|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
NLM (National Library of Medicine ID: 101738825)
*Index Copernicus Value 2018: 75.71*
Review Article
Volume 4, Issue 6; June: 2020; Page No. 52-54

# ANIMALS CAUSING INFECTIOUS DISEASE - A BRIEF REVIEW

**Vijayasankari A [1], Kalpana S [2]**
[1]MSc. Public Health, Department of Epidemiology, The Tamil Nadu Dr MGR Medical University, Guindy, Chennai.
[2]Research Officer, Department of Epidemiology, The Tamil Nadu Dr MGR Medical University, Guindy, Chennai.

**Article Info:** Received 14May 2020; Accepted 08 June 2020
**DOI:** https://doi.org/10.32553/ijmbs.v4i6.1157
**Corresponding author:** Vijayasankari A
**Conflict of interest:** No conflict of interest.

**Abstract**

Background: Zoonotic diseases are the infectious disease which is transmitted to people and vice versa. It is caused by all sorts of pathogens, including bacteria, rodents, fungi, viruses and prions. And though known for hundreds of years, the public health effect has risen in recent decades as a result of the effective combination of vaccination and efficient care to minimize the spread of human infectious diseases and the development of new zoonotic diseases.

Objectives: To systematically review and describe the causes of infections.

Methods: We searched Google search engine, Pubmed and other databases on the internet for the articles on topics related to infectious disease due to animals and zoonotic diseases. We searched reference lists of all primary and review articles based on the key words "zoonotic diseases, animals, infectious disease, spill over, pandemic etc.," Data regarding zoonotic diseases was collected, summarized and analysed.

Results: This review analyse what are all the possible ways the animals causing the infectious disease to the people and how to prevent from the infection.

Conclusion: By strict use of personal protection and some precautious methods are used to prevent the transmission of infection. The advantages of pets far outweigh their fear of zoonotic infections cannot be absolutely prevented by people with animals. It is also their responsibility to provide the required training to provide the healthy use of animals and reduce the risk of zoonotic disease transmission for veterinarians, physicians and public health staff.

**Keywords:** Animals, Infectious disease, Transmission, People, Pets, Personal protection.

## Introduction

Animal provides a lot of benefits to the people. Most of the people interact with the animals, both at the home and outside the home also. Nearly half of the infectious diseases affecting humans come from animals. Infectious diseases of the animals are most important especially, when they are very capable of infecting humans. Such diseases are known as zoonoses. A zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans. Animals thus play an essential role in maintaining zoonotic infections in nature. Zoonoses may be bacterial, viral, or parasitic, or may involve unconventional agents. As well as being a public health problem, many of the major zoonotic diseases prevent the efficient production of food of animal origin and create obstacles to international trade in animal products.[1]. Emerging zoonotic diseases may have significant effects on human health and the economy and will possibly continue to grow. Over the last 30 years, new infectious diseases have risen over human beings, of which 70% are zoonotic. A global pandemic is as good a time as any to reflect on where we as humans went wrong. Human impact on animal populations worldwide is a direct contributor to zoonotic disease spread, according to a timely new study. [2]. An international report from 2012, for example, informed that a total of 56 such diseases were responsible for 2.5 billion cases of illness and 2.7 million deaths across the globe each year. These illnesses included rabies, toxoplasmosis, Q fever, Dengue fever, avian influenzaEbola, and anthrax. Furthermore, respiratory, flu-like diseases acquired from animals wreaked havoc in the past century. The Spanish flu caused 50 million deaths in 1918, and the Hong Kong flu caused 700,000 deaths in 1968. So, why are diseases that humans acquire from animals so dangerous? Part of it is due to our immune system. Part of it is natural selection. The specific animal that transmits the virus may also play a role.[3]. 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.[4]

## Methods

We searched Google search engine, Pubmed and other databases on the internet for the articles on topics related

to infectious disease due to animals and zoonotic diseases. We searched reference lists of all primary and review articles based on the key words "zoonotic diseases, animals, infectious disease, spill over, pandemic etc.," Data regarding zoonotic diseases was collected, summarized and analysed.

