

Viral Infection : Annex

AVIAN INFLUENZA (BIRD FLU) ?

1. Definition ?

- Zoonotic viral infection caused by:
 - **Avian influenza viruses infecting humans ?**
 - Severe respiratory disease with high mortality
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2. Agent ?

- **Influenza A virus ?**
 - Common subtypes:
 - **H5N1 ?**
 - H7N9
 - Reservoir:
 - **Birds (poultry, wild birds) ?**
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3. Transmission ?

- **Animal ? human transmission ?**
 - Contact with:
 - Infected birds
 - Poultry secretions / droppings
 - Rare:
 - Human-to-human transmission
-

4. Clinical Features ?

- High fever
 - Cough
 - Severe respiratory distress
 - **Rapidly progressive pneumonia ?**
 - High fatality rate
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5. Prevention ?

- Avoid contact with infected poultry
 - Proper cooking of poultry products
 - Use of PPE for handlers ?
 - Culling of infected birds
 - Biosecurity measures
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6. Vaccine Relevance ?

- No widely used routine human vaccine
 - Vaccines under development / limited use
 - Poultry vaccination used in some settings
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7. Public Health Significance ?

- High mortality disease ?
 - Pandemic potential (if mutation occurs)
 - Requires:
 - Surveillance
 - Rapid response
 - Example of **zoonotic emerging infection ?**
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EMERGING VIRAL RESPIRATORY INFECTIONS ?

1. Definition ?

- Newly appearing or rapidly increasing **respiratory viral infections** ?
 - Includes:
 - COVID-19
 - Avian influenza
 - SARS, MERS
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2. Agent ?

- Various RNA viruses:
 - **Coronaviruses (SARS-CoV, MERS-CoV, SARS-CoV-2)?**
 - Influenza viruses (novel strains)
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3. Transmission ?

- **Zoonotic origin ? animal to human ?**
 - Human-to-human:
 - Droplet
 - Airborne (in many cases)
 - Rapid spread in globalized world
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4. Clinical Features ?

- Fever
 - Cough
 - Breathlessness
 - Severe pneumonia
 - ARDS in severe cases ?
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5. Prevention ?

- Surveillance and early detection ?

- Infection control:
 - Mask
 - Hand hygiene
 - Isolation and quarantine
 - Travel restrictions (during outbreaks)
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6. Vaccine Relevance ?

- Vaccines may:
 - Be unavailable initially
 - Developed rapidly during outbreaks ?
 - Example:
 - COVID-19 vaccines
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7. Public Health Significance ?

- **Pandemic potential ?**
 - High morbidity and mortality
 - Economic and social disruption
 - Need for:
 - Global surveillance systems ?
 - Preparedness plans
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VACCINE UPDATES & SURVEILLANCE RELEVANCE ?

1. Vaccine Updates ?

- Influenza vaccines:
 - **Updated annually based on circulating strains ?**
 - COVID-19 vaccines:
 - Booster doses for variants
 - Emerging infections:
 - Rapid vaccine development platforms (mRNA, vector-based)
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2. Surveillance Importance ?

- Early detection of outbreaks ?
 - Monitoring:
 - Strain variation (influenza)
 - New variants (COVID-19)
 - Systems:
 - Sentinel surveillance ?
 - Laboratory surveillance
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3. Key Surveillance Goals ?

- Identify outbreaks early
 - Track spread patterns
 - Guide vaccination strategies ?
 - Inform public health response
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High-Yield Exam Points ?

- Avian influenza ? **H5N1, zoonotic ?**
- Transmission ? **bird to human ?**
- Emerging infections ? **SARS, MERS, COVID ?**
- Vaccine update ? **influenza yearly change ?**
- Surveillance ? **key to outbreak control ?**

Table: Emerging Viral Respiratory Diseases ?

DISEASE	AGENT	SOURCE / RESERVOIR	TRANSMISSION	KEY FEATURES	PUBLIC HEALTH IMPORTANCE
COVID-19	SARS-CoV-2	Humans (initial zoonotic origin)	Droplet + airborne ?	Fever, cough, anosmia ?	Global pandemic, high impact ?
SARS	SARS-CoV	Bats ? civet cats	Droplet	Severe pneumonia	High mortality, outbreak control importance
MERS	MERS-CoV	Camels	Droplet + contact	Severe respiratory disease	High case fatality ?
Avian Influenza	Influenza A (H5N1, H7N9)	Birds ?	Animal ? human	Severe pneumonia	Pandemic potential ?
Swine Flu (H1N1)	Influenza A (H1N1)pdm09	Humans (origin swine)	Droplet	ILI, pneumonia	Pandemic (2009) ?

