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

2. Agent ?

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

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 ?**

EMERGING VIRAL RESPIRATORY INFECTIONS ?

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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

VACCINE UPDATES & SURVEILLANCE RELEVANCE ?

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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)

2. Surveillance Importance ?

- **Early detection of outbreaks ?**
- Monitoring:
  - Strain variation (influenza)
  - New variants (COVID-19)
- Systems:
  - Sentinel surveillance ?
  - Laboratory surveillance

3. Key Surveillance Goals ?

- Identify outbreaks early
- Track spread patterns
- Guide vaccination strategies ?
- Inform public health response

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 ?
?
Public health measures ?

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

?
Clinical management ?

- Supportive care
- Antivirals (if available)

?

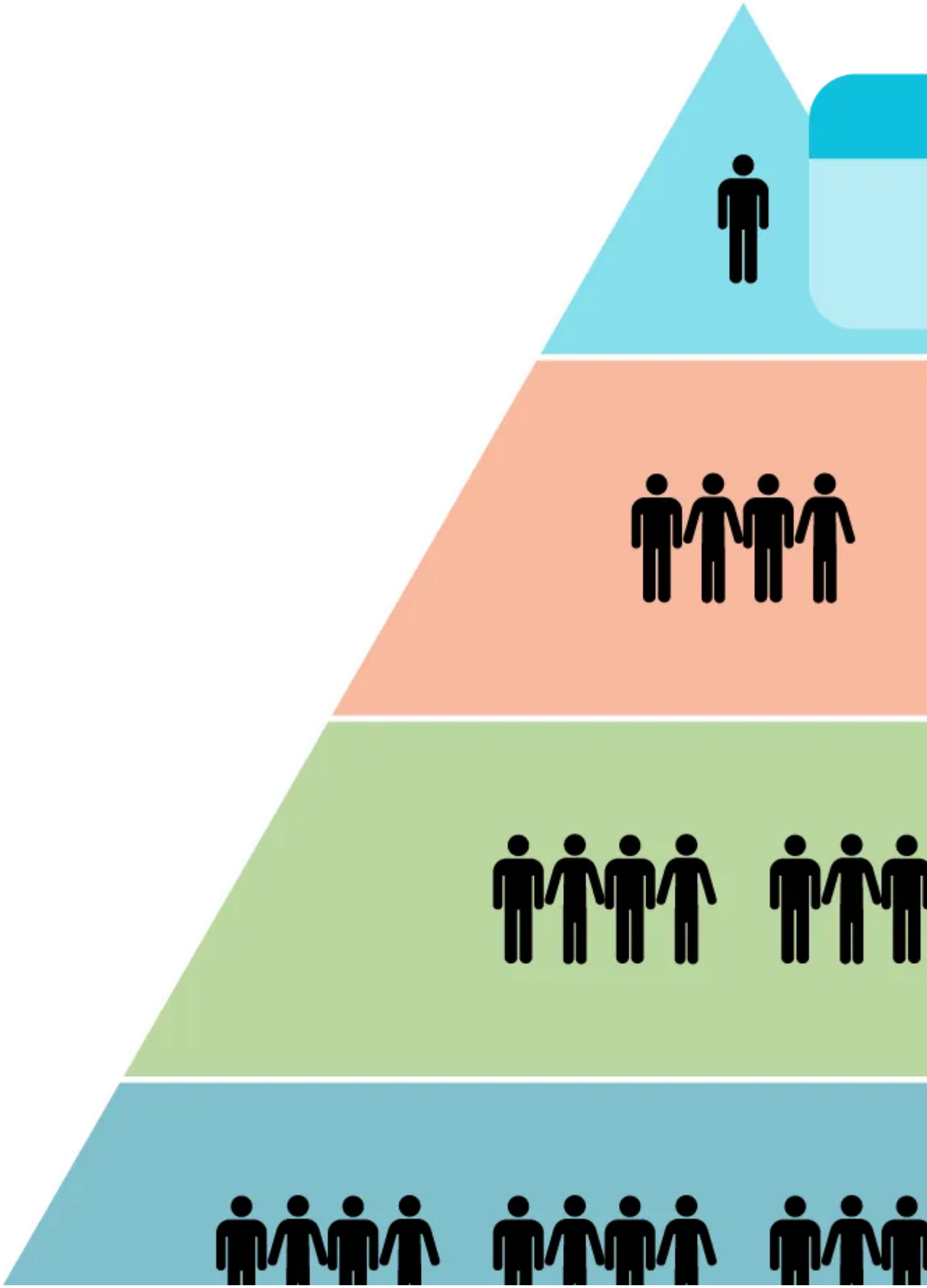
Vaccination strategy (if available)

