

## Regional Zoonotic Diseases

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### **Objectives :**

1. To understand the most important zoonotic diseases of public health significance in Saudi Arabia:
  - Brucellosis
  - Bovine TB
  - Mers-Cov (transmitted from camels).
2. To understand the burden (globally and nationally) of these diseases .
3. Understand the epidemiology of these infections in Saudi Arabia.
4. To define the modes of transmission for the infectious agents responsible for these diseases.
5. To list factors for acquiring these infections.
6. To enumerate the global measures needed for prevention and control of these diseases.
7. To describe the measures taken by the government (health sector and agricultural sector) to prevent and control these infections.

## Regional zoonotic diseases

### Introduction: (1)

Zoonotic diseases are the ‘diseases and infections that are naturally transmitted between vertebrate animals and man,’ as defined in 1951 by the World Health Organisation (WHO) Expert Committee on Zoonoses. The word zoonosis (zoonoses, plural) is the combination of two Greek words (zoon, animals; and noson, disease), and was coined at the end of the nineteenth century by Rudolph Virchow to designate human diseases caused by animals. They account for more than half of all emerging infectious diseases and include such varied examples as human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), Ebola virus, severe acute respiratory syndrome, plague, rabies, influenza, and new-variant Creutzfeldt-Jakob disease.

The types of zoonosis include those caused by:

- a virus
- bacteria
- fungus
- parasites

There are many types of zoonotic diseases like :

animal flu, anthrax, bird flu, bovine tuberculosis, brucellosis, Campylobacter infection, cat scratch fever, cryptosporidiosis, cysticercosis, dengue fever, Ebola, encephalitis from ticks, giardiasis, glanders hemorrhagic, colitis, hepatitis E etc.....

The most common and concerning zoonotic diseases are:

- Zoonotic influenza
- Salmonellosis
- West Nile virus
- Plague
- Emerging coronaviruses (e.g., severe acute respiratory syndrome and Middle East respiratory syndrome)
- Rabies
- Brucellosis
- Lyme disease

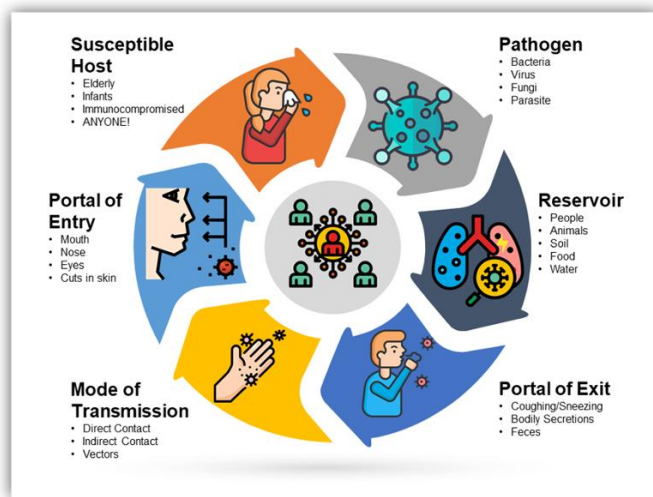
# Brucellosis

## **Introduction:**

Brucellosis or “Malta fever” is a zoonotic infection caused by brucella bacteria, which can be transmitted directly or indirectly

## **Chain of infection:**

It’s a sequence of steps connected to each other, that are required to make the person infected. So any break at any site of the chain will stop the process.



## **Epidemiology:**

- **Worldwide**

Approximately 500,000 cases are reported annually. All age groups and both sexes are affected.(2)

- **In Saudi Arabia**

One of the most frequently diseases in Saudi Arabia is human brucellosis, especially in Riyadh city, in Saudi Arabia between 2004 and 2012 in 37,477 reported cases during this period.(3)

## **Infectious agent: (4)**

**The infectious agent of Brucellosis is Brucella bacteria.**

- *B. abortus* (from cattle)
- *B. melitensis* (from sheep and goats)
- *B. suis* (from hogs)
- *B. canis* (from dogs)

**Transmission(4):** can be transmitted from **animals** through contact with fluids or meat from infected animals.

It can be transmitted from **humans** through:

- Direct contact with an infected animal, or inhalation of aerosols.
- Consumption of unpasteurized dairy products.
- Laboratory workers with exposure to infected specimens.

