Regional Zoonotic Disease

Objective:

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

Many people interact with animals in their daily lives, and they provide many benefits to people such as food and fiber. However, despite the benefits animals can sometimes carry harmful germs that can spread to people and cause illness these are known as zoonotic disease[1].

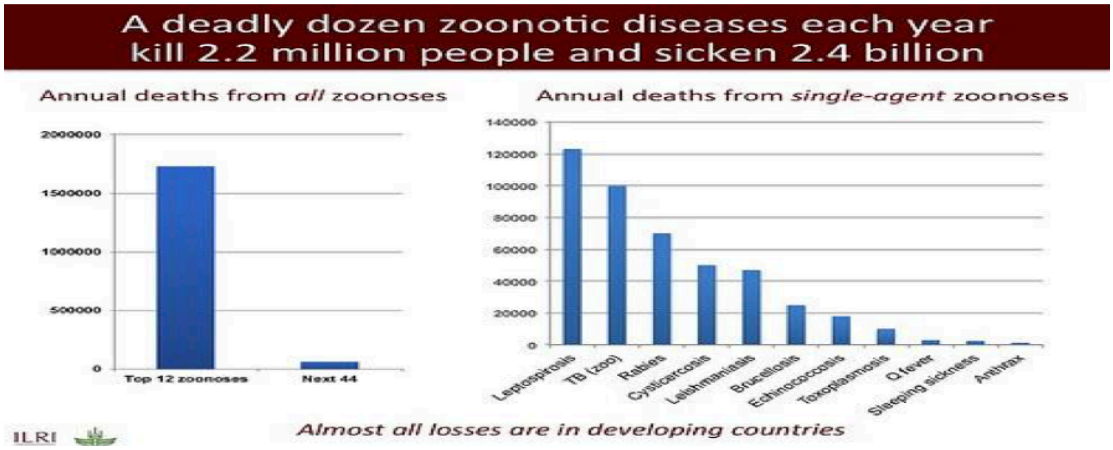
Zoonotic diseases also known as "zoonosis" are infectious diseases that are naturally transmitted from vertebrate animals and humans[1].

Types of zoonosis agents

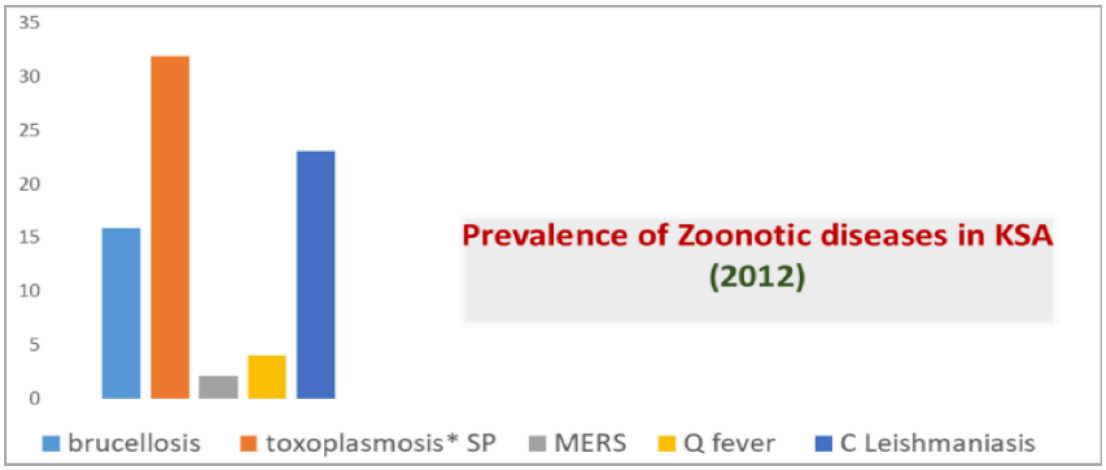
Types of zoonosis causative agents include viruses, bacteria, parasites and fungi. These germs can cause illnesses ranging from mild to serious illness and even death in people and animals[1].

Most common zoonotic diseases

13 of all zoonotic diseases were the most important in terms of their impact on human deaths and the severity of disease in people[2].