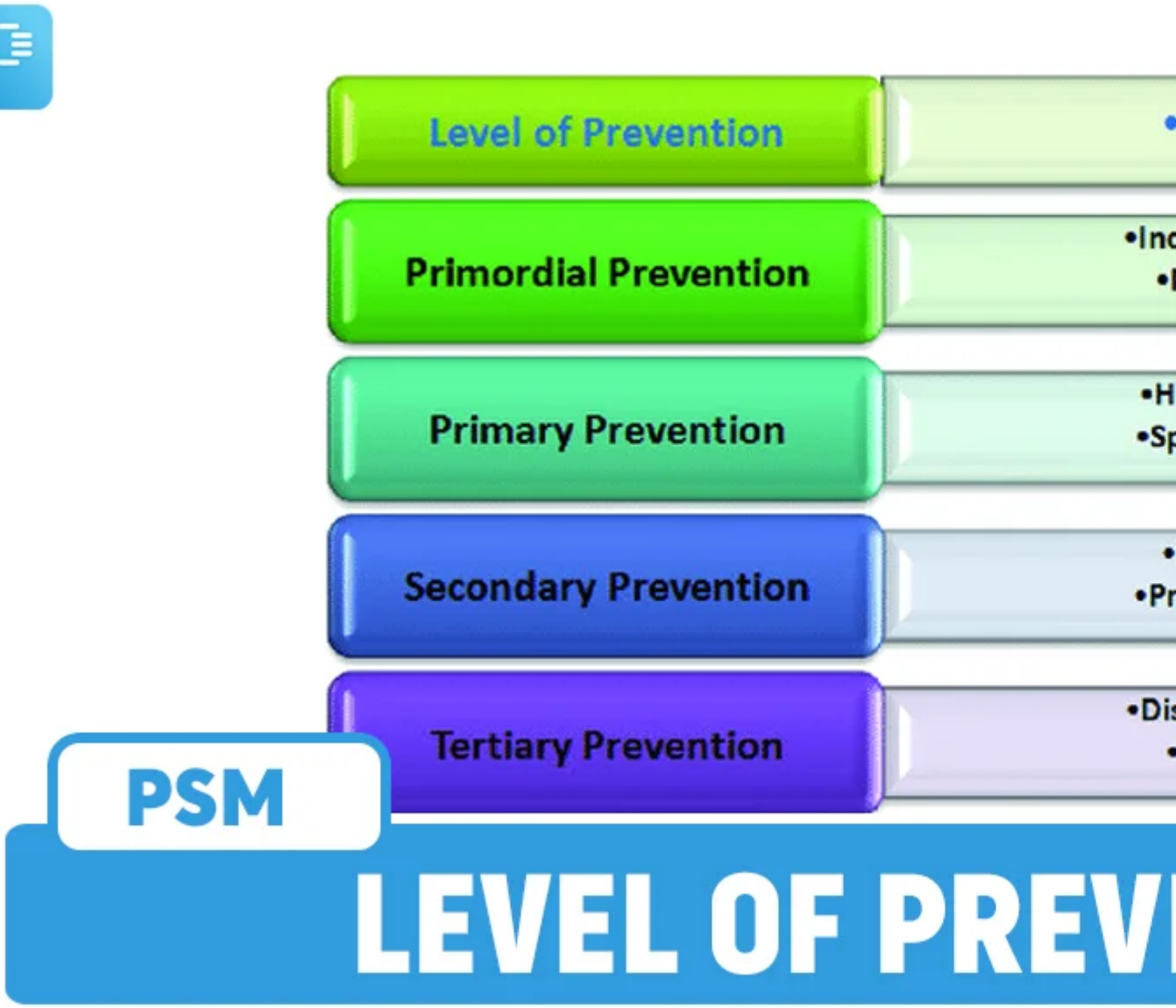
?

