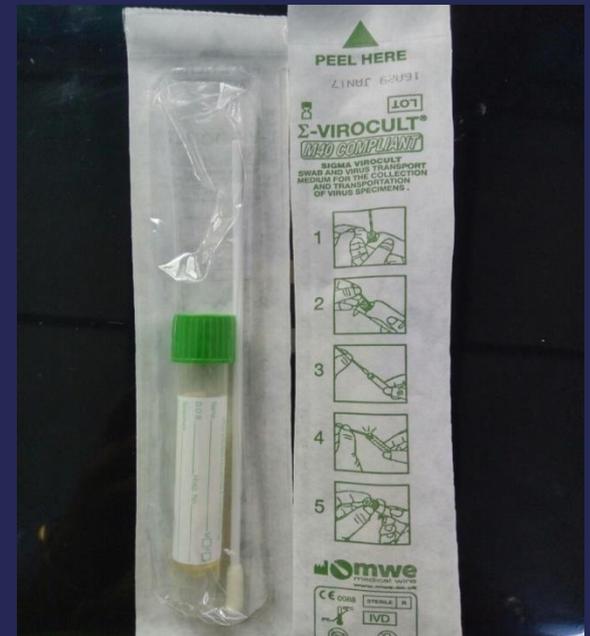
Cotton swab with wooden shaft – inhibit PCR

# What is Viral Transport Medium?

- Used in the collection of samples for viral isolation and testing
- Prevents specimen from drying out
- Prevents bacteria and fungi growth

# Storing VTM

- Sterile collection tubes containing 2-3 ml of VTM
- Tubes can be stored at 4-8 °C until use
- Tubes can be stored for short periods of time at Room Temperature
- Keep records of when the VTM tube was received and its expiry date



# When to Collect Respiratory Specimens

- As soon as possible after symptoms begin
- Before antiviral medications are administered
- Even if symptoms began more than one week ago
- Collect additional specimens when required or indicated

