[redacted]

BMI3706 ASSIGNMENT 2

[redacted]

Unique number 659033
Semester code 02

18

EPIDEMIOLOGY AND DIFERENT FORM OF LISTERIOSIS IN HUMAN:

Foodborne listeriosis is one of the most serious and severe foodborne diseases. It is caused by the bacteria *Listeria monocytogenes*. It is a relatively rare disease with 0.1 to 10 cases per 1 million people per year depending on the countries and regions of the world. Although the number of cases of listeriosis is small, the high rate of death associated with this infection makes it a significant public health concern.
Unlike many other common foodborne diseases causing bacteria, *L. monocytogenes* can survive and multiply at low temperatures usually found in refrigerators. Eating contaminated food with high numbers of *L. monocytogenes* is the main route of infection. Infection can also be transmitted between humans, notably from pregnant women to unborn babies.

Listeriosis is known as the circling disease. Its Cause be a type of bacteria that is commonly found in water, soil, and feces. Humans are infected when they consume foods that harbor the bacteria. Gram-positive motile bacteria in the *listeria* genus cause listeriosis and listerellosis. *Listeria moncytogenes* are considered foodborne pathogens because the majority of these infections are associated with the consumption of contaminated food. However, a woman can pass it to her baby during pregnancy and farmers/veterinarians/butchers can develop listeria skin infections by touching infected calves or poultry.

In past outbreaks, foods involved included ready-to-eat meat products, such as frankfurters, meat spread (paté), smoked salmon and fermented raw meat sausages, as well as dairy products (including soft cheeses, unpasteurized milk and ice cream) and prepared salads (including coleslaw and bean sprouts) as well as fresh vegetables and fruits

TRANSMISION

The main reservoirs of *Listeria monocytogene*s are soil and the intestinal tract of animals. Animals can carry the bacterium without appearing ill and contaminate food of animal origin, including meat and dairy products through faeces, milk and uterine discharges. The bacterium has been found in raw foods (e.g. uncooked meat and vegetables) as well as in processed foods that have become contaminated after processing (e.g. soft cheeses and cold cuts). *Listeria monocytogenes* is mainly spread through ingestion, by inhalation and direct contact. Vertical transmission (transplacentally or via an infected birth canal) is the main route of infection for newborn human infants and ruminants.

[redacted]

DISTRIBUTION

Pregnant women are about 20 times more likely to contract listeriosis than other healthy adults. It can result in miscarriage or stillbirth. Newborn may also have low birth weight, septicaemia and meningitis. Pregnant women, the elderly or individuals with a weakened immune system, such as people with immuno-compromised status due to HIV/AIDS, leukaemia, cancer, kidney transplant and steroid therapy, are at greatest risk of severe listeriosis and should avoid high risk foods. People with HIV/AIDS are at least 300 times more likely to get ill than those with a normally functioning immune system.

Clinical Sign in Animal
In ruminants, listeriosis can cause encephalitis (inflammation of the brain), abortion or blood poisoning. Signs include depression, loss of appetite, fever, lack of coordination, salivation, facial paralysis and circling. Disease is more common in younger animals (one to three years old). Infection can also cause mastitis in cows.

Clinical Sign in Human: A person with listeriosis usually has a fever and muscle aches, sometimes preceded by diarrhea or other gastrointestinal symptoms. Almost everyone who is diagnosed with listeriosis has an invasive infection. This means that bacteria spread from their intestines to the blood, causing bloodstream infection, or to the central nervous system, causing meningitis.

Forms of listeriosis:

listeriosis is a series of diseases caused by the bacteria *L. monocytogenes*, outbreaks of which occur in all countries. There are two main types of listeriosis: a non-invasive form and an invasive form.

Noninvasive listeriosis (febrile listeria gastroenteritis) is a mild form of the disease affecting mainly otherwise healthy people. Symptoms include diarrhoea, fever, headache and myalgia (muscle pain). The incubation period is short (a few days). Outbreaks of this disease have generally involved the ingestion of foods containing high doses of *L. monocytogenes*.

Invasive listeriosis is a more severe form of the disease and affects certain high risk groups of the population. These include pregnant women, patients undergoing treatment for cancer, AIDS and organ transplants, elderly people and infants. This form of disease is characterized by severe symptoms and a high mortality rate (20%–30%). The symptoms include fever, myalgia (muscle pain), septicemia, meningitis. The incubation period is usually one to two weeks but can vary between a few days and up to 90 days.

Clinical presentations of listeriosis:
Infection with *Listeria monocytogenes* may by asymptomatic, or it may result in a spectrum of clinical presentations including acute non-febrile or febrile gastro-enteritis, sepsis, or meningitis. Sepsis (bacteraemia) in pregnant women often results in placental infection, with subsequent premature onset of labour, and neonatal sepsis, with or without meningitis. Meningitis due to *L. monocytogenes* is acute and presents similarly to acute bacterial meningitis. Occasionally central-nervous system infection by *L. monocytogenes* in adults may present with encephalitis, rhombencephalitis (brainstem encephalitis), or focal signs suggestive of brain abscess formation. Uncommonly focal infections involving the eye may occur.
Gastroenteritis due to *Listeria monocytogenes*

[redacted]

Gastroenteritis due to Listeria is typically self-limited and is accompanied by fever (60-100% of cases), non-bloody diarrhoea (33-88%), arthromyalgia (20-100%) and headache (15-88%). Fever and vomiting are more common amongst children, and diarrhoea and arthralgia are more common in adults9. The incubation period for gastroenteritis is usually 24 hours or less but has ranged from 6 hours to 10 days. The usual duration of symptoms is 1-3 days but can last for up to one week. Hospitalization following gastroenteritis due to listeriosis is more common amongst children or the elderly, and amongst these persons, blood cultures may yield Listeria In outbreaks of gastroenteritis a proportion of persons may also present with a flu-like illness without gastro-intestinal symptomS.

