Companion Animal Zoonosis: One Health Approach to Prevention and Control

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ABSTRACT

Zoonoses, infectious diseases transmissible between humans and animals, pose significant threats to global health. Despite the joy and companionship offered by pets, they can also harbor zoonotic pathogens, making it crucial to comprehend and manage this dynamic. The One Health philosophy, integrating veterinary expertise, medical knowledge, and collaboration among diverse professionals, emerges as a comprehensive strategy. The chapter explores the transmission patterns of zoonotic diseases in companion animals, highlighting their role as potential reservoirs. It examines the One Health Concept, emphasizing preventive actions such as vaccinations, regular screenings, and responsible pet ownership. The interconnectedness of human, animal, and environmental health necessitates a unified effort for effective prevention and control. The importance of research, surveillance, and global collaboration in understanding and combating zoonotic diseases is underscored. Adopting a One Health approach is pivotal to ensuring the well-being of both humans and their cherished animal companions. The chapter advocates for multidisciplinary cooperation, responsible pet care, preventive measures, and thorough research as essential components of a holistic strategy. By embracing this approach, the global community can create a safer and more interconnected system for managing zoonotic illnesses, fostering a healthier coexistence between people and their beloved pets.

Keywords: Zoonotic diseases, One Health approach, Companion animals, Disease transmission, Preventive measures

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1. INTRODUCTION

The concept of zoonosis looms large as a constant reminder of our susceptibility to infectious diseases in a connected world where people and animals live. The sneaky infections known as zoonoses, which exist between different species, have the power to cause havoc in people's lives, put a strain on the medical system, and even start worldwide pandemics. Companion animals play a special part in the complex dance of disease transmission, despite. Companion animals have a special place in our hearts and are steadfast in their love and loyalty. We have a variety of furry friends who provide us happiness, comfort, and unwavering love, including dogs who welcome us with wagging tails, cats who cuddle up on our laps, and other animals. Behind this appearance of camaraderie, however, there is a hidden threat since these beloved pets may also be home to zoonotic diseases that could spread disease to humans. The importance of comprehending and managing the complex interaction between companion animals and zoonosis necessitates the use of a One Health approach, a comprehensive and cooperative strategy that cuts across conventional lines because it enables us to combine the knowledge of veterinary specialists, medical professionals, epidemiologists, researchers, and pet owners. Together, we can traverse the complex world of zoonotic diseases, putting prevention, control, and the improvement of human and animal health as our main priorities. The interesting world of companion animal zoonosis will be examined in this chapter through the prism of the One Health philosophy. We shall understand the intricacy of disease transmission patterns within our closest animal companions by examining the dangers companion animals provide as potential reservoirs or carriers of zoonotic infections. We will also look at creative therapies, collaborative projects, and inventive tactics that make use of One Health's guiding principles to prevent and manage zoonosis in companion animals.

In the end, we may pave a route toward a future where the joys of friendship with our furry friends need not be overshadowed by the specter of zoonotic diseases by leveraging the power of information, collaboration, and shared responsibility. We can secure the health and well-being of both people and their beloved animal friends by adopting a unified One Health approach. This will promote peaceful interspecies cooperation and protect the relationship that has enriched our lives for millennia. This chapter reviews some important zoonotic diseases of companion animals and their prevention by achieving optimal health outcomes by understanding the interconnectedness of humans, animals and their common environment.

2. VIRAL DISEASES

2.1. RABIES

Rabies is caused by a single-stranded RNA virus belonging to family Rhabdoviridae. It is a deadly disease in humans as well as animals that have been around for a long time. According to World Health Organization data, rabies infection causes between 30000 and 70000 deaths worldwide each year (Krebs et al. 2004). Rabies is typically spread by dogs. Most people in underdeveloped nations contract rabies from canine bites, while in opulent countries the disease is more commonly spread by contact with wild animals such as bats and foxes (Tang et al. 2005). Extensive vaccination of domesticated dogs was used as part of a rabies control program in the United States, leading to a decrease in the prevalence of the disease (Krebs et al. 2004). Based on size and area of the inoculating lesion, the incubation period for rabies can be anywhere from a few days to several years. Hydrophobia, agitation, anxiety, bewilderment, hallucinations, and other symptoms may be displayed by patients. Post-exposure prophylaxis with multiple doses of human rabies immunoglobulin (HRIG)

can prevent rabies in time duration of 14 days after a suspected canine bite. Using water and liquid soap to clean the wound can drastically cut down on the virus's head start, and infection with rabies is likely (Lucas et al. 2008). Fig. 1 shows the pathogenesis of rabies.

