Emerging Infectious Diseases (SARS, MERS,Covid-19)

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Objectives

Definition of emerging & re-emerging diseases

Factors contributing to emergence

examples for emerging infectious diseases

SARS, MERS-CoV, COVID-19

National health response to COVID-19 in SA

Introduction

- Despite advances in medical science and treatment during 20th century, infectious diseases remain the leading cause of death worldwide.
- Emergence of new infectious diseases, re-emergence of old infectious diseases and persistence of intractable infectious diseases.
- During the last 20 years, at least 30 new diseases has emerged.
- These diseases are the leading cause of death worldwide, claiming at least 17 million lives every year.

Emerging infectious disease

- Emerging infectious disease is a new disease, new problem (new threats).
- An emerging infectious disease is a one that is caused by a newly discovered infectious agent

Or

- By a newly identified pathogen, which has emerged and whose incidence in human has increased during the last 2 decades and is threatening to increase in the near future.

Re-emerging infectious disease

- A re-emerging infectious disease is a one which was previously controlled but once again has risen to be a significant health problem.
- Is an old disease, new problem, (new threats)
- This term also refers to that disease which was formerly confined to one geographic area, has now spread to another areas.

Categories of Emerging infectious diseases

1. New diseases or previously **unknown** diseases. Examples; AIDS, SARS Cov, MERS-CoV, Ebola.
2. Previously known diseases that spread to new **populations** or new **geographical** area. Examples: West Nile, Zika.
3. Re-emerging diseases have had a **decline** in incidence, that are now increasing, worldwide or in groups of countries. Examples: diphtheria and malaria.
4. Pathogens that have developed **resistance** to antimicrobial drugs or insecticides. Examples: tuberculosis or vancomycin resistant Staphylococcus.

Factors contributing to the emergence of infectious diseases:

- Human demographics and behavior
- Technology and industry
- Economic development and land use
- International travel and commerce
- Microbial adaptation and change
- Breakdown of public health measures
- Human susceptibility to infection
- Climate and weather
- Changing ecosystem
- Poverty and social inequality
- War and famine
- Lack of political will
- Intent to harm

Agent

- Evolution of pathogenic infectious agents (microbial adaptation and change)
- Development of resistance to drugs:
  - Wrong prescribing practices
  - Non-adherence by patients
  - Counterfeit drugs
  - Use of anti-infective drugs in animals and plants
- Resistance of vectors to pesticides

Host

1. Natural and man made disaster→ mass migration→ unhygienic conditions.
2. Uninhibited and reckless industrialization→ migration (labor population from rural to urban) → unhygienic settlements
3. International travel (trade/tourism)→ global dispersion of disease agents, reservoirs and vectors
4. Changes in lifestyle → unhealthy and risky behavior
5. Declining immunity (HIV infection)→vulnerable to infections.

Environment

- Climate & changing ecosystems
- Economic development & Land use (urbanization, deforestation)
- Technology & industry (food processing & handling)

