Johor Bahru
Health Office

Public Health Management and Preparedness in Wildlife Zoonotic Disease Outbreak



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Outline of Presentation

- Wildlife as Source of Zoonotic Infection
- Definitions
- Global Health Milestones
- Zoonoses of Wildlife
- Ebola Viral Disease (EVD)
- Influenza A(H1N1)
- Surveillance & Response
- Risk Management Cycle
- Rapid Containment
- Public Health Emergency of International Concern (PHEIC)
- Event Management Process

Wildlife as Source of Zoonotic Infections

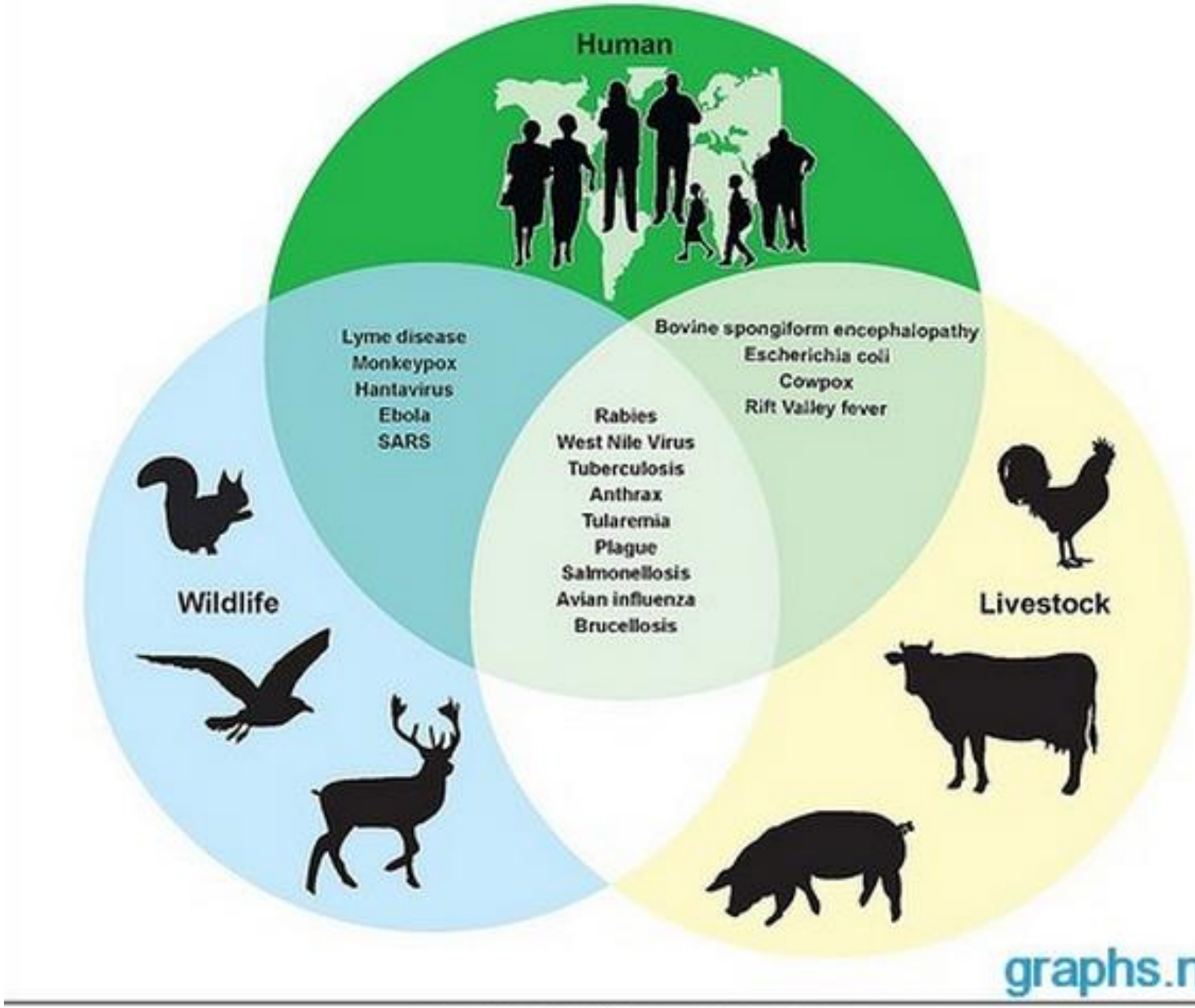
Hilde Kruse,* Anne-Mette Kirkemo,* and Kjell Handeland*

Zoonoses with a wildlife reservoir represent a major public health problem, affecting all continents. Hundreds of pathogens and many different transmission modes are involved, and many factors influence the epidemiology of the various zoonoses. The importance and recognition of wildlife as a reservoir of zoonoses are increasing. Cost-effective prevention and control of these zoonoses necessitate an interdisciplinary and holistic approach and international cooperation. Surveillance, laboratory capability, research, training and education, and communication are key elements.

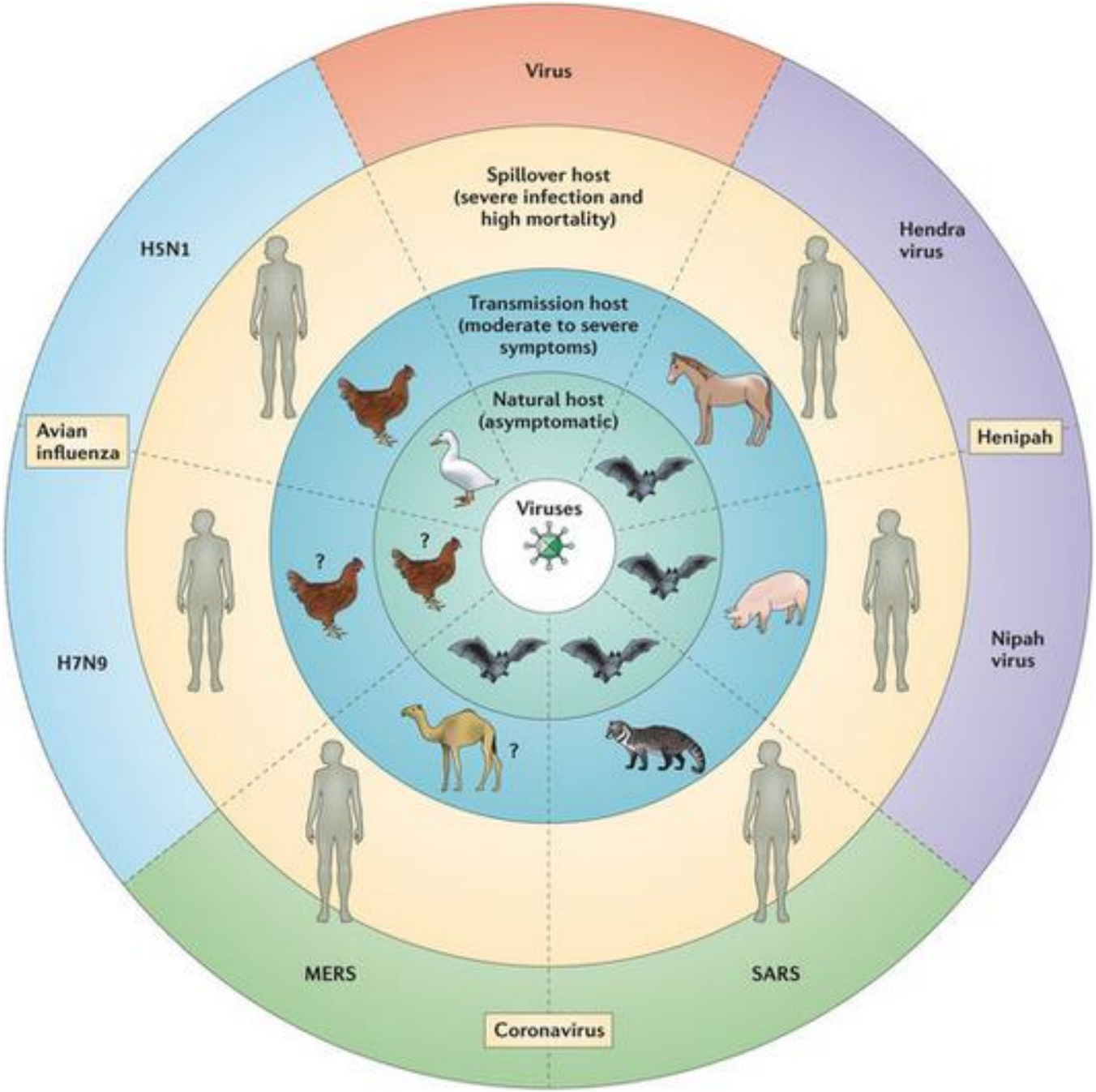
Definitions

Wildlife is normally defined as free-roaming animals (mammals, birds, fish, reptiles, and amphibians), whereas a zoonosis is an infectious disease transmittable between animals and humans

Source: Wildlife as Source of Zoonotic Infections. Kruse H., Kirkemo A. M., Handeland K., Emerging Infectious Diseases. www.cdc.gov/eid. Vol. 10, No. 12, December 2004