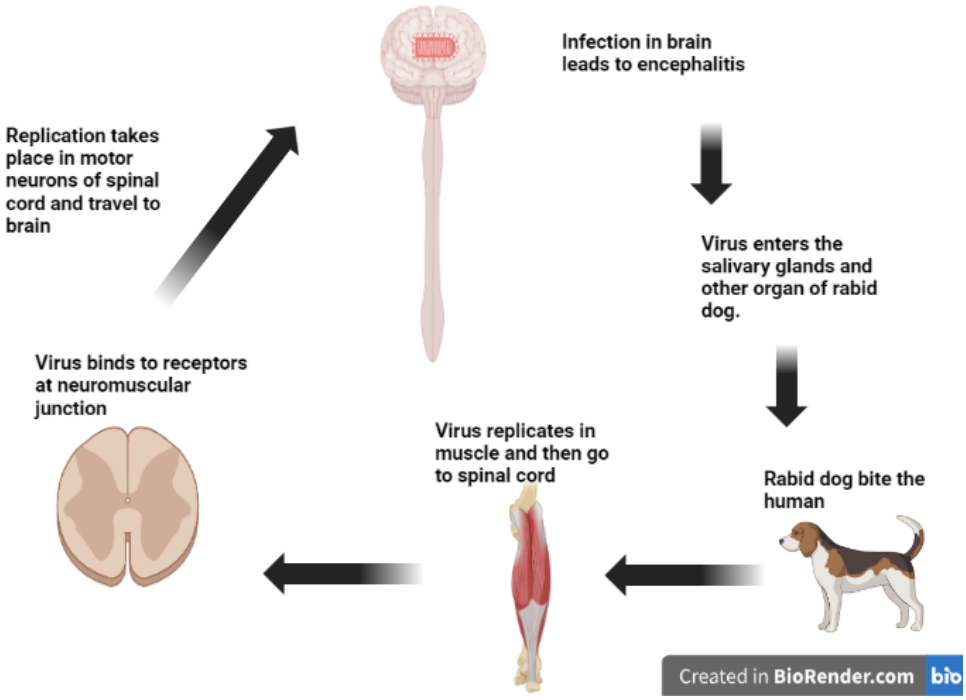

Fig. 1: shows the pathogenesis of rabies virus.

2.2. NOROVIRUSES

Noroviruses are a diverse group of single-stranded RNA viruses that are classified within the *Caliciviridae* family. The majority of cases of sporadic and epidemic gastroenteritis in humans are caused by *noroviruses* (Summa et al. 2012). All age groups are susceptible to this virus. Infected canine faeces and diarrhea contain the virus since it is produced in the dog's digestive system. Infected persons can spread the disease to others through contact with contaminated food or water, and the fecal oral rate can cause the infection to spread rapidly through a population. In cases of acute gastroenteritis, serum treatment may be beneficial for the patient.

3. BACTERIAL DISEASES

3.1. PASTEURELLA

Pasteurella belongs to Gram-negative coccobacilli that are predominantly present in animals. Pasteurella species are commonly found as part of the normal microbial community inhabiting the canine and feline URT (upper respiratory tract). A human can contract *Pasteurella* by direct contact with an infected animal, such as a dog or cat, or through indirect contact, such as through a dog or cat's bite, lick, or scratch. *Pasteurella* infection has the potential to be transferred to humans through both direct and indirect means, including contact with dog or cat bites, licks, and even scratches inflicted by cats (Oehler et al. 2009) . *Pasteurella* spp. is responsible for causing numerous infectious diseases in the human population. The transmission of *Pasteurella* spp. is primarily associated with the soft tissue infection, which holds significant importance in the realm of infections. Nevertheless, conditions such as

meningitis, as well as bone and joint infections, *Pasteurella* spp. have the potential to serve as a vector for the transmission of respiratory infections. In a future research project of the United States, it has been presented that this organism exhibits the highest frequency. Dog and cat bites served as the source for the organism (Talan et al. 1999). *Pasteurella* Infections can be effectively treated through the utilization of second and third generation therapeutic interventions. Cephalosporin, macrolides, and fluoroquinolones are classes of antibiotics commonly used in clinical practice. The medications cotrimoxazole and penicillin have been mentioned. Fig. 2 shows mechanism of pathogenicity of *Pasteurella multocida.*

3.2. SALMONELLA

Salmonella species are anaerobic, motile gram-negative bacilli that can colonize the large intestine of many mammals, including dogs. They have a strong preference for the colon's distal portion and the mesenteric lymph nodes. Infections can also be transmitted to humans via feces. This mode of transmission can lead to the development of various infectious diseases, including gastroenteritis, enteric fever, bacteremia, and osteomyelitis. GIT infections represent the most commonly observed symptom of salmonella infection affecting both humans and canines. It is worth noting that a significant proportion of infected individuals, whether they are animals or humans, do not exhibit any symptoms and can continue to excrete the pathogen through their faeces for up to six weeks. Despite not showing any symptoms themselves, these carriers could potentially spread the disease to others. In developing countries, the prevalence of *Salmonella* spp. is higher compared to developed countries (Leonard 2014). It is advisable to conduct an antibiogram for patients who have contracted this organism. Effective treatment can be done using different classes of antibiotics such as fluoroquinolones, beta-lactams, and macrolides (Leonard et al. 2011).