Table: Pandemic Preparedness Essentials ?

COMPONENT	KEY ELEMENTS
Surveillance ?	Early detection, reporting, lab confirmation
Preparedness Planning ?	National pandemic plans, guidelines
Healthcare System Readiness	ICU beds, oxygen, ventilators
Workforce Training	Trained healthcare workers
Infection Control ?	PPE, mask use, hygiene protocols
Laboratory Capacity	RT-PCR, diagnostic facilities
Vaccination Strategy ?	Vaccine development, distribution
Risk Communication ?	Public awareness, misinformation control

COMPONENT	KEY ELEMENTS
Intersectoral Coordination	Government + health + transport sectors
Stockpiling ?	Drugs (oseltamivir), PPE, equipment

Flowchart: Respiratory Virus Outbreak Response ?

Detection of unusual cluster (ILI / SARI cases)

?

Verification of outbreak ?

?

Case definition formulation

?

Active surveillance ?

- Case finding
- Contact tracing

?

Laboratory confirmation ?

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Public health measures ?

- Isolation of cases
- Quarantine of contacts
- Mask use & hygiene

?

Clinical management ?

- Supportive care
- Antivirals (if available)

?

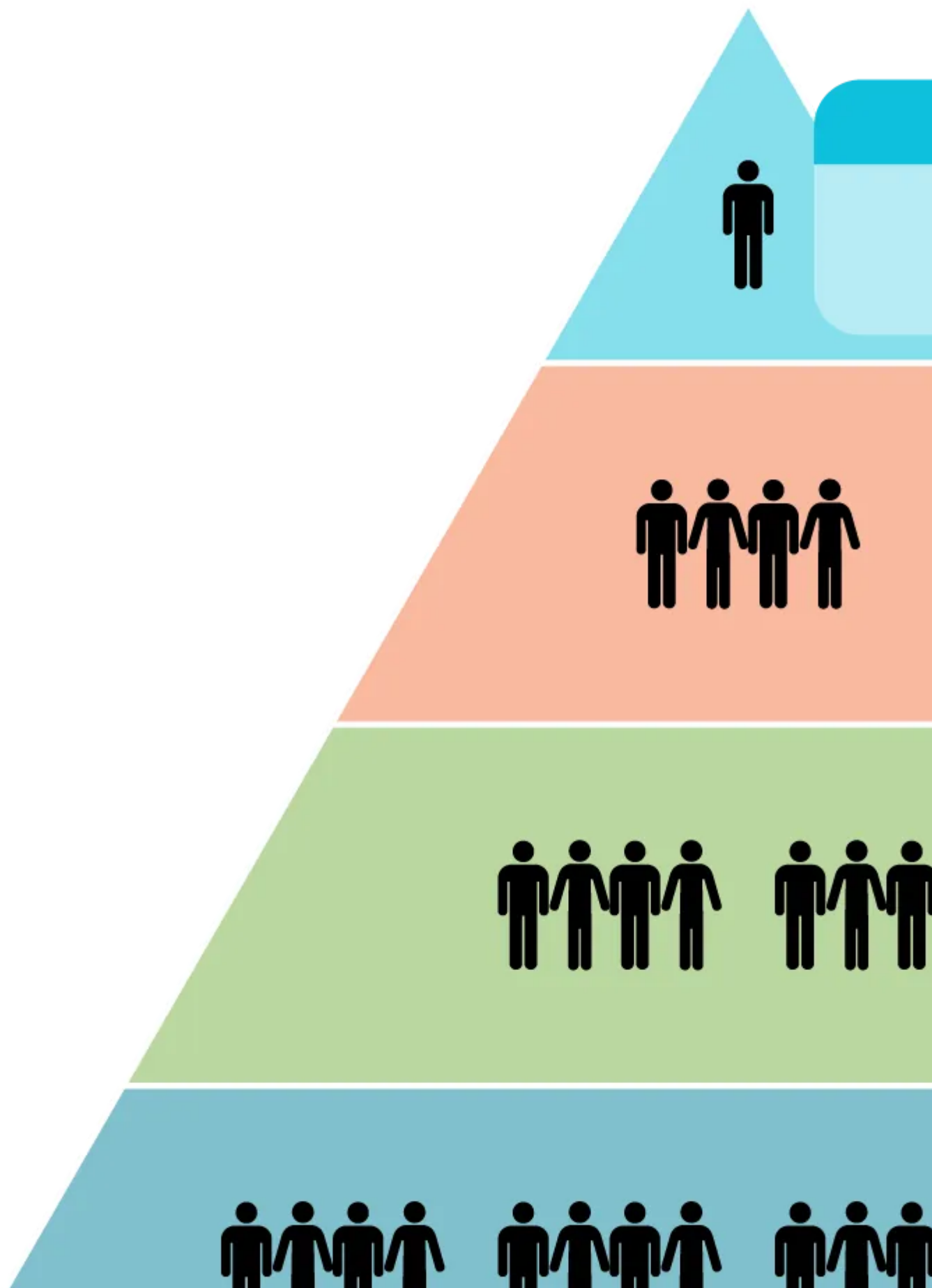
Vaccination strategy (if available)