**Clinical Features: (4)**

- Undulant Fever (rising and falling like a wave)
- Night sweats (drenching)
- Fatigue
- Anorexia
- Weight loss
- Arthralgia
- Low back pain (especially sacroiliac joint)
- Depression
- Headaches & Cough

**Diagnosis: (5)**

- **Blood cultures:** Gram-negative coccobacilli taken from bone marrow or blood.
- **Serology:** Standard Agglutination Test (SAT) Cut off limit 1:640 or 1:320 with symptoms and risk factor.

**Risk of exposure in the development of Brucellosis (centre of disease control and prevention): (6)**

- **Countries at Risk:** it is more common in countries that do not have effective public health and domestic animal health programs
- **Occupational Risks:**
  - Meat-packing employees
  - Veterinarians
  - Laboratory workers
- **Unpasteurized Dairy Products**

## **Prevention:**

The best way to prevent brucellosis infection is to be sure you do not consume:

- undercooked meat
- unpasteurized dairy products, including:
  - milk
  - cheese
  - ice cream

***Pasteurization** is when raw milk is heated to a high temperature for a short period of time.*

People who handle animal tissues should protect themselves by using:

- rubber gloves
- goggles
- gowns or aprons

This will help ensure that bacteria from potentially infected animals do not get into eyes or inside a cut or abrasion on the skin (7).

saudi food & drug authority last version of “Conditions & Requirements for Importing Food to the Kingdom of Saudi Arabia” includes (8):

- The meat has been derived from healthy animals that have no apparent evidence of any contagious and/or infectious disease as listed by (OIE).
- The consignment fulfill one of the conditions listed below:
  - The milk and unheated milk products come from animals from areas/ zones free from Foot-and- Mouth disease and Rift valley fever disease for at least the previous two years prior to export, and the milk were derived from animals which have been tested in accredited laboratory for recorded disease in the country of export which include (tuberculosis- brucellosis) with negative results.
  - The milk and milk products have been treated according to one of the special treatment methods of milk and milk products recommended by Codex Alimentarius.
- The milk and milk products has been derived from healthy animals that have no apparent evidence of any contagious and/or infectious disease as listed by (OIE).

## Treatment: (9)

Treatment of brucellosis must effectively control acute illness and prevent complications and relapse.

- **first choice** regimens is a combination therapy with doxycycline for 45 days and streptomycin for 14 days.
- **Second-choice** consist of combinations of doxycycline and rifampicin (rifampin) for 45 days, or monotherapy with doxycycline for 45 days.

## Bovine TB

### Introduction:

**Bovine tuberculosis (TB)** is an infectious disease that is caused by the bacteria *Mycobacterium bovis*. Bovine TB primarily affects cattle, however, other mammalian species may become infected, including humans.

It is commonly a chronic disease but occasionally may assume an acute, rapidly progressive course. TB is a widespread zoonosis of global magnitude and affects nearly all species of vertebrates.(10)

