



# MODULE V

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## Management of Prevalent Infections in Children Following a Disaster




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## Management of Common Childhood Illness Following a Disaster

### Infections



# FACTORS IMPACTING INFECTIONS IN DISASTER SITUATIONS

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- **Epidemiology of local diseases**
- **Migration**
- **Population immunity status (N/I/P)**
- **Season and geography**
- **Type of natural disaster**

# RISK FACTORS AND CLINICAL PICTURES ACCORDING TO TYPE OF EVENT

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Diseases	Risk factor	Event
Respiratory and viral rash	Overcrowded living conditions	All
Gastrointestinal	Damaged water supply and sanitation systems	Floods Earthquakes
Dengue Malaria	Seasonality and vector breeding sites (stagnant water)	Floods

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# PREVALENT DISEASES

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## PRE-DISASTER

- Cholerae
- Measles
- Tuberculosis
- Meningitis
- Malaria

## POST-DISASTERS

- Measles
- Diarrhea
- ARI
- Meningitis
- Malaria



# MAIN CAUSES OF DEATH

- Acute respiratory infections
- Diarrhea and dehydration
- Measles
- Malaria
- Malnutrition

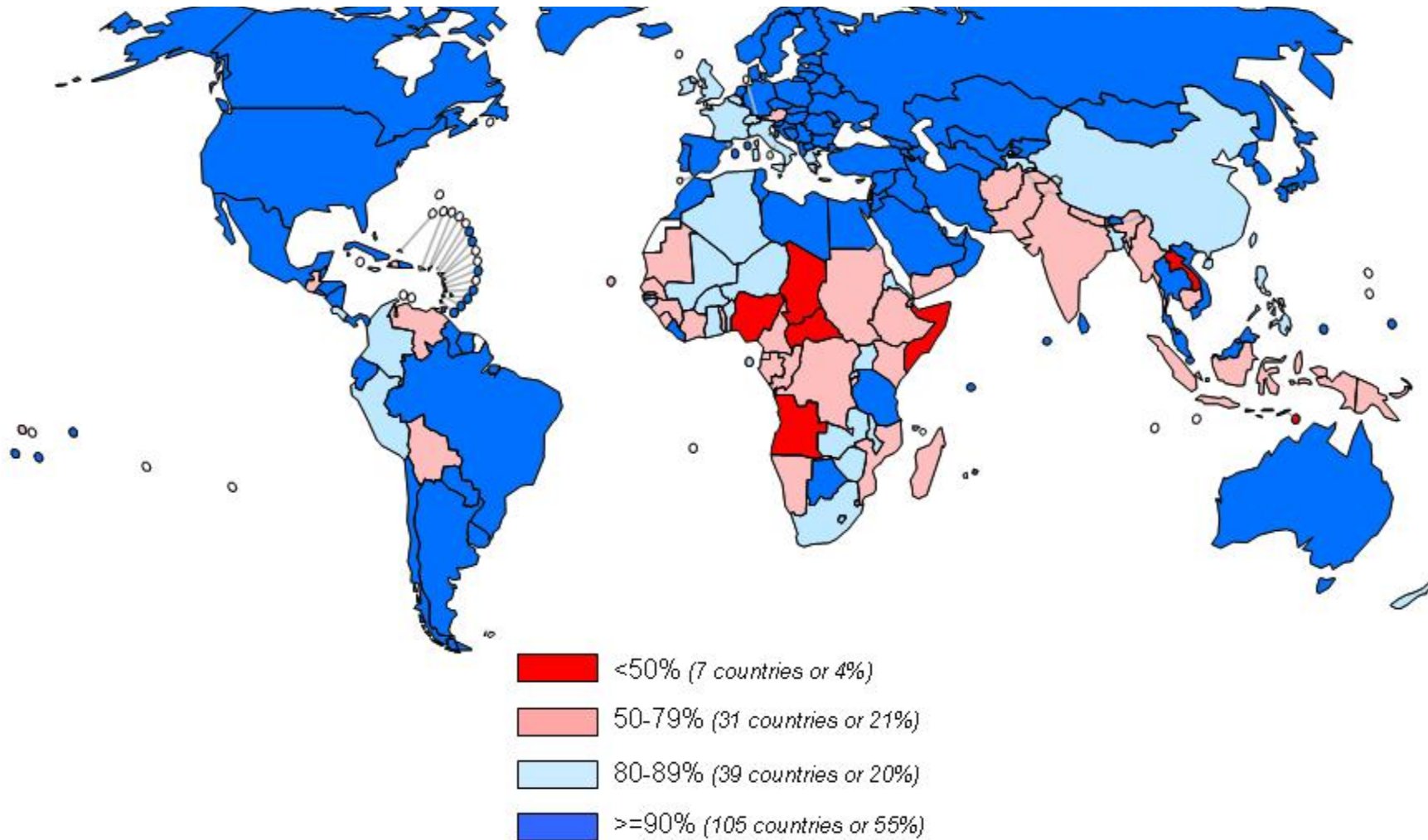


# MEASLES

- Highly contagious infection (98-100% in susceptible contacts)
- Transmission through respiratory secretions (contact and aerosolized particles)
- Incubation period: 10-14 days
- Mortality rate  $\Rightarrow$  Nutrition / crowding / inoculum