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Monitoring & containment ?

Figure: Levels of Prevention in Viral Respiratory Outbreaks ?

Levels of Prevention in Pu





Level of Prevention

Primordial Prevention

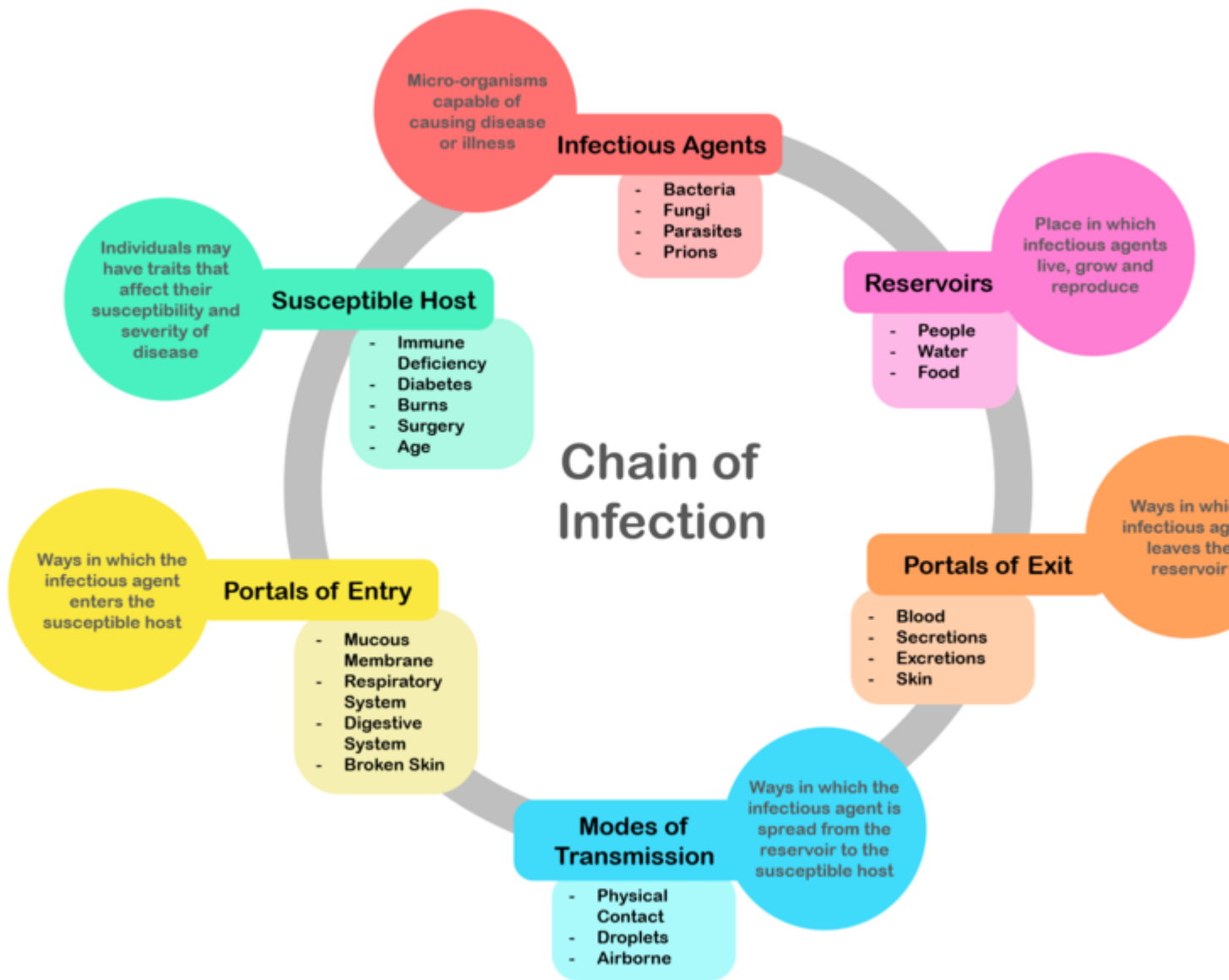
Primary Prevention

Secondary Prevention

Tertiary Prevention

PSM

LEVEL OF PREVENTION



Image

Key Exam Mapping ?

Primary Prevention ?

- Vaccination
- Mask use
- Hand hygiene
- Health education

Secondary Prevention ?

- Early diagnosis
- Testing (RT-PCR)
- Isolation

Tertiary Prevention ?

- Treatment
- ICU care
- Rehabilitation

Ultra High-Yield Recall ?

- Emerging diseases ? **SARS, MERS, COVID, H1N1** ?
 - Pandemic preparedness ? **surveillance + vaccine + PPE** ?
 - Outbreak response ? **detect ? confirm ? control** ?
 - Prevention levels ? **Primary (prevent), Secondary (detect), Tertiary (treat)** ?
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1. Viral Disease Transmission Routes ?

Major Routes of Transmission ?

Respiratory Route ?

- **Droplet transmission**
 - Influenza, COVID-19
- **Airborne transmission**
 - COVID-19 (closed spaces), measles

Feco-oral Route ?

- Contaminated food/water
- Examples:
 - Hepatitis A, Rotavirus

Direct Contact ?

- Skin/mucosal contact
- Examples:
 - Herpes, HPV

Blood-borne Route ?

- Transfusion, needle injury
- Examples:
 - HIV, Hepatitis B, C

Vector-borne ?

- Through insects
- Examples:
 - Dengue (Aedes mosquito), Japanese encephalitis

Vertical Transmission ?

- Mother ? child
- Examples:
 - HIV, Rubella ?

High-Yield Table: Transmission Routes ?

ROUTE	EXAMPLES
Respiratory	Influenza, COVID-19 ?
Feco-oral	Hepatitis A, Rotavirus
Contact	Herpes, HPV
Blood-borne	HIV, Hepatitis B
Vector-borne	Dengue, JE
Vertical	HIV, Rubella ?

2. Herd Immunity and Vaccination Concept ?

Herd Immunity ?

- Protection of **non-immune individuals** when:
