

روزگار



Foodborne Illnesses Associated With the Consumption of Meat and Meat Products

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Zoonoses

- A zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans.

WHO

- Zoonotic diseases, or zoonoses, are diseases shared between animals – including livestock, wildlife, and pets – and people.

WHO-FAO-OIE

868 (61%) pathogens are considered to be **zoonotic**

- The 1,415 pathogens identified in humans include:
- 217 viruses and prions,
- 538 bacteria and rickettsiae,
- 307 fungi,
- 66 protozoa and
- 287 helminths.
- Of these pathogens, 868 (61%) are considered to be **zoonotic diseases**.

From farm to slaughter

- 1990, the Richmond Committee on the Microbiological Safety of Food (Part II) concluded that **‘farmers can contribute to food safety by producing healthy, clean and unstressed animals for slaughter.**

Farm to Fork strategy



From farm to slaughter (cont.)

1. The control of contamination such as heavy metals and radioactive materials

From farm to slaughter (cont.)

2. The correct and appropriate use of veterinary medicinal products and feed additives and their traceability
3. The proper disposal of dead animals and waste

From farm to slaughter (cont.)

4. Protective measures to prevent the introduction of contagious diseases transmissible to humans through food and any obligations to notify the competent authority

From farm to slaughter (cont.)

5. Procedures to ensure that food is produced, handled, packed, stored and transported under appropriate hygienic conditions, including effective cleaning and pest control

Unacceptable faecal/soil contamination



Animal welfare

- An animal's welfare, whether on farm, in transit, at market or at a place of slaughter, should be considered in terms of the 'five freedoms'.

MEAT INSPECTION PROCEDURES

- Objectives :
 1. To ensure that only apparently healthy, physiologically normal animals are slaughtered
 2. To ensure that meat from animals is free from disease agents

The scope of meat inspection has been enlarged over the last few decades.

- The substantial core of meat inspection is public health and consumer protection.
- Public health issues, such as prevention of the transmission of pathogenic microorganisms and contagious diseases, have been important from the beginning of meat inspection.

Proper Meat Inspection

1. Veterinary Antemortem Inspection
2. Veterinary postmortem Inspection
3. If necessary, laboratory tests

Biosecurity measures (cont.)

- Many food pathogens can be detected and controlled in the flock or herd level instead of detection at the slaughter line.
- Biosecurity measures are the main preventive measures for reducing food safety risks at herd level .



Preventive measures for the most important meat-borne zoonotic agents in Europe

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CH7 RISK-BASED MEAT INSPECTION

Table 7.1 Preventive measures for the most important meat-borne zoonotic agents in Europe.

Agent	Preventative measure ^a					
	Herd level	Serological categorization	Meat inspection	Slaughter hygiene	Carcass Decontamination ^b	Freezing
<i>Campylobacter</i>	+++	++	—	+	++	++
<i>Salmonella</i>	+++	++	+	+	++	—
<i>Yersinia</i> ^c	+++	++	—	+	++	—
STEC ^d	+++	—	—	+	++	—
<i>Toxoplasma</i>	+++	++	—	—	—	+++
<i>Trichinella</i>	+++	++	+++ ^e	—	—	+++

^a great effect: +++; good effect: ++; limited effect: +

^b by steam or/and hot water

^c pathogenic *Yersinia enterocolitica* and *Y. pseudotuberculosis*

^d Shiga toxin-producing *Escherichia coli*

^e every carcasses is tested by a validated reference method, usually by digestion method

Crimean-Congo Hemorrhagic Fever (CCHF)

- A tick-borne virus (*Nairovirus*) in the family *Bunyaviridae*
- First characterized in the Crimea in 1944
- later recognized in 1969 in the Congo



Hyalomma

Crimean-Congo Hemorrhagic Fever (CCHF) (cont.)

- Numerous wild and domestic animals, such as **cattle, goats, sheep and hares, serve as amplifying hosts** for the virus.
- Transmission to humans occurs through **contact with infected ticks or animal blood.** CCHF can be transmitted from one infected human to another by **contact with infectious blood or body fluids.**

Crimean-Congo Hemorrhagic Fever (CCHF) (cont.)

- Many birds are resistant to infection, but ostriches appear to be more susceptible.
- Viraemia in livestock is short-lived, and of low intensity.
- These animals play a crucial role in the life cycle of ticks, and in the transmission and amplification of the virus
- Animals do not develop clinical signs.