Listeriosis in pregnancy

Pregnancy is a predisposing factor for the development of invasive disease due to Listeria, as underlying risk factors in pregnant women with listeriosis are uncommon. The incubation period for listeriosis in pregnancy has been estimated to be 27.5 days, with a range of 17-67 days13. Listeriosis in pregnancy presents with mild flu-like symptoms, with fever, backache and headache. A minority of pregnant women may only have gastrointestinal symptoms, and some may even be asymptomatic but infection can be inferred through development of neonatal sepsis due to Clinical Listeria. Most cases of listeriosis in pregnancy tend to occur during the third trimester[15], but listeriosis does occur at earlier stages of pregnancy, and is associated with poorer neonatal outcomes. Adverse sequelae following infection in pregnant women include spontaneous abortion, still birth, or preterm birth. Neonatal infection with *Listeria* does not follow all cases of maternal infection.

Neonatal infections due to Listeria monocytogenes

Neonatal infection with Listeria is acquired through transplacental infection, or through inhalation of infected amniotic fluid, or following colonization from maternal gastro-intestinal or vaginal carriage. Like neonatal group B streptococcal infection, listeriosis in neonates may present with early or late onset disease. Early onset disease presents within 36 hours, and most likely represents transplacental neonatal infection, as more than half of mothers have Listeria isolated from their genital tract or blood culture15. Neonates present with sepsis (90%), respiratory distress or pneumonia (40%), meningitis (25%), and occasionally with disseminated inflammatory granulomata (so-called 'granulomatosis infantiseptica'). Occasionally a characteristic rash is present with maculopapular or papulovesicular lesions on the trunk or extremities. Microabscesses may be seen on the foetal surface of the placenta. Late onset disease develops between 5-30 days postpartum, and presents with the development of non-specific symptoms, sepsis and meningitis.

Bacteraemia due to Listeria monocytogenes:

In adults, bacteraemia due to Listeria may or may not be associated other clinical presentations of illness. Bacteraemia due to Listeria may follow gastroenteritis or be associated with pregnancy or neonatal infection. Isolated bacteraemia in adults is usually associated with underlying risk factors including HIV infection, steroid use, underling malignancy, chemotherapy or age of above 65 years.

Acute bacterial meningitis or invasive neurological disease due to Listeria monocytogenes:

Listeria has been associated with acute meningitis and encephalitis. In addition, L. monocytogenes is associated with rhomboencephalitis - the involvement of the midbrain, pons and/or cerebellum with associated cranial nerve involvement or cerebellar signs (ataxia, tremor), or the development of hemiparesis. The incubation period of meningitis is estimated to be 0-21 days with an average of 10 days. In a study of over 100 cases of neuroinvasive listeriosis, neck stiffness was present in 75% of cases,

[redacted]

focal neurological signs in 30%, seizures in 30% and coma in 7%. Focal neurological signs included single or multiple cranial nerve involvement, (most commonly the 6th and 7th cranial nerves) hemiparesis, ataxia and aphasia. Nine cases had rhombencephalitis. Delay in treatment and the presence of seizures were associated with poor outcome

Management and Control in Animal and Human

Control methods

The control of *L. monocytogenes* is required at all stages in the food chain and an integrated approach is needed to prevent the multiplication of this bacteria in the final food product. The challenges for controlling *L. monocytogenes* are considerable given its ubiquitous nature, high resistance to common preservative methods, such as the use of salt, smoke or acidic condition in the food, and its ability to survive and grow at refrigeration temperatures (around 5 °C). All sectors of the food chain should Implement Good Hygienic Practices (GHP) and Good Manufacturing Practices (GMP) as well as implement a food safety management system based on the principles of Hazard Analysis Critical Control Points (HACCP)

Food manufacturers should also test against microbiological criteria, as appropriate, when validating and verifying the correct functioning of their HACCP based procedures and other hygiene control measures. In addition, producers manufacturing food associated with risks of Listeria must conduct environmental monitoring to identify and eliminate niche environments, including areas that favor the establishment and proliferation of *L. monocytogenes*

In the livestock industry, feeding spoiled silage and other rotten vegetation should be avoided and any sick animals should be isolated from the healthy animals. Good hygiene and sanitation on the farm is also important. Whenever possible, people at risk for listeriosis should avoid the consumption of those foods most frequently linked to listeriosis. Those at risk also need to adhere strictly to the food label directions for storage and "use by" information. It is virtually impossible to provide listeria-free food products because L. monocytogenes infects a variety of animal species; many infections are inapparent and the bacterium can survive and grow at refrigeration temperature levels.

Prevention
L. monocytogenes in food are killed by pasteurization and cooking.
In general, guidance on the prevention of listeriosis is similar to guidance used to help prevent other foodborne illnesses. This includes practicing safe food handling and following the WHO Five Keys to Safer Food
1. Keep clean.
2. Separate raw and cooked.
3. Cook thoroughly.
4. Keep food at safe temperatures.
5. Use safe water and raw materials.)

Other means of prevention include thoroughly washing raw vegetables, thoroughly cooking raw meat, proper hygiene during food preparation, and consuming only pasteurized dairy products. Humans at risk

[redacted]

should also avoid contact with animals that have aborted as well as with aborted materials (placenta and foetuses) on the farm.

Various modes of transmission of zoonotic infectious disease:

Diseases transmitted from animals to humans are called zoonotic diseases, or zoonoses. A number of important human pathogens begin as normal flora or parasites of animals and can often adapt to cause disease in humans. Here we highlight a few of the more notable diseases and the agents that cause them. In addition, being bitten by arthropod vectors (organisms that spread disease from one host to another), such as mosquitoes, ticks, fleas, mites, or biting flies, can lead to infection (e.g., equine encephalomyelitis, malaria, Lyme disease, Rocky Mountain spotted fever, and plague).