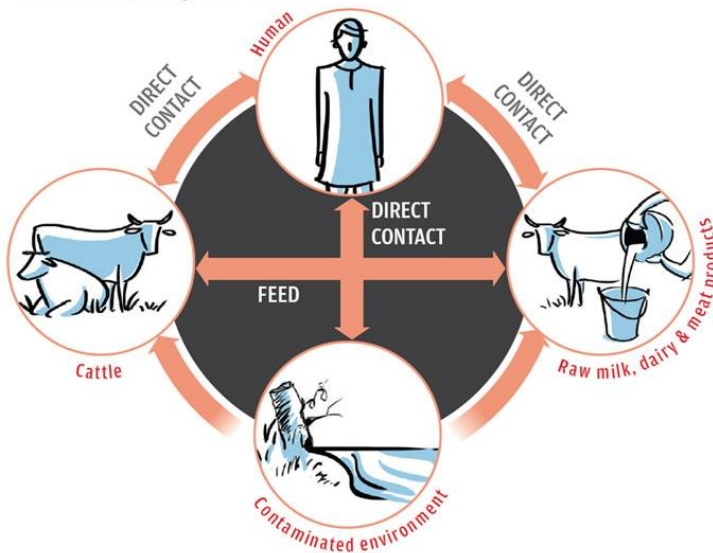
**This is a video to clarify Bovine TB:**

<https://www.youtube.com/watch?v=wa47eNETNno>

**Chain of infection:**



Proximity to cattle can cause bovine-transmitted tuberculosis in humans, and also transmit pathogens to the cattle



### **Epidemiology:**

According to WHO there were an estimated 147 000 new cases of zoonotic tuberculosis and some 12 500 people died of the disease in 2016. Africa carries the largest burden of human cases, followed by Asia.(11)

### **In Saudi Arabia :**

Among the humans, no studies or measurement done by the ministry of health. In the cattle there's a study which was done by measuring prevalence in five regions.

An overall prevalence percentage of bovine tuberculosis in all regions was 9.8%. (12)

The estimates of the global burden of zoonotic TB **are imprecise**. This is due to the lack of routine surveillance data from human and animal populations from most countries. (13)

### **Mode of Transmission: (14)**

- The disease is contagious, and it can be spread directly by contact with diseased domestic and wild animals, or indirectly through intake of contaminated food.
- The usual route of infection within cattle herds is by inhalation of infected aerosol, which are expelled from the lungs (by coughing).

- Calves can be infected by ingesting colostrum or milk from infected cows.
- Humans can become infected by ingesting raw milk from infected cows, or through contact with infected tissues at abattoirs or butcheries.

**Factors for acquiring the infection:**

- **Working with Animals**
- cattle, bison, or cervids (e.g., deer or elk)
- **Working with products from these animals**
- hides, milk, or meat.
- → **Examples of occupations**
- Ranching
- Dairy farming
- Working in slaughterhouse or as a butcher
- Hunting

**Clinical Features: (14)**

Bovine tuberculosis may be subacute or chronic, with a variable rate of progression.

The usual clinical signs include:

- weakness
- loss of appetite and weight
- fluctuating fever
- dyspnoea and intermittent hacking cough
- signs of low-grade pneumonia
- diarrhoea
- enlarged, prominent lymph nodes.

**Prevention: (14)**

The preferred approach to Control bovine tuberculosis in many countries is based on testing and slaughter of infected animals.

Strategies to prevent Bovine TB transmission to Humans:

- Early diagnosis and treatment.
- Tuberculin testing.



- TB treatment (For latent TB& prophylaxis with INH).
- Using Masks & Respirators.
- Pasteurization of milk.
- Immunization with (BCG)vaccine.

**Prevention and control measures taken by government: (15)**

The National Tuberculosis Control & Prevention Program (NTCPP) in Saudi Arabia, some of its main strategies:

- Identify and treat all persons with active TB disease.
- Test high-risk groups for LTBI and offer therapy as appropriate.
- BCG vaccination for children.
- Use of preventive chemotherapy for some contacts and high risk groups.

**Treatment(16):**

M. bovis is treated similarly to M. tuberculosis.

- **Isoniazid**
- **Rifampicin**
- **Ethambutol**
- **Pyrazinamide**

However M. bovis is usually resistant to **pyrazinamide**, But this Resistance does not cause any problem with the treatment because TB disease is treated with a combination of several antibiotics.