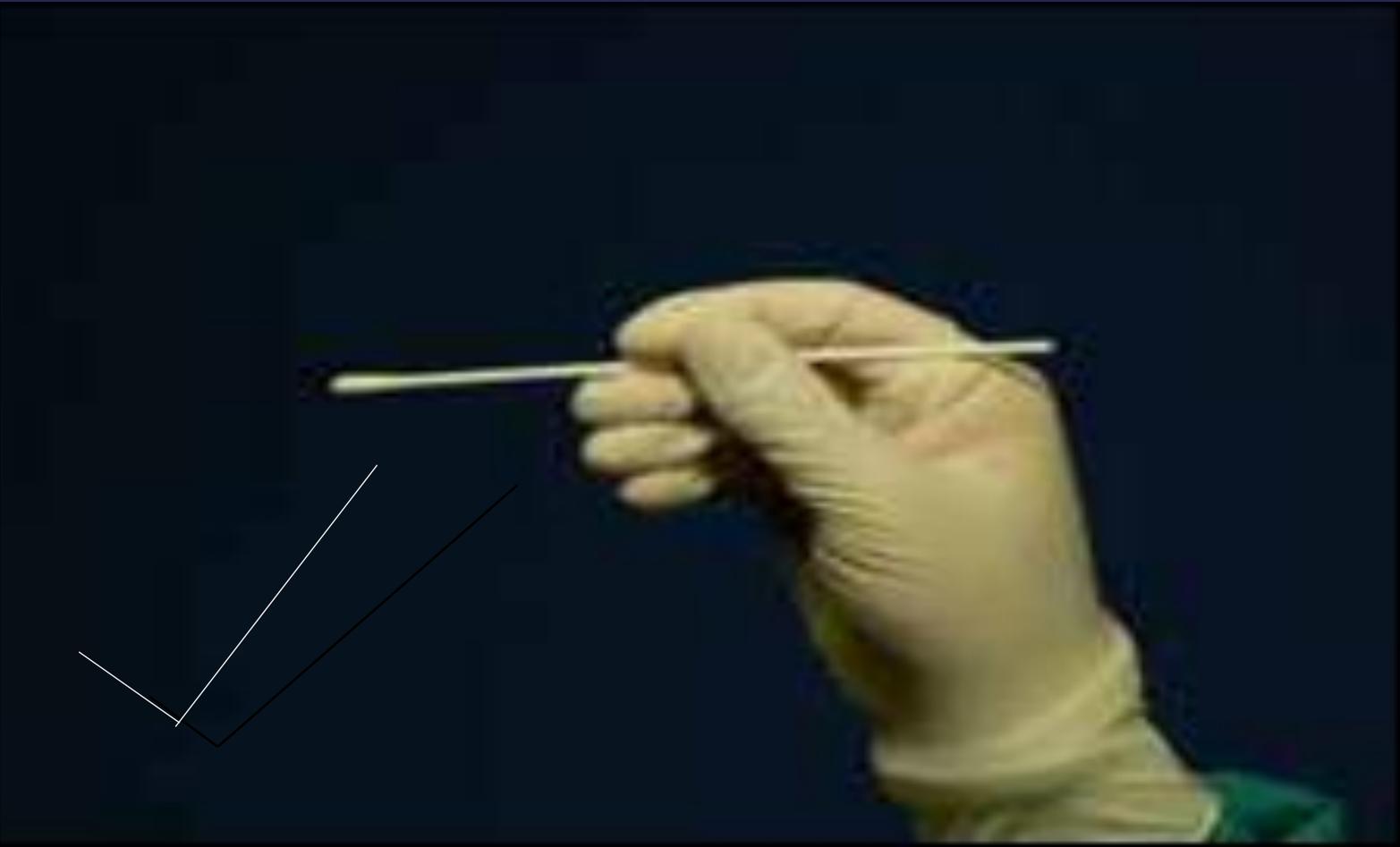
# How to Collect Specimens

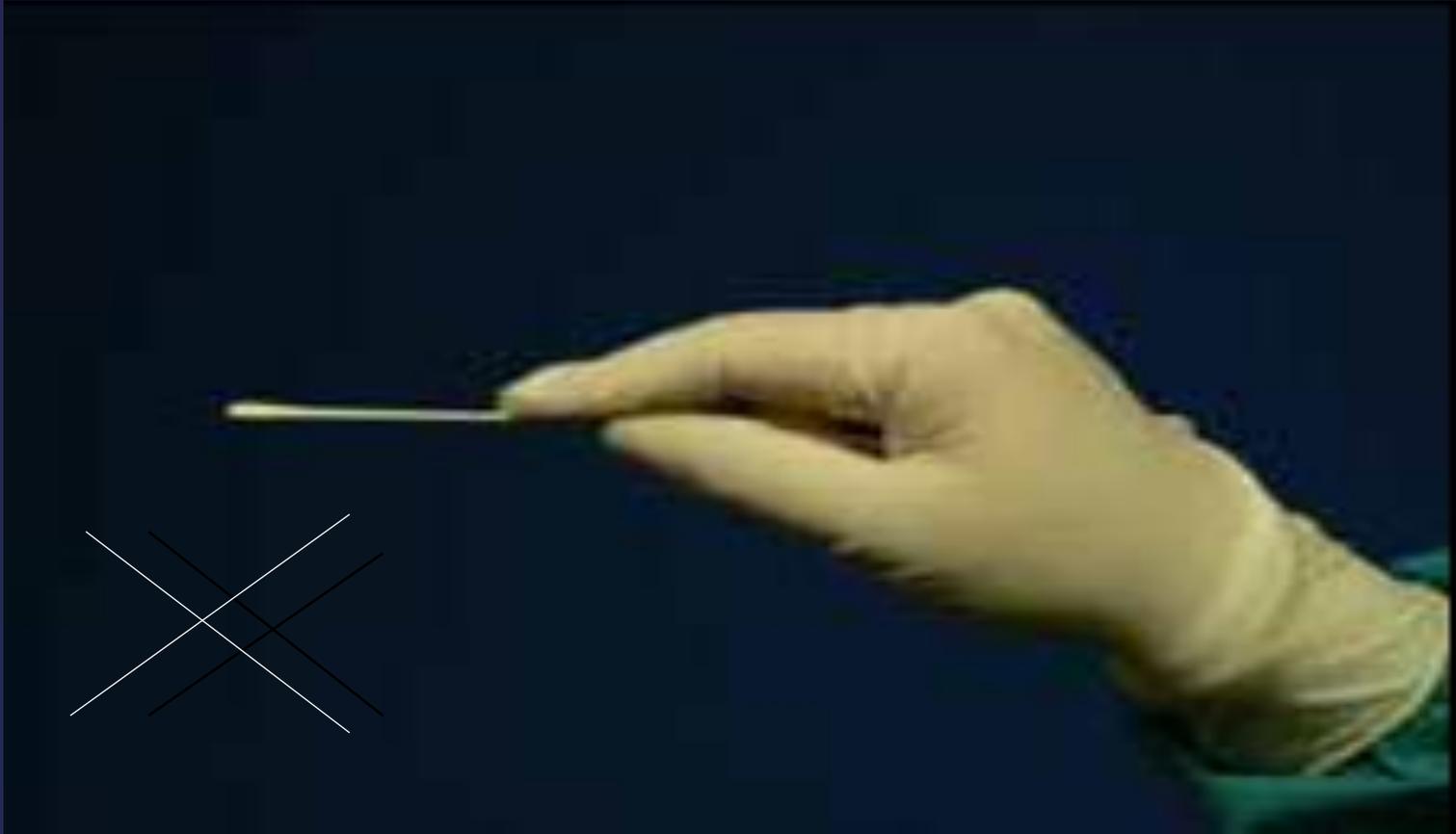
- Before collection - need to reassure and explain the procedure
- Children may need to be restrained
- Child's parents or guardian must be made aware that the child may become distressed
- Parents should not be in room- may interfere, more risk, no PPE