Crimean-Congo Hemorrhagic Fever (CCHF) (cont.)

- Risk of Exposure
 - Animal herders
 - livestock workers
 - slaughterhouse workers

Rabies

- **Importance of Ante mortem inspection**
- Rabies virus is transmitted through direct contact (such as through broken skin or mucous membranes in the eyes, nose, or mouth) with saliva or brain/nervous system tissue from an infected animal.
- People usually get rabies from the bite of a rabid animal. It is also possible, but rare, for people to get rabies from non-bite exposures, which can include scratches, abrasions, or open wounds that are exposed to saliva or other potentially infectious material from a rabid animal.

Rabies

- **Antemortem findings :**
- Furious form
- Incubation from 2 weeks to 6 months or longer
- Restlessness
- Aggressive, may attack other animals
- Sexual excitement
- Bellowing
- Paralysis and death



Rabies

Paralytic form :

- Salivation
- The tail is held to one side
- Tenesmus or paralysis of the anus
- Paralysis
- The animal falls to the ground

Bovine spongiform encephalopathy (BSE, “Mad cow disease”)

- BSE is a progressive and fatal disease of adult cattle
- vCJD is a rare and fatal condition of humans that affects the nervous system.
- Transmission: Eating contaminated beef products. Contact with specified risk material (SRM) during slaughter of infected animals.
- No details of occupational links.
- **Judgement** : Carcass is condemned.

Contagious ecthyma (Orf)

- Orf virus (genus Parapoxvirus -family Poxviridae)
- Mainly occurs in sheep and goats
- Orf has been reported in people who handled infected animals or their tissues.
- The pustular and scabby lesions on the lips, muzzle and udder in sheep and goats.

Contagious ecthyma (Orf)

- Contagious ecthyma affected goat. Scab is formed around the mouth



Contagious ecthyma (Orf)



Contagious ecthyma
(American Academy of Dermatology)



Contagious ecthyma. Close up view of a
proliferative muzzle lesion in sheep

Rift valley fever (RVF)

- RVF is an acute viral disease of sheep, cattle, goats and humans. It is manifested with hepatitis and high mortality in young lambs and calves, and abortion in adult animals.
- Rift valley fever resembles influenza in humans.
- The disease is caused by RVF virus (RVFV), a member of the genus *Phlebovirus* in the order *Bunyavirales*.

Rift valley fever (RVF)

- **Transmission** : Biting insects and mosquitoes. Possible direct contact via cornea. Human infection occur by handling diseased tissues.