***Overcrowded living conditions are an important triggering factor for epidemics***

# 2005 Measles Immunization Coverage among the Pediatric Population Worldwide



Source: WHO/UNICEF Coverage estimates 1980-2005, August 2006

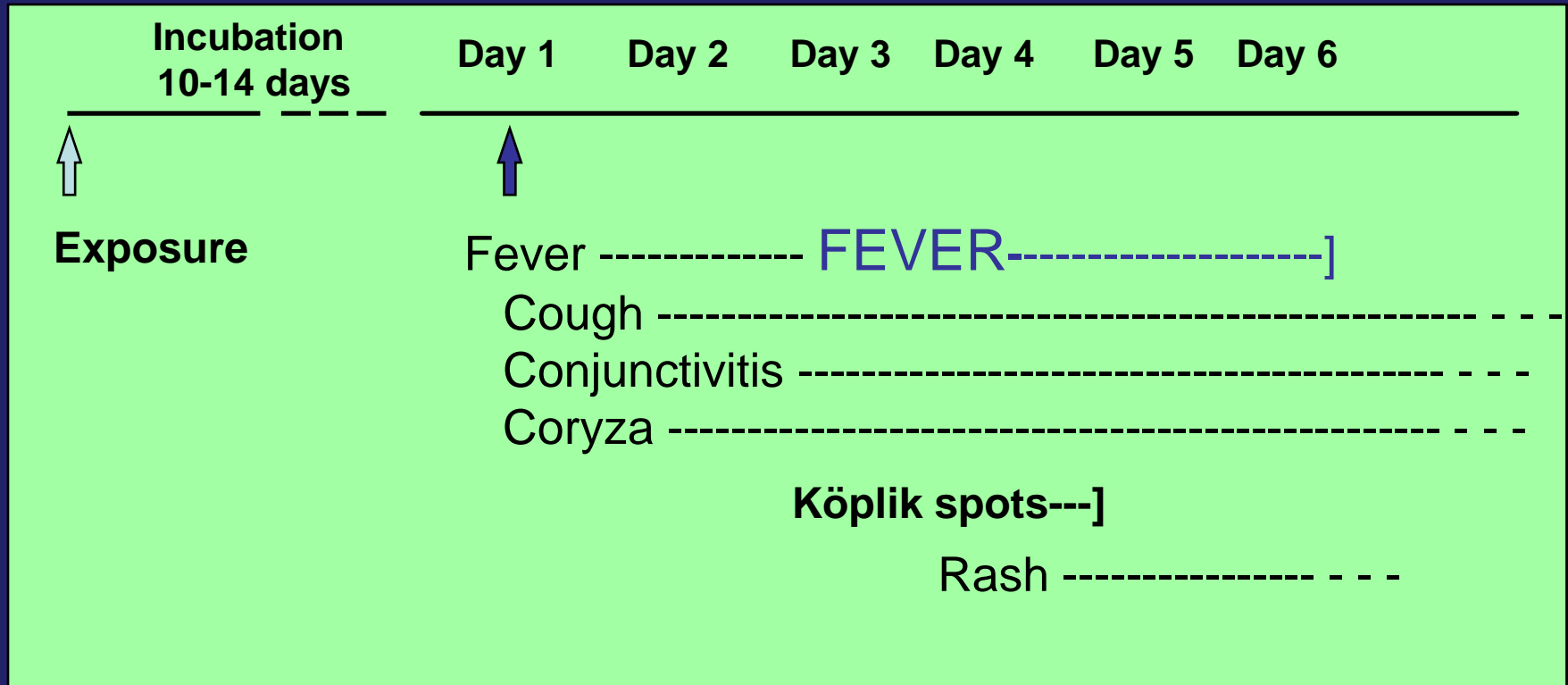
192 WHO Member States.

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organisation concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not be full agreement.

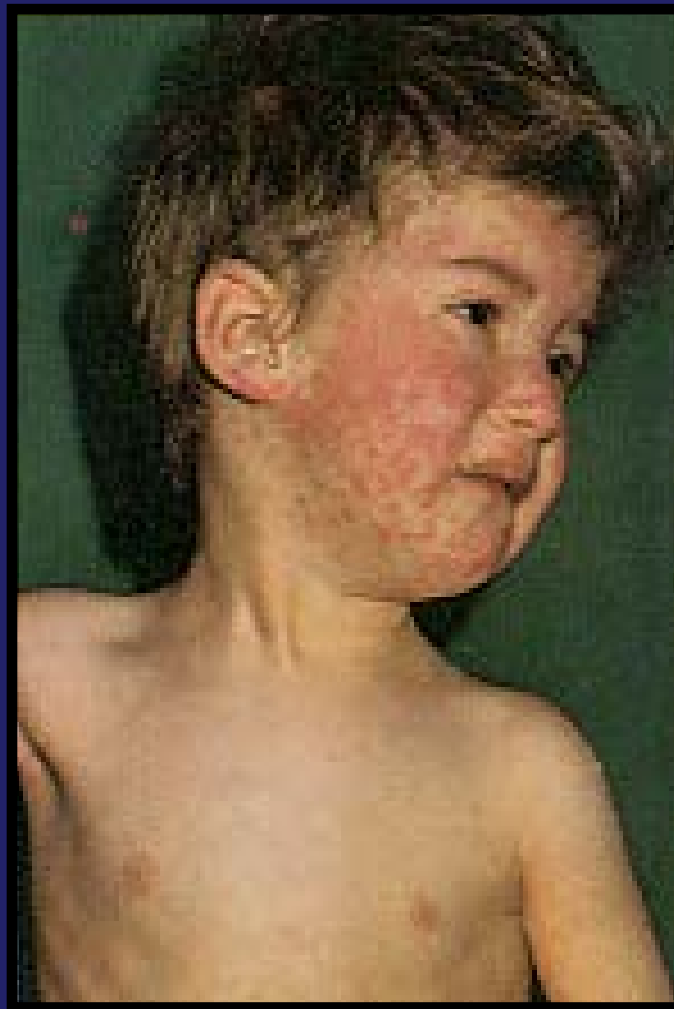


# NATURAL HISTORY OF MEASLES

Identification of one case in a camp should speed up immunization process



# RASH – DAY 1



# RASH – DAY 2



# MEASLES: CLINICAL MANIFESTATIONS

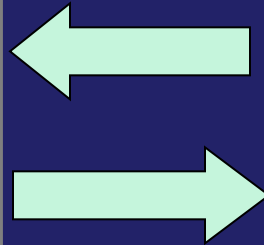
## KÖPLIK SPOTS



# MEASLES AND VITAMIN A DEFICIENCY

## SYNERGIC EFFECT

MEASLES  
unmasks an  
underlying  
Vitamin A  
deficiency



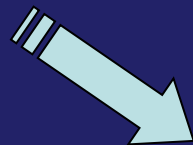
VITAMIN A DEFICIENCY  
(even subclinical)  
increases measles-  
associated morbidity  
and mortality

*Measles-associated morbidity and mortality may be reduced by administering Vitamin A to high risk populations*

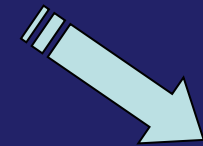
# EFFECTS OF VITAMIN A DEFICIENCY AND MEASLES