Some Newly Identified Pathogenic Agents

Bacteria

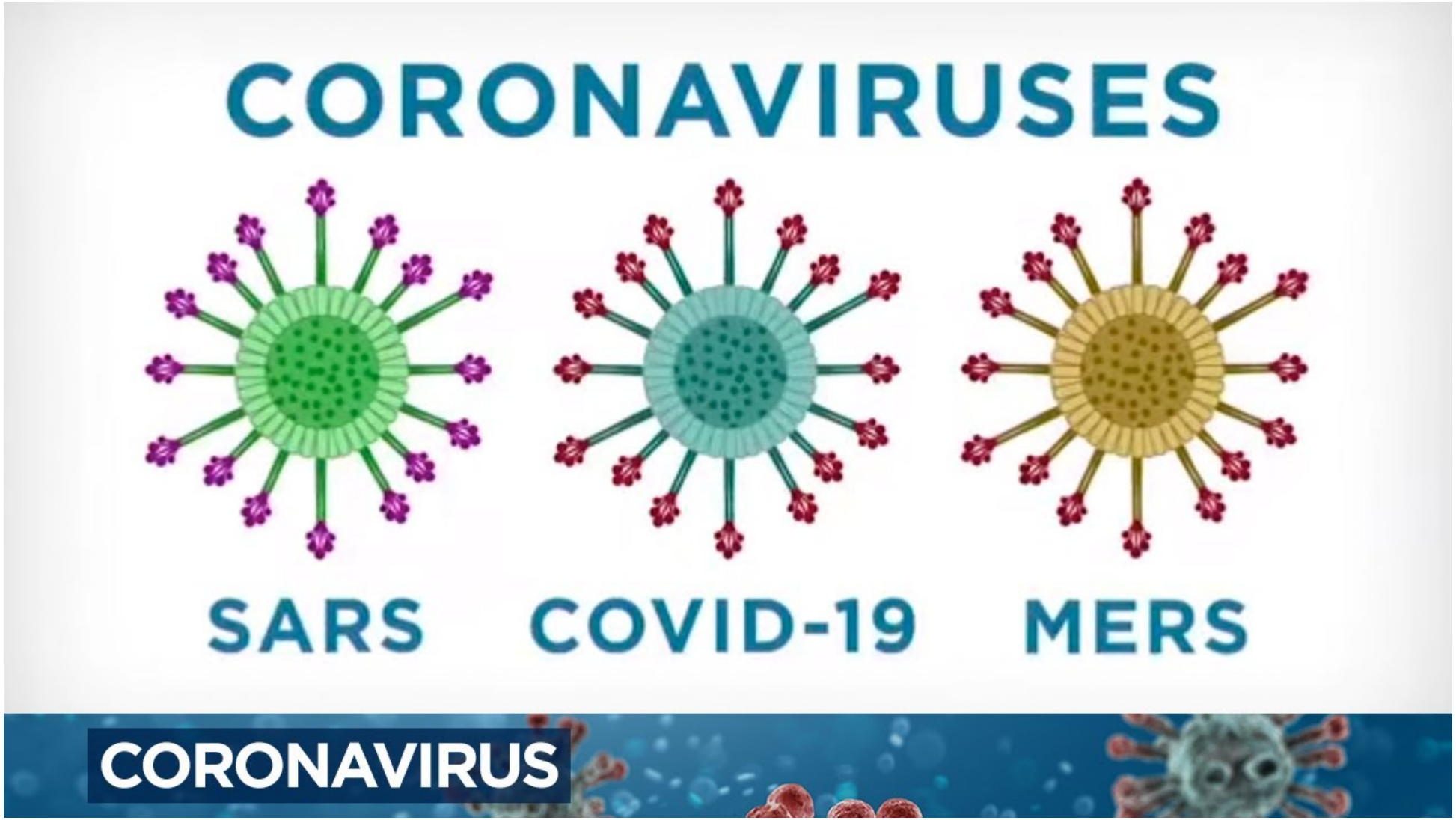
- 1975: *Borrelia burgdorferi*
- 1976: *Legionella pneumophila*
- 1976: *Cryptosporidium parvum*
- 1977: *Campylobacter jejuni*
- 1978: Toxic shock syndrome
- 1982: *Escherichia coli* O157:H7
- 1983: *Helicobacter pylori*
- 1986: *Cyclospora cayatanensis*
- 1992: *Bartonella henselae*

Antibiotic-Resistant Organisms

- *M. tuberculosis*
- *S. aureus (MRSA, VRSA)*
- *N. gonorrheae*
- *P. falciparum, P. vivax, P. malariae*

Viruses

- **1985: Human Immunodeficiency Virus**
- 1986: Human Herpesvirus-6
- 1988: Hepatitis E Virus
- 1989: Hepatitis C Virus
- 1989: Ebola Reston Virus
- 1991: Guanarito Virus
- 1993: Sin Nombre Hantavirus
- 1994: Saba Virus
- 1995: Human Herpesvirus-8
- 1995: Ebola Ivory Coast Virus
- 1999: Nipah Virus
- 2001: Human Metapneumonovirus
- 2002: SARS Coronavirus
- 2003: Avian influenza H5N1
- 2005: Bocavirus
- 2012: Middle East Respiratory Syndrome (**MERS**) coronavirus
- 2019: COVID-19


CORONAVIRUSES
SARS
COVID-19
MERS
CORONAVIRUS

Coronavirus Background:

- A large family of viruses that can cause illness in animals or humans.
- These coronaviruses range from the common cold to more severe diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and COVID-19.

SARS (Severe acute respiratory syndrome)