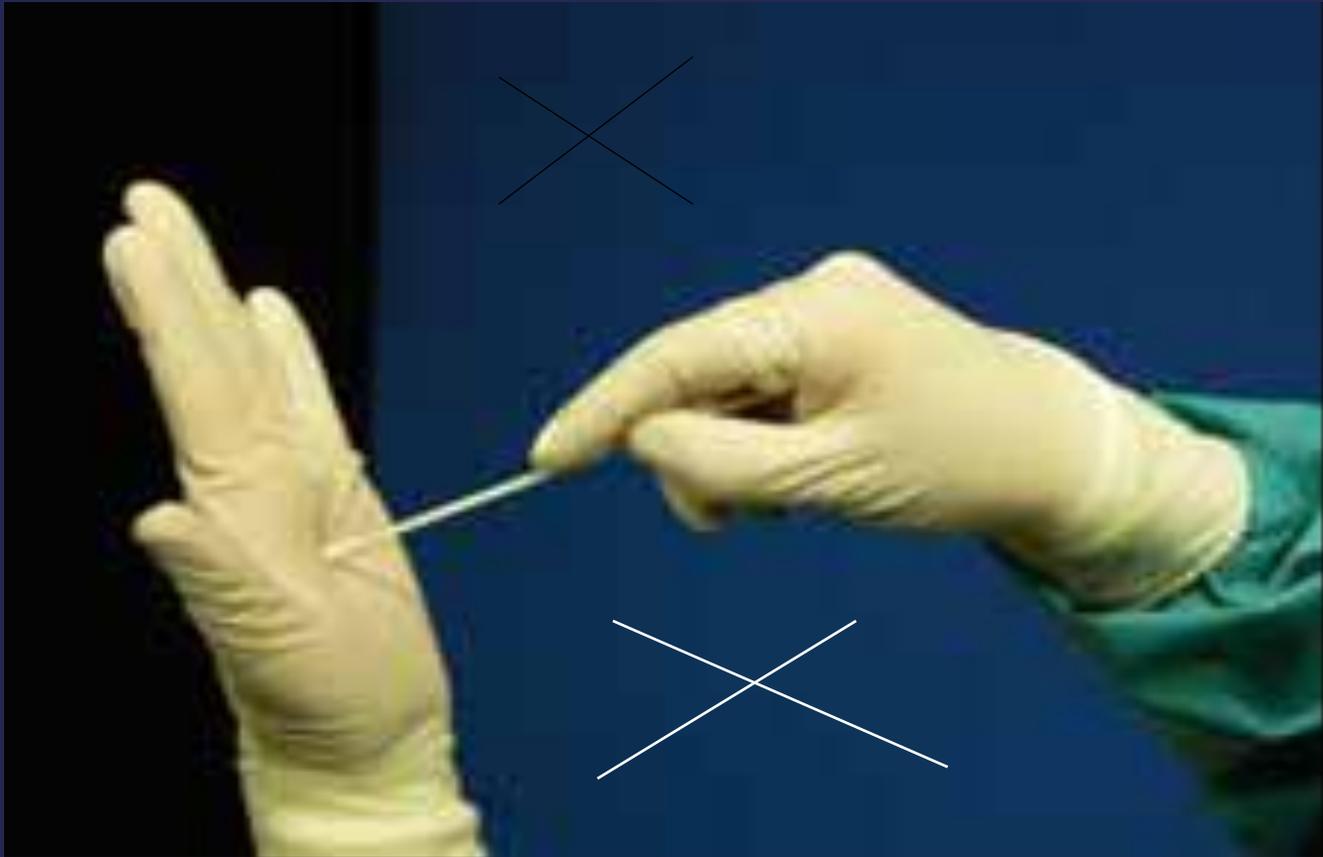






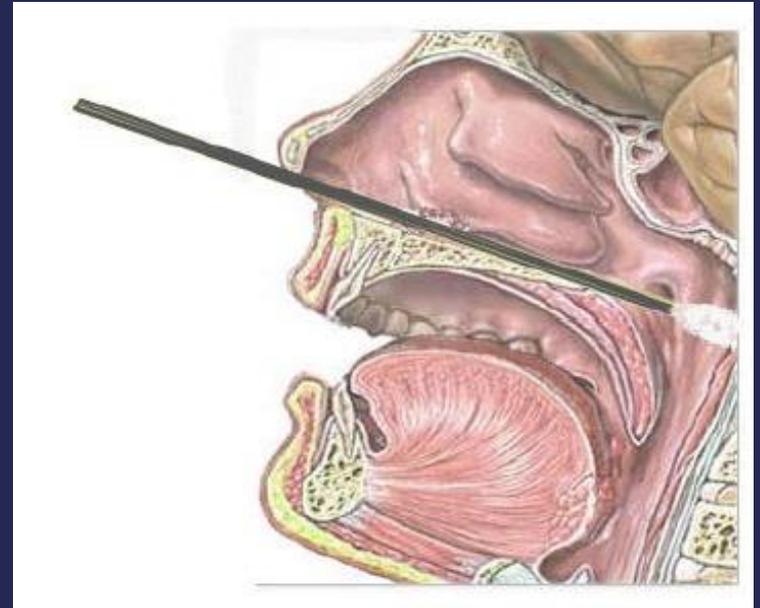






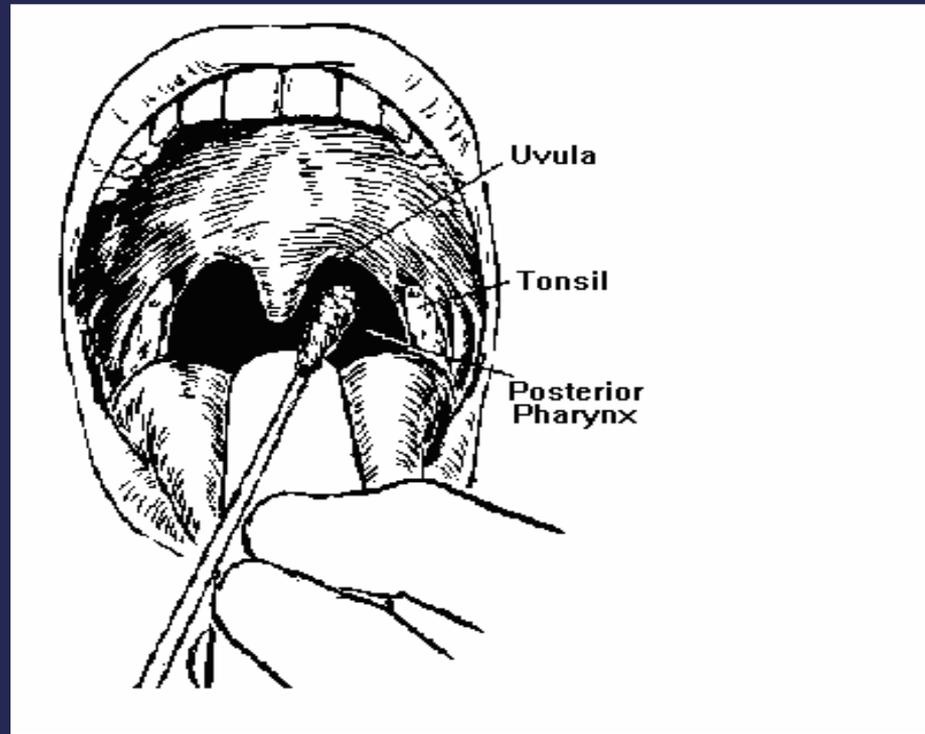
# Nasopharyngeal Swab

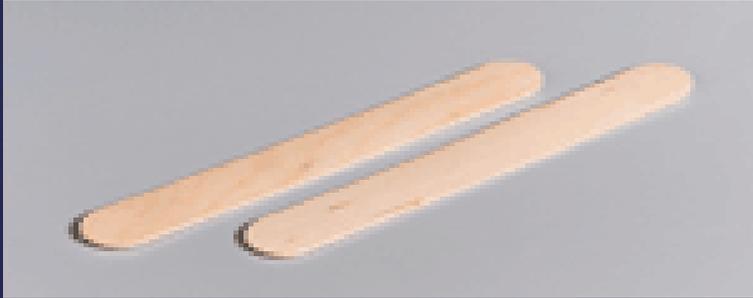
1. Insert dry swab into nostril and back to nasopharynx
2. Leave in place for a few seconds
3. Slowly remove swab while slightly rotating it
4. Put tip of swab into VTM tube, breaking applicator's stick
5. Use a different swab for the other nostril, same procedure as above



# Throat Swab

- Tilt the patient's head back and gently depress the tongue with a tongue depressor
- The tonsillar areas and the posterior pharyngeal wall should be rubbed with the polyester swab to dislodge the epithelial cells
- Care should be taken not to touch the tongue and the lateral walls of the buccal cavity to avoid contamination with commensal bacteria
- After collection, break the shaft of the swab and place immediately into a VTM tube





Tongue Depressor



Throat Swab

# Specimen Tracking System

Maintain a record to track:

- Identification number
- Subject information
- Specimen collection date
- Specimen collection location
- Diagnostic test results

Please complete this form carefully and circle the response.