**Mers- Cov**

**Introduction:**

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

**Epidemiology in Saudi Arabia:**

1- total number of cases of (MERS) in Saudi Arabia from June 2012 to January 2020 was 2121 cases including 788 deaths and 37.1% case-fatality rate. (17)

- The age group 50–59 years had the highest risk for acquiring primary infection. (17)
- Eastern Region of Riyadh had the highest number of cases.(18)
- The prevalence among men is higher than women.(18)

2-Number of cases in Saudi Arabia, June 2012-January 2020. (17)

| Year         | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Total |
|--------------|------|------|------|------|------|------|------|------|------|-------|
| No. Of Cases | 5    | 158  | 662  | 454  | 249  | 233  | 142  | 204  | 14   | 2121  |

MERS cases reported from Kingdom of Saudi Arabia, June 2012–January 2020 According to WHO

## Mode of Transmission:

### 1-Human-to-human transmission:

The virus does not pass easily from person to person unless there is close contact. Human to human transmission has been limited to date, and has been identified among family members, and health care workers. (19)

### 2-Non-human to human transmission:

The route of transmission from animals to humans is not fully understood, but dromedary camels are a major reservoir host.(19)

## Factors for acquiring the infection (20):

- visiting farms, markets, barns, or other places where animals are present.
- consumption of raw or undercooked animal products, including milk and meat
- close contact with dromedaries (e.g. farmers, camel owners)
- close contact with an infected person (health care workers caring for MERS-CoV patients are believed to be at higher risk of infection).

## Clinical Features: (21)

Typical MERS symptoms include

- Fever
- Cough
- Shortness of breath
- Pneumonia
- Diarrhea

Some laboratory-confirmed cases of MERS-CoV infection are reported as asymptomatic.

### **Global measures for Prevention and control:(22)**

#### **Prevention in home and communities**

1.For confirmed case

- Isolate.
- call the healthcare provider before visiting.
- Wear a facemask, wash hands, avoid sharing items.

2.for caregivers

- ensure good airflow.
- wash hands thoroughly.
- wear facemask and gloves.
- avoid sharing household items.

3.for close contacts

- monitor your health for 14 days from when you first exposed to the person and continue for 14 days.

If you developed symptoms follow the same prevention steps for an infected patient.

#### **prevention in healthcare settings**

- minimize exposures to respiratory pathogens.
- adherence to precautions(hand hygiene,PPE)
- Manage Visitor Movement Within the healthcare Facility
- Monitor Exposed Healthcare Personnel
- Ensure that HCP are educated, trained
- cleaning and disinfection procedures

### **Prevention and control measures taken by government: : (23)**

There is not enough information on the characteristics and methods of transmission of this virus. MOH coordinates with the World Health Organization (WHO) and several international experts to learn more about it. Until further information is revealed, MOH advises citizens and visitors in KSA to adhere to health guidelines to limit the spread of influenza and respiratory infections in general. These guidelines include:

- Washing hands regularly with soap, water, or other disinfectants, especially after coughing, sneezing, or using bathrooms.
- Washing hands before and after eating or preparing food.
- Using tissues when coughing or sneezing to cover your mouth and nose then disposing of them in the garbage bin. If tissues are not available, use your inner elbow instead of your hands.
- Avoiding touching your nose and eyes with your hands. The infection could be passed into your body if you touch contaminated surfaces then your face.
- Wearing face masks only when you are visiting a sick person. Otherwise, they can be unnecessary, according to doctors.
- Maintaining healthy habits such as a healthy diet, exercise, and enough sleep can strengthen your immunity against infections.
- Maintaining personal hygiene.
- Avoiding contact with infected individuals.
- Seeking medical advice when need arises, and keeping up with the new information revealed by MOH about the disease.

### **Treatment:(24)**

As the [WHO](#) explain, there is no cure or vaccine for MERS, but vaccines and treatments are currently under development.

Healthcare professionals will work to relieve a person's symptoms and reduce the risk of complications.

People with severe symptoms may require oxygen therapy, a stay in the intensive care unit, and a mechanical ventilator to help them breathe.

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