The routes of transmission of zoonotic diseases vary. Zoonotic pathogens can be transmitted between animal and humans by either direct or indirect transmission.

20

Direct transmission – immediate transfer of an agent from reservoir to susceptible host and
Indirect transmission – transfer of an agent carried from a reservoir to a susceptible host.

Reservoirs may be living or nonliving. Living reservoirs include humans, animals and arthropods. Humans are the most important reservoirs of human infectious diseases. Infected humans may show symptoms of the disease and pass it to another human. Alternatively, they may harbour a microbe, and even though they do not show symptoms, they still have the ability to transfer the microbe to another human/animal (carrier). Wild and domestic animals also act as reservoirs for human disease.
Organisms that transmit infectious agents from one host to the next are referred to as vectors. A vector is an organism that does not cause disease itself, but which spreads infection by conveying pathogens from one host to another. There are two types of vectors:
biological vectors and mechanical vectors.

Nonliving reservoirs include air, soil, dust, food, milk, water and fomites (objects that can transfer disease organisms). Fomites are also referred to as vehicles. Direct contact with zoonotic microbes via a nonliving reservoir can transmit animal diseases to humans.

Disease transmission can further be categorised as horizontal or vertical transmission.
Horizontal transmission is the spread of disease through a population from one infected individual to another.

[redacted]

Vertical transmission, on the other hand, occurs when a disease is transmitted from parent to offspring via placenta, sperm, milk or ovum. Vertical transmission is always direct. A pregnant woman can contract a zoonotic disease directly from an animal then pass that disease to the foetus vertically (indirect transmission from the original animal); however, the disease is spread directly from mother to foetus.
Direct and indirect transmission of zoonotic disease can occur by a variety of mechanisms, including contact transmission, airborne transmission, placental, fomite and arthropod transmission.
Important bacterial zoonoses include anthrax (Bacillus anthracis; brucellosis (Brucella spp.); psittacosis (Chlamydophila psittaci); Q fever (Coxiella burnetii); and tularemia (Francisella tularensis).

Bacterial zoonotic diseases can be transferred between animals and humans in many ways, including the following:

1.The transfer may occur through animal bites and scratches

2. Zoonotic bacteria originating from food animals can reach people through the direct faecal oral route, contaminated animal food products, improper food handling and inadequate cooking.

2. Farmers and animal health workers (e.g. veterinarians) are at increased risk of exposure to certain zoonotic pathogens and they may catch zoonotic bacteria. They could also become carriers of the zoonotic bacteria that can be spread to other humans in the community.

4. Vectors, frequently arthropods, such as mosquitoes, ticks, fleas and lice, can passively or actively transmit bacterial zoonotic diseases to humans.

5. Soil and water resources, which are contaminated with manure, contain a great variety of zoonotic bacteria and pose a great risk for zoonotic bugs and an immense pool of resistance genes that are available for the transfer of bacteria that cause human diseases

Anthrax: Human anthrax usually spreads to human populations through close occupational proximity to infected livestock by handling infected domestic animals, including cattle and goats or their products like skin, meat, hide and bones.

Bite wound: Bacteria found in bite wounds include the following: Pasteurella spp. Staphylococcus aureus, Streptococcus mitis, Moraxella spp., Corynebacterium spp, and Neisseria spp., Bergeyella zoohelcum Capnocytophaga canimorsus and Capnocytophaga cynodegmi,Fusobacterium spp.
Most of these organisms are transmitted by bite wounds, but they can also be transmitted through close animals contact such as an animal licking the open wound of an animal or human (especially immunocompromised individuals.

Listeriosis: The main reservoirs of Listeria monocytogenes are soil and the intestinal tract of animals. Listeria monocytogenes is mainly spread through ingestion, by inhalation and direct contact. Vertical transmission (transplacentally or via an infected birth canal) is the main route of infection for newborn human infants and ruminants.

[redacted]

Amoebiasis: E. histolytica are transmitted via injection of cystic form of the protozoa. cysts can be found in soil, fertilizer or water contaminated by faecal matter, or on the contaminated hands of food handlers. Faecal-oral transmission can also occur in the setting of anal sexual practices or direct rectal inoculation through colonic irrigation devices.

Babesiosis: Ticks are responsible for the transmission of the most cases of babesiosis . Transmission to the host via saliva contaminated with sporozoites occurs when the tick feeds on an animal or human host. *Babesia* spp. can also be transmitted from contaminated blood transfusions, mechanical transmission by insects or during surgical procedures and intrauterine infection; however, these methods are rare.

Cestode zoonosis: Cestodes, more commonly called tapeworms, are symmetric flatworms that parasitise the intestinal tract of vertebrates
The zoonotic cestodes belonging to the family Taeniidae. Example include diphyllobothriasis, echionococcus
Most food-producing animals, including cattle, buffalo, sheep, goat and pigs, as well as some other mammals act as intermediate hosts for *Echinococcus granulosus.* Humans could become infected after accidental consumption of *Echinococcus* species eggs shed in the faeces of the definitive carnivorous host or animal. Or by injection of diphyllobothriasis through raw or undercooked fish infected with the cestode Diphyllobothrium latum.

Nematode zoonoses: Infection occurs when filariform larvae in soil penetrate the skin, enter the bloodstream and are carried to the lungs, where they escape from capillaries into alveoli and ascend the bronchial tree to the glottis. The larvae are then swallowed and carried to the duodenum and upper jejunum, where maturation to the adult stage takes place.

Toxocariasis: Infection is generally in dirt-eating young children who ingest T. canis or T. cati eggs from soil or sand contaminated with animal faeces, most often from puppies.