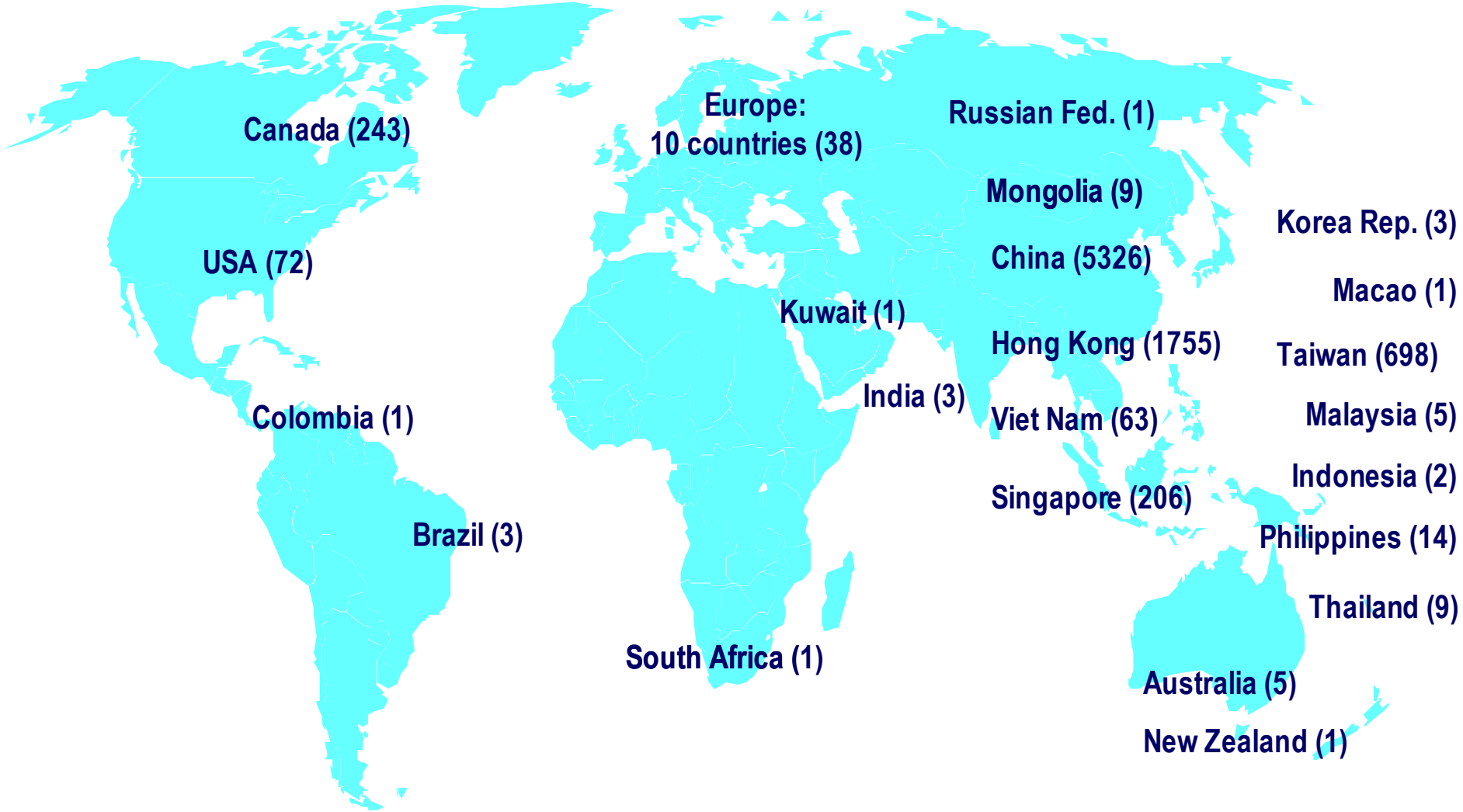
- A viral respiratory illness caused by a coronavirus
- SARS was first reported in Asia in February 2003.
- In few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

The SARS outbreak of 2003

- According to the World Health Organization (WHO), a total of 8,098 people worldwide became sick with SARS during the 2003 outbreak. Of these, 774 died.