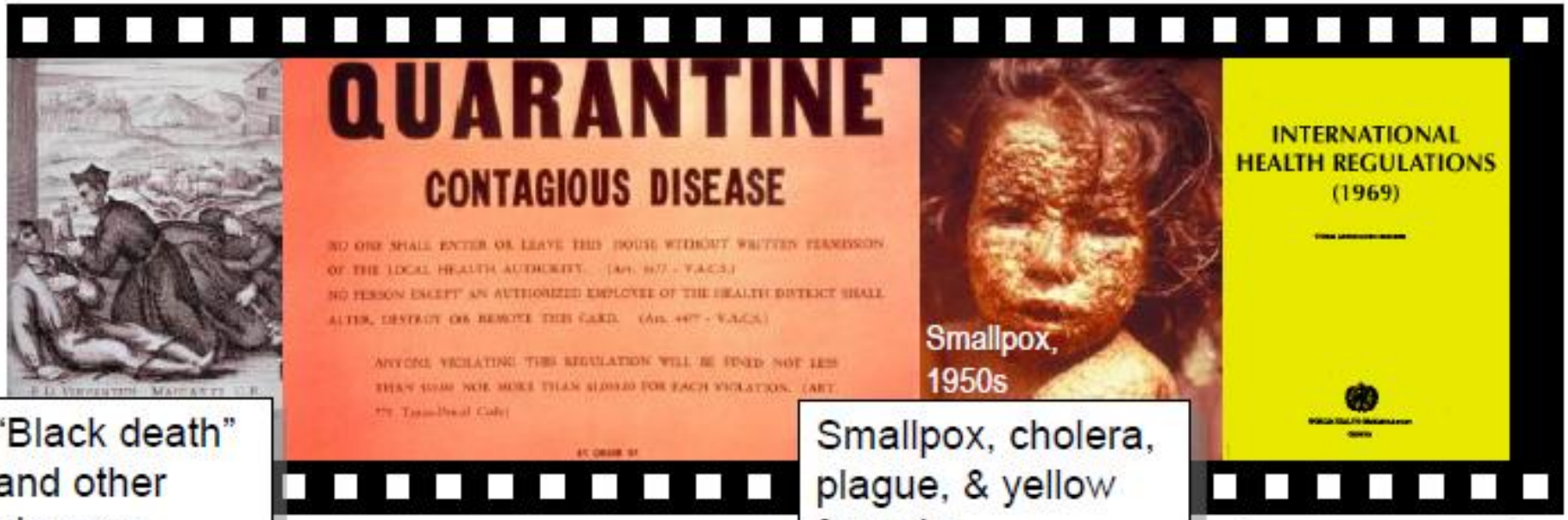


Source: GAO analysis of USGS data (data); Art Explosion (images).



Nature Reviews | Immunology

Global Health Milestones…



"Black death" and other plagues spread across the world

The first effective **public health intervention**

Smallpox, cholera, plague, & yellow fever in **International Sanitary Regulations**

IHR 1951 revised in 1969

Global Health Milestones…

Emergence of the AIDS **pandemic**

Major travel disruption. **WHO's DG on site**

1st global response coordinated by WHO

Global Health Milestones...

World Health Organization

1996

Creation of WHO Department for Emerging Diseases

Emergence in the North. Major economic cost.

Emergence in the South. Major economic cost

Global Health Milestones...

World Health Organization

Geneva, 2000

World Health Organization

Lyon, 2001

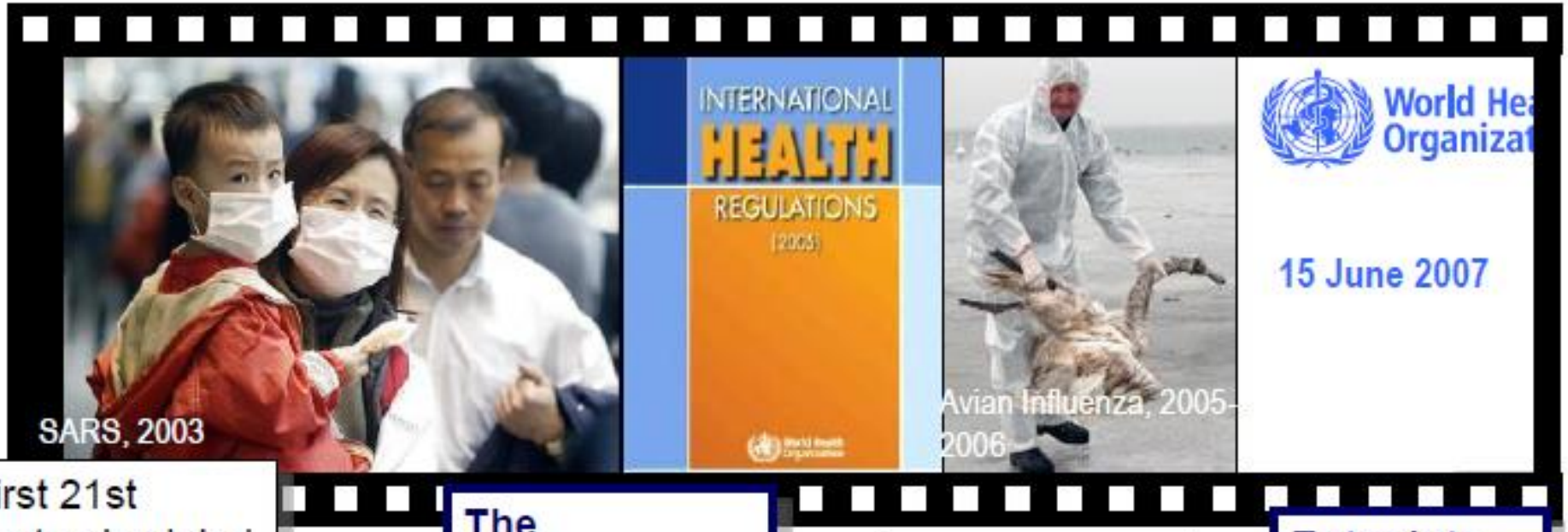
New meningitis strain W135

The Global Outbreak Alert & Response (GOARN)

Major outbreaks continue to strike

WHO's Office for National Epidemic Preparedness and Response

Global Health Milestones...



First 21st century's global epidemic. Major economic cost

The International Health Regulations (2005)

Influenza pandemic threat

Entry into force of IHR(2005)

Zoonoses of Wildlife

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Alphaviruses:			
Eastern encephalitis	Small birds, ducks, horses (mosquitoes)	No apparent disease; encephalitis	Encephalomyelitis
Western encephalitis	Birds, squirrels, snakes, horses (mosquitoes)	No apparent disease; horses die	Encephalomyelitis
Venezuelan encephalitis	Rodents, horses (mosquitoes)	No apparent disease; horses die	Encephalitis

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Flaviviruses:			
St. Louis encephalitis	Birds (mosquitoes)	No apparent disease	Encephalomyelitis
Japanese B encephalitis	Birds, pigs, horses, cattle (mosquitoes)	No apparent disease; domestic animals may die	Encephalitis
Murray Valley encephalitis	Birds (mosquitoes)	No apparent disease	Encephalomyelitis
Tick-born encephalitis	Rodents, birds, goats, cattle (ticks)	No known apparent disease	Encephalitis
Yellow fever virus	Nonhuman primates (mosquitoes)	No apparent disease; death	Yellow fever
Dengue viruses	Nonhuman primates (mosquitoes)	No apparent disease	Dengue fever

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Bunyavirus: California encephalitis	Rabbits, hares, squirrels, deer, horses, cows (mosquitoes)	No apparent disease	Encephalitis
Arenaviruses	Rodents, nonhuman primates	No apparent disease; death	No clinical disease; malaise, fever, shock, meningitis, encephalitis
Rabies virus	Weasel-skunk, civet-ferret, families with bats, foxes, skunks most important; also dogs, cats, cattle	No apparent disease; death with paralysis	Excitation, paralysis, death
Colorado tick fever virus	Squirrels, chipmunks, mice, porcupines (ticks)	No apparent disease	Fever, malaise, leukopenia, rash
Chlamydia psittaci	Psittacine birds, pigeons, poultry	No apparent disease; death	Fever, cough, pneumonia

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Rickettsia typhi	Rats (fleas)	No apparent disease	Murine typhus
Rickettsia rickettsii	Rabbits, squirrels, rats, mice, groundhogs, dogs (ticks)	No apparent disease; dogs may die	Rocky Mountain spotted fever
Rickettsia akari	Mice (mites)	No apparent disease	Rickettsialpox
Coxiella burnetii	Wild ungulates	No apparent disease	Q fever
Brucella spp	Wild ungulates, dogs	No apparent disease; abortion	Brucellosis
Francisella tularensis	Rabbits, squirrels, rats, skunks, bears, muskrats, coyotes, cats, dogs, swine, sheep, cattle (ticks, deerflies, mosquitoes)	No apparent disease; lymphadenitis, septicemia	Tularemia

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Yersinia pestis	Rats, mice, prairie dogs, squirrels, marmots, rabbits, gerbils, chipmunks (fleas)	No apparent disease; death	Bubonic, pneumonic, septicemic plague
Yersinia enterocolitica	Rodents, rabbits, pigs, sheep, cattle, horses	No apparent disease	Enterocolitis, reactive polyarthritis
Campylobacter jejuni	Birds, cattle, sheep, pigs, goats	No apparent disease, death	Gastroenteritis
Pseudomonas pseudomallei	Rats, mice, rabbits, ruminants, dogs, cats, nonhuman primates	No apparent disease; death	Pulmonary abscesses, septicemia
Streptobacillus moniliformis	Rats, squirrels, weasels, turkeys	No apparent disease	Fever, rash
Listeria monocytogenes	Wild mammals, birds	No apparent disease; death	Meningitis, abortion, septicemia
Borrelia burgdorferi	Deer, mice, raccoons (ticks)	No known apparent disease	Lyme disease
Spirillum minor	Rats, mice, cats	No apparent disease	Fever, rash

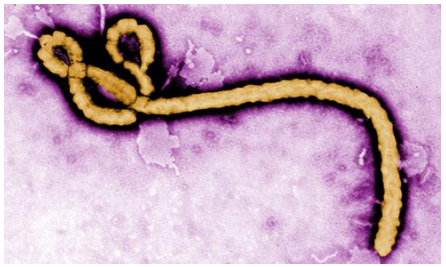
INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Cryptosporidium spp	Rodents, snakes, birds	No apparent disease; enteritis, respiratory disease	Enteritis, dysentery
Blastocystis hominis	Pigs, guinea pigs, fowl, nonhuman primates	No apparent disease; diarrhea	Diarrhea
Leishmania spp	Rodents, canines, rodents, other carnivores (sandflies)	No apparent disease; skin ulcers	Chronic skin ulcerations, mucocutaneous lesions, kalaazar syndrome
Trypanosoma cruzi	Armadillos, bats, rodents, opossums, nonhuman primates, dogs, cats (triatomes)	No known apparent disease; neurologic dysfunctions	Skin rash, myocarditis, conjunctivitis, myositis (Chagas disease)
Trypanosoma brucei var. **gambiense and var.** **rhodesiense**	Wild ungulates (tsetse flies)	No apparent disease; death in coma	Meningoencephalitis