 - A large proportion of population is immune ?

Mechanism ?

- Reduces transmission chain
- Breaks spread of infection

Herd Immunity Threshold ?

- Depends on:
 - Infectivity (R_0)
- Example:
 - Measles ? very high threshold (~95%) ?

Flow Concept: Herd Immunity ?

Vaccinated population ?

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Susceptible individuals ?

?

Transmission chain interrupted ?

?

Disease spread controlled

Vaccination Concept ?

Types of Immunity

- Active immunity
 - Natural ? infection
 - Artificial ? vaccination ?

Key Role ?

- Prevent disease
- Reduce severity
- Achieve herd immunity

High-Yield Points ?

- Herd immunity ? **community protection** ?
- Vaccination ? **main tool for control** ?
- Threshold depends on **R?** ?

3. Outbreak Response Flow in Viral Diseases ?

Flowchart ?

Detection of unusual increase in cases

?

Confirm outbreak (clinical + epidemiological) ?

?

Define case definition

?

Active surveillance ?

- Case finding
- Contact tracing

?

Laboratory confirmation ?

?

Control measures ?

- Isolation
- Quarantine
- Vaccination (if available)

?

Treatment & supportive care

?

Monitoring & reporting ?

4. Isolation and Surveillance Concept ?

Isolation ?

- Separation of:

- **Infected individuals from healthy persons ?**

- Purpose:

- Prevent transmission

Types

- Hospital isolation
- Home isolation

Surveillance ?

- Continuous **systematic collection, analysis, and interpretation of data ?**

Types ?

- **Passive surveillance**
 - Routine reporting
 - **Active surveillance ?**
 - Active case search
 - **Sentinel surveillance**
 - Selected sites
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Flow Concept: Surveillance ?

Data collection

?

Data analysis

?

Interpretation ?

?

Action (control measures) ?

High-Yield Table: Isolation vs Surveillance ?