Xerophthalmia

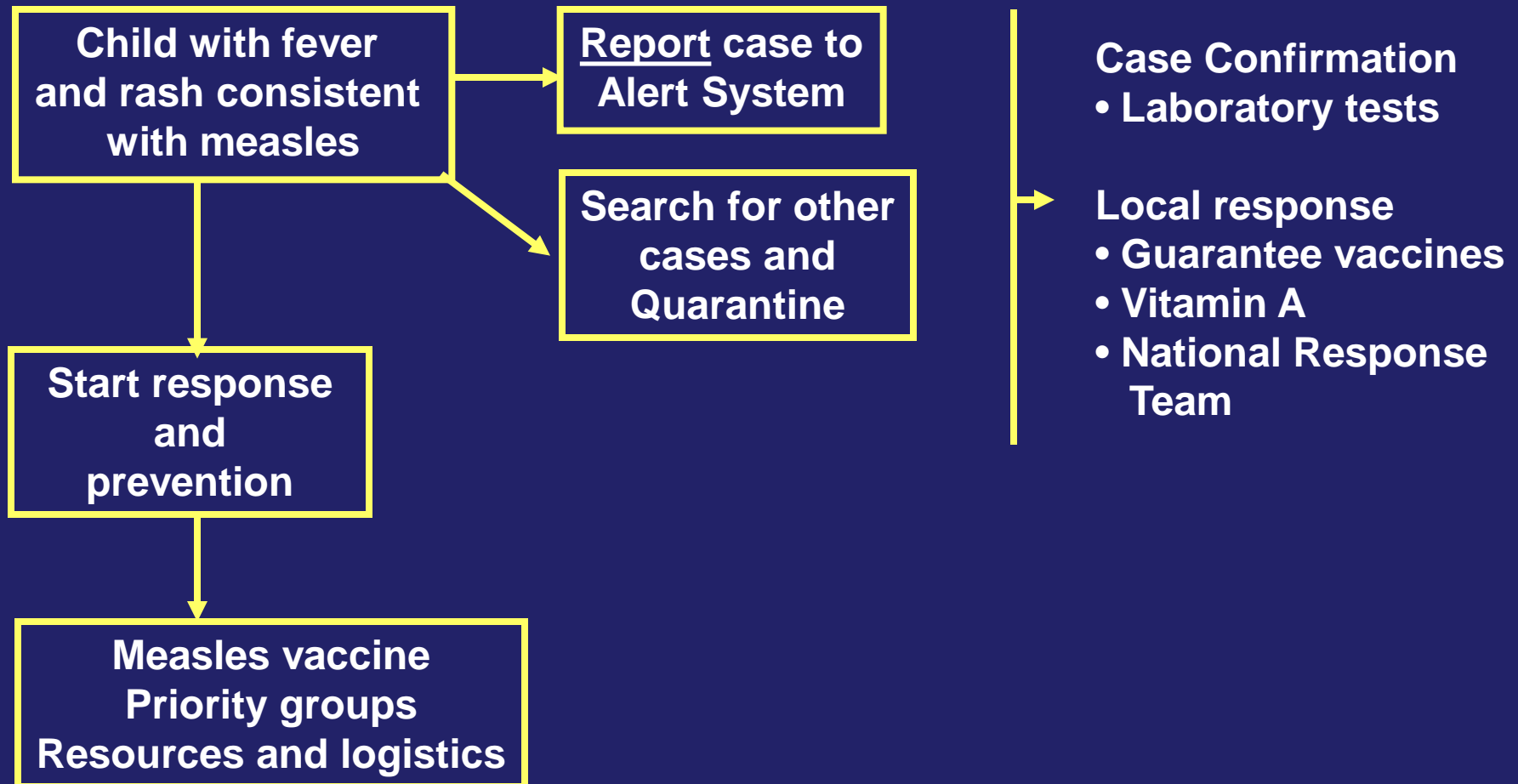


Bitot's spot



Corneal ulceration

# ALGORITHM FOR A SUSPECTED CASE OF MEASLES





# IMCI STRATEGY PRINCIPLES

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- Utilizes limited number of carefully selected clinical signs - classification
- Addresses most, but not all, of the main reasons why a sick child is brought to a clinic
- Uses a limited number of essential drugs
- Encourages active participation of adult caretakers in the treatment of children
- Assesses nutritional and immunization status and feeding problems and offers counseling



# IMCI STRATEGY DANGER SIGNS

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- **Inability to drink / breast-feed**
  - **Vomiting**
  - **Lethargy / unconsciousness**
  - **Seizures**



# IMCI: COUGH OR DIFFICULT BREATHING

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## **Very severe respiratory disease or pneumonia**

Any general danger sign

Chest indrawing

Stridor in a calm child

## **Pneumonia**

Fast breathing

## **Cough without pneumonia**

No signs of pneumonia or severe disease



# ANTIBIOTIC ARSENAL

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- **Oral antibiotics**
  - Amoxicillin
  - Cotrimoxazole (TMP/SMX)
- **Intramuscular (IM) antibiotics**
  - Benzylpenicillin
  - Cefuroxime or Ceftriaxone



# FEBRILE DISEASES SPREAD THROUGH VECTORS

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## Malaria and Dengue

# MALARIA

It is caused by a protozoal blood parasite capable of causing a wide spectrum of diseases

*Plasmodium vivax*

*Plasmodium ovale*

*Plasmodium malariae*

*Plasmodium falciparum*

- Geographical distribution: Tropic / Subtropics
- Transmission: *Anopheles* mosquito

# MALARIA SUSCEPTIBILITY

At endemic areas, there is partial immunity in older children and adults due to previous infection

## *Infection*

Identification of parasitemia

Asymptomatic

## *Disease*

Presence of signs and symptoms

Acute, subacute, chronic

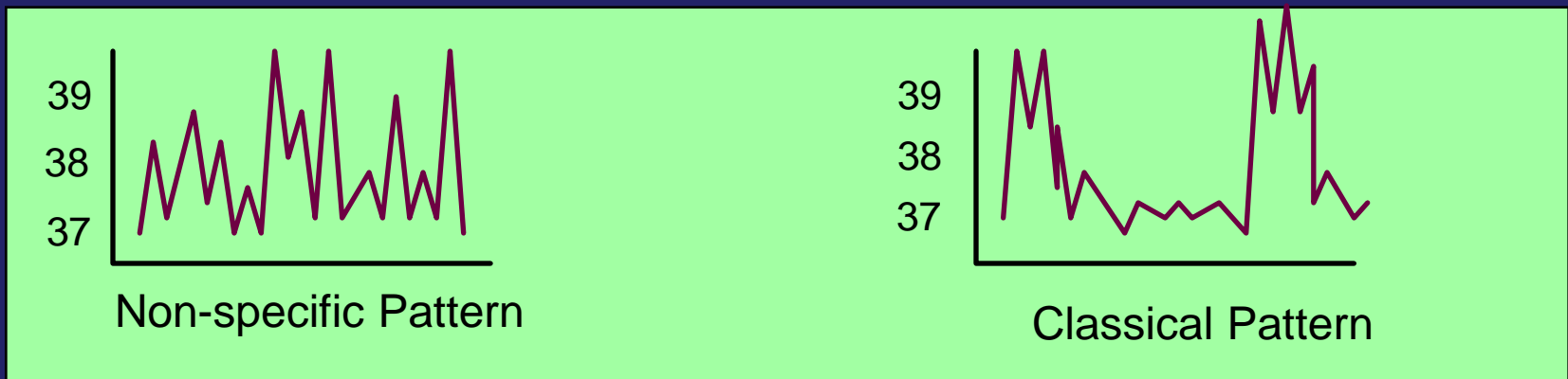
**Most susceptible individuals to severe and fatal malaria:**