<p>1. Report/Investigation Information: Name of Investigator(s): _____</p> <p>Date - Case Reported: ___/___/___ Title / Office / Hospital : _____</p> <p>Date - Case Investigated: ___/___/___ Notified by: _____</p>																			
<p>2. Case Identification: Patient's Name: _____</p> <p>Date of Birth: ___/___/___ Age: years _____ months _____ Sex: _____</p> <p>Father's Name: _____ Mother's Name: _____</p> <p>Full Permanent Address: State/Region: _____ Township: _____</p> <p>Village/ward: _____ Street No. &amp; House No _____</p> <p>Phone No. _____</p>																			
<p>3. Hospitalization: Yes / No Date of Hospitalization: ___/___/___</p> <p>Name of Hospital: _____ Hospital Registration Number: _____</p> <p>Clinical Diagnosis: _____ ( LI / SARI )</p> <p>Outcome: Recovered completely / Death / Unknown</p>																			
<p>4. Immunization History: Vaccinated against Flu? Yes / No / Unknown</p> <p>Date of last Flu dose: ___/___/___</p>																			
<p>5. Signs and Symptoms: Date of onset of first symptoms: ___/___/___</p> <p>Fever: Yes / No / Unknown Cough: Yes / No / Unknown</p> <p>Headache: Yes / No / Unknown Runny or Stuffy Nose: Yes / No / Unknown</p> <p>Muscle Ache: Yes / No / Unknown <b>Sore throat</b>: Yes / No / Unknown</p> <p>Joint Ache: Yes / No / Unknown Vomiting: Yes / No / Unknown</p> <p>Other symptoms: _____</p>																			
<p>Contact History: Yes / No / Unknown If yes, with whom: _____</p>																			
<p>RTD: Yes / No If yes, result of RDT: _____</p>																			
<p>6. Specimen Collection:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Date Collected</th> <th>Date Sent to Lab</th> <th>Date of Result</th> <th>Laboratory Results</th> </tr> </thead> <tbody> <tr> <td>Nasopharyngeal Swab</td> <td>___/___/___</td> <td>___/___/___</td> <td>___/___/___</td> <td>Positive / Negative</td> </tr> <tr> <td>Throat Swab</td> <td>___/___/___</td> <td>___/___/___</td> <td>___/___/___</td> <td>Positive / Negative</td> </tr> </tbody> </table>						Date Collected	Date Sent to Lab	Date of Result	Laboratory Results	Nasopharyngeal Swab	___/___/___	___/___/___	___/___/___	Positive / Negative	Throat Swab	___/___/___	___/___/___	___/___/___	Positive / Negative
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Throat Swab	___/___/___	___/___/___	___/___/___	Positive / Negative															
<p>8. Case Classification: Lab confirmed Seasonal Influenza / Lab confirmed Avian Influenza / Discard</p>																			
<p>9. Signature of responsible person filling the form: _____</p>																			

ILI Case Definition: An acute respiratory infection with: (1) measured fever of  $\geq 38\text{ }^{\circ}\text{C}$ ; (2) and cough; (3) with onset within the last 10 days.

SARI Case Definition: An acute respiratory infection with: (1) history of fever or measured fever of  $\geq 38\text{ }^{\circ}\text{C}$ ; (2) and cough; (3) with onset within the last 10 days; (4) and requires hospitalization.

# Specimen Storage, Handling, and Transportation

# How to Store Specimens

For specimens in VTM:

- Transport to laboratory as soon as possible
- Store specimens at 4 °C before and during transportation within 48 hours
- Do not store in standard freezer – keep on ice or in refrigerator
- Avoid freeze-thaw cycles
  - Better to keep on ice for a week than to have repeat freeze and thaw

# Specimen forwarding

Three main purpose

To maintain specimen viability

To prevent leakage outside the package

To prevent cross contamination

\*All samples for virus diagnosis must be sent in cold chain

# Specimen transportation

# Packing Specimens for Transportation

- Use three packaging layers
- First layer should be water tight
- Use absorbent material in all layers
- No more than 500 mL should be in the specimen container

# Packing Specimens for Transportation

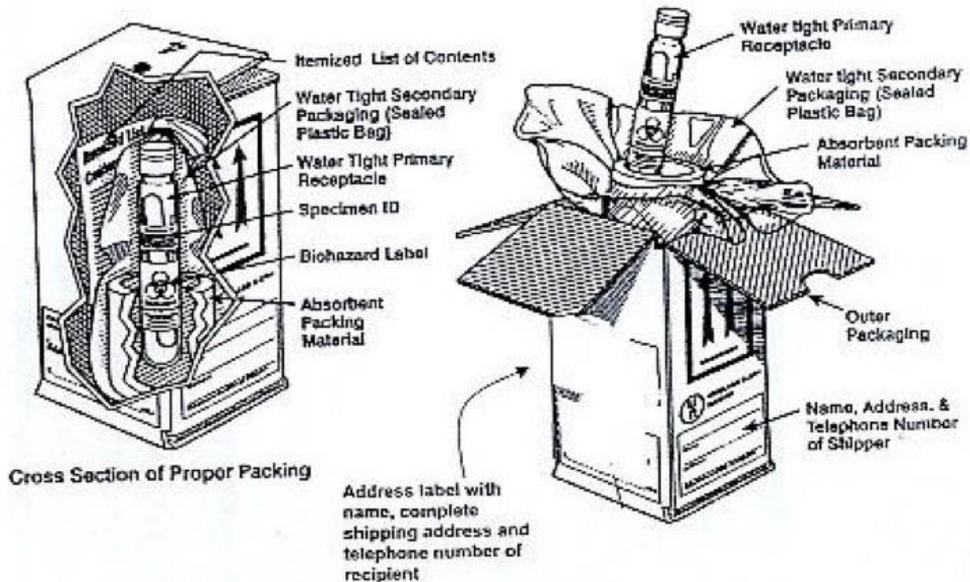
- Keep specimens at 4 °C
  - Fill a cooler with ice packs or coolant packs
- Include an itemized list of specimens with identification numbers and laboratory instructions