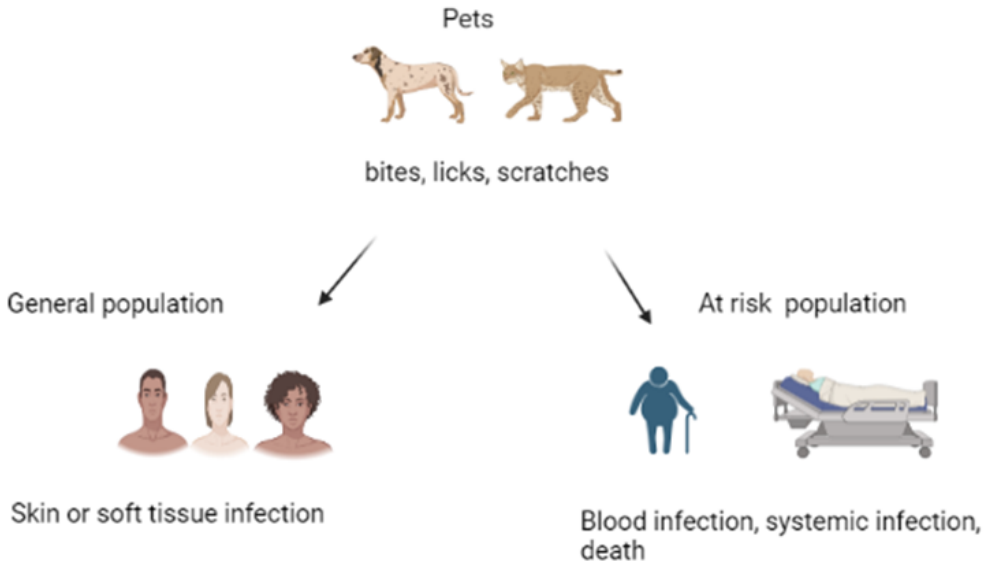

Fig. 2: Mechanism of pathogenicity of *Pasteurella*

3.3. BRUCELLA

Brucellosis is a highly prevalent zoonotic disease that places a significant burden on national healthcare systems. The transmission of the disease to humans often occurs through the consumption of

dairy products that have not undergone the process of pasteurization. Multiple strains of brucella spp. have been identified, leading to the occurrence of human brucellosis, *Brucella(B.) canis*'s role as a frequent human brucellosis pathogen has remained underrecognized. However, *B. canis* has been relatively less recognized as a common pathogen in human brucellosis infections (Seleem et al. 2010). While *B. canis* does not typically cause brucellosis infection in humans, there have been reported instances of this infection primarily among farmers who have had previous contact with bodily fluids from dogs that were infected with *B. canis*. The incubation phase typically lasts for one to four weeks, but it can go on for months in extreme situations. Symptoms include pyrexia, night sweats, and low back pain, may be experienced by patients, especially in endemic areas, or asymptomatic individuals. It is important to distinguish these symptoms from those of tuberculosis and other types of malignancies (Roushan et al. 2004). Treatment of brucellosis is imperative to mitigate the potential complications and sequelae associated with the disease. Combination therapies, commonly utilized in the management of brucellosis, involved the administration of doxycycline in conjunction with either streptomycin or rifampin for duration of 6 weeks (Pappas et al. 2005).

3.4. YERSINIA ENTEROCOLITICA

Yersinia (Y.) enterocolitica is a zoonotic pathogen, coccobacillus and gram-negative in nature responsible for causing yersiniosis in both humans and animals. Various animals serve as primary reservoirs for *Y. enterocolitica*, encompassing avian species, swine, cervids, and bovines. In certain studies, the pathogen has been identified and separated from a wound caused by a dog bite (Fredriksson-Ahomaa et al. 2009). In the early stages, patients may exhibit no symptoms, but upon invasion of the mucosal surface of the intestine by the pathogen, they may experience the presence of watery or bloody diarrhea. The pathogen has the potential to affect the payer's patches and manifest symptoms similar to appendicitis. *Yersinia enterocolitica* is primarily a self-limiting illness that typically does not necessitate the use of antibiotics. Nonetheless, individuals with severe infections and compromised immune systems should receive treatment involving a combination of an aminoglycoside and doxycycline.

3.5. CAMPYLOBACTER

Campylobacter species, such as *Campylobacter jejuni* and *Campylobacter coli*, are classified as gram-negative bacteria and are commonly associated with the development of enteritis. It typically inhabits the GIT of various animal species. The primary mode of campylobacter transmission is through close proximity to infected animals or their byproducts. Canines, including both adult dogs and young puppies, serve as the primary hosts for the bacterium known as *campylobacter*. In a conducted study, it was observed that approximately 47% of the fecal specimens obtained from dogs were found to contain isolated campylobacter (Janda et al. 2006). The duration of the incubation period in *campylobacter enteritis* exhibits variability, ranging from one to seven days. Most patients exhibit symptoms such as fever, vomiting, diarrhea, and abdominal pain. Moreover, it is noteworthy that bloody diarrhea has been observed in over 50% of the afflicted individuals. In certain patients, convulsion and seizure may be observed. This infection typically exhibits a self-limiting course and does not necessitate the administration of antimicrobial therapy. Hydration and balance of electrolytes should be given due consideration. Patients with severe disease are recommended to undergo antibiotic therapy using fluoroquinolones, macrolides, or aminoglycosides (Ternhag et al. 2007).