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Pneumocystis carinii	Rodents, foxes, nonhuman primates, sheep, goats, dogs, cats	No known apparent disease	Pneumonitis
Diphyllobothrium latum	Fresh-water fish, bears, dogs, cats	No known apparent disease	Tapeworm infection, megaloblastic anemia
Hymenolepis nana and diminuta	Mice, rats	Tapeworm infection	Tapeworm infection
Trichinella spiralis	Wild carnivores, wild pigs	No known apparent disease	No apparent disease; muscle invasion death
Fasciola hepatica	Snails, fish, cattle, sheep, goats, camel, deer, rabbits	No apparent disease; death	Acute hepatitis, cholecystitis, cirrhosis
Schistosoma spp	Snails, rodents, baboons	No apparent disease; death	Colitis, hepatitis, cystitis
Dracunculus medinensis	Wild carnivores, nonhuman primates (water fleas)	No known apparent disease	Skin ulcers

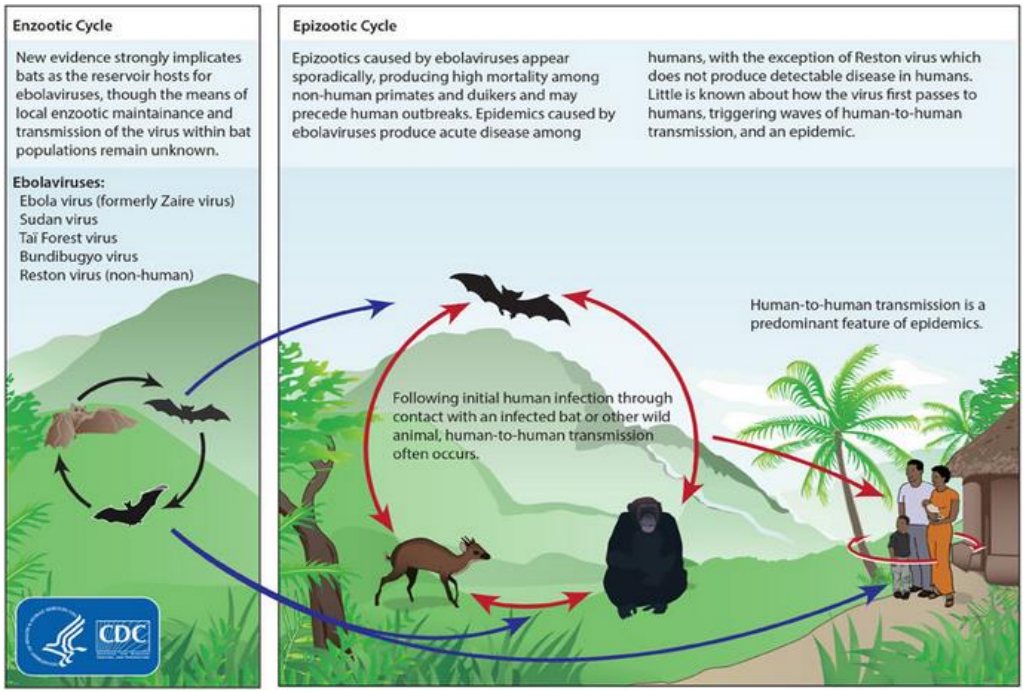
INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Brugia spp	Nonhuman primates, wild carnivores, rodents (mosquitoes)	No known apparent disease	Lymphadenopathy, lymphedema

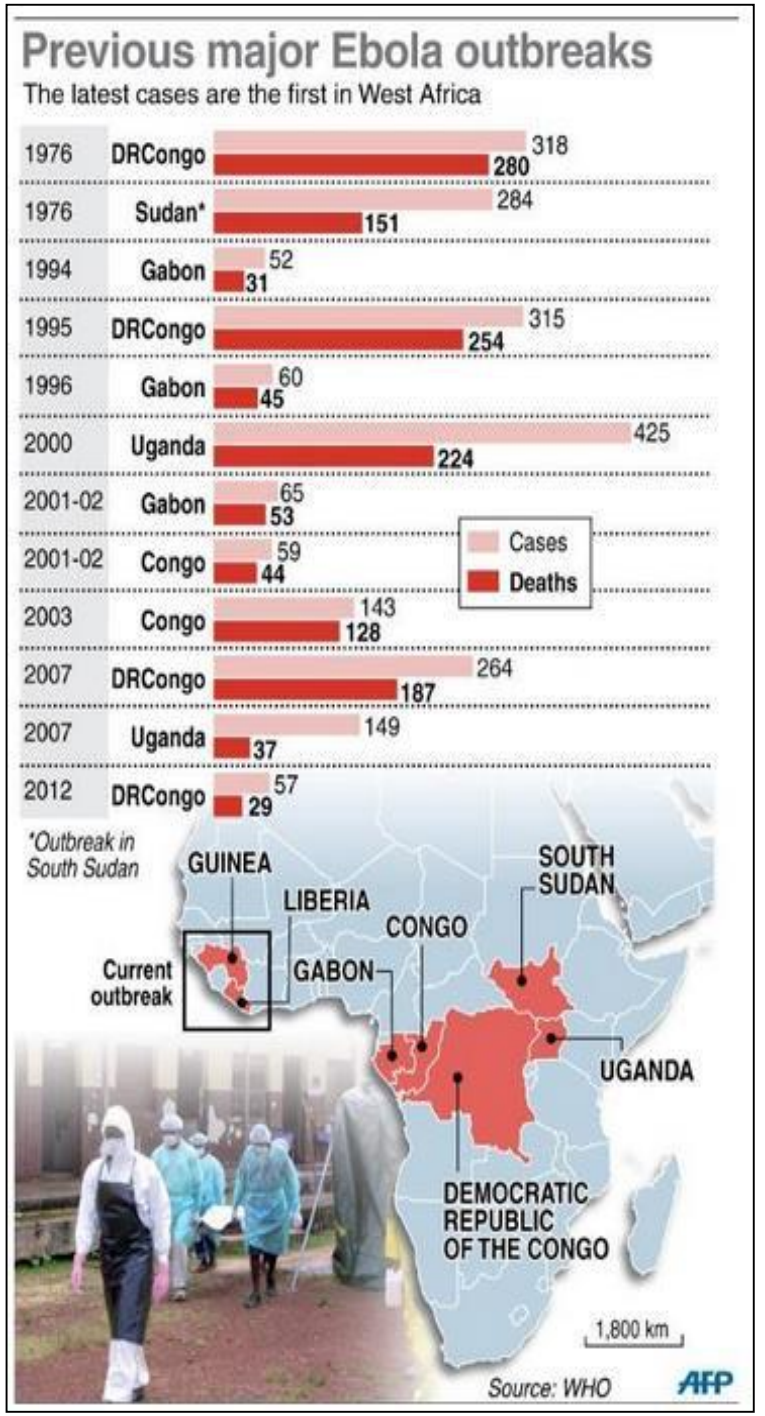
* Table extracted from County of LA - Department of Health Services, Public Health Programs and Services - Disease Control Programs, Veterinary Public Health and Rabies Control "Overview of Zoonoses."
URL: http://phps.dhs.co.la.ca.us/vet/guides/vetzooman.htm.

Ebola Virus Disease (EVD)



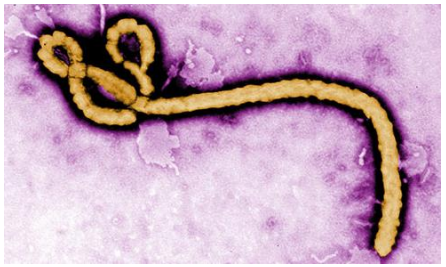
- Ebola Virus Disease (EVD) is a severe illness with high death rate (up to 90%). First appeared in 1976 in the Democratic Republic of Congo and Sudan. It is caused by genus Ebolavirus

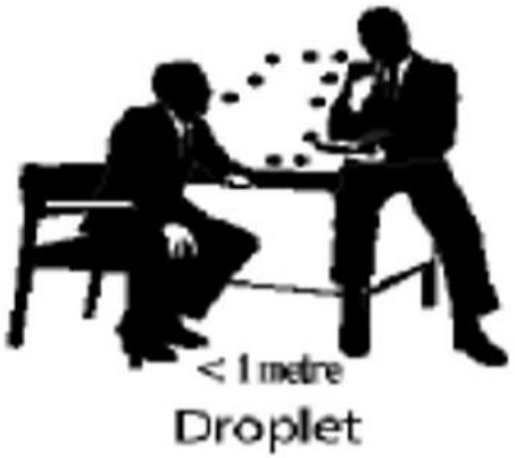




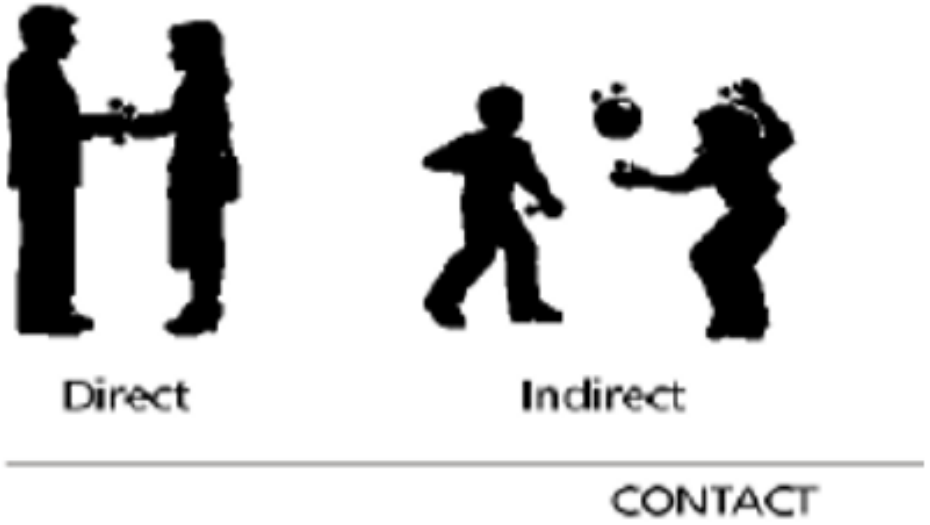

C.N.P.