# Transporting Specimens

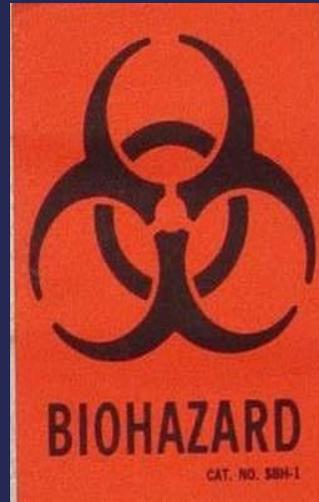
- Refer to WHO guidelines for the safe transport of infectious substances and diagnostic specimens
- Inform and Coordinate with the laboratory
- NHL telephone: 01- 371957, 01- 371925



# Transporting Specimens from Field to Lab

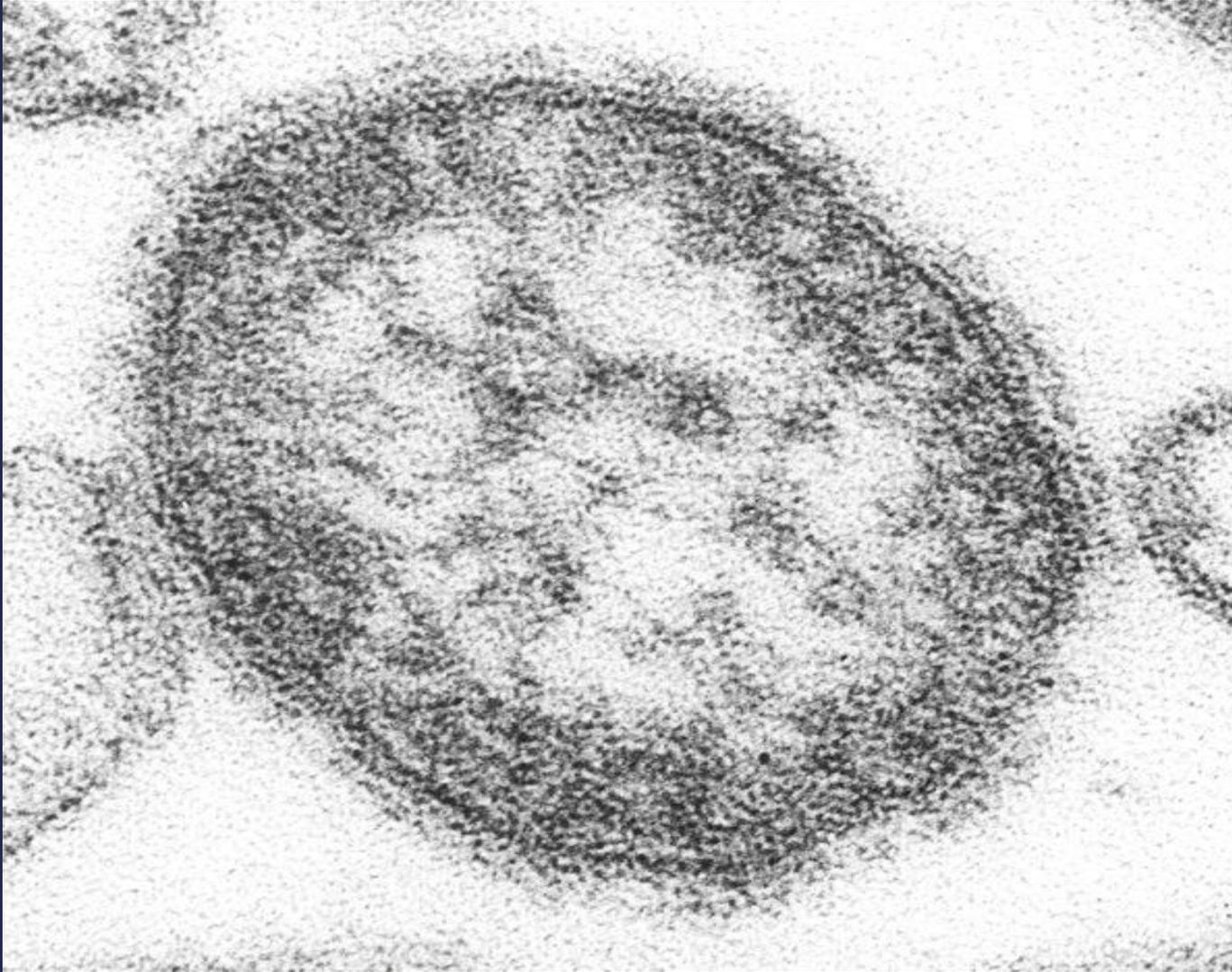


The labeling for contents should include the words:  
“UN 3373 Diagnostic Specimens”



# Measles Virus

# Measles Virus



# Transmission of infection

- Through the inhalation of infected aerosols and droplets
- Infected fomites are involved less frequently
- Highly communicable (99% chance of acquiring disease in non immune person)