Rift Valley Fever (RVF) virus ecology

Enzootic Cycle

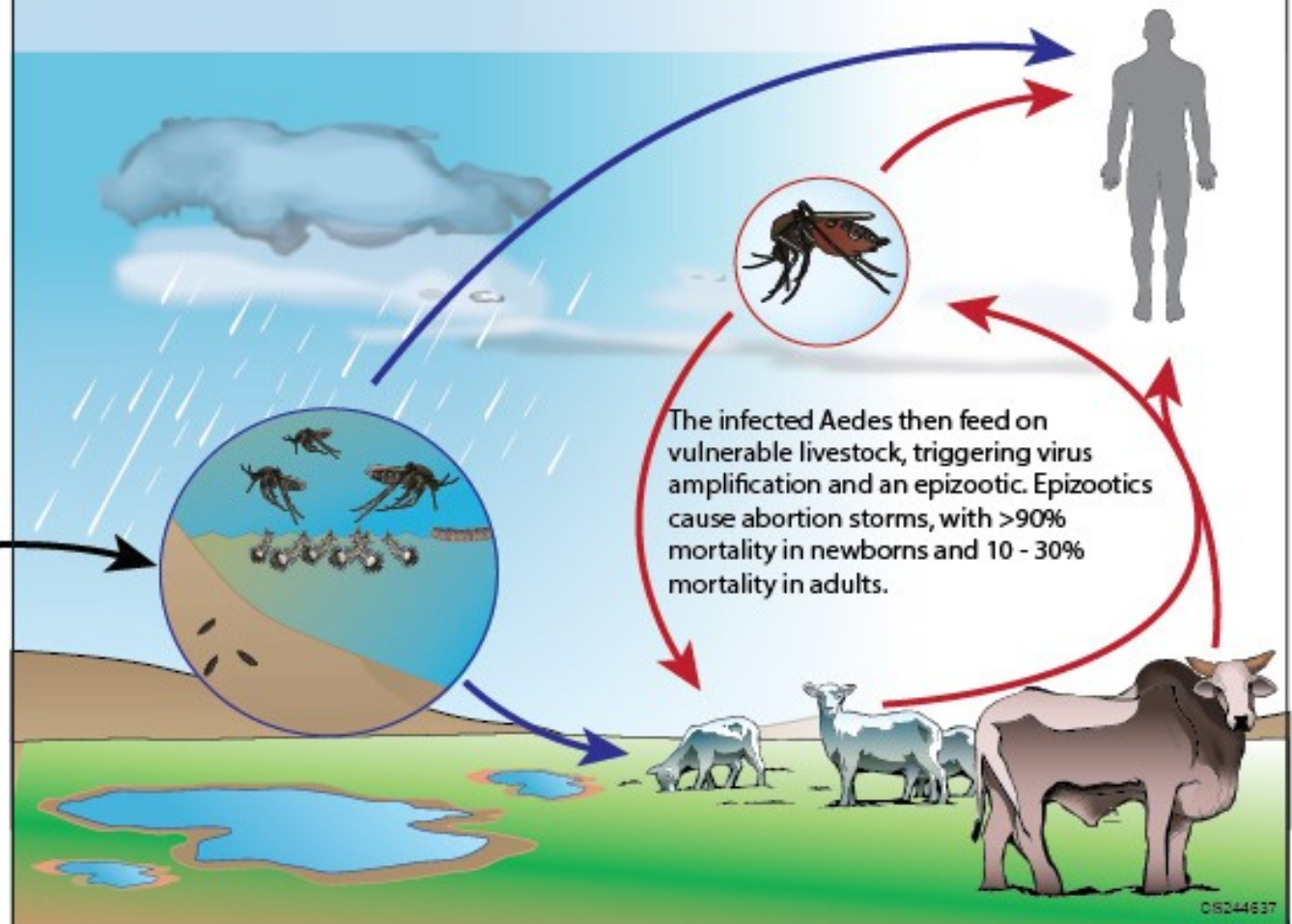
Local enzootic transmission of RVF occurs at low levels in nature during periods of average rainfall. The virus is maintained through transovarial transmission from the female Aedes mosquito to her eggs and through occasional amplification cycles in susceptible livestock.



Epizootic-Epidemic cycle

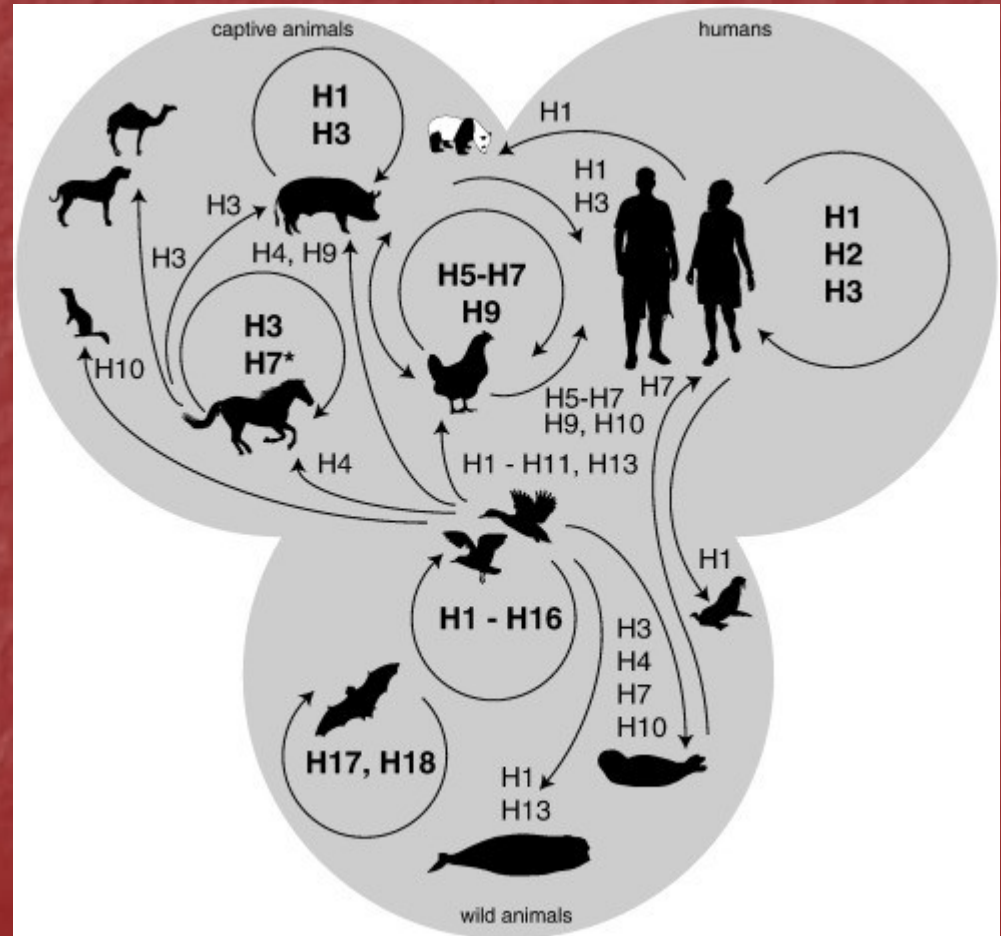
Abnormally high rainfall and flooding stimulate hatching of the infected Aedes mosquito eggs, resulting in a massive emergence of Aedes, including RVF virus-infected Aedes.