Examples of common zoonotic disease **in Saudi Arabia:**



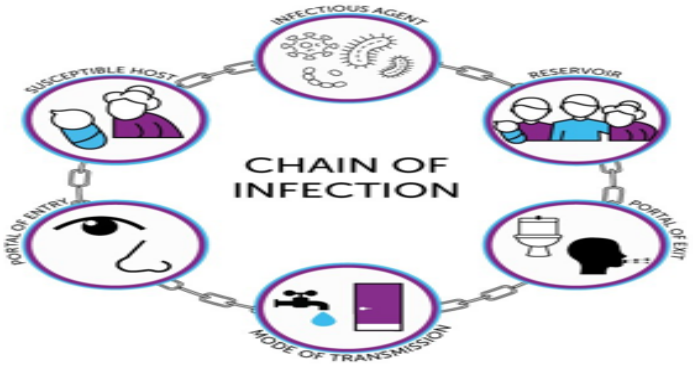
Brucellosis

Introduction

Brucellosis also known as “Malta fever” is a major bacterial zoonotic infectious disease that is transmitted by direct or indirect contact with infected animals. It affects people of all age groups and of both sexes.[3]

Chain of infection

It is a series of events that has to happen to enable germs to cause infections in a person. There are separate ‘links’ in the chain. So, if anything breaks a link at any part of the chain the infection arising will stop[4].



Epidemiology

- **worldwide**

approximately 500,000 cases are reported annually. All age groups and both sexes are affected. [5]

- **In Saudi Arabia**

One of the most frequently reported 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. [6]

Infectious agent [7]

Brucellosis is the result of being infected with the **brucella bacteria.**

- Maltese Brucellosis (B. melitensis): This type is the **most common and most severe**.
- Pig Brucellosis (B. suis): This type infects individuals who come in contact with animals.

Transmission [7]

Eating or drinking unpasteurised/ raw dairy products.

Bacteria can also enter wounds in the skin/mucous membranes through contact with infected animals.

Inhaling airborne agents in barns, stables, and sometimes laboratory and slaughterhouse

Uncommon:

- From mother to fetus through the placenta.
- Breast-feeding
- Sexual contact.
- Blood transfusion

Clinical Features[8]

Brucellosis can cause a range of signs and symptoms, some of which may present for prolonged periods of time.

Initial symptoms can include:

- intermittent fever
- Night sweating
- fatigue

Some signs and symptoms may persist for longer periods of time.

These can include:

- recurrent fevers
- arthritis
- hepatomegaly or splenomegaly

Diagnosis[9]

Laboratory Investigations:

anemia, neutropenia, mild elevation of liver enzyme

Bacterial isolation:

Diagnosis of brucellosis is definitive when Brucella organisms are recovered from blood, bone marrow, or other tissue.

Serology:

It's the most common method

Polymerase chain reaction

Risk of exposure in the development of Brucellosis (Center of disease control and prevention):[10]

- **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[11].

saudi food & drug authority last version of "Conditions & Requirements for Importing Food to the Kingdom of Saudi Arabia" includes[12]:

- 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:

1. 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.
2. 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 [13]

Once a diagnosis is made, a doctor can prescribe antibiotics.

Generally, the antibiotics **doxycycline** and **rifampin** are recommended in combination for a minimum of 6-8 weeks. Patient health status such as:

- pregnant
- allergic to doxycycline or rifampin

- suffer from a reduced or absent immune response (immunosuppressed) should be taken into consideration.

Bovine TB

About the disease :

Tuberculosis (TB) is a contagious disease of both animals and humans. It is caused by three specific types of bacteria that are part of the Mycobacterium group: M. bovis, M. avium, and M. tuberculosis.
Bovine tuberculosis (TB) is a contagious, infectious, communicable disease of animals and humans caused by Mycobacterium bovis.
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. (14)

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. (15)

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%. (16)
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. (17)

Modes of transmission:(18)

- **Contaminated, Unpasteurized dairy products (mainly)**
- **Uncommonly:**
    - direct physical contact with infected animals.
    - consumption of raw or uncooked meat.
    - directly from person to person when people with the disease in their lungs cough or sneeze.
    - inhaling the bacteria in air exhaled by animals

Factors for acquiring the infection:(18)

- **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 a slaughterhouse or as a butcher,
- Hunting.

Clinical features:

- **Asymptomatic**
  - Not all M. bovis infections progress to TB disease
- **Similar to the symptoms of TB caused by M. tuberculosis**
  - Fever
  - Night sweats
  - weight loss.
- **Other symptoms might occur depending on the part of the body affected by the disease.**
  - Disease in the lungs can be associated with a cough
  - Gastrointestinal disease can cause abdominal pain and diarrhea.