Ebola Virus Disease (EVD)





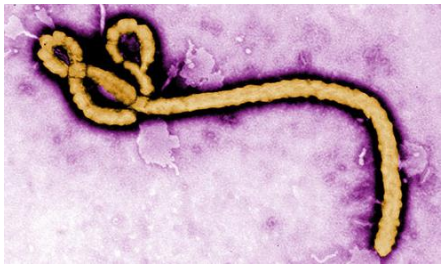
How do you get the Ebola virus?



Direct contact - with infected patients

Indirect contact – touching contaminated objects or surfaces in the patient's environment

Ebola Virus Disease (EVD)



How do you get the Ebola virus?

Direct contact with:

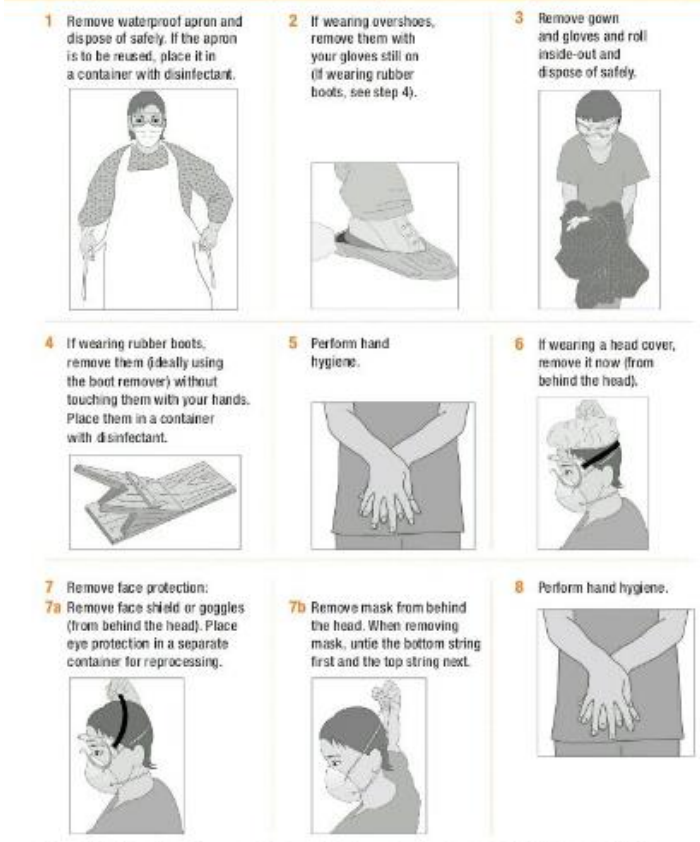
1. **Body fluids of a person who is sick with or has died from Ebola.** (blood, vomit, pee, poop, sweat, semen, spit, other fluids)
2. **Objects contaminated with the virus** (needles, medical equipment)
3. **Infected animals** (by contact with blood or fluids or infected meat)

SYMPTOMS

Symptoms can appear from 2 to 21 days after exposure:

- Fever
- Headache
- Joint and muscle aches
- Intense weakness
- Vomiting
- Rashes
- Diarrhoea
- Unexplained bleeding

Steps to remove personal protective equipment (PPE)



Source: Modified from Clinical Management of Patients with Viral Haemorrhagic Fever: A pocket Guide for the Front line Health Worker. World Health Organization; 2014

World Health Organization

History shall not repeat….

1918 Spanish Flu (H1N1) : > 40 million deaths

1957 Asian Flu (H2N2) : 1-2 million deaths

1968 Hong Kong Flu (H3N2) : ~ 1 million deaths

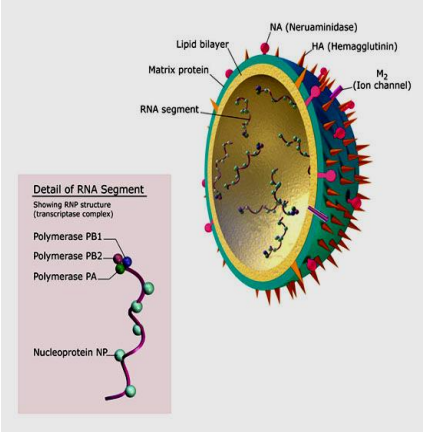


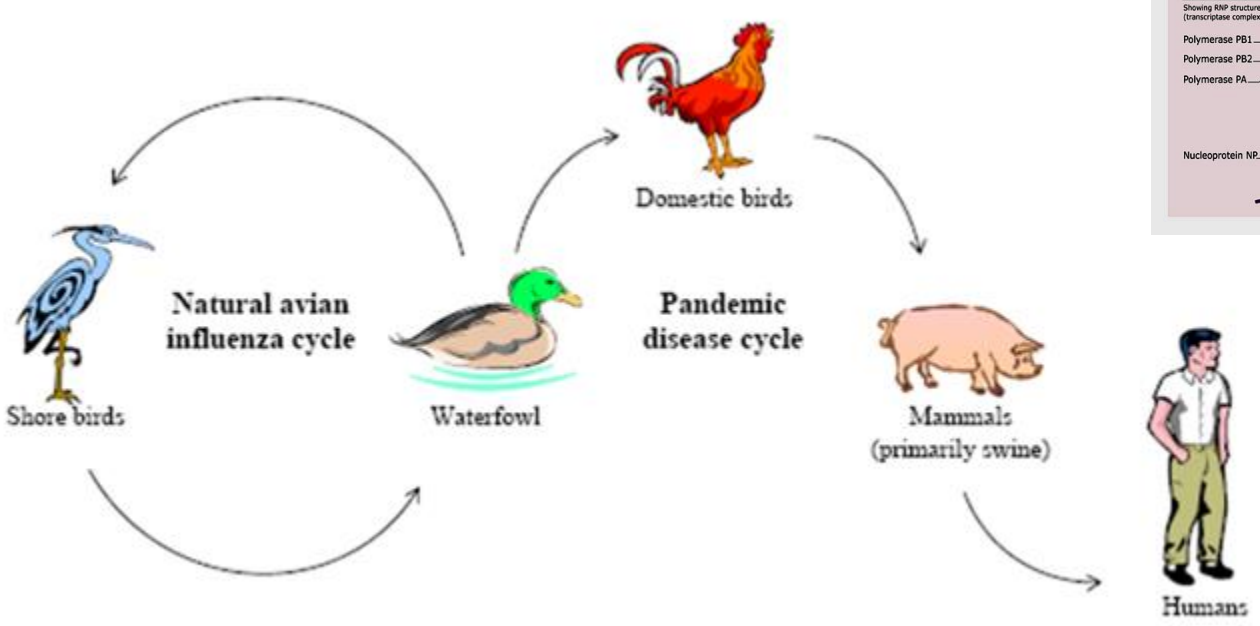
The pandemics of the previous century encircled the globe in 6 to 9 months, even when most international travel was then by **ship**.

http://www.google.com.my/search?q=spanish+flu+images

Evolution of Pathogen

Microbial pathogen adapts, becomes resistant to antibiotics, evades vaccines and emerges to cause novel disease and epidemic

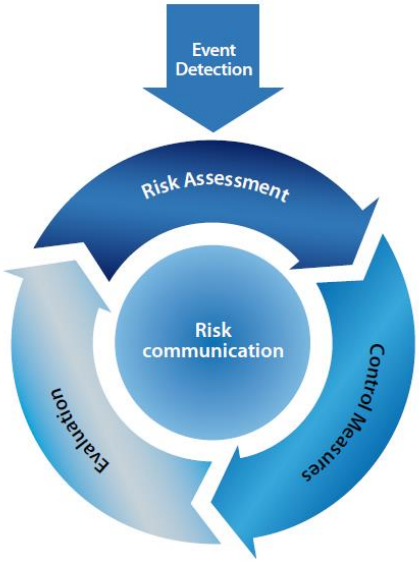


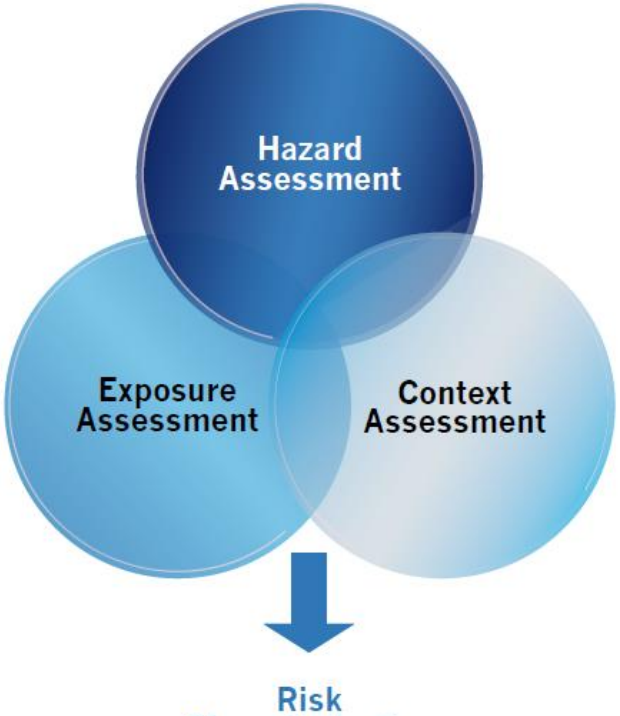


SURVEILLANCE & RESPONSE OPERATIONS

- Systematic gathering of epidemic intelligence
- Rapid verification procedures
- Real time collaborative risk assessment and communications
- Coordination of assistance through national/international teams, stockpile release, virtual networking etc
- Raise global alert if indicated