Secondary vectors include other mosquito genera such as Culex, which can pass on the virus to humans and animals, producing disease. Human exposure to viremic livestock (mostly small ruminants) blood and tissue can occur during slaughtering or birthing activities.



Highly pathogenic avian influenza (HPAI)

- A(H5N1) and A(H7N9) viruses are zoonotic flu viruses of public health concern because they have infected people and caused serious illness. (CDC)



Highly pathogenic avian influenza (cont.)

- Although avian influenza A viruses usually do not infect people, rare cases of human infection with these viruses have been reported. **Infected birds shed avian influenza virus in their saliva, mucous and feces. Human infections with bird flu viruses can happen when enough virus gets into a person's eyes, nose or mouth, or is inhaled.**

Highly pathogenic avian influenza (cont.)

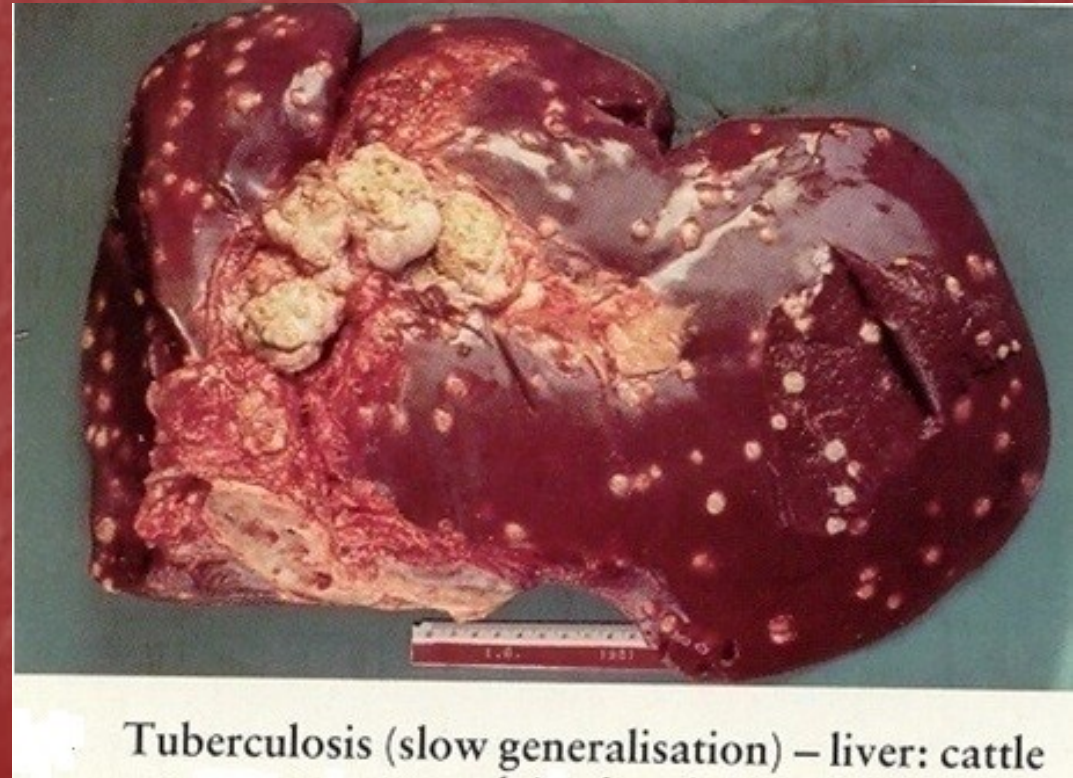
- During 2007, there were 85 cases of AI (H5N1) infection in humans worldwide. (57 deaths in seven different countries)
- In 2007, the first internationally recognized outbreak of H7N2 infection affecting a number of people occurred in North West England and North Wales. **Cases had a history of exposure to infected poultry premises or close contact with confirmed cases.**

Tuberculosis

- Tuberculosis is a chronic disease of many animal species especially cattle and poultry caused by bacteria of the genus *Mycobacterium*.

