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ZOONOTIC DISEASES

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Introduction to zoonoses

DEFINITION of Zoonosis The word 'Zoonosis' (Pleural: Zoonoses) was introduced by Rudolf Virchow in 1880 to include collectively the diseases shared in nature by man and animals. Later WHO in 1959 defined that Zoonoses are "those diseases and infections which are naturally transmitted between vertebrate animals and man". Zoonoses include only those infections where there is either a proof or a strong circumstantial evidence for transmission between animals and man.



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HOSTS

- People are often accidental and dead-end hosts for zoonotic diseases.
- The definitive host of a pathogen is also the natural host of the pathogen.
- In the case of zoonotic diseases, the definitive hosts are animals.
- Sometimes definitive hosts become ill from the pathogens, and sometimes they do not.
- If the animal does not become ill but is still capable of transmitting the disease to people, it is said to be a *carrier*, or *reservoir host*.
- *Carriers can also be inanimate objects*, such as water or food.



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CLASSIFICATION

- **According to the etiological agents**
- Bacterial zoonoses e.g. anthrax, brucellosis, plague, leptospirosis, salmonellosis, lyme disease
- Viral zoonoses e.g. rabies, arbovirus infections, KFD, yellow fever, influenza
- Rickettsial zoonoses e.g. murine typhus, tick typhus, scrub typhus, Q-fever
- Protozoal zoonoses e.g. toxoplasmosis, trypanosomiasis, leishmaniasis
- Helminthic zoonoses e.g. echinococcosis (hydatid disease), taeniasis, schistosomiasis, dracunculiasis
- Fungal zoonoses e.g. deep mycosis - histoplasmosis, cryptococcosis, superficial dermatophytes.
- Ectoparasites e.g. scabies, myiasis



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According to the mode of transmission

Direct Zoonoses: Single vertebrate host: Rabies

Cyclozoonoses: More than one vertebrate host:

Taeniasis, Hydatid disease

Metazoonoses: Requires both vertebrate and invertebrate host Eg. Arbovirus

Saprozoonoses: Inanimate reservoirs and vertebrate host. eg: Histolasmosis.

Anthropozoonoses:: Animals to man

Zoo anthroponoses: Man to Man Eg : Human TB, Amoebiasis

Amphizoonoses: Man Animals Eg: Streptococcal infections



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According to the reservoir host

Anthropozoonoses

Infections transmitted to man from lower vertebrate animals e.g. rabies, leptospirosis, plague, arboviral infections, brucellosis and Q-fever.

Zooanthroponoses

Infections transmitted from man to lower vertebrate animals e.g. streptococci, staphylococci, diphtheria, enterobacteriaceae, human tuberculosis in cattle and parrots.

Amphixenoses

Infections maintained in both man and lower vertebrate animals and transmitted in either direction e.g. salmonellosis, staphylococcosis



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FACTORS INFLUENCING PREVALENCE OF ZONOOSES

- Ecological changes in man's environment
- Handling animal by-products and wastes (occupational hazards)
- Increased movements of man
- Increased trade in animal products
- Increased density of animal population
- Transportation of virus infected mosquitoes
- Cultural anthropological norms



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MODES OF TRANSMISSION of Zoonoses

- There are a number of methods used to transmit diseases from animals to people. The two major categories of transmission are direct transmission and indirect transmission
- **DIRECT TRANSMISSION**
- Contact between the infected animal and the susceptible person can result in *direct transmission of a zoonotic disease. This can take place by*
 1. *touching the animal*
 2. droplet infection through the animal's coughing or sneezing. A person must be within 1 meter in front of an animal for direct droplet transmission to occur.
 3. The pathogen may stay on the person's skin, enter the body through breaks in the skin or mucosal surfaces
 4. be ingested,
 5. or be inhaled.
- Plague is an example of a disease contracted via direct transmission.



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INDIRECT TRANSMISSION

Indirect transmission includes any method of transmission in which the infected animal and susceptible person do not actually come in direct contact. Some of these methods include:

1. Transmission that involves contact between the person and some inanimate object known as a *fomites*.

e.g *dermatophytes, fungi that cause skin infections that can* be transmitted to people via contact with contaminated bedding, grooming tools, etc.



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2. **vectors**. There are two types of **vectors**—**biological vectors** and **mechanical vectors**:
- **Biological vectors** are animals in which the pathogen must go through part of its life cycle before being passed on to a person. Examples of biological vectors are fleas, ticks, flies, and mosquitoes. They can be reservoir hosts for a pathogen, as in babesiosis.
 - **Mechanical vectors** are animals that carry pathogens to people but are not themselves affected by the pathogens. Examples of mechanical vectors are mosquitoes, ticks, flies, and pets. Yes, insects and arthropods can be either biological or mechanical vectors. They can also be carrier hosts for a pathogen. For example, flies can spread salmonellosis with their feet.



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3. *Vehicles*

They are substances that are normally brought into the body upon which a pathogen has hitched a ride. Vehicles include water, air, and food. When water is a vehicle of transmission, it is usually contaminated with feces from an infected animal, as in giardiasis. Air can be a vehicle if the person is standing more than 1 meter away from an infected animal when it sneezes or coughs and the pathogen becomes airborne on dust particles or in droplets. Food transmission usually results in food poisoning.



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Role of wild animals and Birds

The ecologic changes influencing the epidemiology of zoonoses with a wildlife reservoir can be of natural or anthropogenic origin. These include, but are not limited to,

Human population expansion and encroachment, reforestation and other habitat changes, pollution, and climatic changes.

The movement of pathogens, vectors, and animal hosts: Such movement can, for example, occur through human travel and trade, by natural movement of wild animals including migratory birds, and by anthropogenic movement of animals.

Movement of infected wild and domestic animals is an important factor in the appearance of rabies in new locations

Microbial changes or adaptation : These changes include mutations, such as genetic drift in viruses; activation and silencing of genes; genetic recombinations, such as genetic shift in viruses; and conjugation, transformation, and transduction in bacteria. Natural selection and evolution also play a role.



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Severe acute respiratory syndrome (SARS) is a current example of likely microbial adaptation. This viral respiratory illness, caused by SARS-associated coronavirus, is believed to have emerged in Guangdong, China, in November 2002. SARS was first reported in Asia in February 2003, and over the next few months, the illness spread to a global epidemic before it was contained. According to the World Health Organization, 8,098 cases, including 774 fatalities, have occurred. The virus has an unknown reservoir, but wildlife is a likely source of infection. Natural infection has been demonstrated in palm civet cats in markets and also in raccoon dogs, rats, and other animals indigenous to the area where SARS likely originated. The live market and Restaurants in China sold small carnivores and several species of civet cat.

Bush meat in Africa: a serious problem for the emergence of infection. (eg Ebola infection from Chimpanzee, Incidence of HIV 2 from sooty mangabeys)

New Brucella spp. from marine mammals: *The pathologic role of marine Brucella spp. in animals remains unclear, as does their zoonotic potential.* In 2003, two human cases of community-acquired granulomatous central nervous system infections caused by marine *Brucella spp.* were reported



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Main risk groups for zoonotic infection

- Animal handlers
- Neonates and children
- Elderly and infirm people
- Agricultural and food industry workers
- Immunosuppressed or compromised individuals
- Pregnant women



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MORBIDITY AND MORTALITY

At the beginning of each disease section, a scale of 1 to 4 plus arks (+ to +++) indicates the morbidity and mortality for the disease. The *morbidity* is the likelihood that a person will contract the disease. The *mortality* is the likelihood that a person who has developed the disease will die as a result.

Control of Zoonoses: strategies and tactics for control in Animals