3.6. CAPNOCYTOPHAGA CANIMORSUS

The gram-negative bacterium *Capnocytophaga canimorsus* is a member of the typical microbial population of the canine and feline oropharyngeal tract. The spread of microbe to humans primarily occurs through dog bites, resulting in a severe sepsis that is particularly prevalent among elderly individuals, those with compromised immune systems, or patients who have undergone splenectom (Janda et al. 2006) . Additionally, the pathogen has the potential to cause various life-threatening infections such as meningitis, osteomyelitis, arthritis, lung abscess or emphysema, and endocarditis. Furthermore, it is worth noting that *Capnocytophaga septicemia*, particularly in individuals with compromised immune systems, has been found to be potentially linked to thrombotic thrombocytopenic purpura and hemolytic uremic syndrome (Biedermann and Deligne 2004). Evidence from the literature suggests that around thirty-three percent of people infected with *Capnocytophaga* will die from their infection within a year. As a result, people who have received a canine bite should seriously consider starting early empirical treatment with third-generation cephalosporins.

3.7. BORDETELLA BRONCHISEPTICA

The bacterium *Bordetella bronchiseptica* belongs to the genus Bordetella and is a gram-negative rod. Canine and feline upper respiratory tracts are common reservoirs for the infection that can be spread to humans via airborne droplets. *Bordetella (B.) bronchiseptica* has the potential to cause acute tracheobronchitis in canines, characterized by a harsh and persistent cough commonly referred to as kennel cough (Woolfrey and Moody 1991). The incidence of human infection with *B. bronchiseptica* is infrequent; nevertheless, this pathogen has the potential to induce pneumonia and upper respiratory tract infection in individuals who own dogs (Hemsworth and Pizer 2006). Multiple studies have provided evidence indicating that this particular organism exhibits resistance to macrolides and cephalosporins. However, it has been observed in various studies that the organism displays sensitivity to fluoroquinolones and Trimethoprim/sulfamethoxazole.

3.8. COXIELLA BURNETII

Coxiella(C.) burnetii is a gram-negative bacterium that is classified as an obligate intracellular pathogen. It is responsible for causing Q fever, a zoonotic disease in humans. Infection normally occurs when a person breathes in aerosolized pathogen or comes into touch with the fluids of an animal that is already affected. A study indicated that about 10% of farm dogs carried C. burnetii, despite the fact that dogs are not thought to be the principal reservoirs for this bacteria (Cosman et al. 2013). Furthermore, a separate study conducted by Buhariwalla and colleagues revealed that transmission of *C. burnetii* from an infected parturient dog to humans was observed. Furthermore, the patients exhibited symptoms consistent with Q fever, such as fever, chills, nausea, vomiting, and a productive cough. Opacity is a frequently observed characteristic in chest radiography, while crackles may be detected through auscultation during physical examination. The study estimated that the incubation period following exposure to the infected animal ranged from 8 to 12 days. Successful treatment of patients infected with *C. burnetii* can be achieved through the administration of fluoroquinolones or doxycycline (Patel et al. 2011).

3.9. LEPTOSPIRA

Leptospira (L.), specifically *L. interrogans*, is a type of aerobic spirochete that serves as the primary etiological agent responsible for the occurrence of Leptospirosis in humans. Leptospirosis is a

globally prevalent zoonotic disease that is primarily transmitted to humans through various environmental sources, such as soil, water, urine, or infected animal tissues as shown in Fig. 3. Rodents serve as the primary reservoirs for the transmission of Leptospirosis. Nevertheless, it is worth noting that domestic animals, such as dogs, can also contribute significantly to the transmission of Leptospirosis in regions where the disease is prevalent (Moore et al. 2006). Direct contact of infected urine with mucosal surfaces of the human body, such as the eye, vagina, nose, mouth, or erosive lesions, is the primary mode of transmission of Leptospirosis (Fig. 3). This infection has an incubation period of 2–26 days, with a median of 10 days. Leptospirosis can cause a wide variety of symptoms, from no symptoms at all to high fever, a persistent but non-productive cough, a sore neck and back, a loss of appetite, stomach cramps, bloody diarrhea, vomiting, and even a bleed in the lungs or brain (meningitis). A variety of antibiotics, including doxycycline, ceftriaxone, cefotaxime, penicillin, amoxicillin, and ampicillin, have demonstrated efficacy in the treatment of Leptospirosis (Kobayashi 2001).

