Τα ζώα ως αίτιο μετάδοσης βακτηριακών λοιμώξεων

Τόφας Πολύδωρος

Παθολόγος-Λοιμωξιολόγος

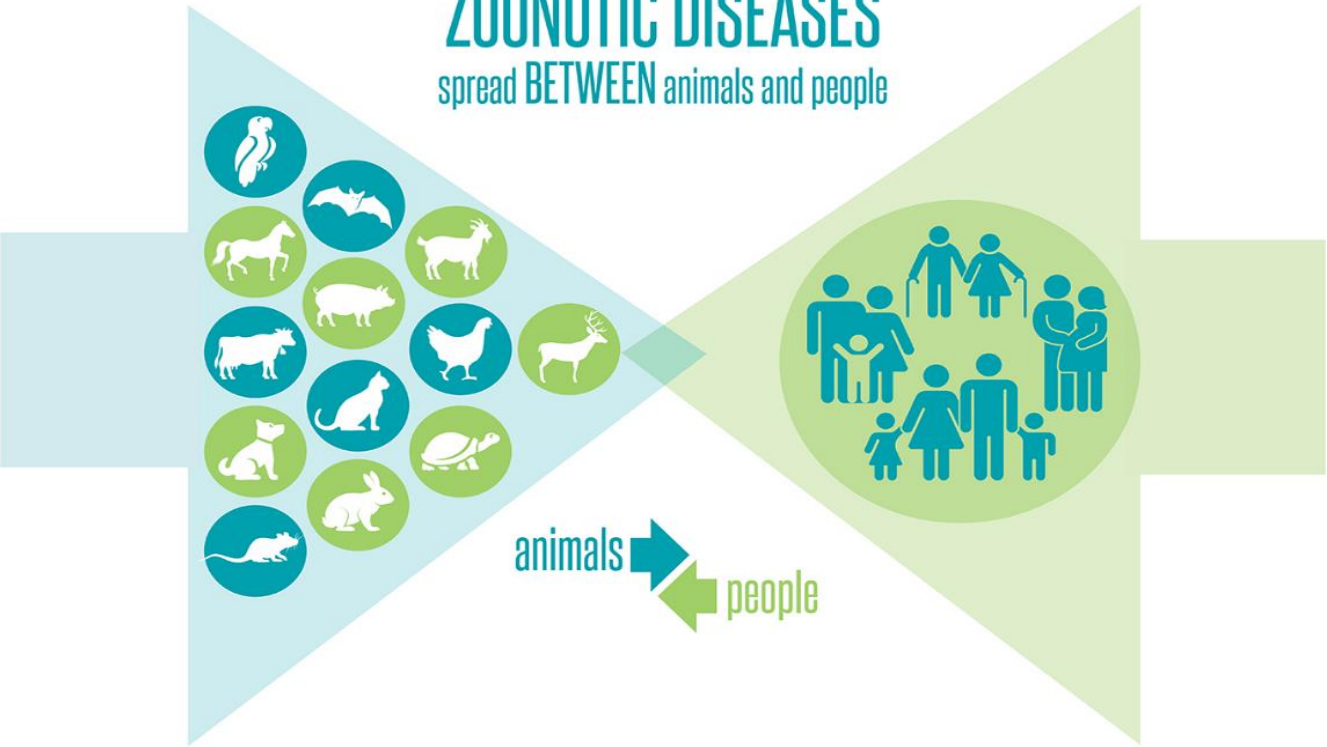
Ευρωκλινική Αθηνών

WHO

A zoonosis is an infectious disease that has jumped from a non-human animal to humans. Zoonotic pathogens may be bacterial, viral or parasitic, or may involve unconventional agents and can spread to humans through direct contact or through food, water or the environment. They represent a major public health problem around the world due to our close relationship with animals in agriculture, as companions and in the natural environment. Zoonoses can also cause disruptions in the production and trade of animal products for food and other uses.

ZOONOTIC DISEASES

spread BETWEEN animals and people



CDC

ABOUT ZOONOSES

Zoonotic diseases are very common, both in the United States and around the world. Scientists estimate that more than 6 out of every 10 known infectious diseases in people can be spread from animals, and 3 out of every 4 new or emerging infectious diseases in people come from animals. Because of this, CDC works 24/7 to protect people from zoonotic diseases in the United States and around the world.

TRANSMISSION

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Foodborne: Each year, 1 in 6 Americans get sick from eating contaminated food. Eating or drinking something unsafe, such as unpasteurized (raw) milk, undercooked meat or eggs, or raw fruits and vegetables that are contaminated with feces from an infected animal. Contaminated food can cause illness in people and animals, including pets.

Waterborne: Drinking or coming in contact with water that has been contaminated with feces from an infected animal.

Why zoonotic diseases are important ?

- **61%** (868 / 1415) of human pathogens are shared by animals (Zoonoses) (Woolhouse*et al.,*2005)

- **64%** (14/ 22) infectious agents identified from1973-1994 are zoonoses (Chomel, 2003)

- **73%** (130/177) of emerging infectious diseases are zoonotic in origin (Woolhouse*et al.,*2005)

Who transmit zoonoses?

HUMANS

Farm Animals

- ✓ Cattle
- ✓ Buffaloes
- ✓ Sheep
- ✓ Goats
- ✓ Swine
- ✓ Cats
- ✓ Dogs
- ✓ Camel
- ✓ Poultry

Wild Animals

- ✓ Rats
- ✓ Mice/rodents
- ✓ Squirrels
- ✓ Raccoons
- ✓ Foxes
- ✓ Bats
- ✓ Migratory birds
- ✓ others

Vectors

- ✓ Mosquitoes
- ✓ Ticks
- ✓ Lice
- ✓ Flea
- ✓ House
- ✓ Flies
- ✓ Insects

ROUTES OF TRANSMISSION

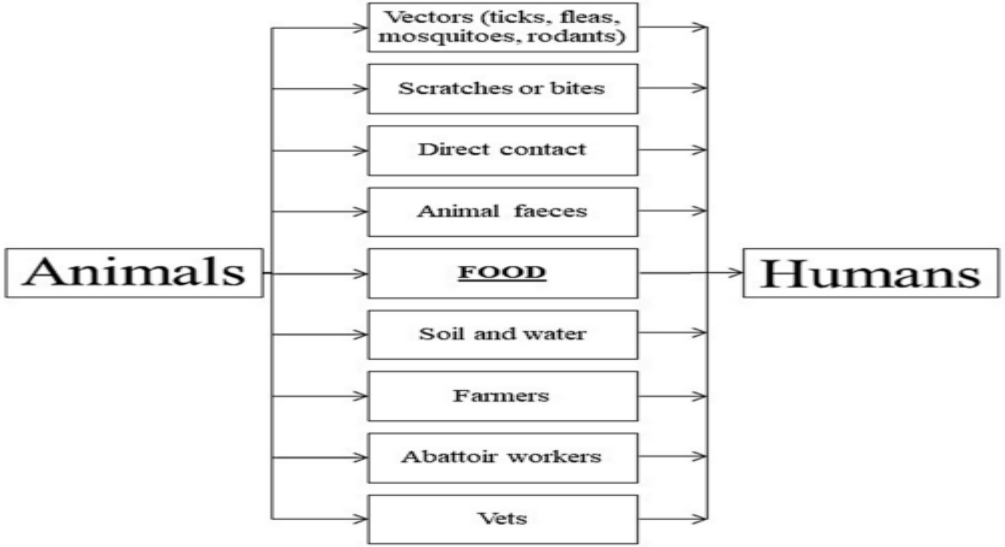

Figure 1. Routes of diseases transmission from animals to humans [7,8].