Trematode: Cercariae in contaminated water penetrate human skin, especially in irrigated fields or rivers. Humans are the reservoir for S. mansoni and S. haematobium. S. japonicum infects cattle, water buffalo, horses, dogs, cats, rodents and monkeys. Intermediate hosts are species of snails (Biomphalaria and Bulinus). S. mansoni occurs in Africa, South America and some Caribbean islands (including Puerto Rico). S. haematobium occurs in Africa.

Viral zoonoses:

Zoonotic disease of bath origin: Transmission of pathogens from bats to humans can occur through intermediate hosts, which are in close contact with humans. The intermediate hosts can be infected in several ways including the following:

1.Ingestion of food partially digested by bats. The inability of frugivorous bats to ingest wide amounts of food due to aerodynamics of flight causes them to extract nutrients by chewing fruits and spitting the residues. Thus, the partially digested food is dropped on the ground where it serves as a meal for other

animals. If there is an infectious agent, then the food is a potential source of transmitting the infectious agent. Insectivorous bats may transmit pathogens in a similar way.

2. Ingestion of infected bat meat in areas where bats are a food source.

3. Through a bat's bite as in the case of the rabies virus.

4.The changing environmental conditions that lead to hibernation of some bats species during winter seasons, which may assist in the maintenance of pathogens in cold environments. In this way, bats are able to transmit pathogens over a 1 000 km radius and acquire new pathogenic strains.
5 The long-life span of bats (>30 years) enables them to transmit pathogens to other species for extended period.

Arthropod born zoonoses: Arthropod-borne viruses are mostly transmitted from one vertebrate host to another by blood-sucking parasites such as mosquitoes or ticks, excluding those transmitted through the bite of an infected host such as in rabies. The viruses multiply in the tissues of the arthropod without evidence of disease or damage.

Prion zoonosis:

Disease	**Host**	**Transmission mechanism**
Kuru	Human	Ritualistic cannibalism
Sporadic Creutzfeldt-Jakob disease (CJD)	Human	Spontaneous PrP_C to PrP_{Sc} conversion, Somatic mutation .
Latrogenic CJD	Human	Infection from prion-containing material (dura mater, electrode, surgical equipment)
Familial CJD	Human	Mutations in PrP gene
Variant CJD (vCJD)	Human	Ingestion from BSE-contaminated meat
Gerstmann-Sträussler-Scheinker syndrome (GSS)	Human	Mutations in PrP gene
Fatal familial insomnia (FFI)	Human	Mutations in PrP gene .

[redacted]

Precaution to prevent Ebola virus and rabies transmission:

The Ebola virus is spread in the blood, body fluids or organs of a person or animal with the infection. Prevention of transmission begins with isolation of individual infected and suspected to be infected (those in contact with affected individual and those with symptoms similar to Ebola virus).
practicing good hand hygiene is an effective method in preventing the spread of dangerous germs, like the Ebola virus. Proper hand hygiene means washing hands often with soap and water or an alcohol-based hand sanitizer.

While in an area affected by Ebola, it is important to avoid the following:

1. Contact with blood and body fluids (such as urine, feces, saliva, sweat, vomit, breast milk, semen, and vaginal fluids).
2. Items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment).
3. Avoid Funeral or burial rituals that require handling the body of someone who died from EVD.
4. Contact with bats and nonhuman primates or blood, fluids and raw meat prepared from these animals (bushmeat) or meat from an unknown source.
5. Contact with semen from a man who had EVD until you know the virus is gone from the semen.
6. make sure fruit and vegetables are properly washed and peeled before you eat them.
7. avoid physical contact with anyone who has possible symptoms of an infection

These same prevention methods apply when living in or traveling to an area affected by an Ebola outbreak. After returning from an area affected by Ebola, monitor your health for 21 days and seek medical care immediately if you develop symptoms of EVD.

Rabies is a serious disease, but individuals and governments can and do act to control and prevent, and, in some cases, wipe it out completely.
Strategies include:

1. regular antirabies vaccinations for all pets and domestic animals,
2. bans or restrictions on the import of animals from some countries widespread vaccinations of humans in some areas
3. educational information and awareness.
4. Visit your veterinarian with your pet on a regular basis and keep rabies vaccinations up-to-date for all cats, ferrets, and dogs.
5. Maintain control of your pets by keeping cats and ferrets indoors and keeping dogs under direct supervision.
6. Spay or neuter your pets to help reduce the number of unwanted pets that may not be properly cared for or vaccinated regularly.
7. Call animal control to remove all stray animals from your neighborhood since these animals may be unvaccinated or ill.

10

[redacted]

3.2 Factors that influence the definition of emerging and re-emerging of zoonotic infectious disease:

10

The spectrum of microbial threats is a continuum that comprises the emergence of newly recognized infectious diseases, the resurgence of endemic diseases, the appearance of newly adapted forms of pathogens such as antimicrobial resistant, and the intentional use of biological agents for harm to both animal and human populations.
The emergence, re-emergence, and spread of microbial threats are driven by a complex set of factors. The convergence of any number of these factors can create an environment in which infectious diseases can emerge and be maintained in society. The increasing interaction of domestic animals, wildlife, and humans is a critical and progressively important factor within the dynamic of emerging diseases and the transmission of zoonotic pathogens.

An emerging disease is defined as a new infection resulting from the evolution or change of an existing pathogen or parasite resulting in a change of host range, vector, pathogenicity or strain; or the occurrence of a previously unrecognized infection or disease. A re-emerging disease is considered a known or endemic disease that either shifts its geographical setting or expands its host range, or significantly increases its prevalence
The convergence model organizes the potential factors into a series of broad domains that include

(1) socioeconomic and biological factors;

(2) ecological and environmental factors; and

(3) the interface of domestic animals, wildlife, and human factors.