Bovine Tuberculosis

- *Mycobacterium bovis*
- The diagnosis may be confirmed by making a smear of the lesion and with Ziehl-Neelsen.



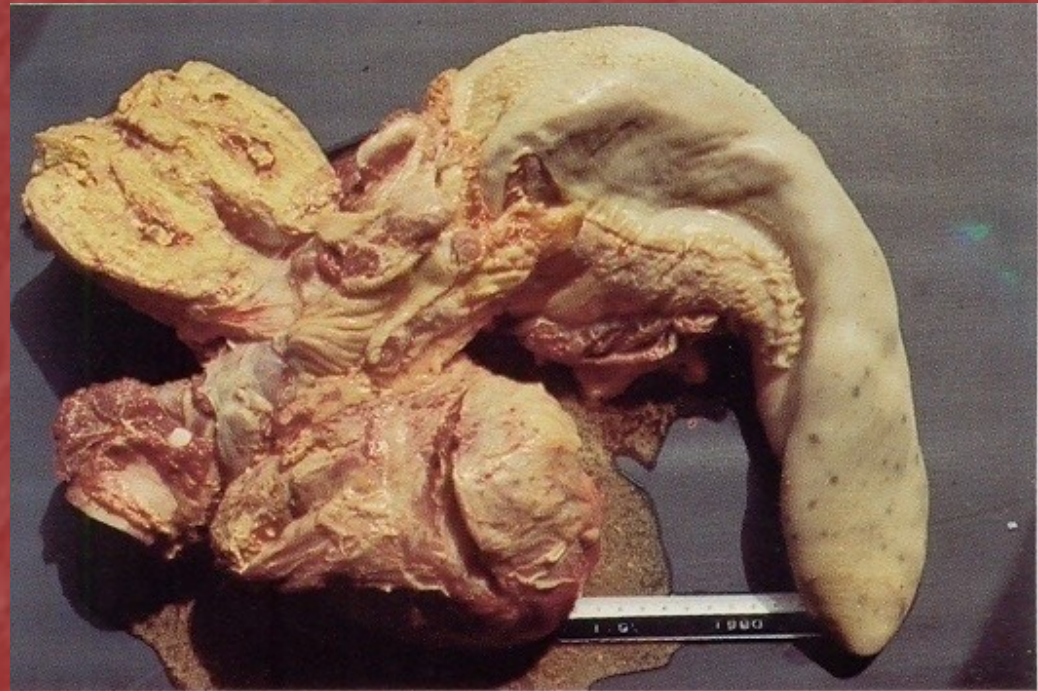
Tuberculosis (slow generalisation) – liver: cattle

Bovine Tuberculosis

- Young calves are infected by ingestion of contaminated milk.
- People are most commonly infected with *M. bovis* by eating or drinking contaminated, unpasteurized dairy products.
- Infection can also occur from direct contact with a wound, such as what might occur during slaughter or hunting, or by inhaling the bacteria in air exhaled by animals infected with *M. bovis*.

Bovine Tuberculosis

- Judgement : Carcass of an animal affected with tuberculosis requires additional postmortem examination of the lymph nodes, joints, bones.



450 Tuberculosis – retropharyngeal lymph nodes: cattle The lymph nodes were enlarged and the parenchyma of one was totally replaced by caseous matter with calcified areas, which explains the stasis of the lymph. The other lymph node showed lesions corresponding to a breakdown of body resistance.

Differential diagnosis: Purulent lymphadenitis; Cysts.

Leptospirosis

- **Leptospirosis or Rice Field Fever**
- Leptospirosis is an important and relatively common disease of domestic and wild animals and humans.
- Interstitial nephritis, anaemia and mastitis and abortion can be occur in cattle.