Risk Management Cycle





Ricin

Transmission
- Not contagious

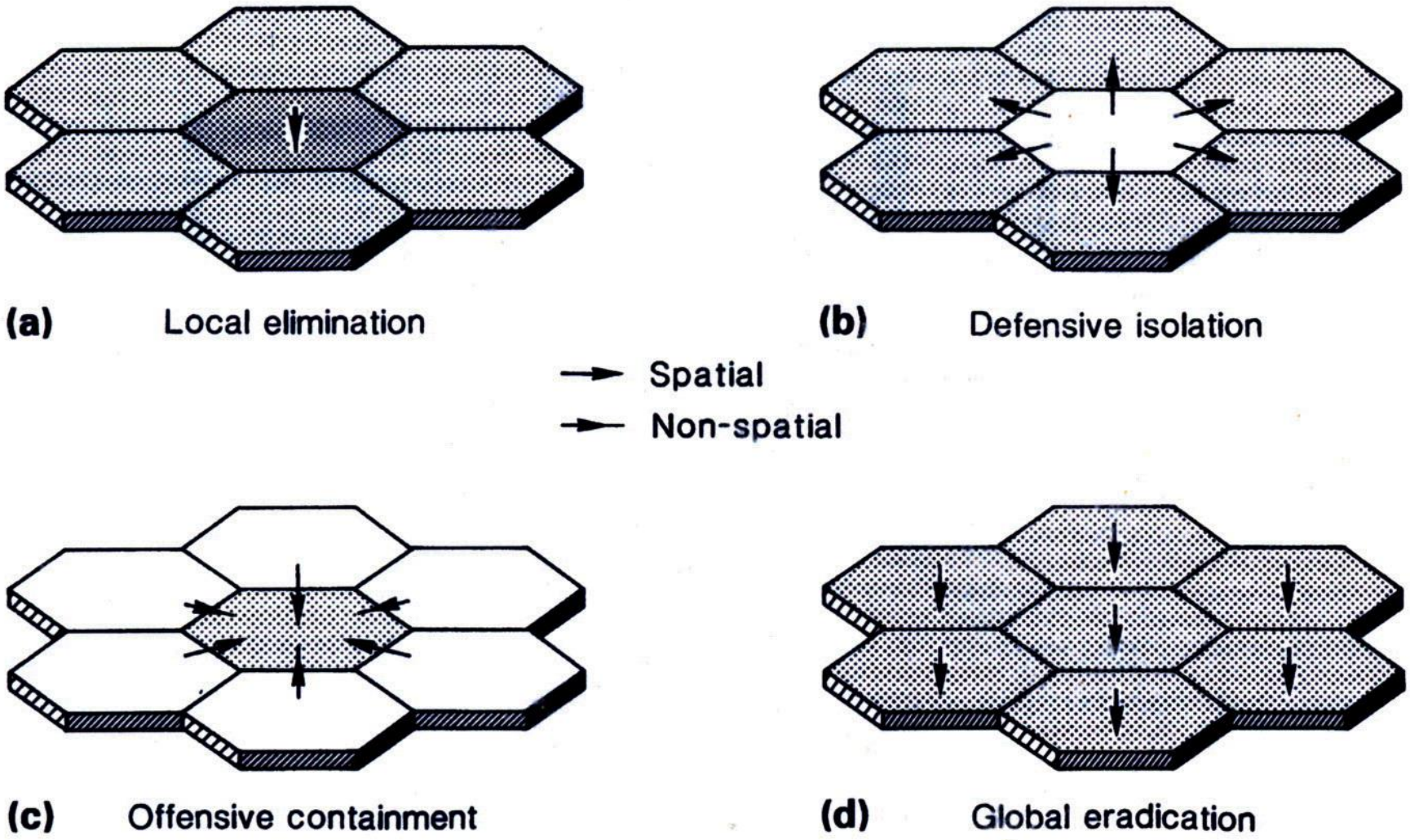
Infection Source
- Castor bean

Transmission*

Hazard	Known	Unknown
Known	•Assess risk • prior studies •Intervention for control • prior studies - specific	•Assess risk • prior studies assist •Intervention for control • can be difficult/resource intensive
Unknown	•Assess risk • many uncertainties •Intervention for control • prior studies - specific	•Assess risk • most uncertainties •Intervention for control • most difficult/resource intensive

*transmission outcomes dependent on source of exposure and vulnerabilities

SPATIAL STRATEGIES FOR DISEASE CONTROL



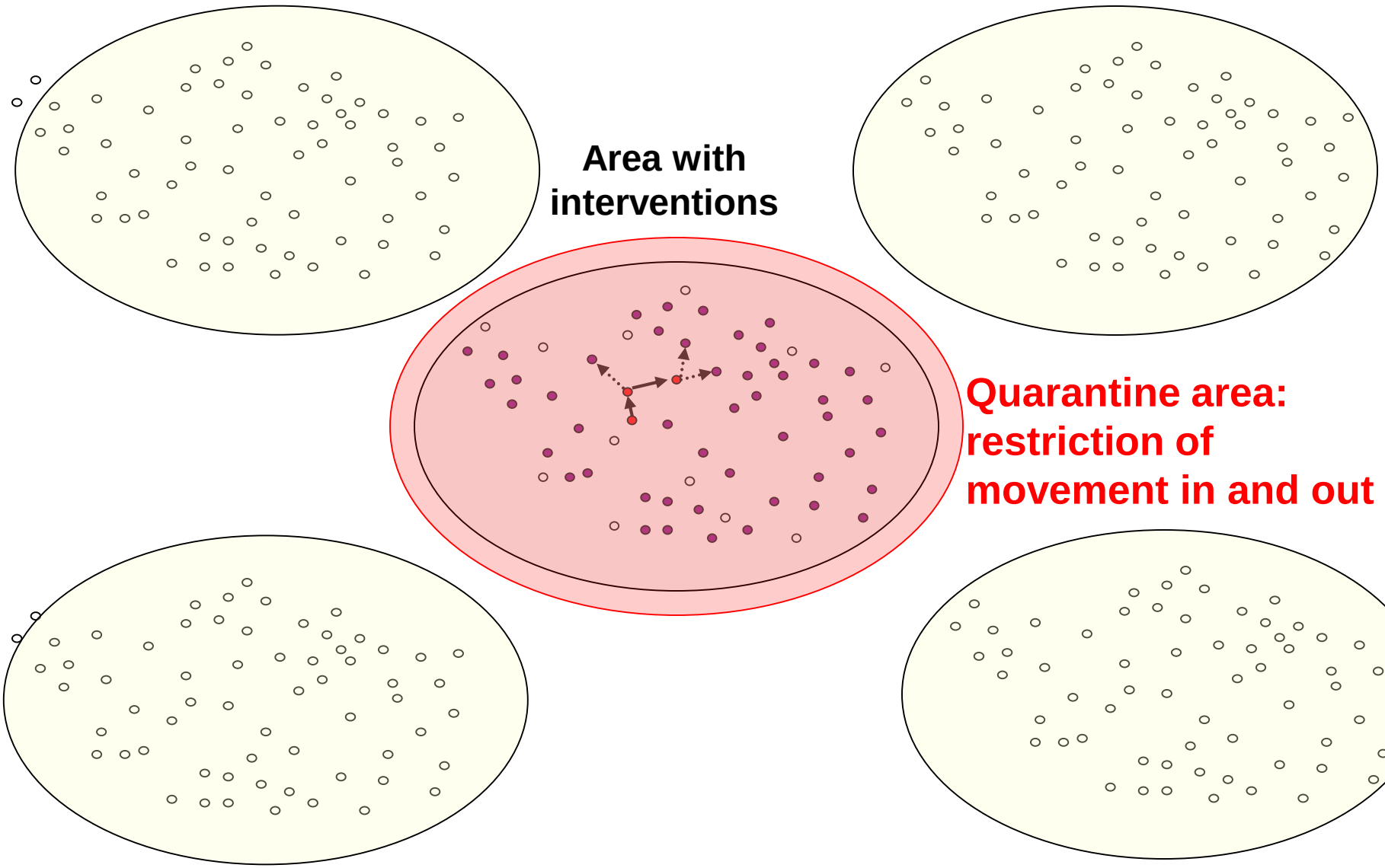
Source: Cliff AD, Haggett P, Smallman-Raynor M. Measles: an Historical Geography of a Major Human Viral Disease from Global Expansion to Local Retreat. 1840-1990. Oxford: Blackwell. 1993, figure 16.9. p.423, quoted in Communicable Disease Epidemiology and Control. Edited by Norman Noah and Mary O'Mahony.John Wiley and Sons. Chichester, England 1998. p 26

Rapid Containment for H2H Influenza Pandemic

Basic Concept of Rapid Response and Containment

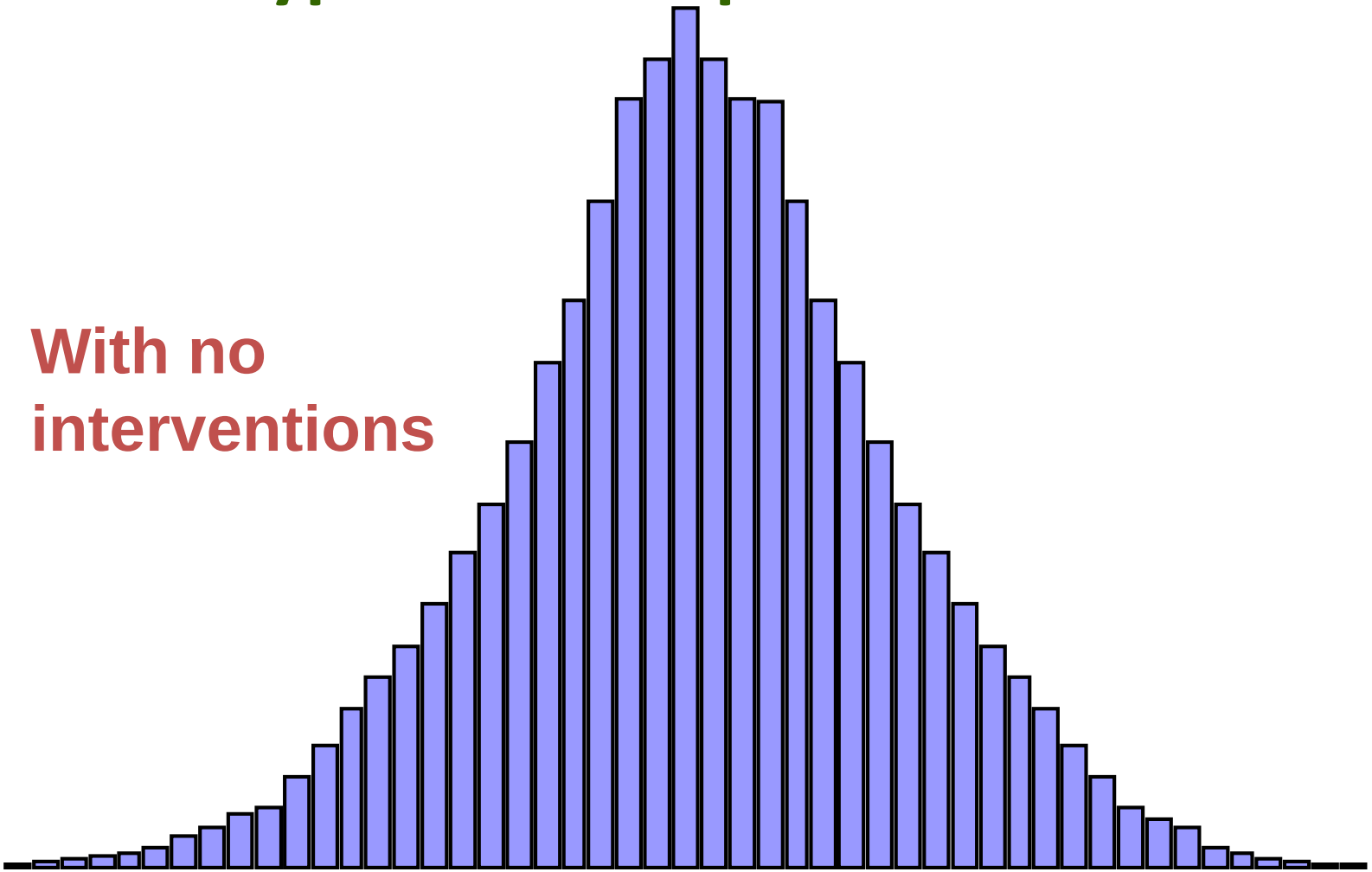
Stop or at least delay international spread