The specific factors of emergence are all contained within these domains and collectively form a

complex, ever-changing milieu that, in turn, helps alter the animal-human-microbe dynamic. The critical factors consist of microbial adaptation and change; host susceptibility; climate and weather; changing ecosystems, demographics, and populations, including issues of wildlife and exotic animals; economic development and land use; international trade and travel; technology and industry; reduction in animal and public health services or infrastructure; poverty and social inequity; war and dislocation; lack of political will; and intent to harm.

below are factors influencing disease emergence with the examples

Factor	**Specific Factor**	**Disease Emergence**
Ecological changes (incl. those due economic development and land use	Agriculture, dams, changes in water ecosystems, deforestation/re-forestation, flood/drought, famine, climate change	RVF (dams, irrigation), Argentine and Hantaan HV (agriculture), Hantavirus pulmonary syndrome (weather anomalies)
Human demographics, behavior	Migration (movement from rural areas to cities), war or civil conflict, economic impoverishment, urban decay, human behaviour e.g.	HIV/AIDS, dengue (urbanization), Ebola (hunting wildlife, (consumption of bush meet), cholera outbreaks (refugee camps)

	commercial sex trade, intravenous drug use, outdoor recreation, high density settings	
International travel and commerce	Worldwide movement of goods and people,; air travel	Dissemination of mosquito vectors, rat borne hantaviruses, SARS, influenza, MERS
Technology and industry	Globalization of food supplies, production and processing	Food production processes: haemolytic uraemic syndrome, BSE, Nipah virus, avian influenza
Microbialadaptationandchange	Microbialevolution	Antibiotic resistance, antigenic drift in influenza virus
Breakdown in public health measures	Reduction in prevention programmes, inadequate sanitation and vector control measures	Resurgence of TB, cholera, measles, diphtheria, rabies

Zoonotic disease affecting central nervous system (CNS)

Prion diseases, also called transmissible spongiform encephalopathies (TSEs), are a large group of animal and human central nervous system (CNS) diseases that have long incubation periods, produce spongiform vacuoles in brain tissue, do not produce an inflammatory response in affected tissues and are uniformly fatal. Infectious prion proteins are the causative agents of many mammalian TSEs, including scrapie (in sheep), chronic wasting disease (in deer and elk), bovine spongiform encephalopathy (BSE – in cattle) and Creutzfeldt-Jakob disease (CJD – in humans).
All prion diseases affect the CNS, especially the gray matter of the CNS. Abnormal prions have a tendency of clumping together forming large aggregates called amyloids. Amyloids damage and kill brain cells causing loss of brain function, loss of coordination and psychological changes. After infection, prions are amplified in peripheral organs such as the spleen and lymphatic tissue.

[redacted]

Disease	Host	Control measure
Scrapie	Sheep (goats to a lesser degree)	The presence of scrapie in the United States of America (USA) prevents the export of breeding stock, semen and embryos to many other countries. The USA has developed surveillance measures to estimate the prevalence of scrapie in sheep. These include the identification of nonclinical infected sheep through live animal testing, active slaughter surveillance, tracing of infected animals to their herd/flock of origin, genetic testing and providing effective clean-up strategies for flocks.
Bovine spongiform encephalopathy	Cattle	Control of BSE revolves around the BSE status of a particular country. BSE-free countries should have targeted surveillance programmed in place to monitor the occurrence of clinical neurological disease, place safeguards on the importation of live ruminant species and their products and determine policy and procedures for the importation of embryos. Specific ways to prevent the spread of BSE in cattle or to keep prions from the human food source, include the following: 1.enforcing the ruminant feed ban 2.banning importation of live ruminants and imposing restrictions on most ruminant products from countries where BSE has been diagnosed 3. prohibition of downer cattle in human food 4. banning brain and spinal cord tissue of animals 30 months of age or older from human food supply 5. banning the use of air-gun stunning to kill cattle, a process which can cause central nervous system (CNS) tissue to move into and to contaminate muscle 6. requiring meat processors to show that tissue is separated from the carcass using advanced meat recovery (AMR) and does not contain CNS tissue 7. removal of all specified risk material (SRM) from entering the human food chain 8. developing a national animal identification plan to trace possibly infected animals

[redacted]

Chronic wasting disease(CWD) ✓	Mule deer, der elk,	Control of CWD involves population reduction, testing and removal of affected animals, and intensified surveillance. Possible human contamination with CWD can be prevented by having hunters or people who handle deer and elk wear rubber gloves for field-dressing, by washing hands and forearms thoroughly when handling deer or elk, and by following state regulations and guidelines for the transportation of harvested game animals. If possible, animal should be tested and not consumed until they test negative for CWD.
Creutzfeldt-jakob (CJD) ✓ diaease. Sporadic CJD, familial CJD, variant CJD, latrogenic CJD.	HUMAN	The best way to reduce the risk of vCJD is by preventing BSE in cattle. Prions are very resistant to disinfectants, heat, ultraviolet (UV) radiation, ionising radiation and formalin. Infected tissues or materials should be autoclaved at temperatures between 134 °C and 138 °C for 18 minutes, incinerated, or treated with 2% or 2N sodium hypochlorite (NaOCl) for more than an hour at 20 °C.
KURU	Human ✓	Kuru is an endemic disease similar to CJD that was only found in isolated cannibalistic tribes in New Guinea in the early 1900s. Kuru killed about 1 100 women, children and the elderly between 1957 and 1968. Kuru has been eradicated with minimal public health risk since the banning of cannibalism
Listeriosis	Human and Animal	In the livestock industry, feeding spoiled silage and other rotten vegetation should be avoided and any sick animals should be isolated from the healthy animals. Good hygiene and sanitation on the farm is also important. Whenever possible, people at risk for listeriosis should avoid the consumption of those foods most frequently linked to listeriosis. Those at risk also need to adhere strictly to the food label directions for storage and "use by" information. It is virtually impossible to provide listeria-free food products because L. monocytogenes infects a variety of animal species; many infections are inapparent and the bacterium can survive and grow at refrigeration temperature levels. Other means of prevention include thoroughly washing raw vegetables, thoroughly cooking raw meat, proper hygiene during food preparation, and consuming only pasteurised dairy products. Humans at risk should also avoid contact with animals that have aborted as well as with aborted materials (placenta and foetuses) on the farm.