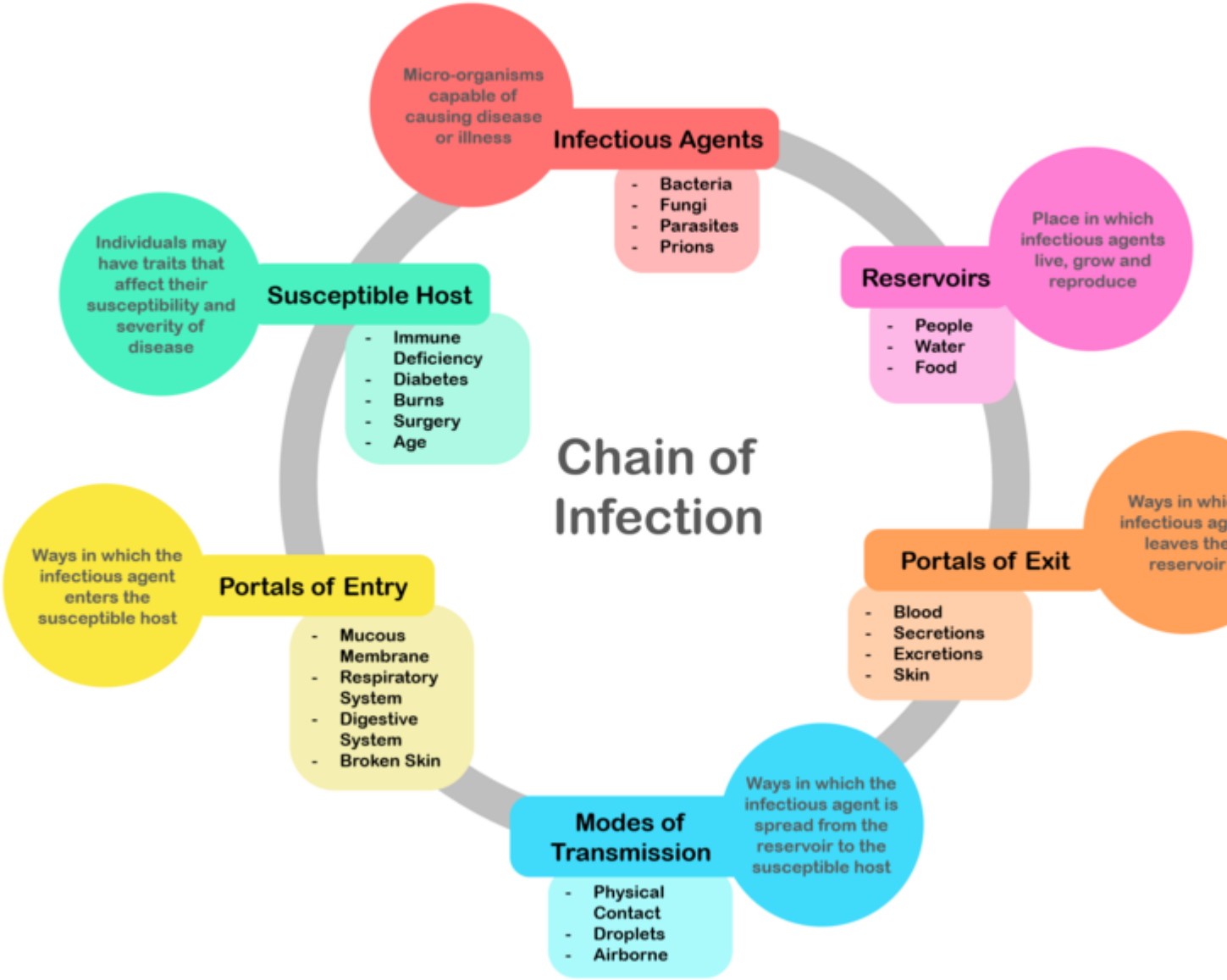
Monitoring & containment ?

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 PREV



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 ?

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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?)
- Example:
    - Measles ? very high threshold (~95%) ?

Flow Concept: Herd Immunity ?

Vaccinated population ?
?
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

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 ?**

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

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3. Varicella-Zoster Relation ?

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

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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 ?**

- 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 ?

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 ?**