If untreated, a person can die of the disease.

Prevention[19,20,21]:

- Early diagnosis and treatment.
- Tuberculin testing.
- TB treatment (For latent TB & prophylaxis with INH).
- Using Masks & Respirators.
- Pasteurization of milk.
- Immunization with Bacillus Calmette-Guerin (BCG) vaccine.

Prevention & control measures taken by the government[22]:

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.

Mers-Cov

Epidemiology of Mers-Cov 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.[23]

- The age group 50–59 years had the highest risk for acquiring primary infection .[23]
- Eastern Region of Riyadh had the highest number of cases.[24]
- The prevalence among men is higher than women.[24]

2-Number of cases in Saudi Arabia, June 2012-January 2020:[23]

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. [25]

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.[25]

Factors for acquiring Mers-Cov:[26]

- 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, slaughterhouse workers, shepherds, 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).

Global measures for prevention and control:[27]

prevention in home and communities

- for confirmed case
    - Isolate
    - call the healthcare provider before visiting
    - Wear a facemask, wash hands, avoid sharing items
- for caregivers
    - ensure good airflow
    - wash hands thoroughly
    - wear facemask and gloves
    - avoid sharing household items
- 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

The measures taken by the government to prevent and control the infection:[28]

Primary prevention:

- **General preventive measures:**

1. Perform Hand hygiene
2. Use appropriate respiratory hygiene measures
3. Avoid touching nose, eyes, or mouth if hands have not been washed
4. Clean and disinfect surfaces and objects
5. Avoid close personal contact with people who are unwell.

- **Prevention of human-to-human transmission:**

1. Standard precautions and droplet precautions are recommended, airborne precautions when performing aerosol-generating procedures
2. Patients with probable or confirmed infection should be placed in an adequately ventilated single room, clearly segregated from other patients.
3. The number of healthcare workers and visitors should be kept to a minimum
4. Hand hygiene should always be performed
5. Movement of the patient outside of the barrier nursing room should be avoided unless medically necessary.
6. all healthcare workers and visitors when in close contact (i.e., approximately 3 feet) with a probable or confirmed case, should always use personal protective equipment

- **Prevention of camel-to-human transmission:**

1. Individuals who are at risk of developing severe infection should avoid direct contact with camels and camel products
2. Frequent hand washing and use of personal protective equipment while handling dromedary camels
3. Educational campaigns that target camel owners and the general public
4. Camels with detectable MERS-CoV RNA should be quarantined and tested at regular intervals
5. Strict regulation of camel movement, including a requirement for MERS-CoV infection clearance prior to importation and transport of camels between farms or to slaughterhouses.

Secondary prevention:

1. Effective environmental cleaning and adequate spatial separation of patients with suspected or confirmed infection from other patients
2. Appropriate clinical triage protocols
3. Visitors and healthcare personnel caring for patients with suspected infection should perform appropriate hand hygiene and use personal protective equipment.
4. Airborne precautions should also be applied during any aerosol-generating procedures .
5. Infection control precautions should be continued up to 24 hours after resolution of all clinical symptoms
6. All healthcare contacts and close contacts of patients should be identified and screened for symptoms of infection.

Summary

Zoonotic disease	Causative Agent	burden (globally and nationally)	modes of transmission	factors for acquiring infections
Brucellosis	**brucella bacteria**	Worldwide 500,000 cases are reported annually. in Saudi Arabia 37,477 reported cases.	1- Eating or drinking unpasteurised/ raw dairy products 2- Wound 3- Inhalation	1- Living or travelling to brucellosis endemic countries 2- Occupational exposure 3- Consumption of unpasteurized dairy products or raw meat products 4- Hunting
MERS COV	**Middle East respiratory syndrome coronavirus**	According to WHO from June 2012 to January 2020, "2121" cases were reported in Saudi Arabia	1- human to human transmission 2- Non human to human transmission (dromedary camels are the main reservoir)	1- visiting places where animals are present 2- consumption of raw or undercooked animal products 3- close contact with camels 4- close contact with an infected person
Bovine TB	**Mycobacterium bovis**	In 2016 the WHO estimated 147 000 new cases 12 500 people died of the disease **Africa** carries the **largest** burden of human cases, followed by **Asia**.	- Unpasteurized dairy products - Inhalation - open wounds	1- Working with Animals cattle, bison, or cervids (e.g., deer or elk) 2- Working with products from these animals hides, milk, or meat.

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