Who are at risk in humans ?

Population at higher risk

- Infants
- Children <5 ys
- Pregnant women
- People undergoing chemotherapy
- People with organ transplants
- People with HIV/AIDS
- Elderly

Most susceptible groups
(Farmers, livestock owners & occupational groups)

- Share air and space with animals
- Frequent contact with domestic and wild animals

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DOG BITES

CAT BITES

EPIDEMIOLOGY/PATHOGENS

- 90% DOG BITES MOST IN CHILDREN / 10% CAT BITES MOST IN ADULT WOMEN
- PASTEURELLA /CAPNOCYTOPHAGA…BARTONELLA…ANAEROBES
- 1% EMERGENCY DEPT VISITS

Uninfected bite

Infected bite

Debridement/Closure

•CONTROL BLEEDING/SOAP AND WATER IRRIGATION/POVIDONE IODINE/LOCAL ANESTHESIA

•PRIMARY CLOSURE IN SMALL LACERATION/FACE

•LEFT OPEN/HEAL BY SECONDARY INTENTION

- Crush injuries
- Puncture wounds
- Cat bite wounds (facial wounds are an exception; see below)
- Wounds involving the hands and feet (picture 3)
- Wounds ≥12 hours old (≥24 hours old on the face)
- Wounds in immunocompromised hosts (including diabetes)
- Wounds in patients with venous stasis

Abx prophylaxis/Uninfected wounds

- Lacerations undergoing primary closure and wounds requiring surgical repair
- Wounds on the hand(s), face, or genital area
- Wounds in close proximity to a bone or joint (including prosthetic joints)
- Wounds in areas of underlying venous and/or lymphatic compromise (including vascular grafts)
- Wounds in immunocompromised hosts (including diabetes)
- Deep puncture wounds or laceration (especially due to cat bites)
- Wounds with associated crush injury

•Wounds more than 8 hs old!

AMOX/CLAV 1st choice 3-5 days

Abx treatment/infected wounds

- **Treat as complicated SSTI**…
- **Surgical consultation**…

Deep infection (abscess, septic arthritis, osteomyelitis, tenosynovitis, pyomyositis, or necrotizing

Infection involving the hands or face

Infection associated with neurovascular compromise

Infection with associated foreign body requiring removal

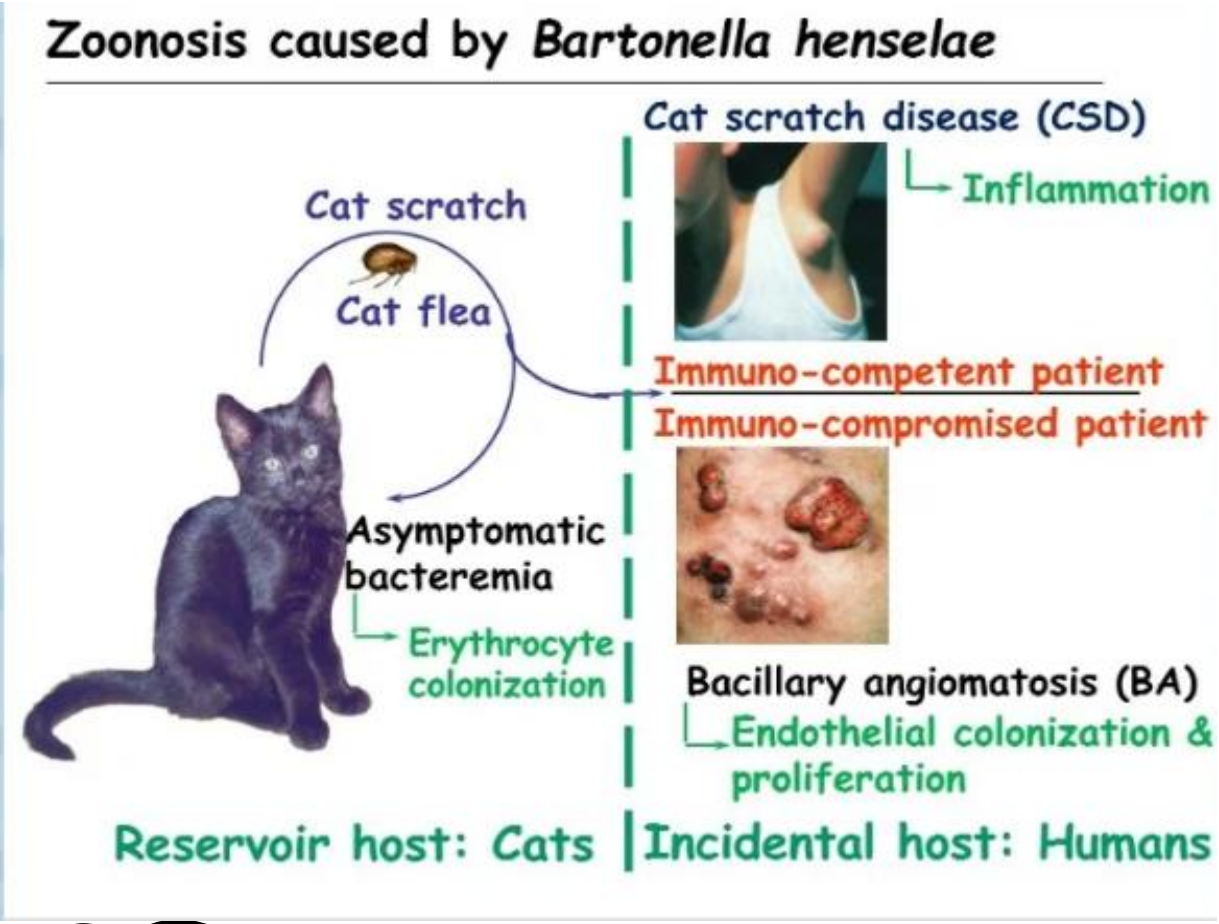
Infection in immunocompromised hosts (including diabetes) or patients with venous stasis

Rapidly progressive infection

Presence of crepitus

Persistent signs and symptoms of infection despite appropriate antibiotic therapy

Cat Scratch Disease and Other *Bartonella* Infections



- Cat Scratch Fever
- Benign Inoculation Lymphoreticulosis
- Benign Inoculation Reticulosis
- Regional Granulomatous Lymphadenitis
- Parinaud's Oculoglandular Syndrome
- Bacillary Angiomatosis

Transmission in Humans

- Not well understood
- Patient history usually includes:

➢ Cat scratch
➢ Cat bite
➢ Being licked by cats

- Vector-borne (fleas)?
- Exposure to other animals

➢ Other *Bartonella* species?