Leptospirosis

- Many different kinds of wild and domestic animals carry the bacterium. These can include, but are not limited to:
 - Cattle
 - Pigs
 - Horses
 - Dogs
 - Rodents
 - Wild animals

Leptospirosis

- Humans can become infected through:
 - Contact with urine from infected animals.
 - Contact with water, soil, or food contaminated with the urine of infected animals.
- It is an occupational hazard for many people who work outdoors or with animals, such as:
 - Farmers
 - Mine workers
 - Sewer workers
 - Slaughterhouse workers
 - Veterinarians and animal caretakers
 - Fish workers, Dairy farmers

Leptospirosis

- The bacteria can enter the body through skin or mucous membranes (eyes, nose, or mouth), especially if the skin is broken from a cut or scratch.
- Drinking contaminated water can also cause infection.
- Outbreaks of leptospirosis are usually caused by exposure to contaminated water, such as floodwaters.

Leptospirosis

- Interstitial nephritis in a bovine.
- Carcass of an animal affected with acute leptospirosis is *condemned*.



Brucellosis

- *Brucella abortus, Brucella Melitensis*
- Transmission: Eating or drinking contaminated material, inhalation of the organism from infected animals or through skin wounds.

Brucellosis

- Hygromas on the knee joints.





- Personal protective equipment (PPE) for inspection of brucellosis reactors.

Anthrax

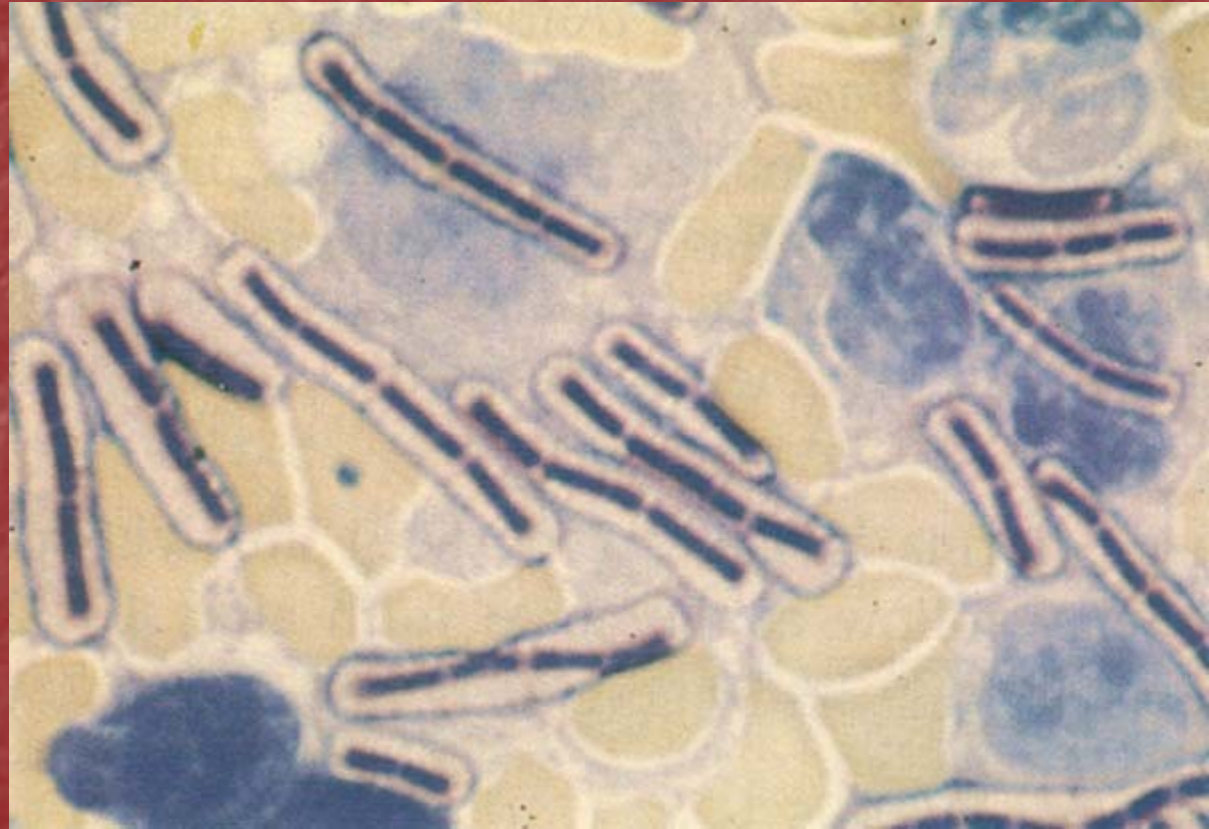
- Human may contract anthrax by inhalation (inhaling spores from wool from infected carcasses), ingestion and through a wound in the skin.
- The peracute and acute forms in cattle and sheep are without clinical signs. Death may follow in the acute form after 1 – 2 hours of illness. The acute form lasts about 48 hours.