- Non-immune and immunocompromised people
- Infants and young children, pregnant women and malnourished
- *Plasmodium falciparum*-infected people

# MALARIA

## CLINICAL MANIFESTATIONS

### FEVER



**Partially immune patients may develop moderate fever with a non-specific pattern**

**Patients will feel and look sick due to fever, but they will feel relatively well between paroxysms of fever**



# CLINICAL PRESENTATION

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## UNCOMPLICATED

- Paroxysmic fever
- Chills
- Headache
- Myalgia
- Diarrhea
- Anemia

## SEVERE COMPLICATED

- > 5% parasitemia
- Severe anemia
- Hemoglobinemia
- Bleeding diathesis
- Shock/Hypotension
- Renal failure
- Hypoglycemia
- Acidosis
- Encephalopathy (coma, seizures)

# DIAGNOSIS OF MALARIA

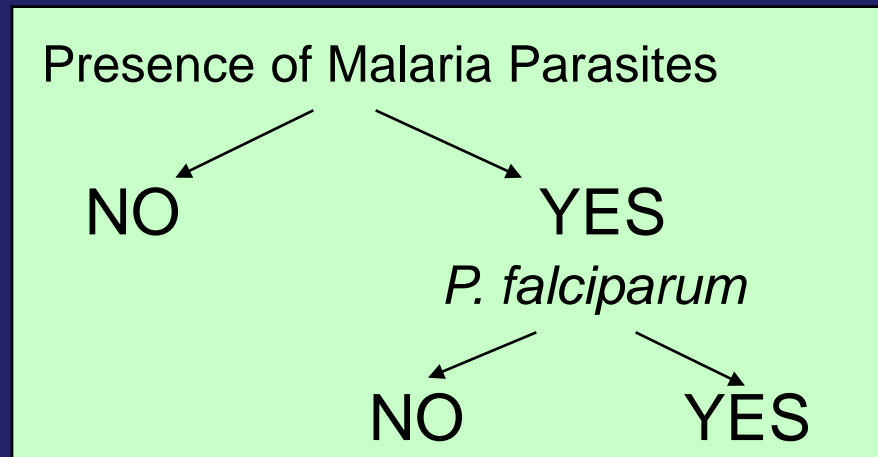
Malaria infection is diagnosed by identifying the parasite in stained (**Giemsa or Wright**) blood smears

**THICK SMEARS** to detect and quantify parasitemia

**THIN SMEARS** for morphological identification of the species

*Preparing the stain is simple. Reading it requires experience*

Usefulness of the stain  
at the site of disaster



# TYPES OF MALARIA

- *P. falciparum* – SEVERE MALARIA (MALIGNANT)

High letality rate in infected individuals

Highly drug-resistant

*Plasmodium vivax*

*Plasmodium ovale*

*Plasmodium malariae*



“BENIGN” MALARIA

Most are sensitive  
to chloroquine

- These infections cause morbidity and contribute to multifactorial mortality

# TREATMENT OF CHLOROQUINE-SENSITIVE UNCOMPLICATED MALARIA

- **Children:** a total dose of 25 mg/kg of CHLOROQUINE over a 3-day period

*Obtain a blood smear if lab is available*

t = 0	10 mg/kg po	
t = 6 h	5 mg/kg po	} or 10mg/kg at t = 24 h
t = 24 h	5 mg/kg po	
t = 48 h	5 mg/kg po	

- **Adults:** similar schedule. 1 gr followed by 500 mg x 3
- **Pregnant women:** Malaria is SEVERE. Chloroquine treatment is safe



# TREATMENT OF CHLOROQUINE-SENSITIVE UNCOMPLICATED MALARIA

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## Alternatives

- **Hydroxychloroquine sulfate**
  - 400 mg = 500 mg of chloroquine sulfate
- **Primaquine**
  - Prevents relapses from liver stages (*P. vivax* and *P. ovale*)



# OTHER THERAPY FOLLOW-UP

- **Supervised therapy is an ideal approach**

At least the first dose should be administered at treatment area

- **If the patient vomits within the first 30 minutes, dose must be repeated**
- **Days 2-3 doses may be administered by a caregiver after having been clearly instructed to bring back the child should he/she vomit any dose**




# MALARIA

## SUPPORTIVE TREATMENT

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- **Fever control**
  - Antipyretics, no more than a few doses
  - Cool compresses
- **Dehydration**
  - Oral rehydration solution, increased need for fluids
- **Malnutrition**
  - Assess and treat

**Control at 48-72 hours**



# CHLORIQUNINE OR UNKNOWN DRUG-RESISTANT *P. FALCIPARUM* UNCOMPLICATED MALARIA

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- A. Quinine sulfate plus one of the following drugs:  
doxycycline, tetracycline or clindamycin
- B. Atovaquone-proguanil (Malarone™)
- C. Mefloquine (Lariam™ and generic drugs)
- D. Mefloquine, Halofantrine, Artesunate



# TREATMENT PRINCIPLES FOR SEVERE MALARIA

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- Assume you are treating drug-resistant malaria: quick action is the key
- Start treatment with the best available drug **no later than an hour after** having seen the patient
- When possible, **transfer the patient** to a facility with the highest available level of care in the area, but initiate treatment before transfer (!)