Signs and symptoms

- Usually mild, self-limiting
  - Immunocompetent people
- Initial skin rash
- Lymph node enlargement
- Fever, malaise, fatigue
- Complications usually resolve

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Fish tank cleaning hazards

***Mycobacterium marinum* infection**

Also known as fish tank granuloma, swimming pool granuloma

Uncommon infection that occurs most often in people with recreational or occupational exposure to contaminated freshwater or saltwater

Usually, a single lump or pustule that breaks down to form a crusty sore or abscess

Other lumps may occur around the initial lesion, particularly along the lines of lymphatic drainage (sporotrichoid forms)

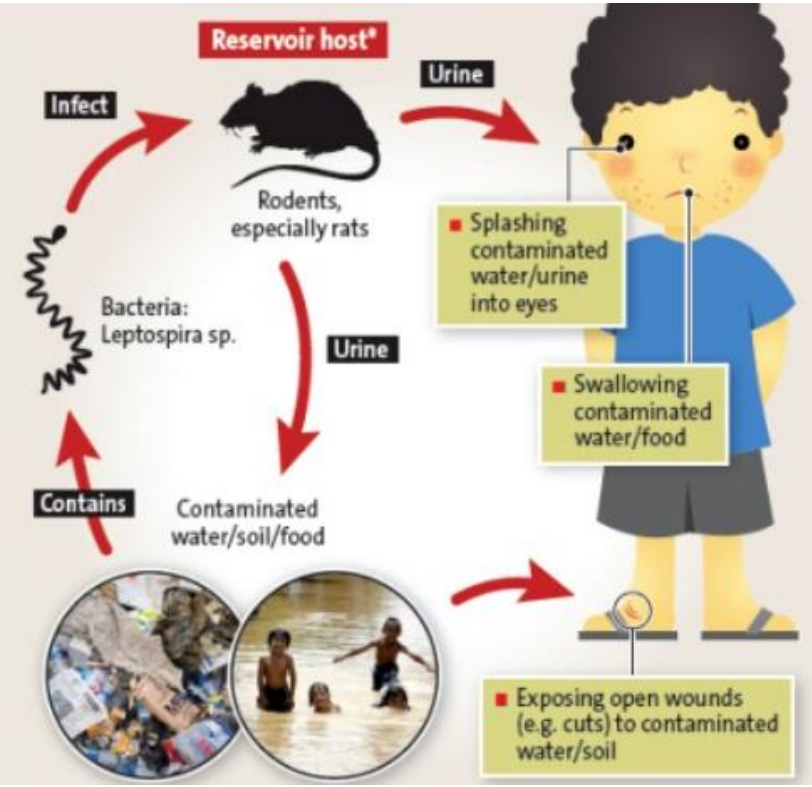
Most often affects elbows, knees, top of feet, knuckles or fingers

Multiple lesions and widespread disease may occur in immunocompromised patients

Rarely causes red, swollen and tender joints (bursitis, tenosynovitis, arthritis, osteomyelitis)

Requires long term treatment with more than one Abx…

LEPTOSPIROSIS



- Ingestion (oral)
- Inhalation (aerosol)
- Indirect contact

Symptoms

Flu-like signs: Fever, body aches, headache
Weakness, vomiting, mental confusion
Jaundice, stiff neck
Liver, kidney or central nervous system damage

Hurricanes, Floods, and Leptospirosis

Leptospirosis is a bacterial disease that occurs worldwide and can cause serious illnesses such as kidney or liver failure, meningitis, difficulty breathing, and bleeding. Cases of leptospirosis can increase after hurricanes or floods when people may have to wade through contaminated water or use it for drinking or bathing.

How do people get leptospirosis?

People can get leptospirosis when they have contact with water or soil containing urine or other body fluids from infected animals or if they directly touch the urine from an infected animal. A variety of animals can spread leptospirosis, including rodents, dogs, livestock, and wildlife. During a hurricane or heavy rain, animal urine in the soil or on other surfaces can run into floodwater, contaminating it. Streams and other natural water sources can also be contaminated.

What are the symptoms of leptospirosis?

Symptoms usually start from 5 to 14 days after contact with the bacteria that causes leptospirosis. However, symptoms can begin anywhere from 2 to 30 days after contact. Early symptoms can include:

- Fever
- Headache
- Muscle aches
- Red eyes
- Vomiting
- Diarrhea
- Abdominal pain
- Jaundice (yellowing of the skin and eyes)
- Skin rash
- Cough

Who is at risk?

Leptospirosis most often affects people who work outdoors or with animals, or those who take part in recreational activities involving water or soil, like swimming, boating, and gardening. **After floods or heavy rains, anyone who has been in contact with floodwater, contaminated freshwater (rivers and streams) or soil could be at risk for infection.**

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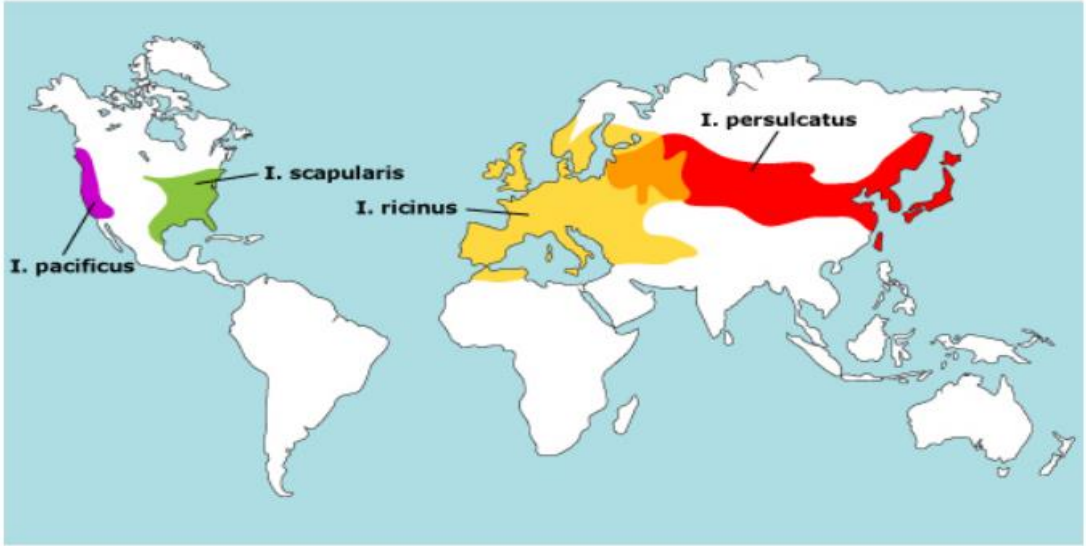
Borelliosis/Lyme disease

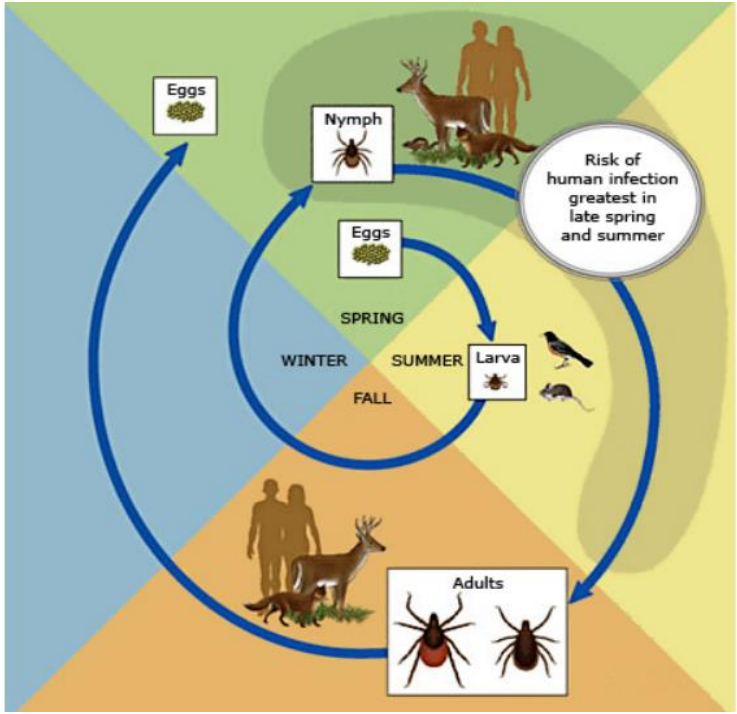
Female Ixodes ticks are orange-reddish, with a dark brown oval-shaped structure called a scutum covering the superior portion of the dorsal surface. Unengorged adults are approximately 3 mm in length.