3.10. STAPHYLOCOCCUS

Staphylococcus(S.) intermedius is a species of bacteria that belongs to the Staphylococcus genus. *S.s intermedius* is a coagulase-positive, gram-positive bacterium that lives in the anterior nasal cavity of many animals, including dogs, pigeons, and horses. Multiple lines of evidence show that the gingival region of healthy canines is also a viable source for isolating this particular virus (Hoekstra and Paulton 2002). *S. intermedius* is not frequently observed as a zoonotic pathogen in the human population. Nevertheless, multiple studies have provided evidence suggesting that this bacterium has the capability to cause infection in humans who have suffered dog bite wounds, leading to the development of cellulitis (Barr et al. 1953). It is imperative to differentiate this pathogen from *S. aureus*. Penicillin and amoxicillin-clavulanate have been found to be efficacious in the therapeutic management of this particular infection.

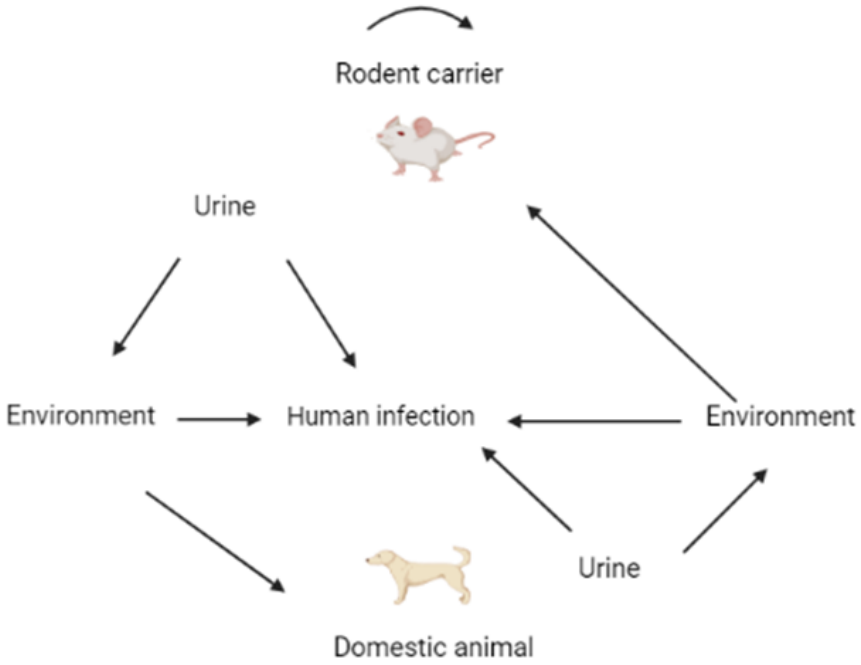

Fig. 3: Transmission cycle of Leptospirosis

3.11. METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a significant contributor to lethal infections in the human population. Multiple studies have documented the isolation of this pathogen from various animal species, including pigs, horses, cattle, cats, and dogs. Among the individuals surveyed, a subset held the belief that companion animals served as the primary reservoirs for the transmission of MRSA, as they were capable of transmitting the bacterium through direct contact with their human owners. However, it appears that the transmission of MRSA from animals to humans is predominantly observed in individuals with compromised immune systems. However, there is evidence indicating that this bacterium has the potential to be transmitted to humans who are in possession of an infected animal (Välimäki et al. 2005). The efficacy of conventional antibiotics against MRSA infections is not superior. Therefore, recent pharmaceuticals such as vancomycin, linezolid, and daptomycin have gained significant usage in the management of MRSA infections (Morgan 2008).