SARS Cases
19 February to 5 July 2003

Total: 8,439 cases, 812 deaths, 30 countries in 7-8 months



Source: www.who.int.csr/sars

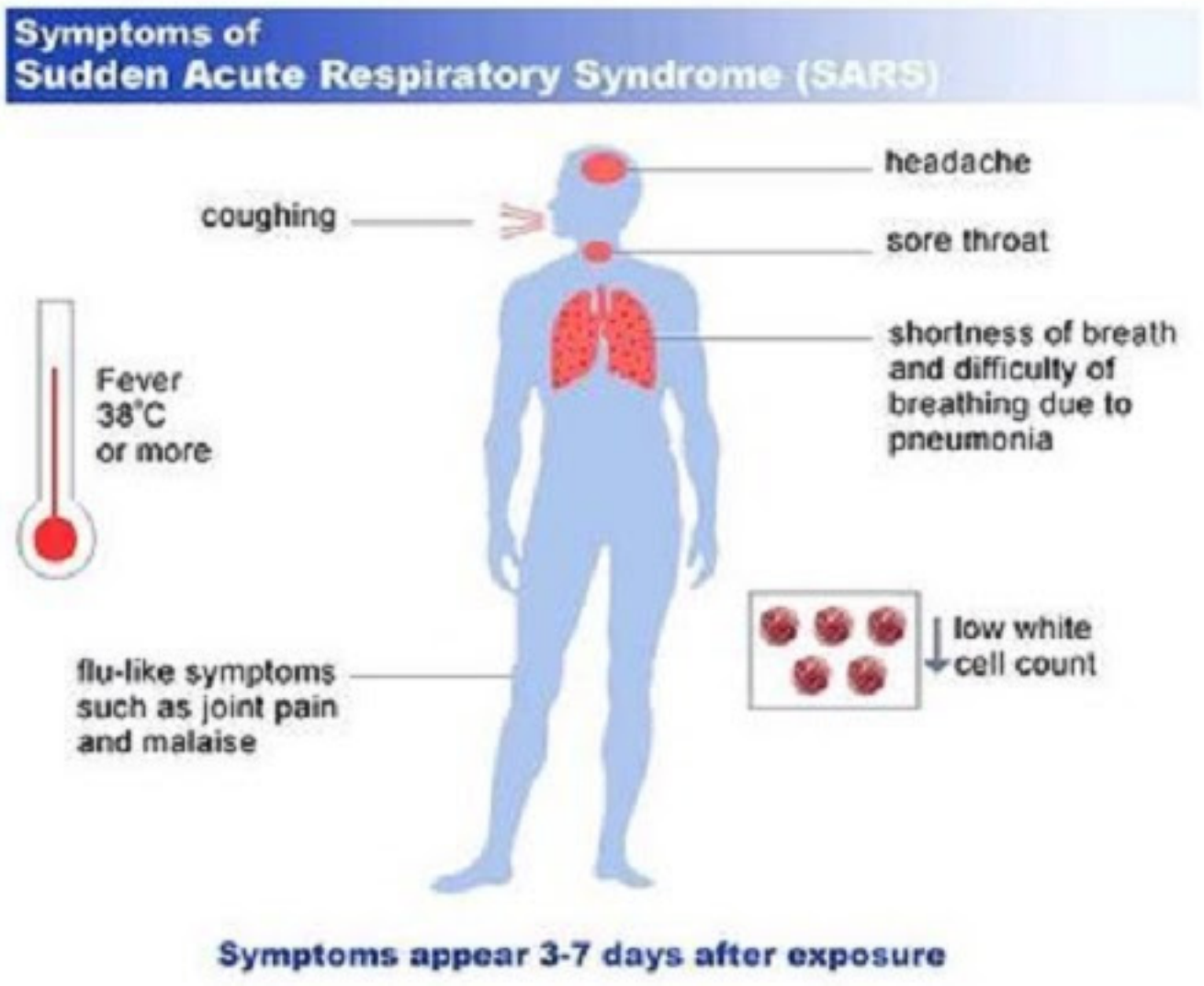
Transmission

- Close person-to-person contact.
- By respiratory droplets (droplet spread)(generally up to 3 feet)
- Touching a surface or object contaminated with infectious
- (airborne spread?!)

Symptoms

- High fever (>38.0°C)
- Headache
- Body aches and discomfort
- Mild respiratory symptoms
- Diarrhea
- Dry cough

Most patients develop pneumonia



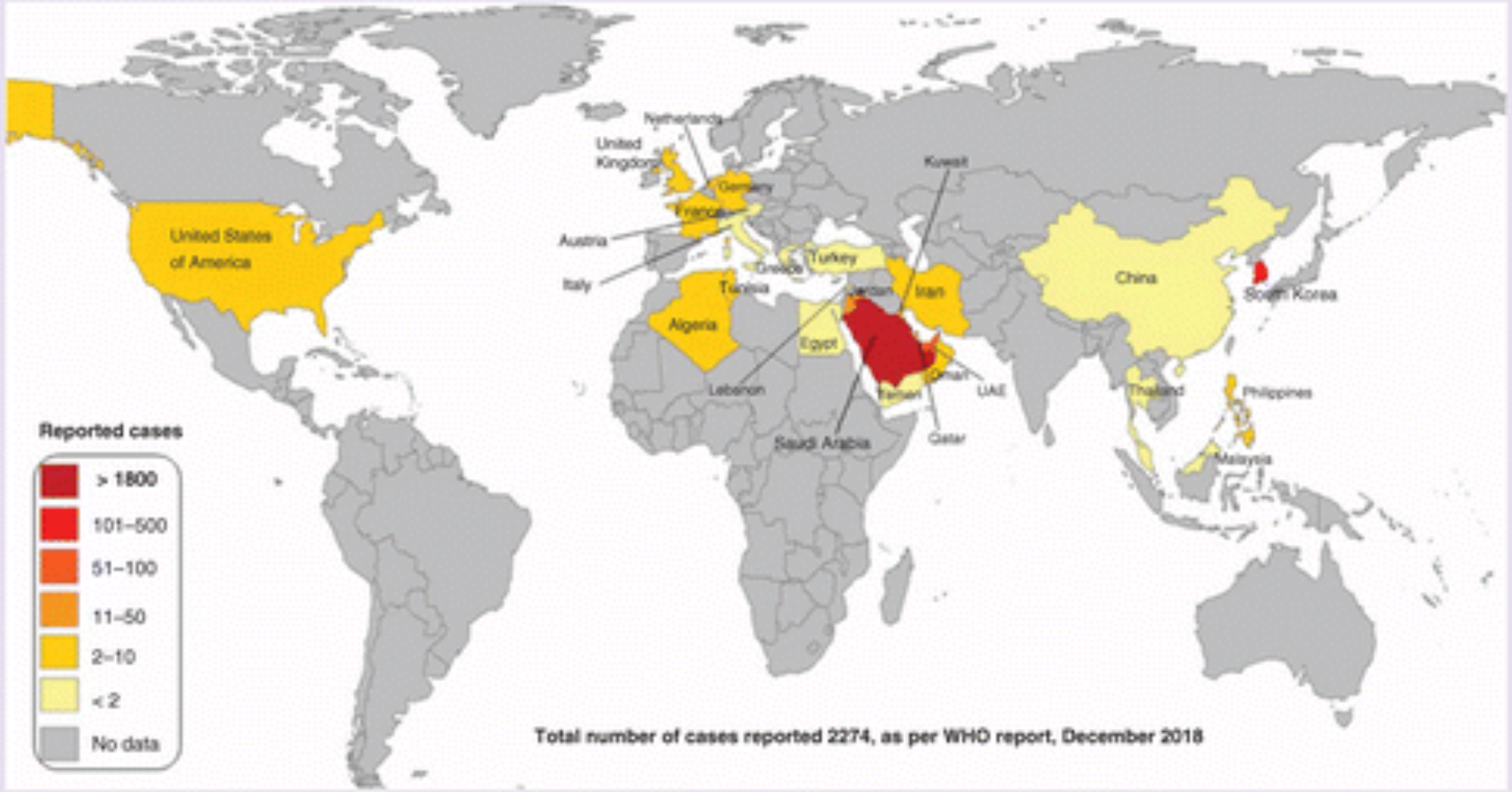
CDC’s response to SARS during the 2003 outbreak