Lyme disease vector map

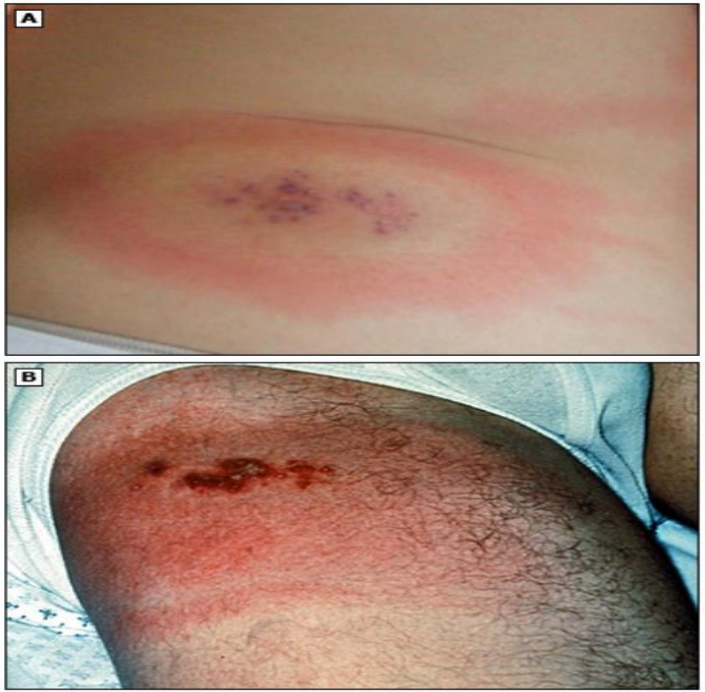


The geographical distribution of the Ixodes tick vectors of the spirochetes that cause Lyme disease.

EPIDEMIOLOGY/ERYTHEMA MIGRANS



Ixodes scapularis ticks are capable of transmitting Lyme disease, babesiosis, and human granulocytic anaplasmosis.



(A) Erythema migrans lesion in a patient with Lyme disease. The lesion has the complex "bull's eye" appearance with central clearing and vesicular lesions.

Clinical manifestations of Lyme disease

Early localized disease, occurring a few days to one month after the tick bite*
Erythema migrans - occurs in approximately 80 percent of patients
Associated symptoms and signs may include: fatigue, malaise, lethargy, mild headache, mild neck stiffness, myalgias, arthralgias, regional lymphadenopathy
Early disseminated disease¶, occurring weeks to months after the tick bite*Δ
Carditis - about 1 percent of patients reported to the CDC◇
Manifestations include AV nodal block, mild cardiomyopathy or myopericarditis
Neurologic disease - occurs in approximately 15 percent of untreated patients◇
Manifestations include lymphocytic meningitis, cranial neuropathy (most often facial, can be bilateral), peripheral neuropathy; rarely myelitis or encephalitis
Musculoskeletal involvement - occurs in approximately 60 percent of untreated patients◇
Manifestations include migratory arthralgias
Skin involvement - multiple erythema migrans lesionsΔ, borrelial lymphocytoma (in Europe)
Lymphadenopathy - regional or generalized
Eye involvement§ - conjunctivitis, iritis, choroiditis, vitritis, retinitis
Liver disease - liver function test abnormalities, hepatitis
Kidney disease - microhematuria, asymptomatic proteinuria
Late disease¶, occurring months to years after the tick bite*
Musculoskeletal symptoms - approximately 60 percent of untreated patients develop intermittent monoarticular or oligoarticular arthritis; approximately 10 percent of untreated patients develop persistent monoarthritis, usually affecting the knee
Neurologic disease - incidence has not been established
Peripheral neuropathy or encephalomyelitis (both rare)
Cutaneous involvement - acrodermatitis chronica atrophicans, morphea/localized scleroderma-like lesions (both described only in Europe)

CDC: United States Centers for Disease Control and Prevention.

SYMPTOMS/MULTIPLE ERYTHEMA MIGRANS IN CHILDREN

- Erythema migrans – 89 percent
- Arthritis – 7 percent
- Facial palsy – 3 percent
- Aseptic meningitis – 1 percent
- Carditis – 0.5 percent

Multiple erythema migrans lesions of early disseminated Lyme disease. In Panel A, the more typical primary lesion is on the abdomen, with a smaller secondary lesion on the upper thigh.

TREATMENT

Depends on the timing/age /symptomatology

Erythema migrans (early disease)				
	Doxycycline¶ △ ◇	100 mg orally twice daily for 10 days	4.4 mg/kg/day orally divided twice daily (maximum 100 mg per dose) for 10 days	▪ Patients with early disseminated disease who present with multiple erythema migrans lesions are treated the same way as those with a single erythema migrans lesion. ▪ For patients unable to tolerate the preferred regimens, alternative treatments include: • Azithromycin (in adults: 500 mg orally once daily; in children: 10 mg/kg/day [maximum 500 mg per dose]) for 7 days (range 5 to 10 days); **or** • Clarithromycin (in adults: 500 mg orally twice daily; in children: 15 mg/kg/day divided twice daily [maximum 500 mg per dose]) for 14 to 21 days.
	or Amoxicillin	500 mg orally 3 times daily for 14 days	50 mg/kg/day orally divided 3 times daily (maximum 500 mg per dose) for 14 days	
	or Cefuroxime axetil	500 mg orally twice daily for 14 days	30 mg/kg/day orally divided twice daily (maximum 500 mg per dose) for 14 days	

TREATMENT

Neurologic disease[§]			
Acute neurologic disease, such as: ▪ Cranial nerve palsy (eg, facial nerve palsy) ▪ Meningitis ▪ Radiculoneuropathy (early disseminated disease)	Doxycycline[¶ Δ ◇]	100 mg orally twice daily for 14 to 21 days	4.4 mg/kg/day orally divided twice daily (maximum 100 mg per dose) for 14 to 21 days
Severe neurologic disease, including encephalitis	Ceftriaxone[¥ ‡]	2 g IV once daily for 14 to 28 days	50 to 75 mg/kg IV once daily (maximum 2 g per dose) for 14 to 28 days

CARDITIS…ARTHRITIS…CHRONIC LYME…

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COMMON FOODBORNE BACTERIAL ZOONOSES

- *CAMPYLOBACTER*
- *SALMONELLA*
- *YERSINIA*
- *LISTERIA*

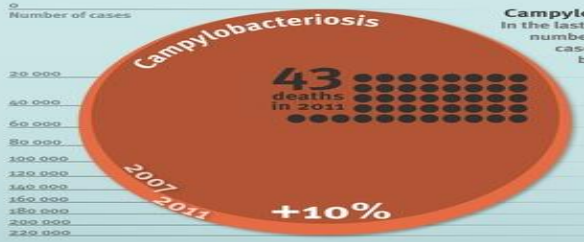
Zoonoses

Zoonoses are infections or diseases that can be transmitted between animals and humans. Most zoonotic infections have mild symptoms and do not require medical treatment. However, they can also turn into life-threatening conditions.