- **Identify area of local spread and establish quarantine**
- **Use antiviral drugs**
  - Treatment of infected persons
  - Prophylaxis of non-ill persons
- **Implement other public health measures**
  - Infection control measures to reduce exposure
  - Social distancing measures to reduce "mixing" of people
  - Support population within quarantine
- **Monitor situation & reassess**


Area with interventions
Quarantine area: restriction of movement in and out

Hypothetical epidemic curve

With no interventions



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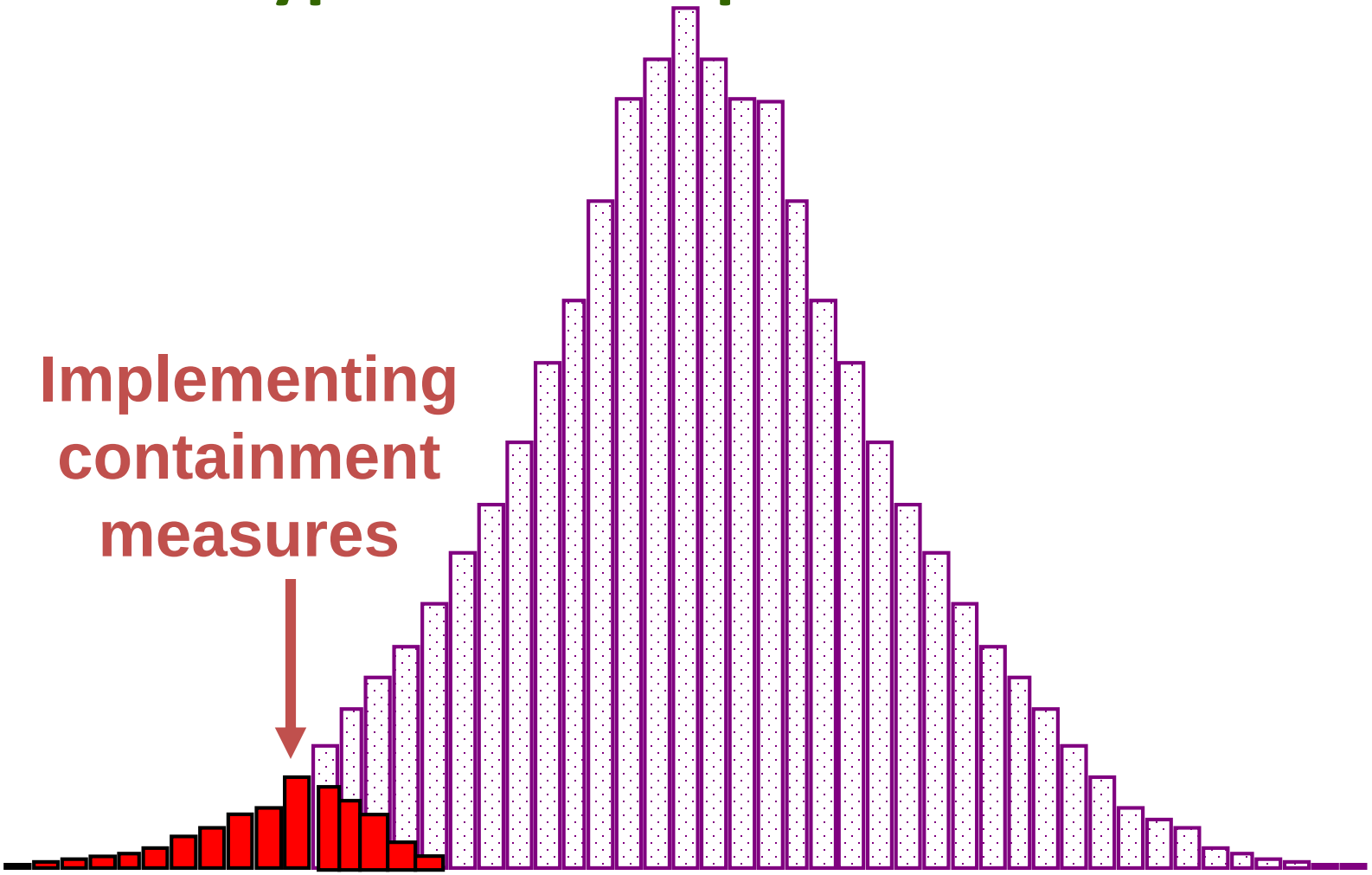
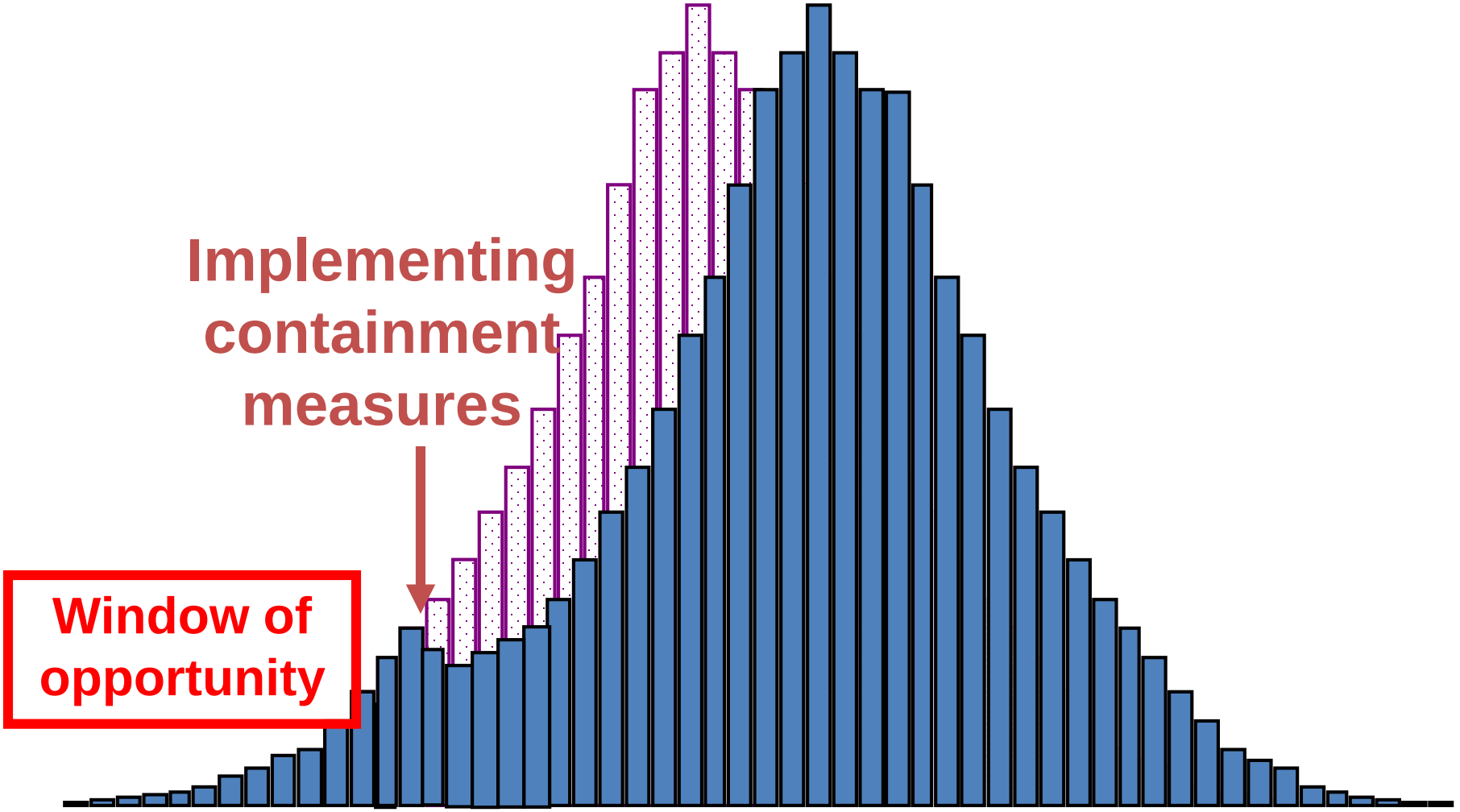
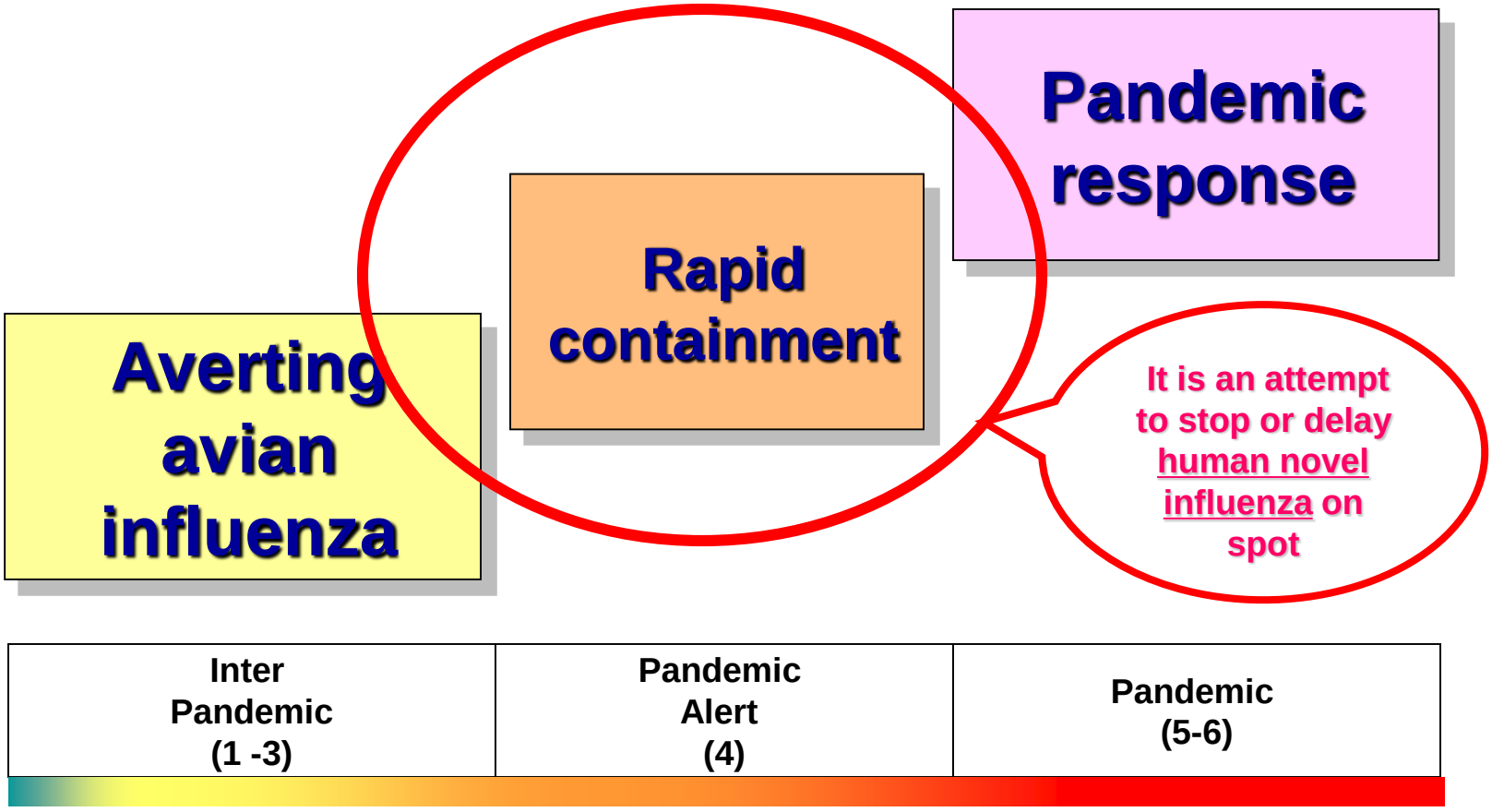
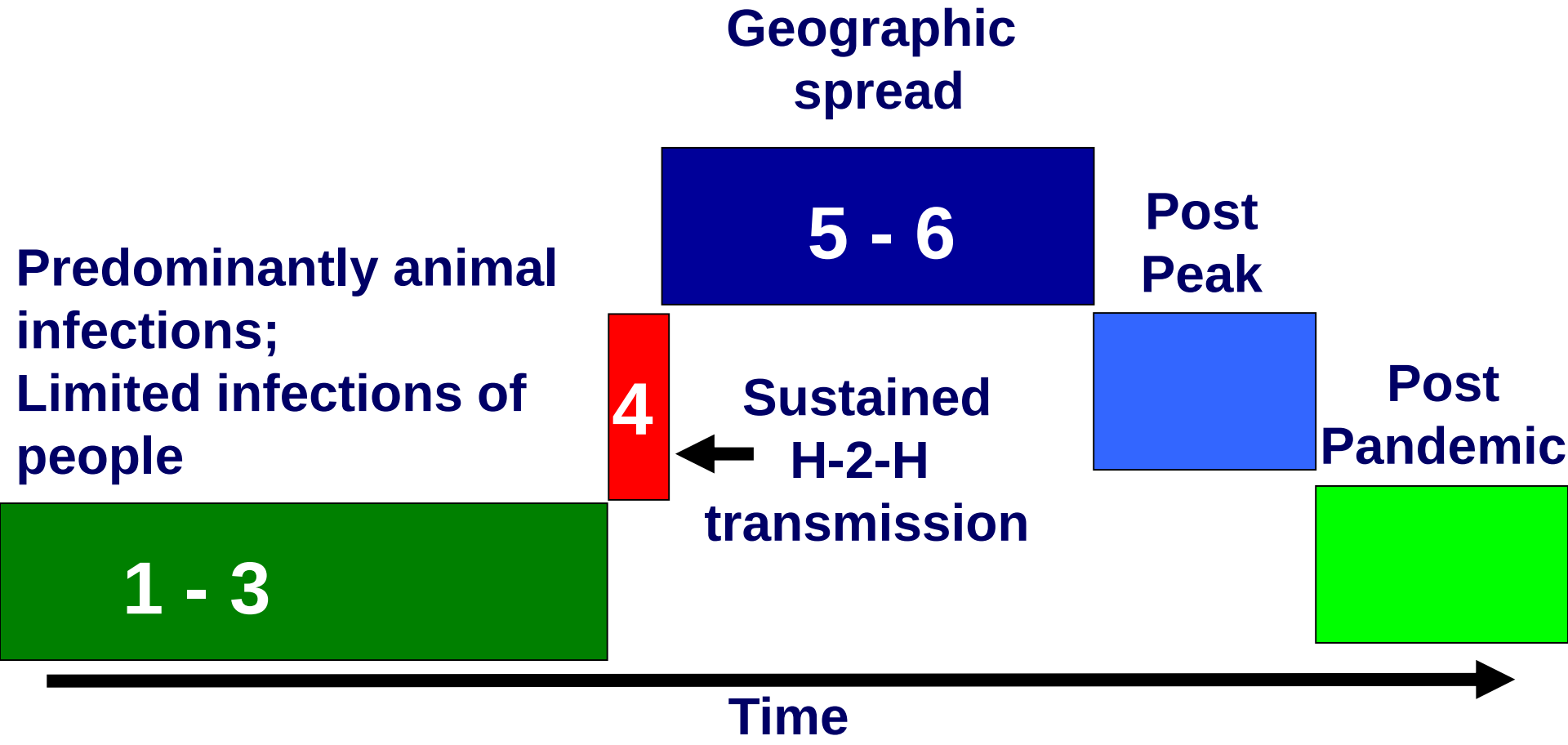