- Activated its **Emergency Operations Center** to provide round-the-clock coordination and response.
- Committed more than 800 **medical experts** and support staff to work on the SARS response.
- Deployed medical officers, epidemiologists, and other specialists to assist with on-site **investigations** around the world.
- Provided assistance to state and local health departments in investigating possible cases of SARS in the United States.
- Conducted **extensive laboratory testing** of clinical specimens from SARS patients to identify the cause of the disease.
- Initiated a system for distributing health alert notices to **travelers** who may have been exposed to cases of SARS.

Middle East Respiratory Syndrome (MERS)

- An illness caused by a coronavirus called Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

Cases of MERS-CoV

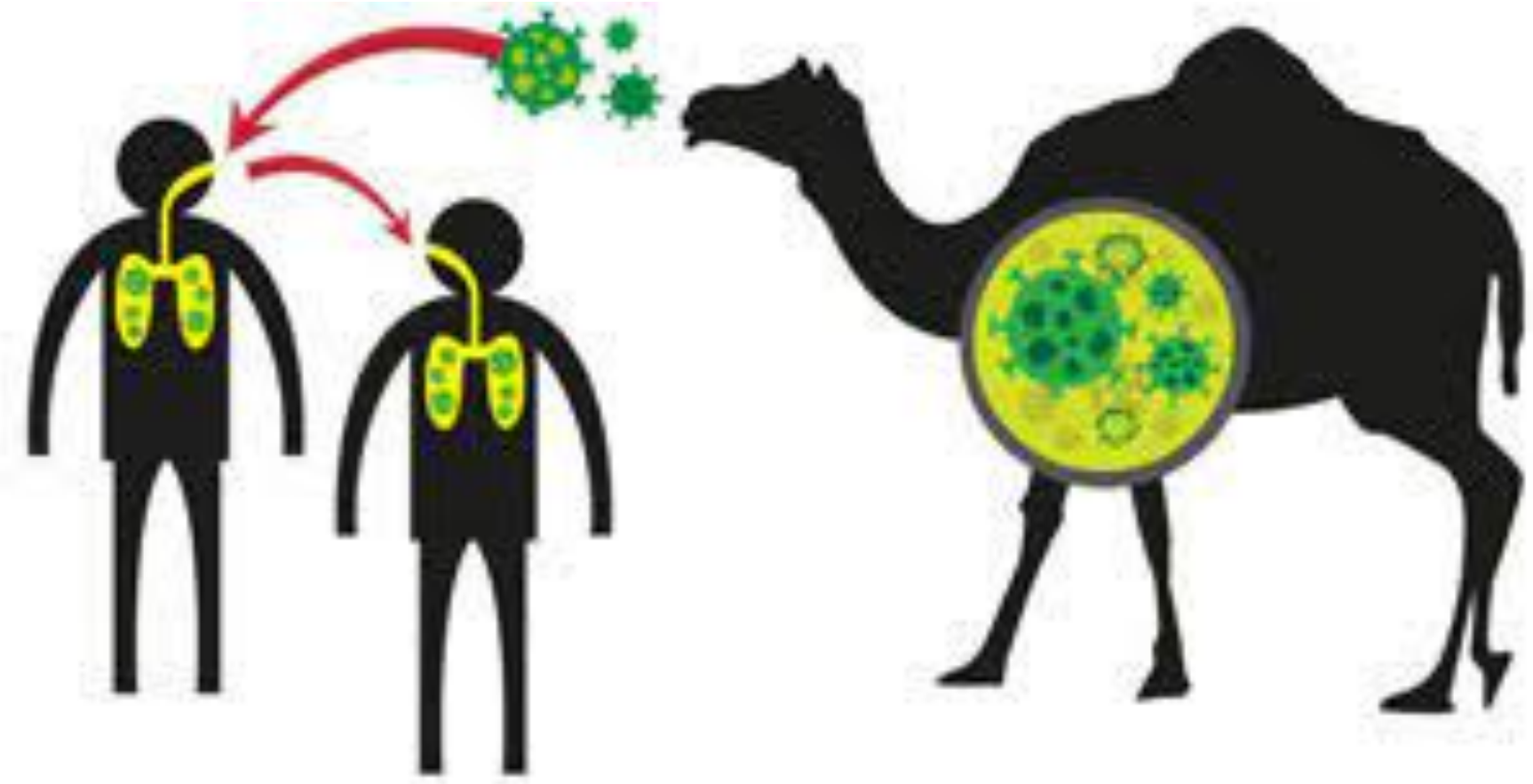


All cases are linked to the Arabian Peninsula

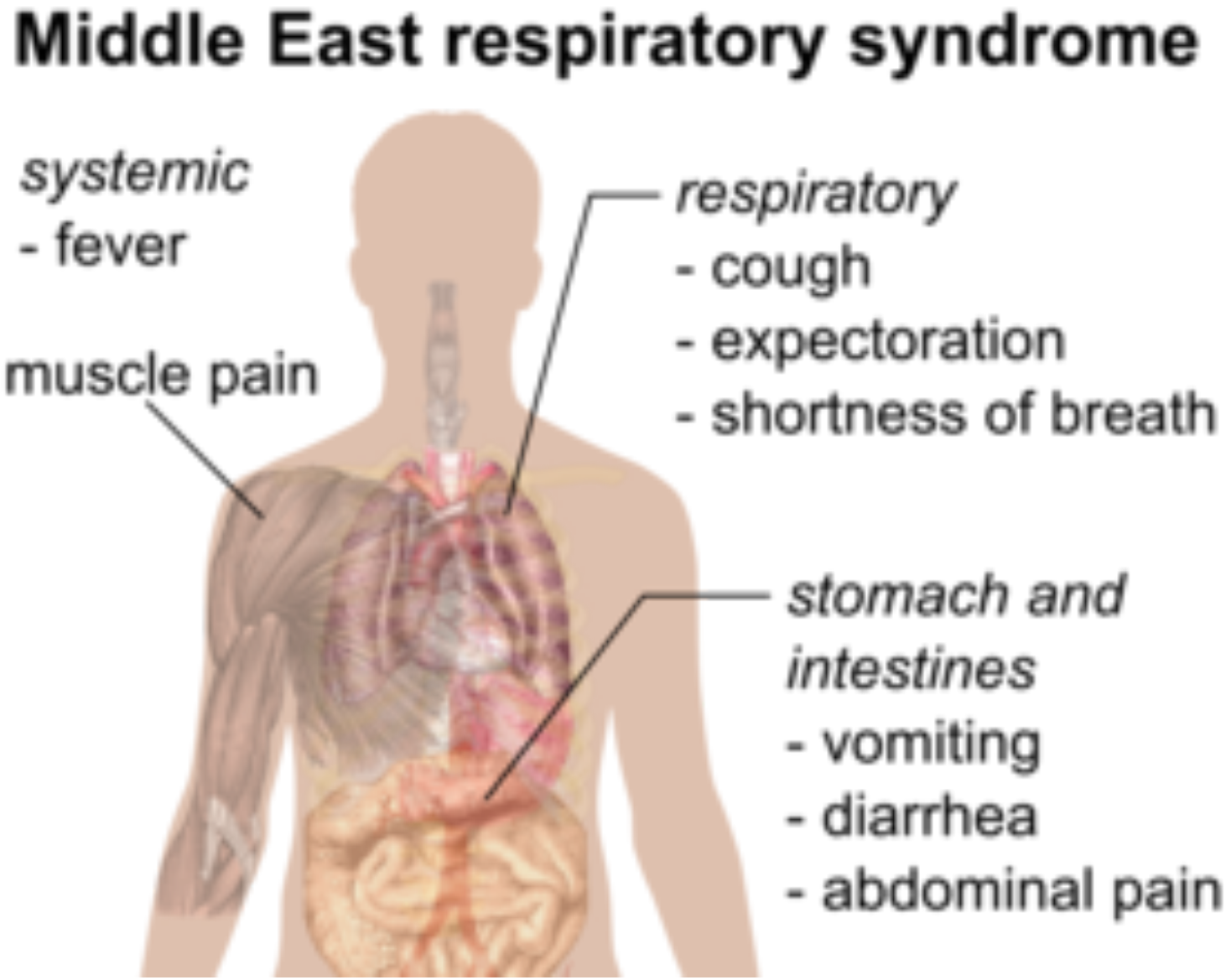
- It was first reported in Saudi Arabia in September 2012.
- First known cases of MERS occurred in Jordan in April 2012 (retrospective investigation)
- All cases have been linked to Arabian Peninsula (travel/residence)
- Outbreak in Korea in 2015 associated with traveler returning from the Arabian Peninsula.

Transmission

- Direct contact with infected camels or infected person.
- It can spread from person to person



Symptoms



Some patients have mild symptoms or no symptoms at all.
IP: about 5 or 6
Last for 2 to 14 days.