Disseminated sporotrichosis	Human and animal	Sporotrichosis in animals can be prevented by limiting their exposure to potentially infective animals and by proper cleaning and examination of wounds. Humans can limit their exposure by practising strict hygiene when handling animals with suspected or diagnosed sporotrichosis. Skin contact with sphagnum moss should also be avoided, as this material has been implicated in several outbreaks of sporotrichosis. Gloves should be worn while handling or treating affected animals, particularly cats. After the gloves are removed, the hands should be washed thoroughly and disinfected with chlorhexidine, povidone, iodine or another solution with antifungal activity. Controlling epidemics in cats is expected to reduce concurrent cases in humans

15

5

Prevention and control of tuberculosis in both human and animals

Detection of early cases and prompt treatment are crucial in controlling the spread of TB.

Most important in TB prevention is for people with infectious TB to take their medicine as prescribed. If you are taking medication, you need regular check-ups and possibly additional chest X-rays or sputum tests to show whether the medicine is working, and whether you are still infectious. If the tests show that you still have the bacteria in your sputum even after a few months of treatment, you may need to take some extra drugs, or change the drugs you are taking. Detection of early cases and prompt treatment are crucial in controlling the spread of TB. The local health department may need to test people who have spent time with you for TB infection.

If you are sick enough to go to hospital, you may be put in a special room with air vents that keep TB bacteria from spreading. People working in these rooms wear face masks to protect themselves from bacteria. You must stay in the room to prevent spreading bacteria.

If you are infectious while at home, protect yourself and others as follows:

Wash your hands after sneezing, coughing or holding your hands near your mouth or nose.

Cover your mouth with a tissue when you cough, sneeze or laugh. Discard used tissues in a plastic bag, then seal and throw it away., Do not attend work or school, avoid close contact with others, Sleep in a room away from other family members, Ventilate your room regularly. TB spreads in small closed spaces, put a fan in your window to blow out air that may contain bacteria.

[redacted]

Prevention of TB: Measures to prevent TB involve screening children who are the household contacts of a TB case (usually an adult family member) to enable those children found to have TB to be treated and those children not found to have TB to receive isoniazid preventive therapy (IPT).

Management of TB: Measures to manage TB involve the routine diagnosis, treatment, and recording and reporting of TB in children as part of routine NTP activities, in line with international standards and guidelines. The diagnosis and treatment of drug-resistant TB in children are complex and should be carried out at referral centres.

TB Vaccine (BCG): BCG vaccine
has documented protective efficacy against TB meningitis and miliary disseminated disease in children (86% on average).
In countries with a high burden of TB, a single dose of BCG vaccine should be given to all infants as soon as possible after birth. Since severe adverse effects of BCG vaccination are extremely rare, all healthy neonates should be BCG -vaccinated, even in areas endemic for HIV. BCG vaccination should not be given to (i) infants and children with AIDS, (ii) infants and children known to be HIV-infected or (iii) children known to have other immunodeficiencies.
In situations where infants have been exposed to smear-positive pulmonary TB shortly after birth, BCG vaccination should be delayed until completion of six months of IPT.
Vaccination of health staff, and particularly laboratory workers, is an option in high-risk environments (if staff are in close contact with cases of drug-resistant TB).
There is no evidence that revaccination increases protection, and revaccination is not recommended.

Management of high-risk groups: The management of high-risk groups involves the identification of specific population groups who are at increased risk of TB (or TB infection) and the implementation of strategies for active TB case-finding as well as the identification of latent TB infection, ensuring provision of supervised and supported treatment, and monitoring of treatment outcomes. The policy for high-risk group management should specify how risk groups are defined in the country or region, e.g. by epidemiological characteristics such as a specified threshold of TB incidence or high prevalence of risk factors for TB (recent immigration from high TB incidence countries, deprivation, alcohol and substance misuse, malnutrition, homelessness) and/or by cost-effectiveness considerations.

Prevention of TB through addressing the risk factor:
Changes in exposure to various risk factors may significantly influence trends in the incidence of TB. Reducing the level of exposure of the population to risk factors including HIV, smoking, diabetes, malnutrition and crowding is mainly the responsibility of other public health programmed as well as stakeholders outside the health sector.

Smoking: Both active and passive smoking increase (i) susceptibility to TB infection, (ii) progression to active TB disease and (iii) the risk of adverse anti-TB treatment outcomes. Systematic reviews suggest that the risk of TB disease among smokers is increased two- to threefold compared with people who have never smoked. There is insufficient evidence to support an association of smoking and patient delay, default, slower smear conversion or risk of acquired drug resistance. Weighted smoking

prevalence across countries with a high TB burden was about 18% in 2004–2005, with much higher prevalence among men than among women in most countries. The prevalence of smoking is increasing in developing countries. Tobacco control and smoking cessation among people with TB can therefore play an important role in limiting the burden of TB.

Malnutrition: Malnutrition is common in most countries with a high TB burden. The weighted prevalence of undernutrition, as defined by the Food and Agriculture Organization of the United Nations, across the high TB burden countries is almost 20%. Malnutrition may be linked to increased risk for TB disease through immune deficiency caused by deficiencies in protein, energy and/or micronutrients (vitamins and minerals). Estimates of relative risk for TB disease differ considerably for different types of malnutrition and in different populations. However, the historical importance of improved nutrition to help control TB in many countries that now have a low TB burden is well established.