# Clinical Features

- Incubation period approx: 1 week to 10 days

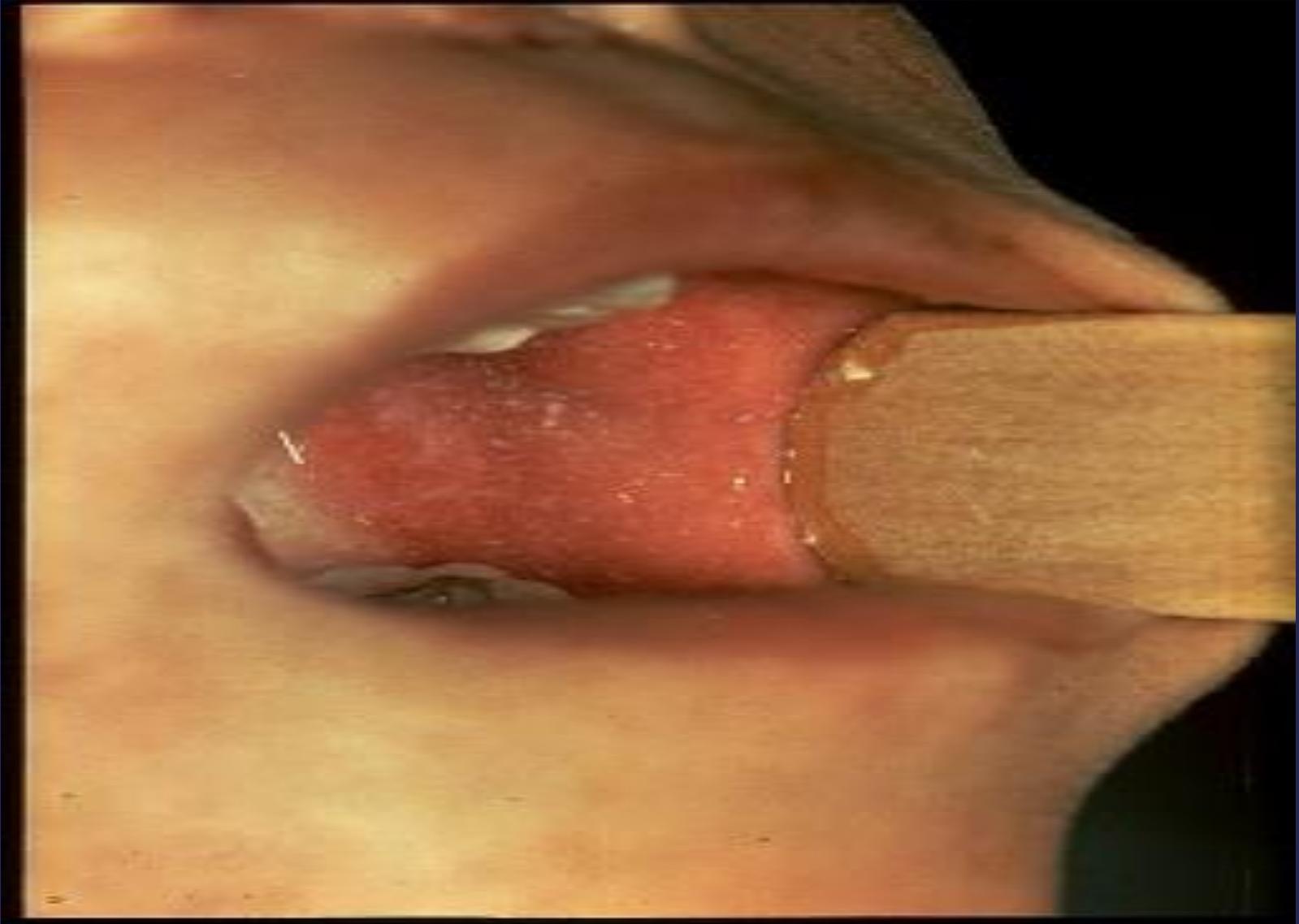
- Clinical features are

fever ,	}	3-4days
cough, coryza		
conjunctivitis		
Koplik's spots (50-90%)	}	4—5 days
Rash		

# Koplik's spots

- Appear on the buccal mucosa
- Shortly before rash onset
- Small irregular red spots with a bluish white speck in the centre