4. ENDOPARASITES

Toxoplasma gondii and *Toxocara(T.) cati* are two examples of protozoan and ascarid zoonotic parasites, respectively, that mostly infect felids (both domestic and wild). *B. procyonis*, like raccoons, serves as a host for these parasites, and excretes the highly resistant eggs (*Toxocara*) or oocysts (*Toxoplasma*) (Hernandez et al. 2013). Infected humans may not show symptoms until months or longer period after the cat has successfully removed the parasite egg. Because of this factor, outdoor recreational areas such as playgrounds, garden soil, sandboxes, and similar locations that are contaminated with cat faeces have the potential to act as a reservoir for human infection (Holland and Smith 2006). The occurrence of *T. cati* was found to be more prominent in urban regions compared to rural regions. *T. cati*, unlike its canine counterpart *T. canis*, was more commonly found in soil samples from metropolitan parks. The study indicates a positive correlation between elevated levels of T. cati and the presence of free-roaming cats in urban environments. Infections caused by *T. cati* have been linked to larval migrans affecting the viscera and eyes, which can lead to irreversible ocular impairment in affected individuals (Lee et al. 2010).Toxoplasmosis is primarily contracted by humans through the ingestion of sporulated oocysts found in soil or water contaminated with cat faeces, or through the consumption of undercooked or raw meat containing tissue cysts (Elmore et al. 2010). According to researchers, it was shown that the frequency of T. gondii was lowest in indoor-only cats and highest in free-roaming cats (Kulasena et al. 2011). The primary risk factor for human toxoplasmosis has been demonstrated to be contact with infective *T. gondii* oocysts in cat feces. For a significant period of time, the likelihood of contracting an infection from oocysts has been regarded as significantly less prevalent compared to the risk of infection resulting from the consumption of undercooked or raw meat. In a recent study conducted by (Hill et al. 2011), a specific antibody called TgERP, which is associated with embryogenesis in *T. gondii*, has been developed. This antibody is unique to sporozoites, enabling the differentiation between oocyst and tissue cyst infections. This distinction is possible because sporozoites are exclusively found in oocysts. Approximately 6-8 months after infection, the TgERP can be detected, allowing for early identification of oocyst infection. Researchers found that 103 (or 63%) of 163 patients in the acute infection stage tested positive for TgERP. This finding suggests that a significant proportion of human infections can be attributed to oocyst infection. Toxoplasma infections have the potential to present themselves as ocular diseases, neurological impairments, and can result in blindness, abortions, and birth defects, specifically hydrocephalus, in human beings (Dubey and Odening 2001). Toxoplasmosis poses a substantial risk to individuals undergoing immunosuppressive therapy, as well as transplant

recipients, and is a prominent contributor to systemic infection and mortality among immunosuppressed patients, such as those with HIV/AIDS. There have been suggestions of a heightened susceptibility to schizophrenia, autism, Alzheimer's, and other neuro-inflammatory diseases in relation to T. gondii infection (Fekadu et al. 2010). However, additional investigation is necessary to gain a comprehensive understanding of the neurological impacts of T. gondii. Toxoplasmosis poses a significant disease concern for wildlife, affecting various species of wild birds and mammals, particularly marine mammals and Australian marsupials. This has been well-documented in scientific literature by researchers such as (Dubey and Odening 2001) .Furthermore, toxoplasmosis plays a significant role in inducing abortion in domestic animals such as sheep and goats. Furthermore, there have been documented cases of human infections with domestic cat hookworms, specifically *Uncinaria stenocephala*, *Ancyclostoma tubaeforme, A. brazilense*, and *A. ceylanicum* (Bowman et al. 2010). Hookworms are parasites that infect both animals and humans through their filariform larvae, which emerge from hookworm eggs after defecation. Skin lesions caused by infective larvae are called cutaneous larva migrans (CLM), and they can also cause pneumonitis, muscular infection, and ocular symptoms, albeit these are much less common. In some instances, A. ceylanicum has the potential to mature into a fully developed hookworm within the human body, resulting in abdominal discomfort(Prociv 1998) . There have been multiple documented cases of human infections caused by feline hookworms, which have been reported in soil found beneath residential structures or on beaches where cats have defecated. According to (Anderson et al. 2003), approximately 75% of the free-roaming cats in Florida tested positive for *A. tubaeforme*, while 33% were found to be positive for *A. braziliense*. In the year 2006, a total of 22 individuals received a diagnosis of Cutaneous Larva Migrans (CLM) while attending a children's camp located in Miami-Dade County. The Centers for Disease Control and Prevention (CDC) reported in 2007 that while free-roaming cats were observed near the camp, the exact origin of the infection could not be ascertained. According to a personal communication from the Miami-Dade Health Department, in 2010, at least seven confirmed and eight probable cases of human hookworm infections trace their origins to beaches in Miami-Dade County that were contaminated by cat feces. To reduce the likelihood of further human illnesses, the County public health agency paid for and took responsibility for trapping the stray cats as well as disposing of the feces left behind. A tapeworm of the genus Echinococcus infection is referred to as echinococcosis. Despite spending a portion of its life cycle inside rodents (who are its intermediate hosts), E. multilocularis is principally a parasite of coyotes and foxes. Echinococcosis can be transmitted to dogs by the consumption of diseased rodents (such as mice and squirrels) or other small mammals, such as rabbits(Mani and Maguire 2009). Alveolar echinococcosis and cystic echinococcosis are the two most significant types in humans. Humans can become infected by eating or drinking contaminated food, water, or soil, or by coming into close contact with animal hosts. Treatment for echinococcosis is frequently expensive and difficult, and it may call for significant surgery or protracted pharmacological therapy. Dog deworming is the main component of prevention programs because dogs are the only hosts. In the case of cystic echinococcosis, additional preventive measures include dog deworming, slaughterhouse cleanliness, and community awareness campaigns. Echinococcosis affects more than 1 million individuals at once. Cystecercosis is caused by *Taenia solium.* Humans are the definitive hosts, followed by domestic and wild pigs, and sporadically other mammals like humans, as intermediate hosts. Where pigs are raised and have access to human waste, the cycle can continue. Most occurrences occur in rural regions with poor sanitation in Africa, Asia, Central America, and the US. Sporadic cases can occur in affluent nations like the US, particularly in foci where human carriers transmit eggs to other humans. Eggs may be found in water, vegetables (or other food infected by human carriers), dirt, or even in water. Ingestion of eggs (including autoinfection from eggs shed by adult parasite in human intestine) is a likely method of

transmission to humans. Clinical instances are most frequently documented in subcutaneous tissues, the central nervous system, and the eye in humans. Numerous cysts in the muscles can also be symptomatic.