Diabetes mellitus: Estimates of the relative risk for developing TB (all types) among people with diabetes (type I or II) compared with control groups range between 1.5 and 8. Diabetes prevalence is increasing globally, including in many countries where the burden of TB is high. The implication for the TB burden of changing diabetes prevalence is unclear. Future TB control strategies may need to include explicit efforts to support public health programmed aimed at reducing diabetes prevalence and improving management of diabetes.

Crowding: Crowding is a classical TB risk factor. Household occupation density, ventilation and humidity influence the risk of exposure to infectious droplets. The precise increase in risk associated with different levels of crowding is not well established. It is clear, however, that improved living conditions in private dwellings and in various residential institutions can have an important impact on the transmission of TB.

Indoor air pollution: Indoor air pollution caused by indoor burning of solid fuels without proper ventilation is a common phenomenon in most poor countries. More than 70% of households in high TB burden countries are exposed to this health hazard. A limited body of evidence suggests that indoor air pollution may increase the risk of TB. If a causal link is confirmed, the implications at the population level will be important given the high prevalence of exposure.

Alcohol abuse and dependency: The increased risk of TB disease among people who abuse alcohol has been shown in many studies. Analytical epidemiological studies that have controlled for important confounding factors have reported relative risk of TB disease ranging between 2 and 8 for people with very high alcohol consumption or a diagnosis of alcohol abuse or alcohol dependence. This risk increase might be explained by specific social mixing patterns and living conditions for people abusing alcohol leading to increased risk of infection as well as by compromised immunity linked to toxic effects of alcohol or to medical conditions caused by alcohol abuse. A definite causal link between alcohol abuse and TB disease has not yet been established.

Silicosis and other rare chronic conditions: Silicosis, and a wide range of other chronic diseases, malignancies, systemic illnesses and immunosuppressant treatments, increases the risk of TB disease

dramatically. Prevalence of silicosis is high in certain population groups where employment in the mining industry is common. Most of the other risk factors are probably of limited importance at a population level.

Risk of transmission of tuberculosis in health-care settings:
Health-care workers are at much higher risk of TB infection and disease compared with the general population. In health-care settings, other non-medical staff may also be at risk through contact with infectious sources. Measures to control infection are needed in all settings where there is a significant risk of transmission of TB infection. These settings include general health facilities where patients with cough and in whom pulmonary TB has been diagnosed are in close contact with health staff and others in a crowded and poorly ventilated environment.
Waiting rooms (or corridors) where patients and accompanying people, including children, wait to receive medical care are often areas of particular risk. In hospitals, the risk of transmission is relatively high, especially in pulmonary disease wards. The risk of spread increases when the prevalence of HIV in the Infection control in health -care settings contacts (staff and other patients) is high. Laboratories, particularly those carrying out M. tuberculosis culture procedures, are also high-risk areas. Other high-risk settings include institutions such as jails, prisons and detention centres, and drug rehabilitation centres. Other situations, such as enclosed environments during prolonged travel, may require special attention. There are specific strategies to address infection control, but the main infection control measure is the proper organization and implementation of case detection procedures. Patients receiving adequate treatment are rapidly rendered non-infectious.

20

Infection control strategies:
The three levels of TB infection control are workplace and administrative (managerial) control measures, environmental control measures and personal protective equipment (respiratory protection).
Each level operates at a different point in the transmission process:
workplace and administrative control measures reduce the exposure of staff and patients;
Environmental control measures reduce the concentration of infectious droplet nuclei; and
personal protective equipment (respiratory protection) protects staff in specific settings where the concentration of droplet nuclei cannot be adequately reduced by administrative and environmental control measures.

Environmental control measures: Environmental controls are the second line of defense for preventing the spread of TB in health-care settings. It is important to recognize that if workplace or administrative controls are inadequate, environmental controls will not eliminate the risk. Many environmental control measures are technically complex and expensive, and therefore only practical for referral hospitals. Environmental controls include: ventilation (natural and mechanical), filtration, and ultraviolet germicidal irradiation.

Workplace and administrative control measures: Workplace and administrative control measures have the greatest impact on preventing TB transmission. They serve as the first line of defense for preventing the spread of TB in health-care settings. The goals are (i) to prevent TB exposure of staff and patients and (ii) to reduce the spread of infection by ensuring rapid and recommended diagnostic investigation and treatment for patients and staff suspected or known to have TB.
The five components of good workplace and administrative control are:

1. an infection control plan;

[redacted]

2. administrative support for procedures contained in the plan, including quality assurance;
3. training of health-care and other staff;
4. education of patients and increasing community awareness;
5. coordination and communication with the TB control program.

Personal protective equipment (respiratory protection): Personal respiratory protection involves training in the selection and use of respirators. Respirators should not be relied upon to protect health care workers from inhaling M. tuberculosis in the absence of standard workplace and environmental controls. They are expensive, require specialized equipment to ensure proper fit and are often unavailable in resource-limited settings. Their use should be restricted to specific high-risk areas in hospitals and referral centers, such as rooms where spirometry or bronchoscopy are performed or specialized treatment centres for patients with MDR-TB.
Respirators should be distinguished from face masks, such as surgical masks made of cloth or paper. Use of face masks is not generally recommended for health-care staff because they do not protect against TB transmission by aerosol. However, the use of face masks in high-risk settings for drug resistant-TB is recommended for patients to reduce the risk of droplet nuclei generation and spread, particularly in high-prevalence HIV settings where many health-care workers may be HIV-infected. Respiratory protection may be used as an interim measure while selected administrative and/or environmental control measures are awaiting implementation.