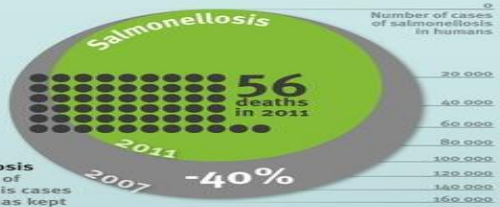
People can be infected directly from animals, or through the ingestion of contaminated foodstuffs, or other indirect contact.

Most common zoonoses

In the European Union, the most common zoonotic infections are Campylobacter and Salmonella.



Campylobacteriosis
In the last four years the number of confirmed cases of campylobacteriosis has increased by 10%, from around 200 000 cases in 2007 to 220 000 cases in 2011.



Salmonellosis
The number of salmonellosis cases in humans has kept decreasing. In 2011 around 95 000 confirmed cases were reported, a decrease by 40% compared with 2007 (154 000 cases).

Trends of 10 zoonoses in humans in the last 5 years

Data from the European Union Summary Reports on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks 2011

Prevention and control

In order to prevent zoonoses from occurring, it is important to identify which animals and foodstuffs are the main sources of infections. For this, ECDC collects information on cases of zoonoses reported in humans in Europe. ECDC and EFSA (European Food Safety Authority) analysed the information submitted by 30 European Countries, including the 27 EU Member States, on the occurrence of zoonoses and food-borne outbreaks in 2011. The results of the analysis of the data are published in the annual European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011, which covers 10 zoonoses as well as food-borne outbreaks.

Epidemiology

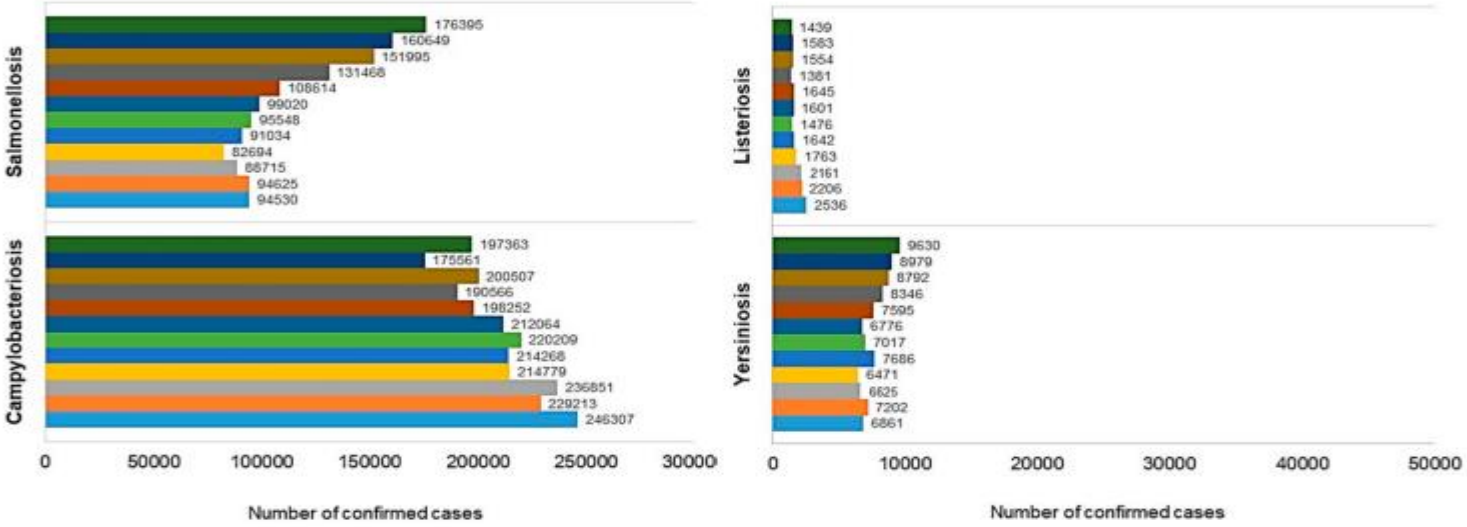


Figure 2. Number of confirmed cases of selected bacterial zoonoses in the European Union between 2005–2016 [1,13,16–25].