**Regional distribution of the infection**

Both new and re-emerging infectious diseases have an effect on human populations depending on the movement of human hosts or vectors or reservoirs of infection. They are distributed through geographical areas. Travel plays an important role in bringing people into contact with the infectious agents. The factors affecting the emergence and re-emergence of diseases especially zoonotic diseases. These include microbial adaptation and change, human susceptibility to infection, climate and weather, changing ecosystems, human demographics and behaviour, economic development and land use, international travel and commerce, technology and industry, breakdown of public health measures, poverty and social inequality, war and famine, lack of political will and intent to harm.[5] The constant production and renewal of vector-borne diseases can cause unpredictable epidemics and difficult public health challenges, especially when we realize that both ill and relatively healthy animals can be attributed to zoonoses. The key elements in controlling emerging zoonoses are surveillance and response. These depend on rapid clinical diagnosis, early detection and containment of infections in populations and in the environment. Globally, such efforts are coordinated by the World Health Organization, which recently led a multi-faceted effort to successfully contain the global SARS outbreak of 2002 - 2003, and in the United States, the US Centres for Disease Control and Prevention (CDC) is responsible for handling such threats. The enormous influx of US government-funded research resources (largely through the National Institutes of Health) and public health resources (mainly through the CDC, and state and local public health agencies) in response to the increased threat of a bioterrorist attack will fortify the response capabilities related to all emerging zoonoses.[5] With certain diseases affecting humans, most species function as a reservoir. Such reservoirs contain numerous species of fish, domestic and wild animals, birds and even insects. This analysis will highlight the main zoonotic diseases transmitted by various animal groups in the hope that this will lead to an early warning system to detect pathogenic diseases that affect individuals who are exposed to animals.

**Table 1:**

| Author and year of the study | Name of the study | Type of the study | Sample size | Findings |
|---|---|---|---|---|
| Nyahoga et al., at 2017 | Cross-study of malaria prevalence in History, Bed net utilization and knowledge about the disease among Tanzanian college students. | A cross- sectional study | 246 participants | -220 students were answered positively<br>-145 reported sufficiently from infection within the last year |
| Sor S et al., at 2018 | Knowledge of rabies and dog related behaviour among people in Siem Reap Province, Cambodia. | A cross – sectional study | 360 participants | 9.7% of respondents had adequate knowledge of rabies |
| Holla and Darshan et al., at 2018 | Leptospirosis in Coastal South India: A facility based study. | Record based Retrospective study | 202 Leptospitosis victims | Acute renal failure was found to be the most common complication among the participants. |
| Rabiee M et al., at 2018 | | Review article | - | -21 out of 34 diseases were reported from both human and rodents .<br>-Most infected rodent were rattus norvefgicus. |

**Common sources of the Zoonotic Diseases**

Most people live around animals, even if they don't have farms or pets. From ticks to squirrels to rats, many members of the animal kingdom can transmit disease. Here's a short list of common animals and some of the diseases we can get from them:

**Cats**: toxoplasmosis; Pasteurella; ringworm

**Bats**: Ebola virus; SARS; MERS; rabies; Nipah virus; Hendra virus

**Dogs**: rabies; noroviruses; Pasteurella; salmonella; ringworm; hookworm

**Ticks**: Lyme disease; Rocky Mountain spotted fever; Powassan disease

**Mosquitoes**: malaria; dengue; West Nile virus; Zika virus; Chikungunya virus

**Birds**: bird flu (H1N1, H5N1); salmonella; psittacosis

**Cows**: Escherichia coli; ringworm; salmonellosis

**Rodents**: Hantavirus pulmonary syndrome; plague; rat-bite fever; salmonellosis

**How the Zoonotic agents cause infection**

Viruses, bacteria and parasites which are transmitted through bloodborne water-borne, foodborne or airborne infection can include zoonotic diseases. These include:

- Animal bites that break the skin
- Insect bites, including mosquitos and fleas
- Drinking tainted water or dairy products
- Eating infected meat
- Inhaling pathogenic droplets or particles
- Direct skin-to-skin contact
- Direct or indirect contact with animal feces or urine

Animals can often transmit a disease that they are not affected. We often see this with bats. On the other hand, there are diseases, like rabies, that both humans and animals equally.[6]

Often the path of transmission may be reversed and certain animals unintentionally poisoned. This is definitely true of primates who have anatomical similarities with humans but have somewhat different immune responses.