Process of contact investigation
TB contact is defined as any household member at the moment of the identification of the index case. All children in the household, especially those aged under 5 years, should be assessed for TB. High priority should also be given to contacts who have HIV infection and those with other underlying risk factors for TB.
The index case should be interviewed as soon as possible after diagnosis to identify contacts. The interview should, as a priority, focus on the household, but the questions should cover other environments, as mentioned above. Ideally, the interview should be conducted by a person familiar with the culture and the setting. Wherever possible, a home visit should be made to obtain a clearer understanding of the patient’s circumstances and to confirm the results of the interview.
All identified prioritized contacts of the index case should be instructed to come to the health facility for evaluation. The identified contacts should be listed; if they do not appear for evaluation, a home (or other setting) visit should be made. As a priority, every effort should be made to assess children and people living with HIV/AIDS or those with other conditions and situations associated with an increased risk of TB. After listing the contacts, the results of their assessment should be recorded. The procedure for screening TB contacts should be clearly defined. The evaluation may be limited to determining whether the contact has symptoms that may suggest TB. As a minimum, all adolescent and adult TB contacts should be asked whether they have a persisting cough (>2 weeks). Sputum smear examinations should be carried out on those with a persistent cough. All children and PL HIV should be more thoroughly assessed for TB, including of extrapulmonary sites.

Provision of treatment:
Four important considerations should be considered when providing treatment.
(1) Any contact identified as having active TB should be registered and treated in line with the NTP policy.

[redacted]

(2) Children aged under 5 years who are close contacts and who do not have evidence of TB should be systematically treated with isoniazid chemoprophylaxis:5 mg/kg daily for six months.
(3) children aged 5 years and above who are in good health do not require chemoprophylaxis but should be followed up on a clinical basis.
(4) PLHIV who are close contacts of an infectious index case and who do not have evidence of TB should be treated with isoniazid: 300 mg/day for 6–9 months.

Follow-up of treatment: All patients receiving isoniazid preventive therapy (IPT) should be seen at regular intervals at least early during treatment to determine whether any adverse effects of isoniazid occur and to encourage adherence. After completing treatment, patients should be asked to seek care if a cough or other possible symptoms of TB develop; there is no need for further follow-up. Likewise, contacts with no evidence of TB should be asked to visit a health facility if a persistent cough or other symptoms develop in the following weeks or months.

Monitoring: The implementation of TB contact investigation activities requires a monitoring and evaluation system to provide information on (1) the process of TB contact investigation, (2) the yield of TB contact screening and (3) the activities and monitoring of IPT. A model of register for contacts is proposed in the WHO recording and reporting system.

In animal, Bovine tuberculosis (TB) is a chronic disease of animals caused by some bacteria called Mycobacterium bovis.
The standard control measure applied to TB is test and slaughter. Disease eradication programs consisting of post mortem meat inspection, intensive surveillance including on-farm visits, systematic individual testing of cattle and removal of infected and inContact animals as well as movement controls have been very successful in reducing or eliminating the disease.
Post mortem meat inspection of animals looks for the tubercles in the lungs and lymph nodes (OIE *Terrestrial Animal Health Code*). Detecting these infected animals prevents unsafe meat from entering the food chain and allows veterinary services to trace-back to the herd of origin of the infected animal which can then be tested and eliminated if needed. Pasteurisation of milk of infected animals to a temperature sufficient to kill the bacteria has prevented the spread of disease in humans. Treatment of infected animals is rarely attempted because of the high cost, lengthy time and the larger goal of eliminating the disease. Vaccination is practiced in human medicine, but it is not widely used as a preventive measure in animals: the efficacy of existing animal vaccines is variable, and it interferes with testing to eliminate the disease. Several new candidate vaccines are currently being tested.

[redacted]

Reference

1. BMI3706 STUDY GUIDE
2. Prescott, Harley and klein microbiology 9th edition
3. http://www.who.int/mediacentre/factsheets/listeriosis/en/ (date acces 20/8/2018)
4. http://www.health.gov.za/index.php/gf-tb-program/379-outbreak-of-a-food-borne-disease-listeriosis-in-south-africa(DTAE ACCESS 20/8/2018).
5. Clinical guidelines_Listeriosis_20171205_version1, NATIONAL INSTITUTE OF COMMUNICABLE DISEASE , Colleen Bamford Noma Bosman ,Tom Boyles,Mignon Du Plessis,Vindana Chibabhai,Cheryl Cohen,Heather Finlayson,Victoria Howell, Prudence Ive, www.nicd.ac.za/wp-content/uploads/2017/12/Listeriosis_Clinical_Guidelines.pdf
6. https://www.cdc.gov/vhf/ebola/prevention/index.html
7. https://www.nhs.uk/conditions/ebola/
8. Rabies prevention, Center of disease control. https://www.cdc.gov/rabies/prevention/index.html
9. Emerging And Re-Emerging Zoonotic Diseases:Challenges And Opportunities. Lionnel j. king 5/2004. https://pdfs.semanticscholar.org/17c9/7352041fa26c8a0e21e5a094d22e67834ad7.pdf
10. FACTORS AFFECTING THE EMMERGECE OF ZOONOTIC DISEASE. National institute of communicable disease . janusz t. paweska . 6th FDSSA congress oct/2015 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=2ahUKEwiC8-aH3fvcAhVsCsAKHeayBe8QFjADegQIBhAC&url=http%3A%2F%2Fwww.mm3admin.co.za%2Fdocuments%2Fdocmanager%2F47f686f5-acdf-4462-8366-64afd5633d81%2F00090274.pdf&usg=AOvVaw0i0ozdOkDPPa0NZTRHu5vl
11. Implementing the WHO Stop TB Strategy: a handbook for national tuberculosis control programmes.WHO/HTM/TB/2008.401 http://www.who.int/tb/publications/tb-control-strategy/en/.
12. Preventing the Flu: Good Health Habits Can Help Stop Germs. https://www.cdc.gov/flu/protect/habits/index.htm
13. infection control in health care setting . https://www.cdc.gov/tb/topic/infectioncontrol/default.htm
14. Infection Control and Prevention - Tuberculosis (TB) https://www.dhs.wisconsin.gov/ic/tb.htm

RESULTS

Total = 93 / 100 (93%)

Finalize