# MANAGEMENT OF SEVERE MALARIA

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*Initiate outpatient treatment and, if possible, arrange transfer to a hospital*

- Fever
- Dehydration
- Seizures
- Hypoglycemia

*If cultures or LP cannot be obtained, administer broad spectrum antibiotics*



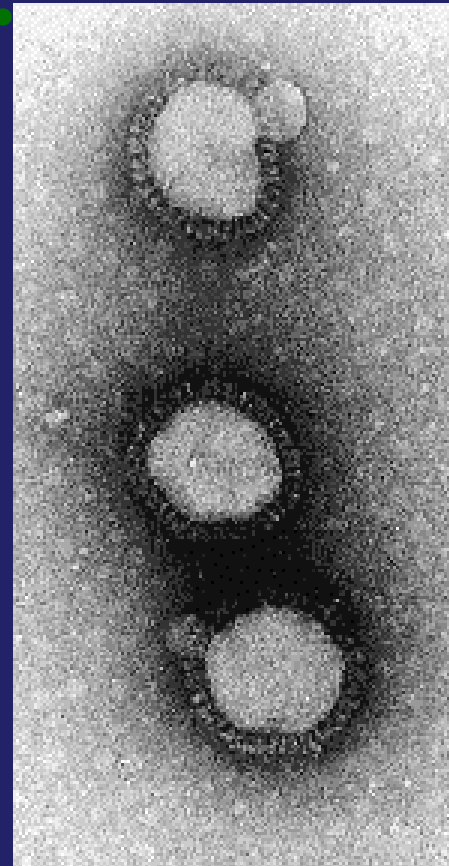
# SEVERE MALARIA

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- **First dose: PO or NG quinine sulfate 10 mg/kg**
  - Repeat if vomit within 30 mins
  - If persistent vomiting: 10 mg/kg IM every 4 h
- **Quinidine gluconate (10 mg/Kg IV over 1-2 hr then 0.02 mg/kg/min CI) + one of the following drugs:**
  - Doxycycline
  - Tetracycline
  - Clindamycin

# INFLUENZA VIRUS

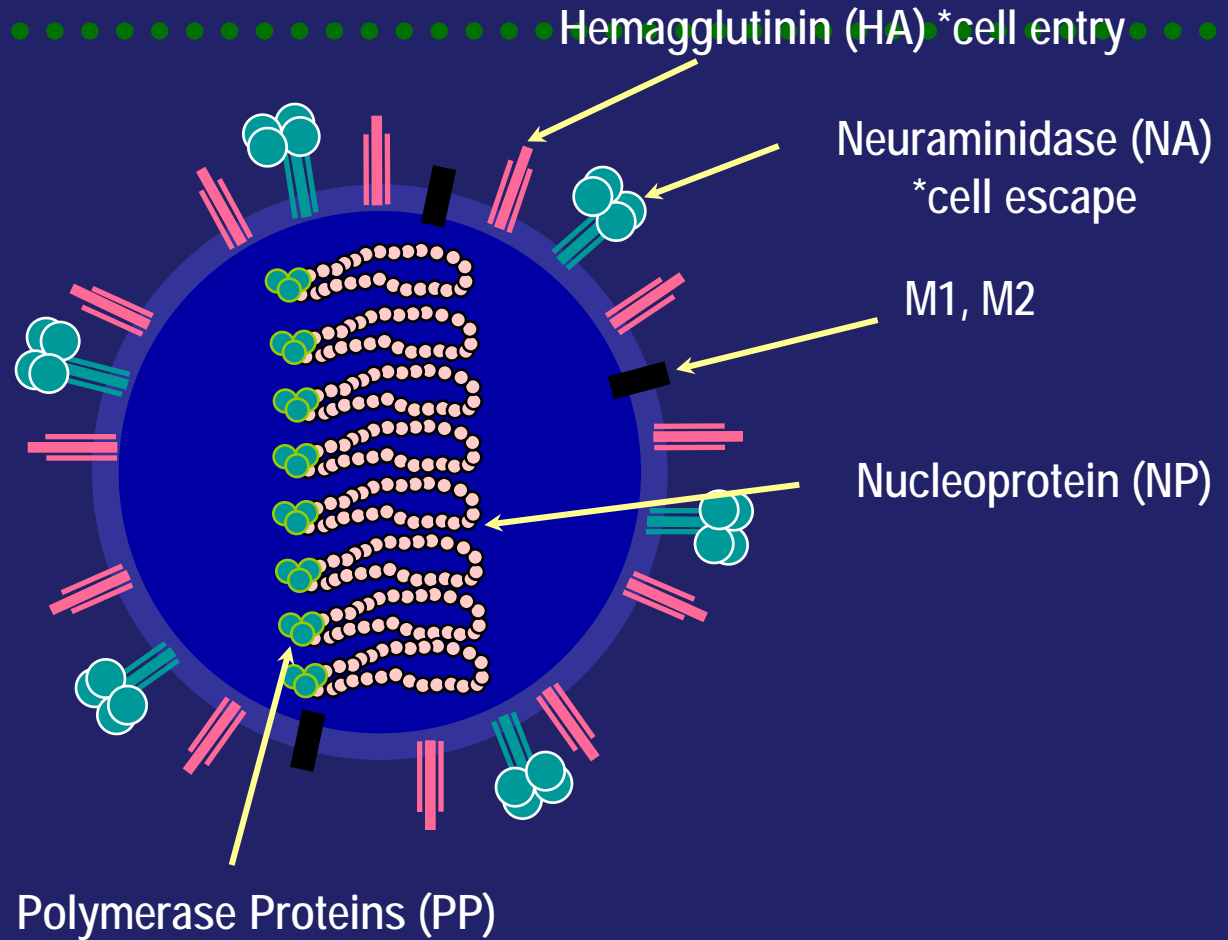
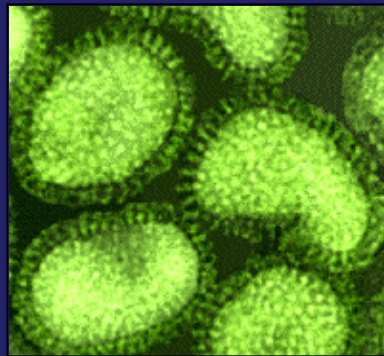
- Family Orthomyxoviridae
  - “myxo” mucus
  - Segmented, single-stranded RNA
- Influenza A first isolated 1933; Influenza B 1940
- 15 hemagglutinin (HA) and 9 neuraminidase (NA) subtypes
  - Only H1N1, H2N2, H3N2 subtypes associated with widespread epidemics in humans