5. ECTOPARASITES

Ectoparasites that infest domestic cats, particularly the cat flea (*Ctenocephalides felis*), play a significant role in the transmission of zoonotic diseases. There are three significant diseases that are associated with fleas in cats in the United States. These diseases include cat-scratch disease (CSD), flea-borne typhus, and plague (McElroy et al. 2010). Cat-scratch disease, also known as bartonellosis, is attributed to the pathogenic gram-negative bacterium. Cats are the most important reservoir of Bartonella henselae, despite the fact that they show no outward signs of sickness. There are a number of ways in which animals can transmit disease to humans, including by entering an open wound, scratching a human, or biting a human. Additionally, transmission can also happen through the contamination of flea faeces with B. henselae. Fleas obtain B. henselae bacteria through a prior blood meal from a cat that is infected. Symptoms observed in individuals affected by cat scratch disease (CSD) encompass fever, headaches, and localised lymph node enlargement. This particular ailment represents a commonly encountered diagnosis of benign lymphadenopathy among paediatric populations. According to(McElroy et al. 2010), this study focuses on the population of young adults. Atypical complications, such as encephalitis, retinitis, and endocarditis, have been observed in 5-15% of humans infected with CSD (Chomel et al. 2004). Additionally, recent studies have found an association between Bartonella spp. infection and chronic rheumatic symptoms that resemble those of chronic Lyme disease in humans (Maggi et al. 2012). Studies show that the seroprevalence of B. henselae in cat's ranges from 14% to 93% (Case et al. 2006). In addition, it was observed by (Nutter et al. 2004) that the seroprevalence was substantially greater in free-roaming cats compared to pet cats. Besides the ability to spread CSD, cat fleas can also spread rickettsial diseases including murine typhus (Rickettsia typhi) and the closely related zoonotic disease agent Rickettsia felis. In places with high densities of cats, rodents, or fleas, these diseases could spread and endanger human health (Case et al. 2006). In a manner analogous to that of CSD, R. typhi can be carried by cats without causing any outward signs of illness (Case et al. 2006). In addition, it was observed by (Nutter et al. 2004) that the seroprevalence was substantially greater in free-roaming cats compared to pet cats. Besides the ability to spread CSD, cat fleas can also spread rickettsial diseases including murine typhus (Rickettsia typhi) and the closely related zoonotic disease agent Rickettsia felis. In places with high densities of cats, rodents, or fleas, these diseases could spread and endanger human health (Case et al. 2006). Just like CSD, felines carry R. typhi without showing any visible symptoms, and instances of outbreaks have been linked to the presence of free-roaming cat colonies in Hawaii (Jessup et al. 1993). Additional documented instances of murine typhus in the United States have been primarily observed in central and south-central Texas, as well as the Los Angeles area (Adams et al. 1970). In the study conducted by (Sorvillo et al. 1993), it was observed that 90% (n=9) of the cats collected in the Los Angeles R. typhi focus were found to be seropositive for R. typhi antibodies. Conversely, no seropositive cats (n=21) were identified in the control areas where no human infections had been reported. The initial course of action in public health often involves the suppression of fleas. Nevertheless, if the population of free-roaming cats is not effectively managed, it can result in subsequent outbreaks of disease. Moreover, there have been documented cases of human bacterial diseases such as tularemia, which is caused by Francisella tularensis, and plague, caused by Yersinia pestis, being linked to direct contact with cats or cat fleas (McElroy et al. 2010). Around 8% of plague cases in the USA are linked to transmission from cats. Reports of cat exposure associated with

plague occur throughout the year, while cases related to flea transmission are typically limited to warmer months. Cats commonly exhibit a higher susceptibility to the pneumonic variant of the plague, a highly contagious form that poses a greater risk to humans in close proximity. This particular strain of the plague leads to a rapidly advancing and often fatal illness. Both tularemia and plague have the potential to induce a range of symptoms and can potentially result in fatal respiratory disease or multiorgan failure in both humans and other animals (Spagnoli et al. 2011). It has been suggested that cats, in addition to hosting infected fleas, may carry the bacterial agents of tularemia and plague in their oral cavities when preying on infected rodents. Consequently, there is a potential for cats to transmit these bacteria to humans through bites or scratches.