Anthrax

- **Postmortem findings:**
- Dark-tarry blood discharge from body orifices
- Absence of rigor mortis
- Haemorrhage of the mucous and serous membranes, lymph nodes and subcutaneous tissue
- Enlarged spleen
- Severe haemorrhagic enteritis
- Degeneration of the liver and kidneys
- Bloating and rapid decomposition of carcass
- Localized lesions in the intestine of pigs (dysentery)

Anthrax

- Toluidine blue stain
- *Bacillus anthracis* in tissue seen in short chains surrounded by a common capsule.



Salmonellosis in bovine

- In animals, salmonellosis is characterized clinically by one of three syndromes: a) *peracute septicemic form.*; b) *acute enteritis* or c) *chronic enteritis*.

Salmonellosis in bovine

Antemortem findings:

- Peracute septicemic form
- Occurs most frequently in colostrum deficient animals up to four months of age.
- Increased temperature 40.4°C – 41.5°C.
- Depression
- Diarrhoea and dehydration
- Death within 24–48 hours
- Approximately four weeks after the onset of diarrhoea
- Polyarthrititis
- Meningoencephalitis
- Necrosis of distal limbs, tails and ear

Salmonellosis in bovine

Acute enteritis

- Common form in adult cattle in late pregnancy and early postpartum
- High temperature of 40°C – 41°C
- Depression and loss of appetite
- Watery, foul smelling diarrhoea and dehydration
- Emaciation
- Reduced milk production and abortion
- Death

Salmonellosis in bovine

Postmortem findings:

- Septicemic form
- Absence of gross lesions in animals
- Submucosal and subserosal haemorrhage
- Acute enteritis
- Mucoenteritis to diffuse haemorrhagic enteritis
- Severe necrotic enteritis of ileum and large intestine caused by *S. typhimurium*
- Abomasitis in *S. dublin* infection
- Enlarged, edematous and haemorrhagic lymph nodes
- Thickened inflamed gall bladder wall

Salmonellosis in bovine

- **Judgement:** Carcass affected with Salmonellosis is *condemned*.

Campylobacteriosis

- *Campylobacter coli*, *Campylobacter jejuni*
- The main sources for campylobacter are raw meat, especially offal, and poultry.
- In the United States, poultry is associated with 50–70% of human cases of campylobacter infection.
- People can get *Campylobacter* infection by:
 - eating raw or undercooked poultry or eating something that touched it
 - eating seafood, meat, and
 - drinking untreated water.

Other Common Meat-borne Diseases

Organism	Onset of Symptoms Associated Food(s)	Associated Food(s)
Campylobacter	2 - 5 days, range 1 - 10 days	Undercooked chicken or pork, unpasteurized milk
E. coli (shiga-toxin) <i>Enterohemorrhagic E coli</i> (EHEC)	3 - 4 days, range 2 - 10 days	STEC live in the guts of ruminant esp. cattle, contaminated fruits or vegetables, person-to-person
Listeria	3 weeks, range 3 - 70 days	deli meats, hot dogs, undercooked poultry, unwashed raw vegetables
Salmonella	12 - 36 hours, range 6 - 72 hours	Contaminated eggs, poultry, beef, raw fruits and vegetables, unpasteurized milk or juice, cheese

Fascioliasis

- *Fasciola hepatica*
- *Fasciola gigantica*
- Fasciola gigantica is two or three times larger than Fasciola hepatica.



Fascioliasis



- Aquatic snail *Lymnaea truncatula* is intermediate host.

Fascioliasis

Antemortem findings :

- Weight loss and emaciation
- Fall in milk production
- Anaemia
- Chronic diarrhoea
- Swelling in the mandibular area



Pharyngeal fascioliasis (halzoun)

- Pharyngeal fascioliasis (halzoun) in humans results from eating raw *Fasciola*-laded bovine liver where young flukes become attached to the pharyngeal membranes, resulting in pain and coughing.