Complications

- Pneumonia
- Kidney failure.
- Fatality rate: 34.4%

- Pre-existing conditions increases risk of mortality:
- Diabetes
- Cancer
- Chronic lung disease
- Chronic heart disease
- Chronic kidney disease

MERS-CoV

MIDDLE EAST RESPIRATORY SYNDROME

PREVENTION

STAY HOME

KEEP DISTANT FROM INFECTED PEOPLE

WEAR PROTECTIVE MASKS

WASH HANDS OFTEN WITH WATER AND SOAP

DRY YOUR HANDS WITH SINGLE USE WIPES

COVER YOUR FACE WITH A TISSUE WHEN COUGHING

DO NOT TOUCH YOUR FACE WITH UNWASHED HANDS

DISINFECT OFTEN ALL FREQUENTLY USED OBJECTS

CALL BEFORE VISITING YOUR DOCTOR

PRACTICE GENERAL HYGIENE

Prevention and treatment

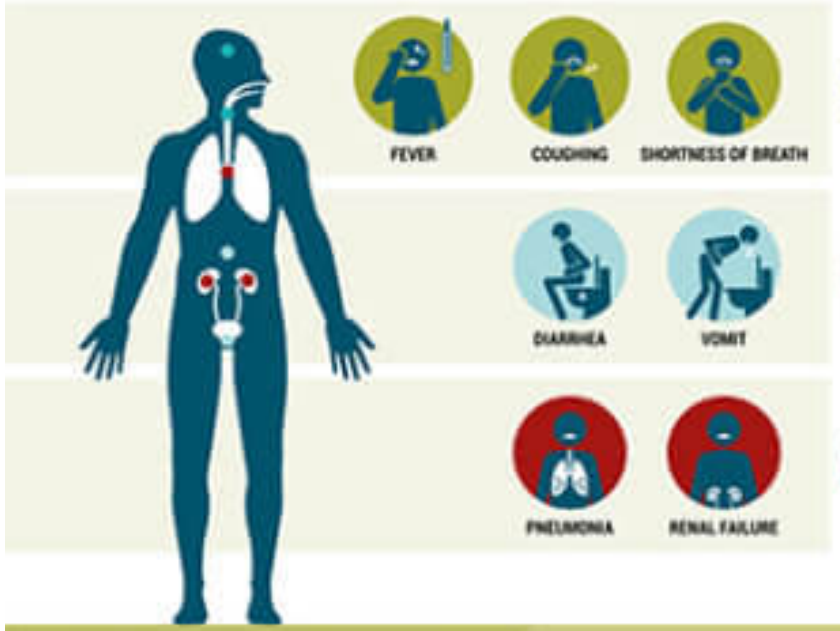
- Currently there is no vaccine against MERS. But scientists are working to develop one.

- **Treatment**:
- No specific treatment.
- Supportive treatment …

MERS-CoV

MIDDLE EAST RESPIRATORY SYNDROME

SYMPTOMS



PREVENTION

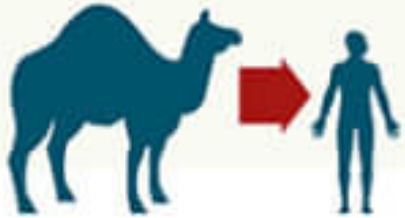
ORIGIN AND STRUCTURE

CORONAVIRUS

Family of common viruses that affects humans and animals that includes SARS.

CAMEL CONNECTION

The virus has been detected in a camel and linked to a human case



VIRUS SPREAD

FIRST CASE

2012 in Saudi arabia

VACCINE

There is no vaccine, symptoms can be treated

INFECTION

The virus can pass between people in close contact

- https://www.who.int/health-topics/middle-east-respiratory-syndrome-coronavirus-mers#

Coronavirus Disease 2019 (COVID-19)

- First identified in Wuhan, China in December 2019
- Caused by the virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a new virus in humans causing respiratory illness which can be spread from person-to-person.

Transmission

- **Droplet** transmission
- Inhalation, through mucous membrane, infected hands and objects
- CDC recommends maintaining a **physical distance of at least 1.8 meters** between persons.

- Increased risk:
- poor ventilation, prolonged exposure, close contact with infected persons, activities that leads to exposure to a greater amount of respiratory droplets and particles.

Symptoms

- Fever or chills/ Headache
- Cough/ Sore throat
- Muscle or body aches
- Nasal congestion or runny nose
- Diarrhea/ Nausea/Anorexia
- Shortness of breath or difficulty breathing
- Loss of smell or taste

- IP: 2 and 14 days with a median of 5 days.
- Some cases are asymptomatic

What are the most common symptoms of COVID-19

Cough

Fever

Shortness of breath

Sore throat

Headache

Runny nose

Sneezing

Tiredness

Muscle pain

Diarrhoea

Loss of smell

Loss of taste

People at Higher Risk for Severe Illness

- The risk of severe disease increases with age in addition to underlying medical conditions, including heart disease, diabetes or lung disease
- Need hospitalization and intensive care.
- Might lead to death.