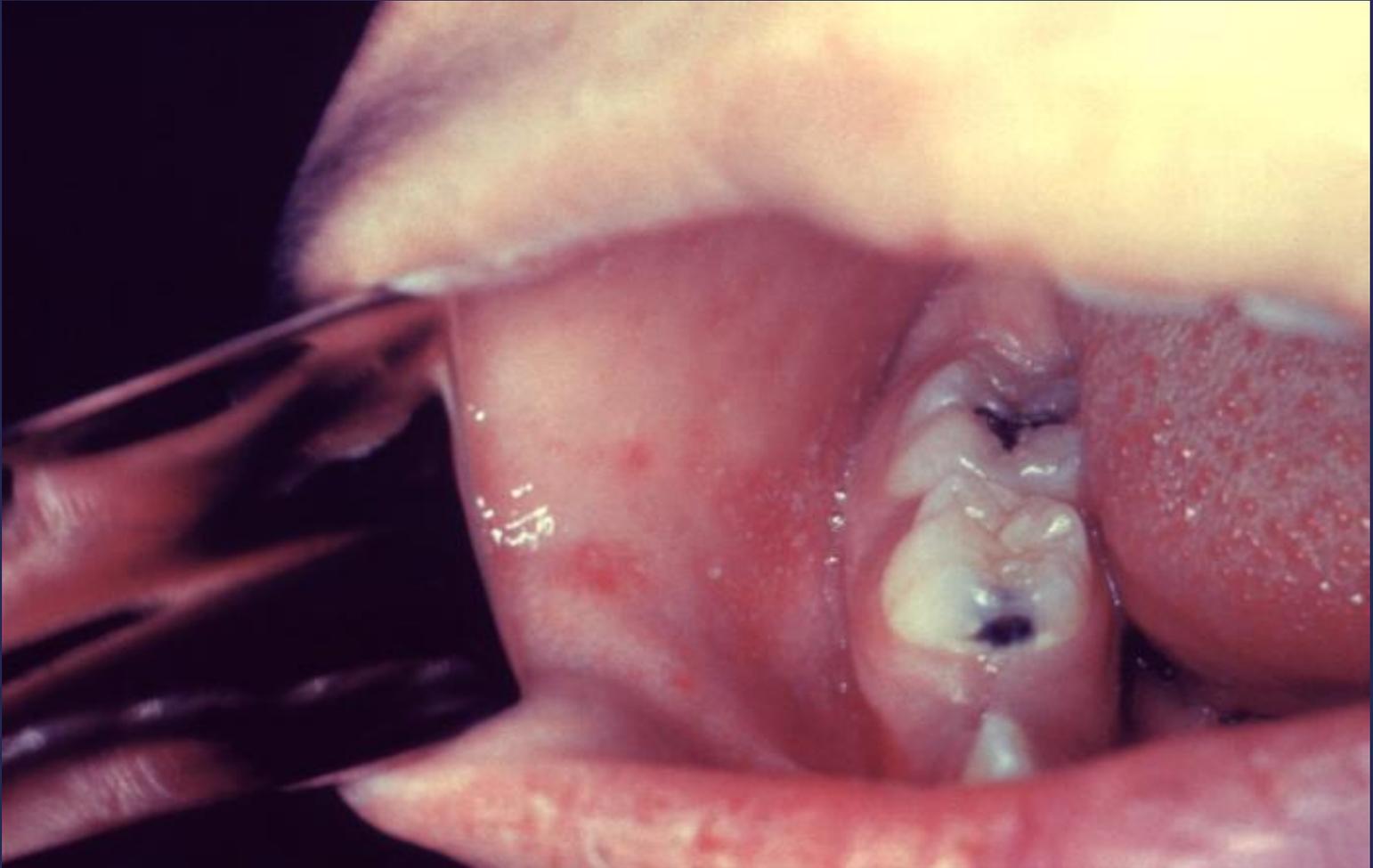
# Koplik's Spots



# Koplik's spots



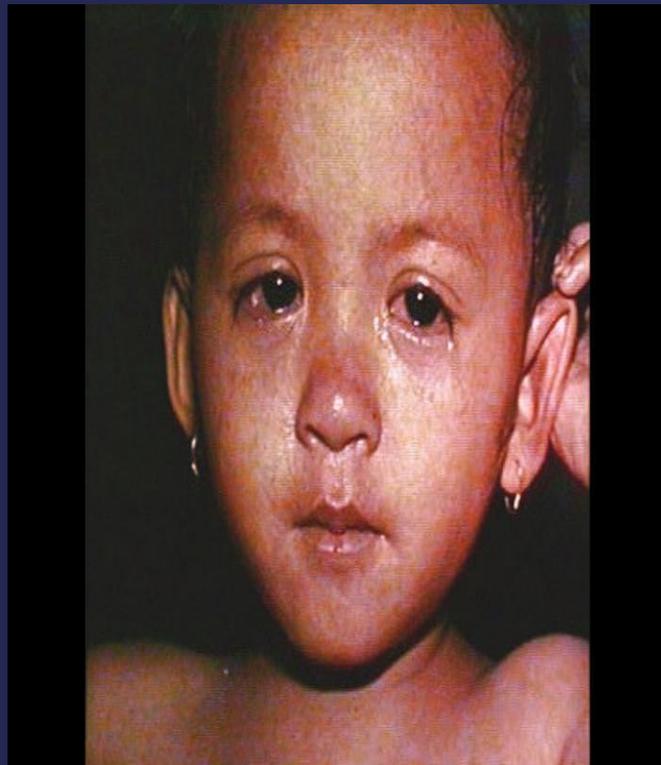
# Koplik's spots



# Measles Rash

- First appear on the forehead or neck or behind the ears
- Lesions are red macules and become maculopapular
- By the end of second day upper extremities and trunk
- Third day lower extremities are affected

# Measles



# Measles Rash contd

- Rash resolves in the same order first disappearing from the face and neck
- last about 6 days
- turn brown and persists for 7-10 days
- Followed by fine desquamation

# Complications

- Bronchitis, bronchiolitis, pneumonia and otitis media
- Encephalitis
- Diarrhoea
- Blindness
- Death- 1/1000 cases
- Risk of death is greater for infant and adult than children and adolescents

# Laboratory Diagnosis

For Measles Virus culture,  
Urine/ Throat swab are collected

# 1.Urine

- 10-20ml of urine collected in a sterile container
- First urine passed in the morning
- **Collect within 3 days after the onset of rash**
- Label the tube with the patient's name, outbreak ID number, specimen number, date of collection and specimen type

# 1.Urine

- Before transport, in the hospital laboratory, they should be kept at 4-8°C.
- Urine should be sent to NHL within 24 hours after collection (in cold box) with laboratory request form

## 2.Throat Swab

- **Collect within 3 days after the onset of rash**
- Tilt the patient's head back and gently depress the tongue with a tongue depressor.
- The tonsillar areas and the posterior pharyngeal wall should be rubbed with the polyester swab to dislodge the epithelial cells.
- Care should be taken not to touch the tongue and the lateral walls of the buccal cavity to avoid contamination with commensal bacteria

## 2.Throat Swab

- After collection, break the shaft of the swab and place immediately into a sterile leakproof container containing viral transport medium (VTM)
- Label the tube with the patient's name, outbreak ID number, specimen number, date of collection and specimen type.
- Before transport, in the hospital laboratory, they should be kept at 4-8°C.
- Throat swab should be sent to NHL within 48 hours after collection (in cold box) with laboratory request form.