Cysticercosis

- *Cysticercus bovis*
- *Taenia saginata*
- *masseter muscles, tongue, heart and diaphragm*
- Infection in man occurs following consumption of raw or undercooked beef containing viable cisticerci.

Cysticercosis

- Cattle become infected by ingestion of feedstuff containing ova passed from infected humans.



Sarcocystosis

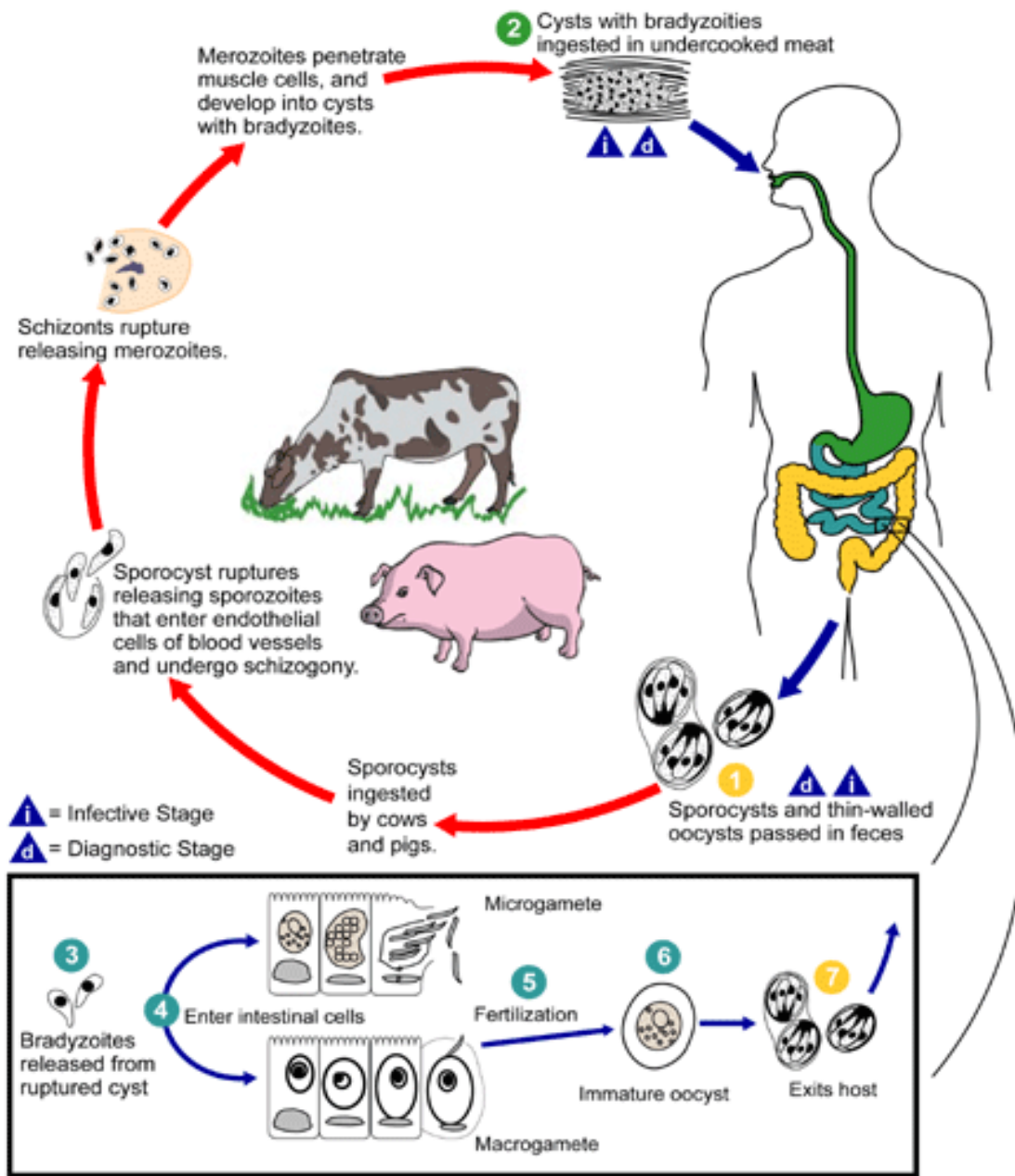
- All Sarcocystis species require two hosts and a prey-predator cycle to complete their life-cycle.



Sarcocystosis

- *Sarcocystis hominis*





- Sporocysts ingested by the intermediate host (cattle for *S. hominis* and pigs for *S. suihominis*)



Thanks for your attention.