Hypothetical epidemic curve

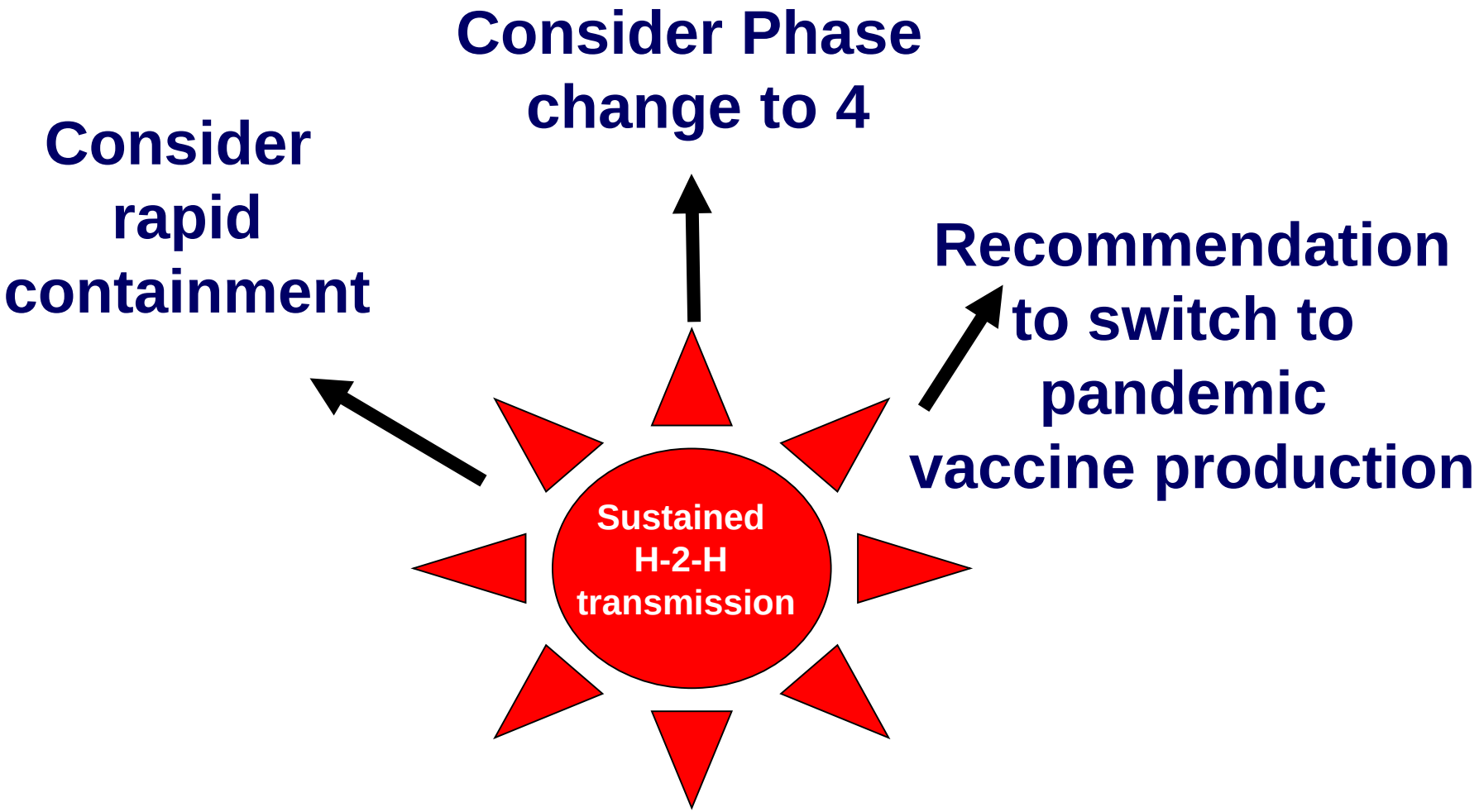


Stage-wise Intervention




Geographic spread
5 - 6
Post Peak
Predominantly animal infections;
Limited infections of people
4
Sustained H-2-H transmission
Post Pandemic
1 - 3
Time