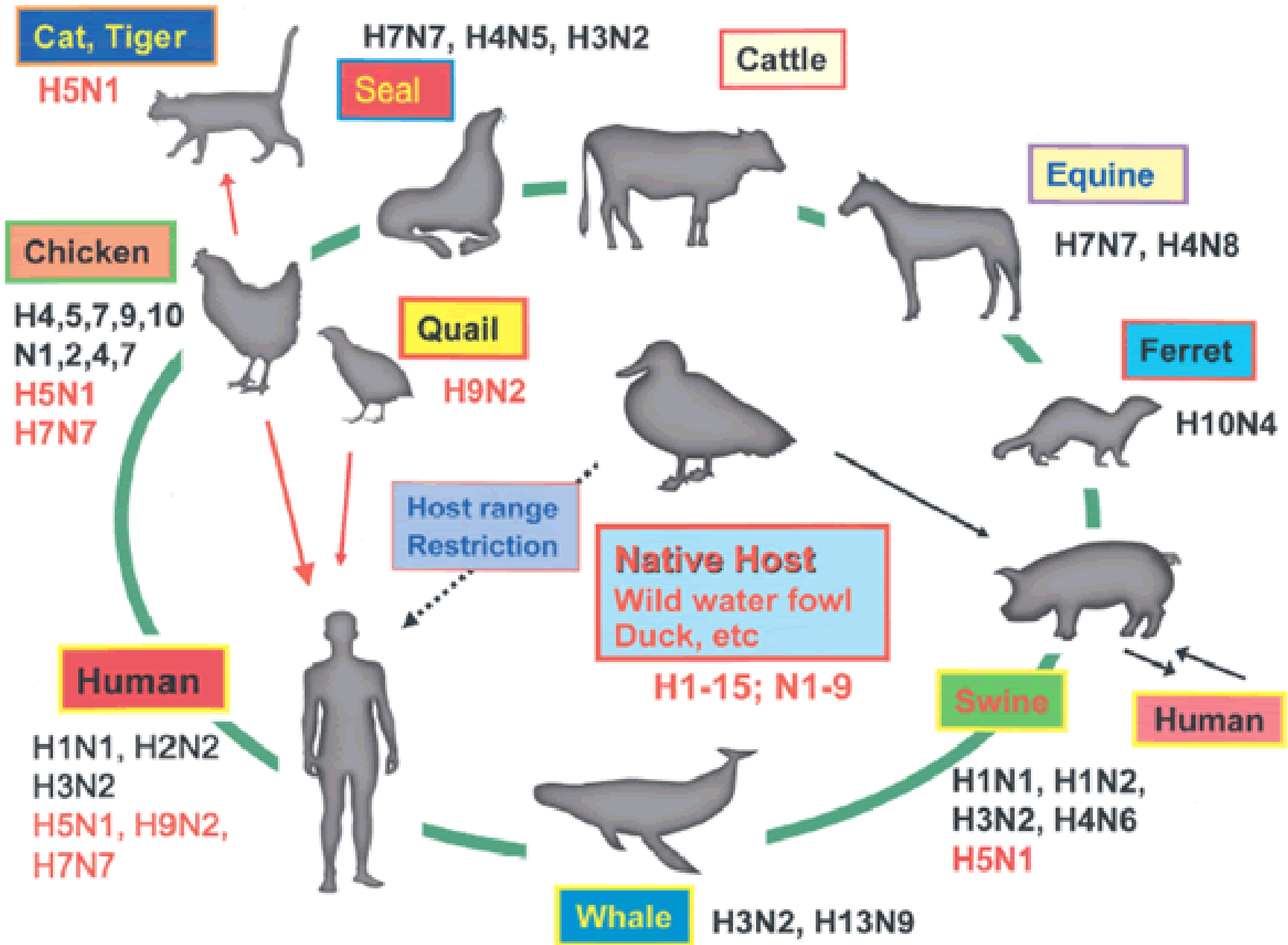
# CLINICALLY RELEVANT INFLUENZA VIRUSES

- Type A
  - Potentially severe illness
  - Epidemics and pandemics
  - Rapidly changing
  - Birds, swine, horses, seals, humans
- Type B
  - Usually less severe illness
  - Epidemics
  - More uniform
  - Humans
- Type C
  - Usually mild or asymptomatic illness
  - Minimal public health impact
  - Humans, swine

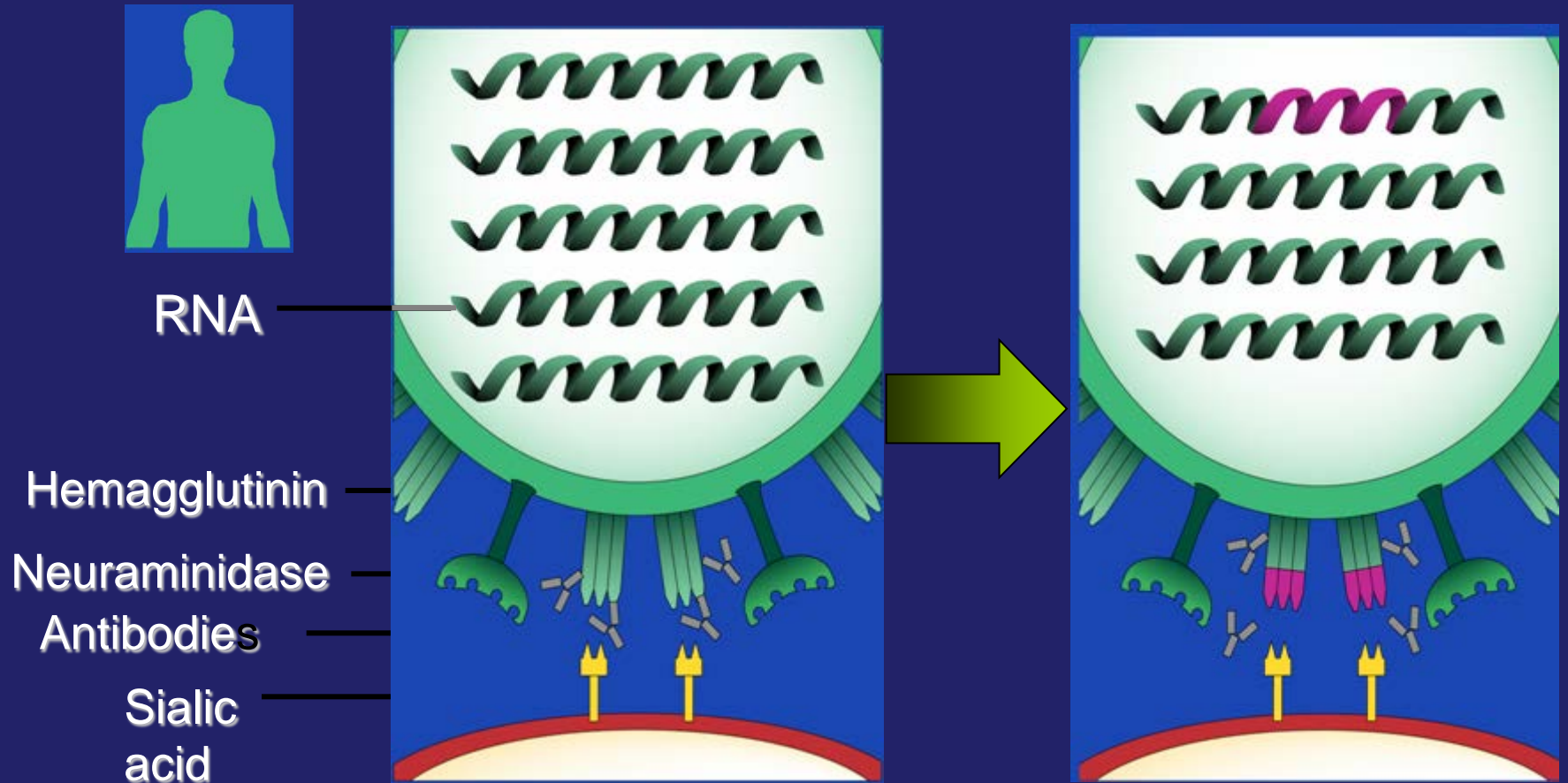
# INFLUENZA: A CONTINUOUSLY CHANGING VIRUS