**Human effect of the Transmission of viruses on wildlife**

Farming, hunting and worldwide migration has contributed to major biodiversity declines in the risk of dangerous viruses such as Covid-19 spilling between animals and human beings. The underlying cause of the current pandemic situation is likely to be highly human contact with wildlife. There were three groups of animals that carried the greatest risk of spill over viruses. Unsurprisingly, domesticated animals, like livestock, shared the highest number of viruses with their human owners, eight times more so than their wild counterparts.[2]. Wild animals that have adapted well to human-dominated environments also share more viruses with people. Rodents, bats and primates – which often live among people, and close to houses and farms – together were implicated as hosts for nearly 75% of all viruses. Bats alone have been linked to diseases like Sars, Nipah, Marburg and Ebola.[7]. Of these wild creatures, ones that appeared to share the most viruses with humans were those that had increased in abundance and adapted to human-dominated environments - animals such as bats, rodents and primates. (2).

**Spillover and pandemic characteristics of zoonotic viruses**

Spill over transmission is promoted by successive processes that enable an animal pathogen to establish infection in a human. The probability of zoonotic spillover is determined by interactions among several factors, including disease dynamics in the reservoir host, pathogen exposure and the within-human factors that affect susceptibility to infections. These factors can be partitioned into three functional phases that describe all major routes of transmission. In the first phase, the amount of pathogen available to the human host at a given point in space and time, known as the pathogen pressure, is determined by interactions among reservoir host distribution, pathogen prevalence and pathogen release from the reservoir host, followed by pathogen survival, development and dissemination outside of the reservoir hosts. Second, human and vector behaviour determine pathogen exposure; specifically, the likelihood, route and dose of exposure. Third, genetic, physiological and immunological attributes of the recipient human host, together with the dose and route of exposure, affect the probability and severity of infection.[8] The different phases of a pathogen from a reservoir host to a recipient host pose many obstacles for the flow. Spill over ensures that the pathogen crosses every barrier and can thus only take place if space and time are separated in every successive barrier. As a result, zoonotic spill over is fairly rare and, while many potentially infectious pathogens from other animals are routinely introduced to human beings, most of them can not cause or contribute to disease in humans.

**How to prevent from infection**

Anyone working with or handling animals should take precautions to minimise the risk of infection. Because different zoonotic diseases behave differently, avoiding specific infections requires an individual approach. A few straight forward practices can provide a high level of general protection.

Precautions include:

- **Good personal hygiene:** Wash hands after handling animals and before preparing or eating food or smoking cigarettes. Unwashed hands should not be put in the mouth, including someone else's mouth.
- **Hygienic food preparation:** Food-borne diseases can be largely avoided through correct processing and hygienic food preparation.
- **Vaccination for people:** Vaccines are available for some zoonoses and they should be made use of. Abattoir workers, farmers and vets should seek advice on Q fever vaccination. To protect against Australian bat lyssavirius, bat carers are advised to have a rabies vaccination.
- **Personal protection:** Gloves, boots and aprons or overalls should be worn when handling animals. Cover cuts and scratches with waterproof plasters.

For some diseases that may be fatal to people, e.g. Hendra virus, full protective clothing is essential including respiratory protection.

- **Maintain animal health:** Farm biosecurity and animal health programs, including the use of vaccines, play an important role in reducing the risk of some zoonotic diseases. Pet owners should make sure their animals are healthy and regularly wormed; private veterinarians can provide advice on treatments.
- **Care when pregnant:** To reduce the risk of toxoplasmosis, pregnant women should not empty cat litter boxes and or handle pregnant ewes.
- **Care when immuno-suppressed:** People with depressed immunity whether due to illness or medical treatments, should avoid all exposure to zoonotic diseases.
- **Suspect and stray animals:** Animals that appear ill, or carry skin infections should not be handled without taking precautions. It is also wise to avoid handling stray animals.
- **Control of pest animals:** Animals such as rats or feral pigs can carry zoonotic diseases and control programs will reduce the likelihood of transmission to people.[9]