First Detection of Community Level Outbreaks Will Require Several Urgent WHO Decisions



Rapid Containment Steps

STEP 0 Early detection, reporting & response

STEP 1 Assessment and decision making

STEP 2 Implementation

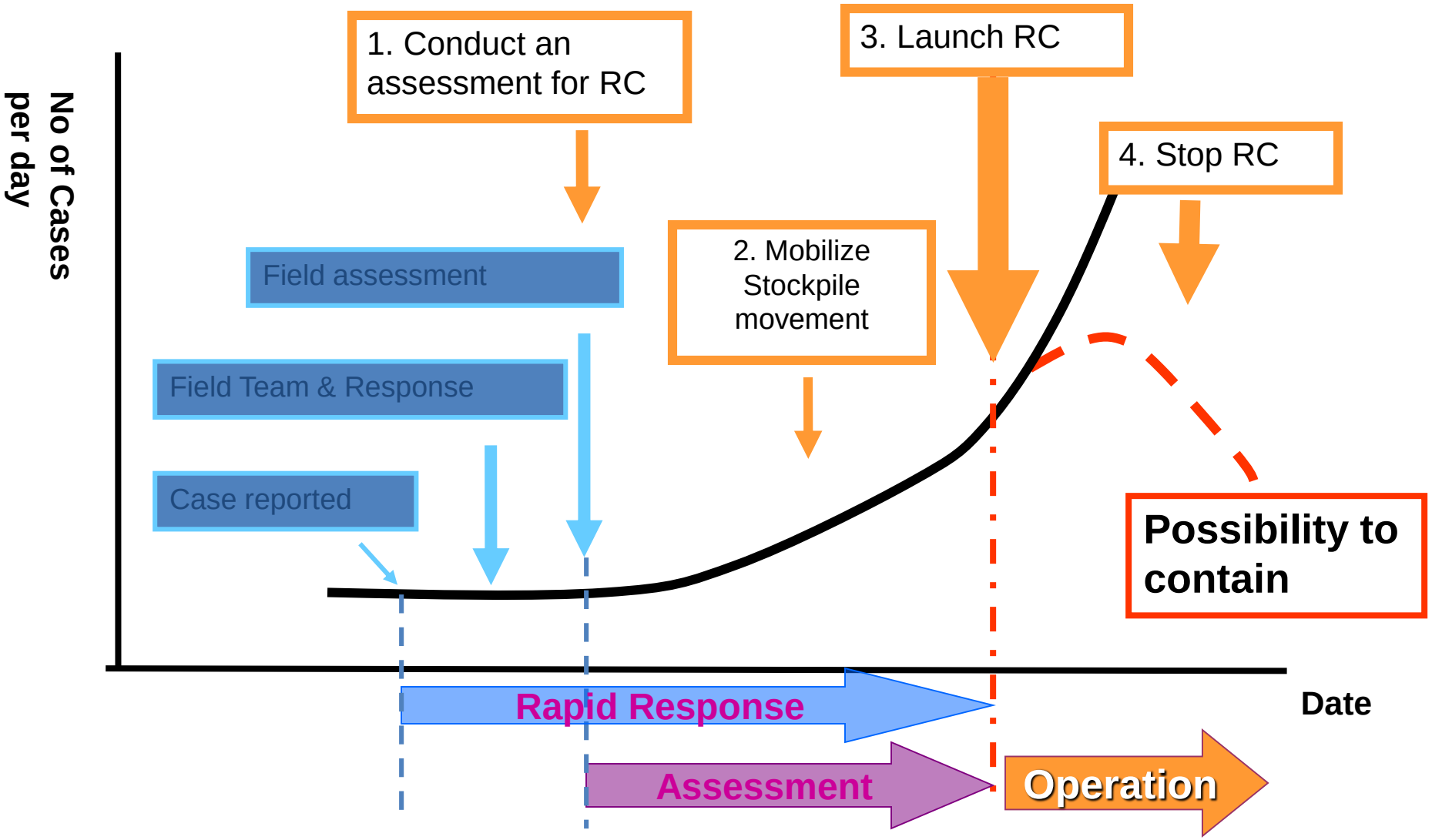
STEP 3 Monitoring and evaluation

Rapid Containment

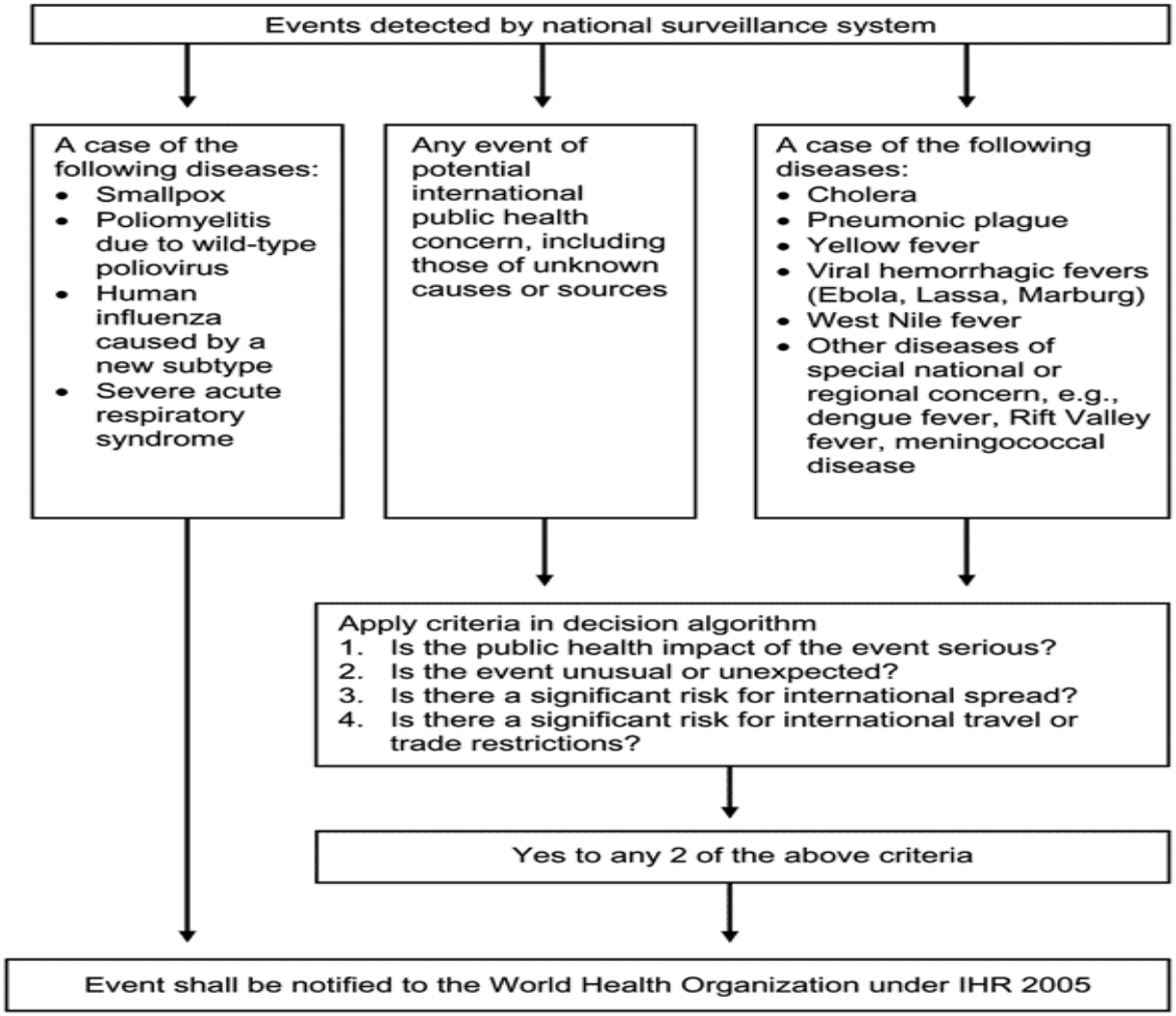
Rapid response vs Rapid containment

- **Rapid response = ROUTINE**
  - Early detection of human cases
  - Initial field investigation
  - Standard control measures
  - Notification of National authority and WHO
- **Rapid containment = EXTRAORDINARY**
  - Joint risk assessment by country and WHO
  - Additional field assessment if needed
  - Decision made by national authorities in consultation with WHO
  - Large scale use of antivirals and non-pharmaceutical interventions

RC Time line
and 4 Decision making points



PHEIC Decision Instrument



Event Management Process

Formal Reports

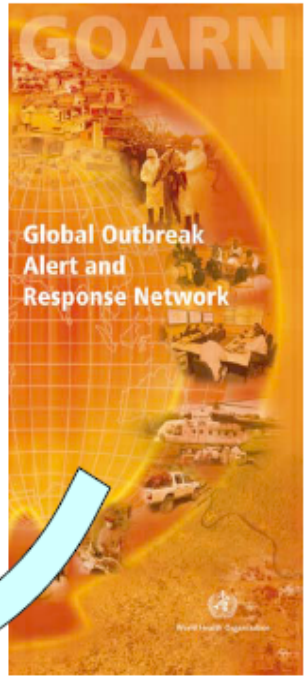
Informal

Initial Screening

Event Verification

Risk Assessment

— WRO/RO/HQ —



Response Strategy and Operations

Media | Social Mobilization | Operational and Technical Coordination | Logistics | Security | Finance

Epidemiological Investigation | Infection control | Containment & Control | Clinical Management | Information Management | Field Communications

Laboratory | Environmental health | Medical Anthropology


Kami Sedia Membantu
Penyayang • Profesionalisme • Kerja Berpasukan

THANK YOU