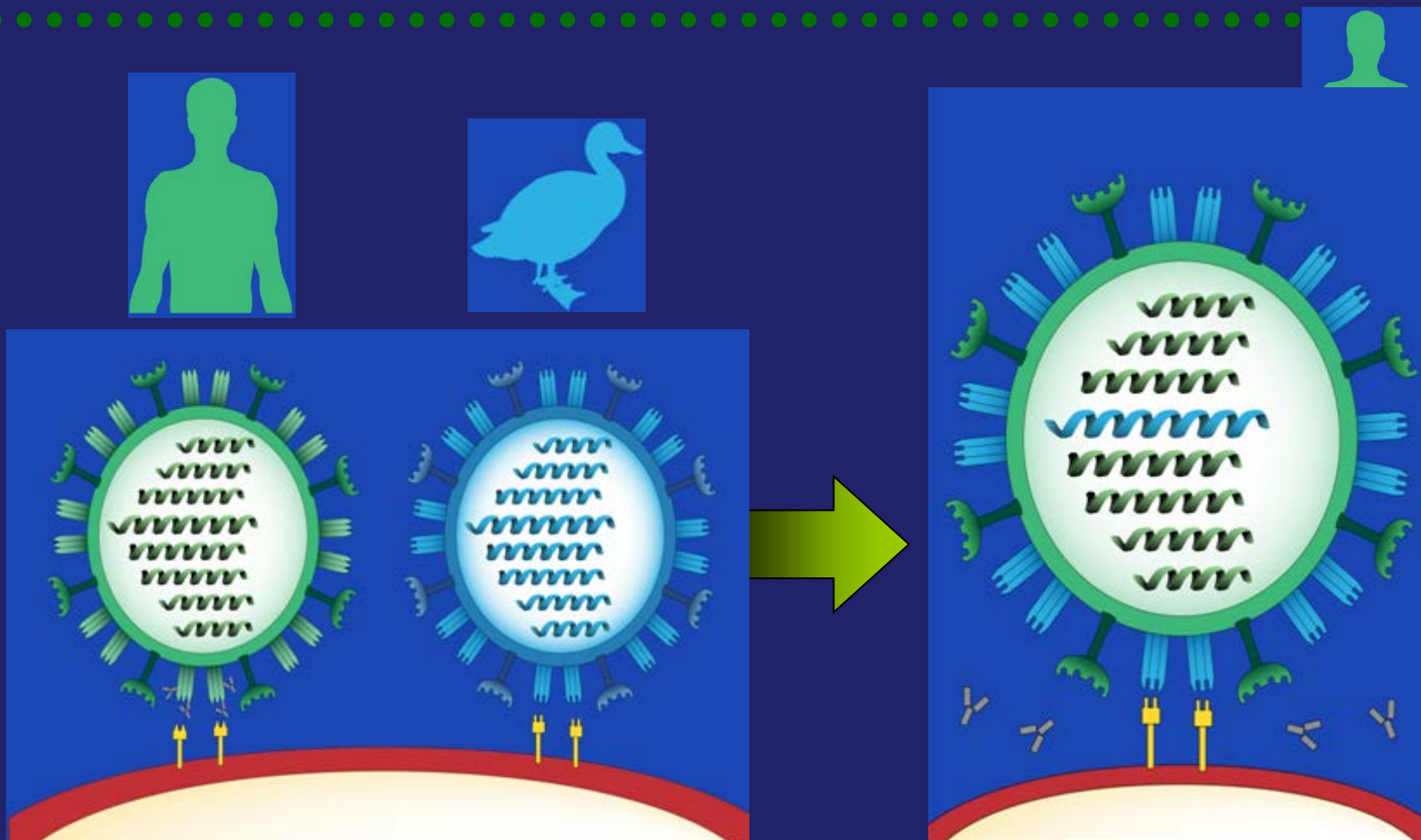
Adapted from: Hayden FG et al. *Clin Virol.* 1997:911-942.