COVID-19 Preventative Actions

- Pharmaceutical (vaccination)
- Non-pharmaceutical interventions (masking, physical distancing, hand hygiene).

Vaccination

- Different types and doses.
- Important to use preventive measures even after vaccination.
- Does not prevent infection but decrease risk of infection and severe disease

Masks

- Have two or more layers of washable, breathable fabric
- Completely cover the nose and mouth
- In a community setting, cloth masks or surgical mask
- During aerosol generating procedures in a healthcare setting N95

WHAT TYPE OF MASK DO I NEED?

HOMEMADE MASK OR PAPER MASK

WHO SHOULD WEAR:

General public

WHEN TO WEAR:

When a person can't perform social distancing; scarves and bandanas can be used if necessary.

USE LIMITATIONS:

Cloth masks should be washed after each use; don't wear damp or when wet from spit or mucus.

SURGICAL MASK

WHO SHOULD WEAR:

Health care workers and patients in health care settings

WHEN TO WEAR:

During single or multiple patient interactions or routine health procedures; recommended when N95s aren't available.

USE LIMITATIONS:

Ideally should be discarded after each patient encounter. Extended use is preferable to reuse.

N95 RESPIRATOR

WHO SHOULD WEAR:

Health care workers

WHEN TO WEAR:

Caring for patients with COVID-19 and performing procedures that put them most at risk of virus exposure.

USE LIMITATIONS:

Ideally should be discarded after each patient encounter. Extended use is preferable to reuse.

Standard Precautions

Standard precautions are a set of practices that apply to the care of patients in all healthcare settings at all times.

- Hand hygiene
- Personal protective equipment (PPE)
- Respiratory hygiene and cough etiquette
- Cleaning and disinfection of devices and environmental surfaces
- Safe injection practices
- Medication storage and handling

COVID-19 PPE

- Used before entering the room of suspected or confirmed COVID-19 patients.
- Use a medical mask (at least a surgical/medical mask)
- Wear eye protection (goggles) or facial protection (face shield)
- Wear a clean, non-sterile, long-sleeve gown
- Use gloves

COVID-19 Transmission-Based Precautions:

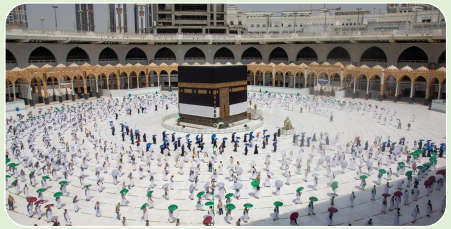
- For suspected or confirmed COVID-19 patients:
- **Contact** and **droplet** precautions in addition to standard precautions
- If aerosol generated procedure→ **airborne** precautions
- Disposable or dedicated patient care equipment, such as stethoscopes, blood pressure cuffs, should be used.
- If equipment needs to be shared among patients, it should be cleaned and disinfected between use for each patient using products containing ethyl alcohol of at least 70%.
- Adequately ventilated single rooms or wards are suggested.
- When single rooms are not available→ suspected patients grouped together with beds at least 1 meter (3ft) apart based on WHO's recommendations,
- Dedicated bathrooms, cleaned and disinfected at least twice daily.

- Designating healthcare workers to care for patients with COVID-19 and restricting the number of visitors
- Transportation: avoided unless medically necessary; patient-> mask, Healthcare workers → appropriate PPE when transporting patients.

COVID-19 Infection prevention and control (IPC) Priorities

- Rapid identification of suspect cases
  - Screening/triage and rapid implementation of source control
  - Limiting entry of healthcare workers visitors
- Immediate isolation and referral for testing
  - Group patients with suspected or confirmed COVID-19 separately
  - Test all suspected patients for COVID-19
- Safe clinical management
  - Immediate identification of inpatients and healthcare workers with suspected COVID-19
- Adherence to IPC practices
  - Appropriate use of personal protective equipment (PPE)
  - Stress on the importance of vaccination to hcw and community

COVID-19 in Saudi Arabia: the national health response



Country-level coordination, planning and monitoring

- National emergency response committee
- Risk assessment tool for mass gathering events

Risk assessment and community engagement

Surveillance, rapid response team and case investigation

- Health electronic surveillance network
- Mass screening programs (mawed, tetaman, tawakalna)

Points of entry, international travel and transport

COVID-19 in Saudi Arabia: the national health response

National laboratories

Infection prevention and control

- Health care awareness guidance
- Public awareness guidance

Case management

- Readiness of healthcare facilities in SA (mawed, tawakalna, tabaod)
- Quarantine process
- Free healthcare services
- National treatment protocol (best evidence)

Operational support and logistics

- Inventory control (availability of medical stocks, national factories: masks, sanitizers, ventilators)
- Electronic health support
- Community volunteering

COVID-19 in Saudi Arabia: the national health response

Maintaining essential health services and systems (virtual clinics)

COVID-19 vaccination

Research

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