The European Union One Health 2020 Zoonoses Report

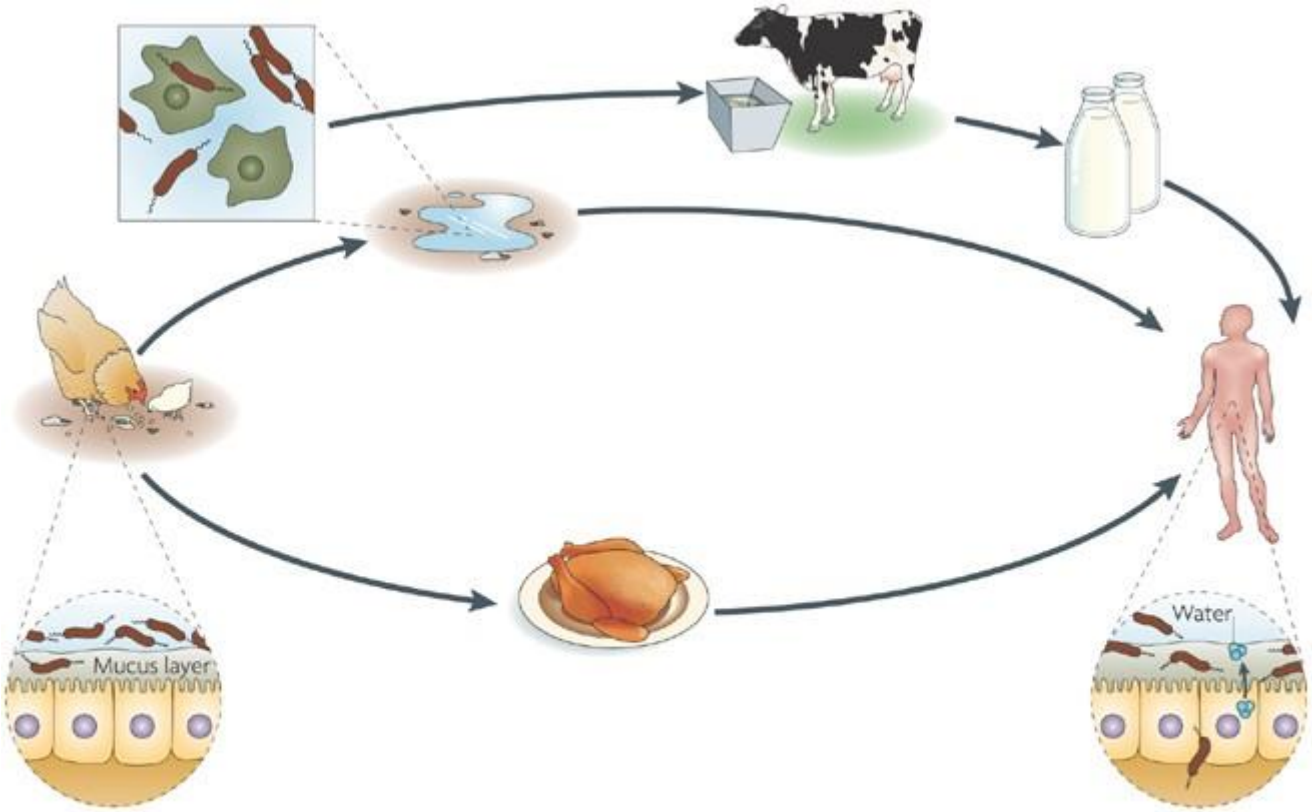
Surveillance report

9 Dec 2021

Executive summary

Two events impacted 2020 MS data collection and related statistics: the Coronavirus Disease 2019 (COVID-19) pandemic and the withdrawal of the United Kingdom from the EU. In 2020, the first and second most reported zoonoses in humans were campylobacteriosis and salmonellosis, respectively. The EU trend for confirmed human cases of these two diseases was stable (flat) from 2016 to 2020. Fourteen of the 26 MS reporting data on Salmonella control programmes in poultry met the reduction targets for all poultry categories. Salmonella results for carcases of various species performed by competent authorities were more frequently positive than own-checks conducted by food business operators. This was also the case for *Campylobacter* quantification results from broiler carcases for the MS group that submitted data from both samplers, whereas overall at EU level, those percentages were comparable. Yersiniosis was the third most reported zoonosis in humans, with 10-fold less cases reported than salmonellosis, followed by Shiga toxin-producing *Escherichia coli (STEC)* and *Listeria monocytogenes* infections. Illnesses caused by *L. monocytogenes* and West Nile virus infections were the most severe zoonotic diseases with the highest case fatality. In 2020, 27 MS reported 3,086 foodborne outbreaks (a 47.0% decrease from 2019) and 20,017 human cases (a 61.3% decrease). *Salmonella* remained the most frequently reported causative agent for foodborne outbreaks. *Salmonella* in 'eggs and egg products', norovirus in 'crustaceans, shellfish, molluscs and products containing them' and *L. monocytogenes* in 'fish and fish products' were the agent/food pairs of most concern. This report also provides updates on tuberculosis due to *Mycobacterium bovis* or *Mycobacterium caprae*, *Brucella*, *Trichinella*, *Echinococcus*, *Toxoplasma*, rabies, *Coxiella burnetii* (Q fever) and tularaemia.

CAMPYLOBACTER INFECTION



Nature Reviews | Microbiology

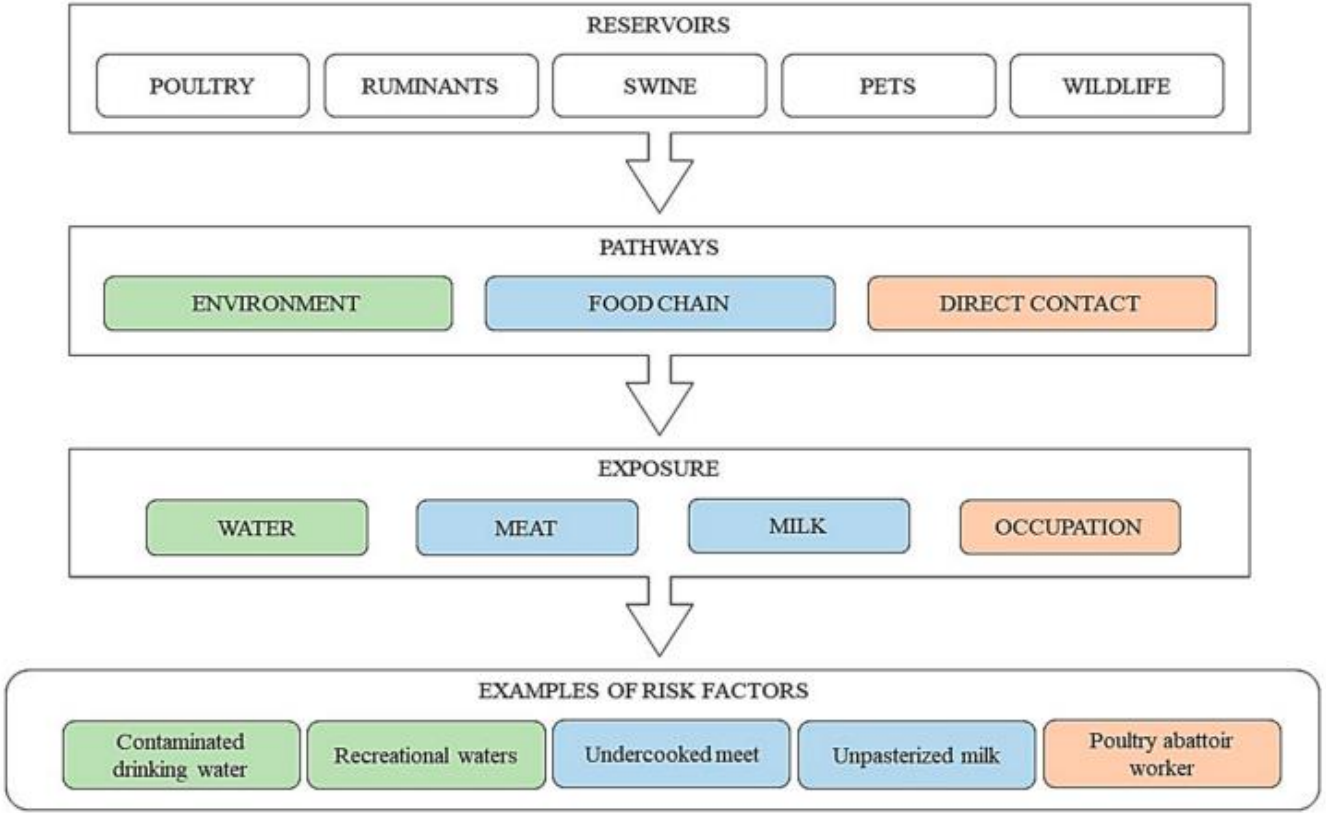


Figure 3. Reservoirs, transmission routs, and examples of source of infections caused by *Campylobacter* genus [56,66].

Clinical manifestations

The mean incubation period is three days

In children:
Diarrhea, fever, abdominal pain, and vomiting
Bloody stools may be present in more than half of children.
Fever tends to be pronounced in children over one year of age and convulsions may occur.

In infants:
Vomiting and bloody stools are frequently observed
Abdominal pain and fever are less common than in older children
The presentation of bloody stools in the absence of diarrhea or fever can mimic intussusception.