# ANTIGENIC DRIFT (A & B)

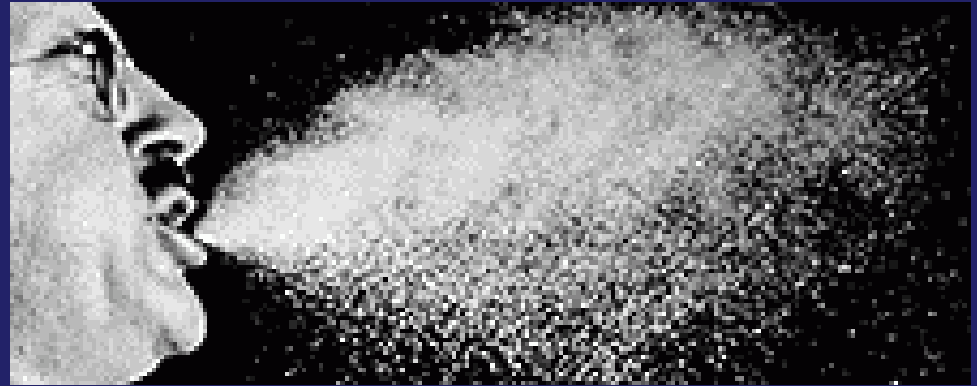


# ANTIGENIC SHIFT (A ONLY)



# TRANSMISSION OF INFLUENZA

- Person to person
- Droplet spread-
  - small particle aerosols
- Fomite contamination
  - Steel and plastic 24-48 hrs
  - Cloth, paper, tissues 8-12 hrs
  - Hands 5 min (high viral titer)



- Principal site of replication- columnar epithelium
- Incubation period- 18 hrs to 5 or more days (avg 2-3 days)
- Virus shedding 3-7 days
- Viral titers are generally higher in young children with shedding lasting 10 days or longer

# RECOGNIZING PEDIATRIC INFLUENZA

## Neonates

High fever  
Lethargy  
Decreased eating  
Mottling  
Apnea

## Infants/Toddlers

GI symptoms  
Fever  $>103^{\circ}\text{F}$  ( $>39.5^{\circ}\text{C}$ )  
Anorexia  
Respiratory syndromes  
Malaise  
Headache  
Sore throat

## Children/Teens

Rapid onset  
High fever  
Cough  
Chills

# INFLUENZA VIRUS INFECTION COMPLICATIONS

## Common Complications

- Acute otitis media (children)
- Sinusitis
- **Pneumonia**
- Exacerbation of underlying illness
- **Dehydration (infants)**

## Uncommon Complications

- Encephalopathy
- Reye syndrome (children)
- Myositis
- Myocarditis
- Febrile seizures

# DEFINITION OF A PANDEMIC

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Global outbreak occurring when:

(1) A new influenza A virus appears/emerges in the global immunologically naïve human population

- New subtype
- Subtype that has never circulated among humans
- Or has not circulated for a long time

(2) Infection results in serious illness and high mortality

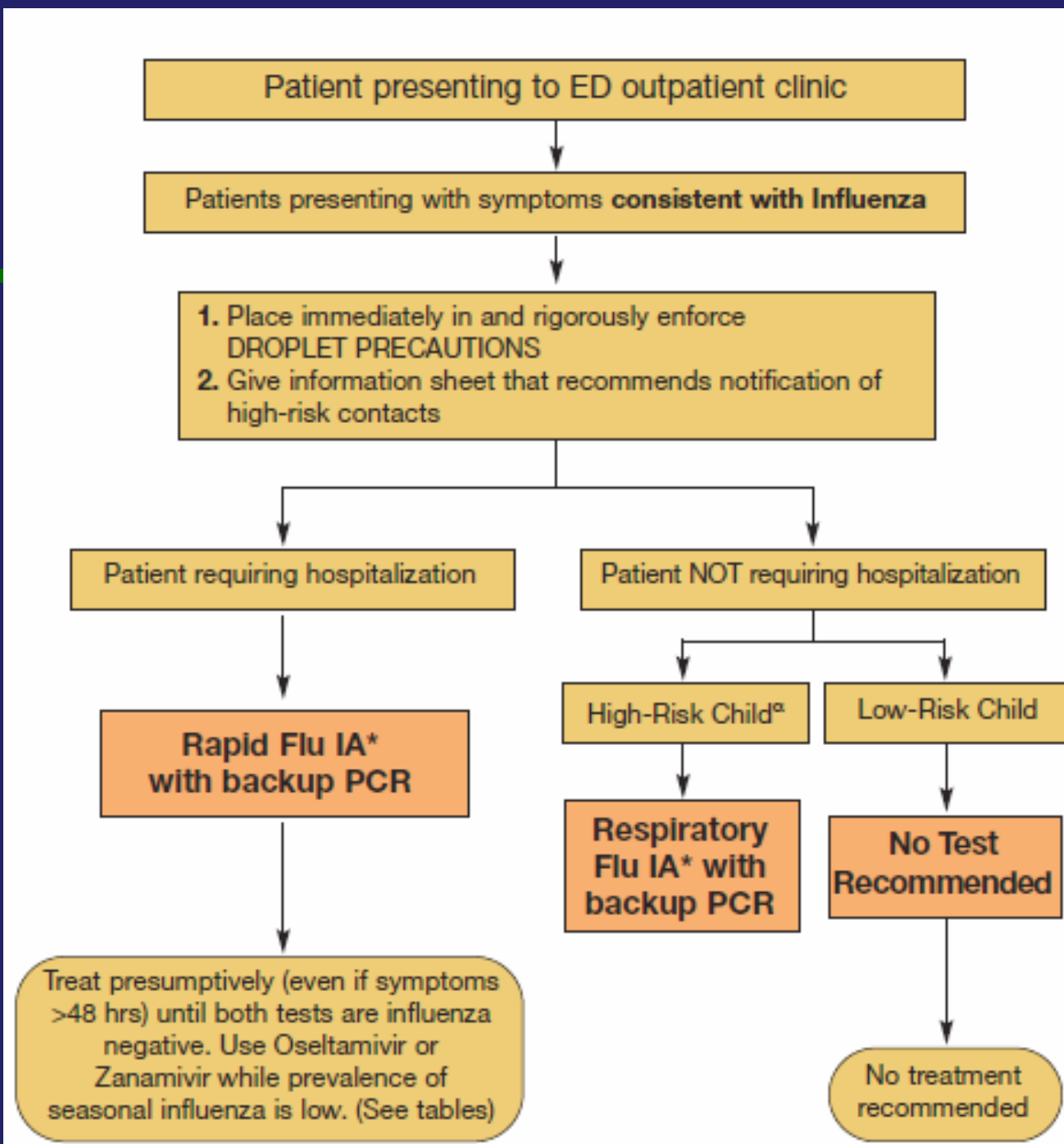
AND

\*\*\*(3) Effective person-to-person transmission

# PANDEMIC RESPONSE CHALLENGES

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- Healthcare system capacity- overwhelmed
- Antiviral supplies- insufficient
- Vaccine- none for at least 5 months
- Critical infrastructure- disruption
- Economy- disruption





Thank you