# For serology

- **Collect within 4 - 28 days after the onset of rash**
- Collect 5ml of blood in a sterile plain tube
- **one tube** is enough
- Test for Measles IgM Ab for recent infection
- Label the tube with the patient's name, age, sex, outbreak ID number, specimen number, date of collection and specimen type
- **We cannot do the samples without label on the tubes**

- Transport the whole blood specimen to NHL if it can reach within 24 hours.
- If it cannot reach NHL within 24 hours, do separation of serum
- Separate serum after clotting, and transfer into a new sterile bottle or microvial and send to NHL.
- To prevent insufficiency, collect **5 ml of blood or 2 ml of serum** in a sterile bottle
- For outbreak, **5 cases** enough
- Before transport, in the hospital laboratory, they should be kept at 4-8°C
- The specimens should be sent to NHL in cold box with laboratory request form

- The serum/ blood samples should not be haemolysed samples (Prevent hemolysis of samples – narrow needle, rapid suction, rapid pushing blood out of syringe, wet container should not be used)
- Measles Laboratory Requisition Form must include
  - Date of collection
  - Date of onset of rash
  - History of measles vaccination
  - Patient's address

**Some of the lab forms are not filled completely. Please fill completely. Some samples are without lab request forms**

# Rubella Virus

# Clinical and Virological Features

- Infects susceptible individuals via respiratory route
- Nasopharyngeal secretions- principle source
- Primary replication---epi cells of nasopharynx
- IP-14-21 days
- Viremia-widespread dissemination of the virus (blood, nasopharynx, urine, stool, synovial fl, skin, cervix, & L/N)
- Joint symptoms-commonest complication, appear soon after the rash faded, lasts for 3-4 days

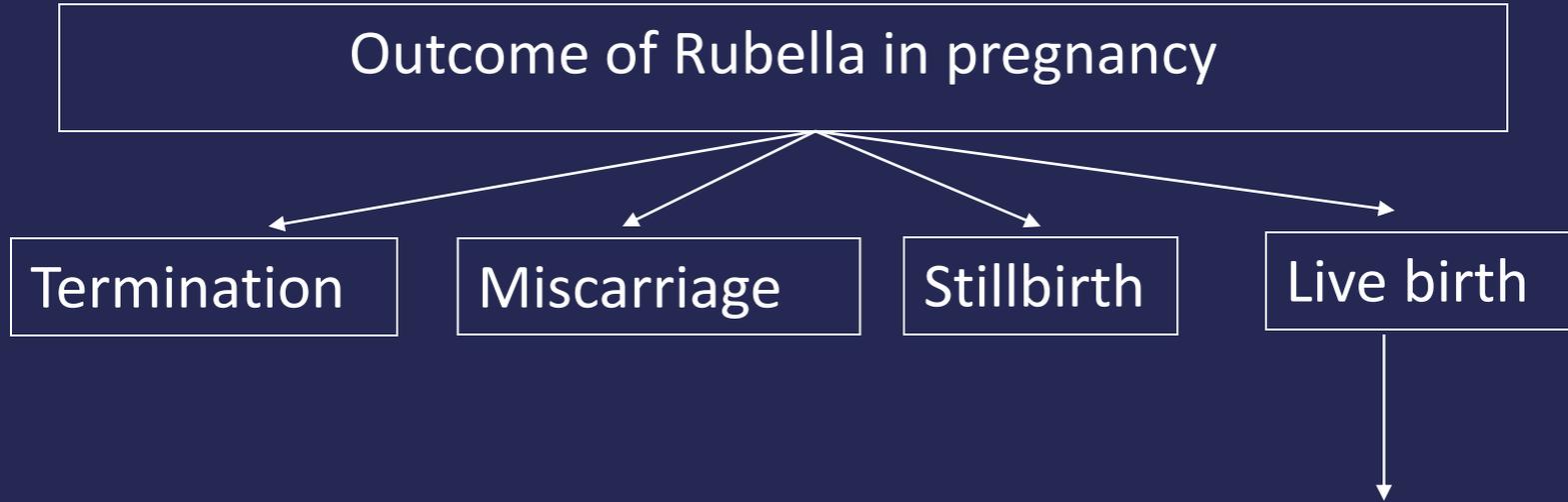
# Clinical and Virological Features contd

- Patients- infectious for 3 wks----nasopharyngeal excretion may occur up to a week before the onset of rash & for 7-10 days thereafter
- Viremia is present about a week before the onset of rash, and end as rubella Ab develop
- 25%- inapparent infection
- Typical rubelliform rashes may result from infection with enteroviruses, human parvovirus B19 & some arboviruses (Chikungunya)

# Rubella



# Why is rubella infection so concerning ?



1. Congenital Rubella Syndrome
2. Congenital Rubella Infection
3. Normal

# What is Congenital Rubella Syndrome (CRS)?

- A sequel of rubella infection in pregnancy
- Associated with Infection early in pregnancy
  - Weeks 1- 10 – 90% CRS\*
  - Weeks 11-12– 33%
  - Weeks 13-14– 11%
  - Weeks 15-16– 24%
  - Weeks  $\geq$  17– 0%

\* Miller E, Cradock-Watson JE, Pollock TM. Consequences of confirmed maternal rubella at successive stages of pregnancy. Lancet. 1982 Oct 9;2(8302):781-4. PubMed PMID:6126663.

**The purpose of rubella vaccination program is thus prevention of congenital rubella infections which can lead to fetal deaths/loss, pre-mature delivery or CRS**

# Congenitally Acquired Infection

- Rubella in pregnancy--fetal death and spontaneous abortion or delivery of a severely malformed infant, an infant with minimal damage or a healthy infant
- Outcomes depend on gestational age at which maternal infection occurs
- First 8 weeks of pregnancy- spontaneous abortion in 20% of cases
- 13<sup>th</sup>-16<sup>th</sup> weeks of gestation- 17% of infant may develop deafness & retinopathy

# Congenitally Acquired Infection contd

- Rubella virus can be recovered from most infants with severe congenitally acquired rubella at birth
- 3 months of age----50-60% of nasopharyngeal secretions
- 9-12 months of age---10%
- Delayed manifestation- diabetes mellitus & other endocrinopathies, sensory neural deafness, glaucoma and progressive panencephalitis

# How does CRS present clinically?

Organ specificity generally related to stage of gestational infection.

## **PERMANENT**

- Hearing Impairment
- Ophthalmologic
  - Cataract, Microphthalmia, Retinopathy, Glaucoma
- Heart defects
  - Patent Ductus Arteriosus
- Microcephaly
- Developmental Delay

## **TRANSIENT**

- Thrombocytopenia
- Jaundice
- "Blueberry muffin" appearance
- Hepatosplenomegaly
- Bone lucencies

## **DELAYED**

- Endocrinopathies
- Progressive auditory or ocular dysfunction



Thank you for your kind attention

<http://go.funpic.hu>