Review Article

Role of *Campylobacter jejuni* Infection in the Pathogenesis of Guillain-Barré Syndrome: An Update

Kishan Kumar Nyati[1] and Roopanshi Nyati[2]

[1] *Immune Regulation Laboratory, World Premier International-Immunology Frontier Research Center (WPI-IFReC), Osaka University, Osaka 865-0871, Japan*
[2] *Department of Microbiology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow 226 014, India*

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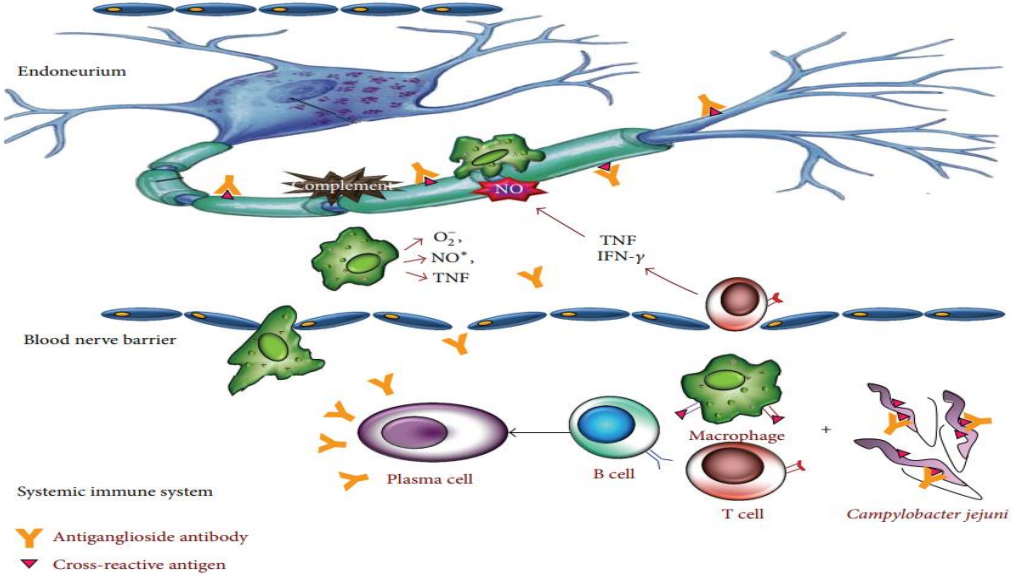
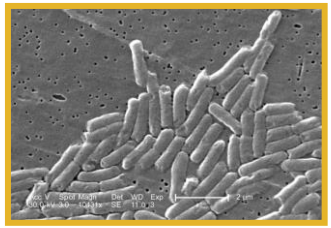


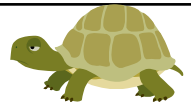
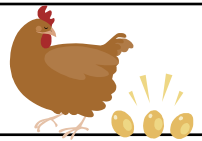
Salmonellosis

Table 3. *Salmonella* spp. serotypes most often isolated from animal reservoirs in European Union countries. Underlined serovar was the one isolated most frequently [1,13,25].

Year	Animal Reservoirs			
	Broiler	Cattle	Pigs	Turkey
	Salmonella Serotypes			
2014	S. Typhimurium S. Infantis S. Enteritidis S. Mbandaka S. Livingstone S. Kedougou S. Enftenberg S. Kentucky S. Typhimurium Copenhagen S. Brandenburg	S. Typhimurium S. Enteritidis S. Dublin S. Mbandaka S. Coeln S. Give S. Montevideo S. Anatum S. Bredeney S. Typhimurium Copenhagen	S. Typhimurium S. Infantis S. Derby S. Typhimurium monophasic S. Typhimurium Copenhagen S. Rissen S. London S. Muenchen S. Livingstone ar14	S. Typhimurium S. Infantis S. Derby S. Enteritidis S. Newport S. Hadar S. Stanley S. Saintpaul S. Virchow S. Kottbus
2015	S. Typhimurium S. Infantis S. Enteritidis S. Derby S. Typhimurium monophasic S. Livingstone S. Mbandaka S. Cerro S. Thompson S. Kedougou	S. Typhimurium S. Infantis S. Enteritidis S. Dublin S. Typhimurium monophasic S. Mbandaka S. Newport S. Goldcoast S. Brandenburg	S. Typhimurium S. Infantis S. Enteritidis S. Derby S. Typhimurium monophasic S. Goldcoast S. Rissen S. Brandenburg S. London	S. Typhimurium S. Infantis S. Enteritids S. Derby S. Typhimurium monophasic S. Newport S. Kedougou S. Branderburg
2016	S. Enteritidis S. Typhimurium S. Typhimurium monophasic S. Infantis S. Derby	S. Enteritidis S. Typhimurium S. Typhimurium monophasic S. Infantis S. Derby	S. Enteritidis S. Typhimurium S. Typhimurium monophasic S. Infantis S. Derby	S. Enteritidis S. Typhimurium S. Typhimurium monophasic S. Infantis S. Derby



Prevalence in animals

	86%
	50%
	1-36%
	2-20%
	6%

Transmission

- Fecal-oral: direct or indirect

- Commonly contaminated items

Meat, eggs, water

- Fecal material from:

*Reptiles
*Chicks
*Ducklings
Livestock, dogs, cats, adult poultry

Symptoms

Incubation period: Gastroenteritis: 12 hrs to 3 days / Enteric fever: 10 to 14 days

Gastroenteritis

- Nausea, vomiting, cramping abdominal pain and diarrhea (may be bloody)
- Headache, fever, chills, myalgia
- Severe dehydration: infants, elderly
- Symptoms resolve in 1 to 7 days
- Sequela: Reiter's syndrome