## Conclusion

Diseases may be either infectious or non- infectious. Wild animals were implicated as a source of disease spill over to humans for the vast majority of zoonotic viruses, further substantiating the concept that the diversity of wildlife on our planet has provided a rich pool of viruses, a fraction of which have successfully adapted to infect humans.[10]. The threat of diseases moving from animals to people has been the focus of many studies and is well documented in public and scientific communications. 60% of infectious diseases in humans have been estimated to come from animals. Nevertheless we need to be concerned about the threat that people present to the health of animals.[11]. The advantages of pets far outweigh their fear of zoonotic infections can not be absolutely prevented by people with animals. It is also their responsibility to provide the required training to provide the healthy use of animals and reduce the risk of zoonotic disease transmission for veterinarians, physicians and public health staff.[5]. A reality the world now understands all too well. In the last century, infectious diseases from wildlife have been picking up steam, and the new results suggest the most abundant mammals are a big part of the problem.[2]. The organisations argue that zoonotic diseases are responsible for over 2 billion cases of human illness and over 2 million human deaths each year, including from Ebola, Mers, HIV, bovine tuberculosis, rabies, and leptospirosis.[7]

## References:


1. WHO | Zoonoses [Internet]. WHO. World Health Organization; [cited 2020 Apr 22]. Available from: http://www.who.int/topics/zoonoses/en/
2. Cassella C. Our Exploitation of Wildlife Is Directly Causing More Viruses to Spread to Humans, Study Shows [Internet]. ScienceAlert. [cited 2020 Apr 22]. Available from: https://www.sciencealert.com/human-exploitation-has-directly-increased-the-risk-of-animal-diseases-spilling-over-to-humans
3. Why are infections from animals so dangerous to humans? [Internet]. [cited 2020 Apr 22]. Available from: https://www.medicalnewstoday.com/articles/zoonotic-diseases-why-are-infections-from-animals-so-dangerous-to-humans
4. Zoonotic Diseases | One Health | CDC [Internet]. 2020 [cited 2020 Apr 22]. Available from: https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html
5. J.c A, A.a D, M.b O, D.d D. Animals as Reservoir of Some Human Diseases. Electronic Journal of Biology [Internet]. iMedPub; 2013 [cited 2020 Apr 22];9(2). Available from: https://ejbio.imedpub.com/abstract/animals-as-reservoir-of-some-human-diseases-5971.html
6. Zoonotic Diseases Passed From Animals to Humans [Internet]. Verywell Health. [cited 2020 Apr 22]. Available from: https://www.verywellhealth.com/all-about-zoonotic-disease-1958844
7. Vidal J. Human impact on wildlife to blame for spread of viruses, says study. The Guardian [Internet]. 2020 Apr 7 [cited 2020 Apr 24]; Available from: https://www.theguardian.com/ environment/2020/apr/08/human-impact-on-wildlife-to-blame-for-spread-of-viruses-says-study-aoe
8. Plowright RK, Parrish CR, McCallum H, Hudson PJ, Ko AI, Graham AL, Lloyd-Smith JO. Pathways to zoonotic spillover. Nat Rev Microbiol. 2017;15(8):502–510. PMCID: PMC5791534
9. Preventing zoonoses [Internet]. 2013 [cited 2020 Apr 27]. Available from: https://www.daf.qld.gov.au/business-priorities/biosecurity/animal-biosecurity-welfare/animal-health-pests-diseases/preventing-zoonoses
10. Kreuder Johnson C, Hitchens PL, Smiley Evans T, Goldstein T, Thomas K, Clements A, Joly DO, Wolfe ND, Daszak P, Karesh WB, Mazet JK. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific Reports. Nature Publishing Group; 2015 Oct 7;5(1):1–8.
11. Miller M. The threats humans present to wildlife through infectious diseases [Internet]. The Conversation. [cited 2020 Apr 22]. Available from: http://theconversation.com/the-threats-humans-present-to-wildlife-through-infectious-diseases-49475