FEATURE	ISOLATION	SURVEILLANCE
Definition	Separation of infected cases	Continuous monitoring of disease
Purpose	Prevent spread	Early detection & control ?
Focus	Individual	Population
Example	COVID isolation ward	Influenza surveillance system

Ultra High-Yield Recall ?

- Transmission ? **respiratory most important** ?
 - Herd immunity ? **breaks transmission chain** ?
 - Outbreak response ? **detect ? confirm ? control** ?
 - Isolation ? **case separation** ?
 - Surveillance ? **data ? action cycle** ?
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HIGH-YIELD BOX TOPICS ?

1. Smallpox Eradication ?

- Declared eradicated in:
 - **1980 by WHO ?**
- Last natural case:
 - **1977 (Somalia) ?**
- Strategy:
 - **Surveillance + containment (ring vaccination) ?**
- Vaccine:
 - Live vaccinia virus
- Importance:
 - First disease eradicated globally ?

2. Smallpox vs Chickenpox ?

FEATURE	SMALLPOX	CHICKENPOX (VARICELLA)
Agent	Variola virus	Varicella-zoster virus
Rash distribution	Centrifugal (face, limbs) ?	Centripetal (trunk) ?
Lesion stage	Same stage ?	Different stages ?
Severity	Severe, high mortality	Mild
Palms/soles	Involved ?	Usually spared

3. Varicella-Zoster Relation ?

- Same virus causes:
 - Varicella (primary infection) ?
 - Herpes zoster (reactivation) ?
- Latency:
 - Virus remains dormant in **dorsal root ganglia** ?

4. Secondary Attack Rate of Chickenpox ?

- Very high (~90%) ?
- Indicates:

- Highly contagious disease
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5. Koplik Spots in Measles ?

- Pathognomonic sign ?
 - Appearance:
 - Bluish-white spots on buccal mucosa
 - Timing:
 - Before rash onset ?
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6. 2-dose Measles-containing Vaccine Strategy ?

- 1st dose:
 - **9–12 months ?**
 - 2nd dose:
 - **16–24 months ?**
 - Purpose:
 - Ensure immunity in non-responders
 - Given as:
 - **MR / MMR vaccine ?**
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7. Teratogenic Importance of Rubella ?

- Infection during:
 - 1st trimester ?
 - Leads to:
 - Severe fetal abnormalities
 - Prevention:
 - Vaccination before pregnancy ?
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8. Congenital Rubella Syndrome (CRS) ?

Classic Triad ?

- Cataract
- Congenital heart disease
- Deafness ?

Other Features

- Microcephaly
 - Mental retardation
 - Growth retardation
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9. Mumps Complications ?

- Aseptic meningitis (~15%) ?
 - Orchitis (post-pubertal males)
 - Pancreatitis
 - Deafness (irreversible) ?
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10. MMR Vaccine ?

- Components:
 - Measles + Mumps + Rubella ?
 - Type:
 - Live attenuated vaccine ?
 - Schedule:
 - 2 doses (childhood)
 - Benefit:
 - Combined protection ?
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11. Influenza Pandemics ?

- Caused by:

- **Influenza A ?**
 - Mechanism:
 - **Antigenic shift ?**
 - Examples:
 - H1N1 (2009) ?
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12. Antigenic Drift vs Shift ?

- **Drift ?**
 - Minor mutation
 - Causes epidemics
 - **Shift ?**
 - Major change
 - Causes pandemics
 - Only in **Influenza A ?**
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13. H1N1 pdm09 ?

- Pandemic declared:
 - **2009 ?**
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- Virus:
 - Influenza A (H1N1)pdm09
 - Key feature:
 - Affects young adults
 - Drug:
 - **Oseltamivir ?**
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14. Avian Influenza ?

- Agent:
 - **Influenza A (H5N1) ?**
 - Transmission:
 - **Bird ? human ?**
 - Feature:
 - Severe pneumonia
 - Importance:
 - Pandemic potential ?
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Ultra High-Yield Rapid Recall ?

- Smallpox ? **eradicated 1980 ?**
 - Chickenpox ? **90% secondary attack rate ?**
 - Measles ? **Koplik spots ?**
 - Rubella ? **CRS + teratogenic ?**
 - Mumps ? **meningitis + orchitis ?**
 - Influenza ? **shift = pandemic ?**
 - H1N1 ? **2009 pandemic ?**
 - Avian flu ? **H5N1 zoonotic ?**
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