Enteric Fever

- Systemic salmonellosis

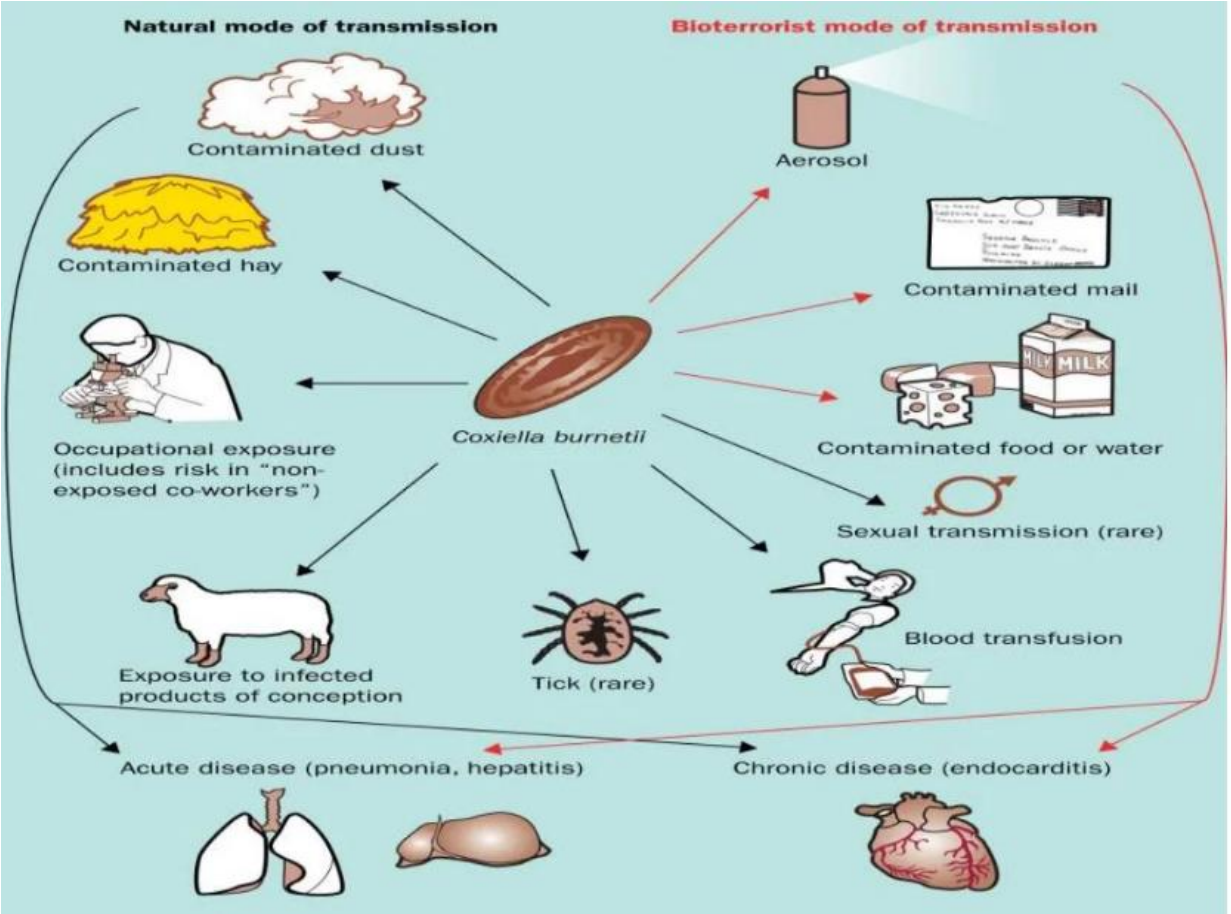
Caused by S. typhi or other species

Clinical signs

- Non-specific
- Gastrointestinal disease
- Fever, anorexia, headache, lethargy, myalgias, constipation

Can be fatal: meningitis, septicemia

COXIELLA BURNETTII/Q FEVER



Symptoms

Acute infection — The incubation period for acute infection is approximately 20 days (range 14 to 39)

Patients with acute Q fever can present with any of the following manifestations described below.

Flu-like illness — high-grade fevers (104ºF or 40ºC), fatigue, headache, and myalgias.

Pneumonia

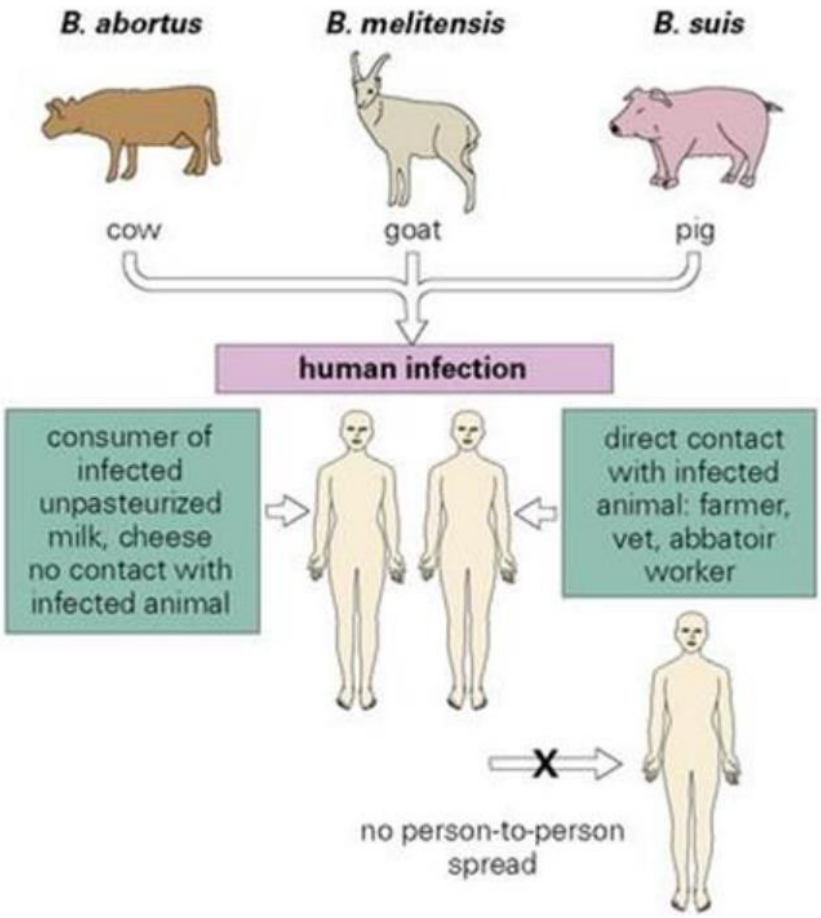
Hepatitis

Acute endocarditis

Additional manifestations :

- Maculopapular or purpuric rash (10 percent).
- Pericarditis and/or myocarditis (1 percent).
- Aseptic meningitis and/or encephalitis (1 percent)
- Adenitis
- Arthritis, specifically acromioclavicular

BRUCELLA SPP



Clinical manifestations of brucellosis

Features	Percentage of cases
Signs and symptoms	
Fever (symptom)	76
Malaise	68
Night sweats	72
Arthralgia	80
Hepatomegaly	50
Splenomegaly	29
Laboratory findings	
Elevated alanine aminotransferase	33
Anemia	27
Leukopenia	9
Leukocytosis	8

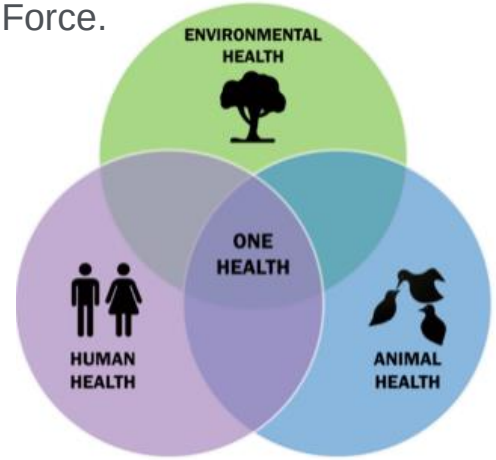
TAKE HOME MESSAGE

- A zoonosis is an animal disease that is transmissible to humans.
- Humans are usually an accidental host that acquires disease through close contact with an infected animal, who **may or may not be symptomatic**.
- **Children are at highest risk for infection** because they are more likely to have close contact with pets.
- Pets are responsible for transmission of an extensive array of bacterial, fungal, and parasitic zoonotic pathogens. The route of transmission can be through the saliva (eg, bites or contaminated scratches), feces, respiratory secretions, direct contact, or by the animal acting as a vehicle and source of tick or flea exposure.
- Although pets have been implicated in transmission of zoonoses to their owners, **risk of transmission from contact with pets is low and may be further reduced by simple precautions.**

PET THERAPY WORKS…

PREVENTION

One Health is an approach calling for "the collaborative efforts of multiple disciplines working locally, nationally, and globally, to attain optimal health for people, animals and our environment", as defined by the One Health Initiative Task Force.



THANK YOU