6. PREVENTION AND CONTROL OF ZOONOTIC DISEASES WITH ONE HEALTH PERSPECTIVE:

Human, animal, and environmental health are all intertwined, so it is important to use a One Health approach to preventing and controlling zoonotic infections in household pets. Pets play a major part in the transmission of zoonotic illnesses, which are infections that can be passed between animals and humans. Many people consider their dogs to be members of their family, making it all the more important to take measures to ensure their safety and well-being. In order to effectively implement a One Health strategy, it is necessary for human health experts, veterinarians, environmentalists, and other interested parties to work together. Regular contact and information exchange between these groups can aid in the detection and investigation of possible disease outbreaks. The ability to detect and respond quickly to new risks is enhanced by a systematized approach to monitoring zoonotic infections in household pets. The One Health Concept, Depicted in a Fig. 4.

The One Health philosophy relies on taking preventative action. Vaccinations are an important part of keeping pets healthy because they protect them from infectious diseases and lessen the likelihood of zoonotic transmission. In addition, getting checked and screened regularly can aid in early diagnosis, which is crucial for prompt treatment and halting the spread of diseases. The One Health movement also emphasizes the importance of responsible pet ownership. Proper cleanliness and responsible pet care can be emphasized in educational and awareness programmes aimed at pet owners. Hand washing following contact with pets, especially before eating, is an easy way to prevent the spread of zoonotic diseases. The environment also plays a significant influence in the spread of zoonotic illnesses from pets to humans.

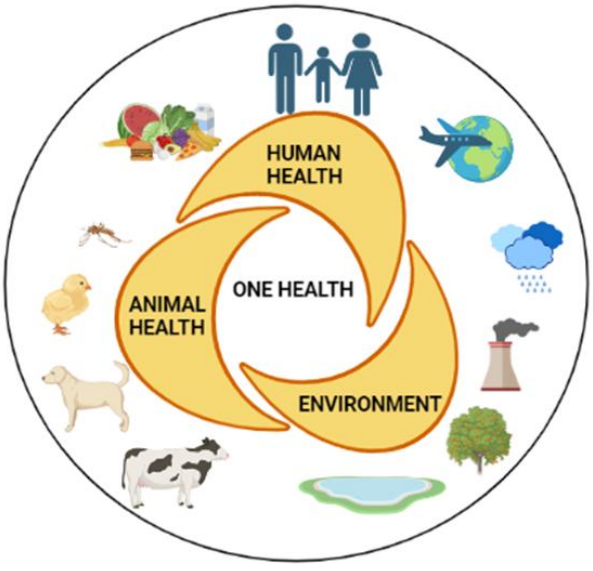

Fig. 4: Shows the one health perspective.

Proper waste disposal and sanitation procedures are fundamental in protecting people from infectious diseases. The dangers of zoonotic illnesses can be lessened by keeping pet enclosures clean and disposing of pet waste in the right places. In addition, it is crucial to do research that draws from other fields of study in order to completely grasp the complexities of zoonotic illnesses in domesticated animals. Disease prevention and control efforts can benefit greatly from research understanding the frequency, transmission, and behavior of diseases in animal populations. More effective measures against zoonotic illnesses can be developed with a deeper knowledge of the interplay between animals, humans, and their environments. Because zoonotic illnesses can appear anywhere, worldwide collaboration and information exchange are essential parts of the One Health concept. Disease surveillance information, research results, and effective control measures must be shared across governments and organizations. The genesis and spread of zoonotic illnesses in pets and their potential transfer to people can be thwarted with the help of coordinated efforts from around the world.

18. CONCLUSION

Zoonoses refer to diseases that affect both humans and animals, and can be transmitted through contact with domestic pets or wildlife animals. Numerous animal species and their associated products have the potential to serve as reservoirs for zoonotic pathogens. Among these, canines are accountable for the dissemination of various zoonotic ailments to their human carriers. Therefore, it is imperative to educate dog owners about zoonotic diseases and their modes of transmission in order to mitigate the prevalence of these infections among the human population. Numerous preventive and treatment approaches have been implemented with the aim of reducing the incidence of zoonotic diseases. It is advisable to engage in hand hygiene practices subsequent to any form of direct physical contact. In the presence of their canine companions, individuals may encounter various substances such as their belongings, bodily waste in the form of urine or faeces. In order to reduce the number of people who become ill from zoonotic diseases, proper food hygiene practices, including thoroughly washing vegetables and properly preparing meats, should be strictly adhered to at all times. In addition to that, dogs need to be treated for any diseases that cause diarrhea. Additionally, in order to prevent infections caused by campylobacter and salmonella, owners of dogs should only feed their pets meat that has been prepared. Dogs should never be given raw meat or eggs due to their increased risk of contracting an infection from the foods. The rabies vaccination is something that should be considered for domestic dogs, and dog owners should be aware of the benefits of getting vaccinated against rabies both before and after being bitten by their dogs. Numerous writers have found that raising the knowledge of dog owners regarding dog-associated zoonotic illnesses and prevention techniques can drastically lower the number of zoonotic infections that occur in dog owners and their families. In conclusion, maintaining the health and well-being of both animals and humans requires using a One Health approach to the prevention and control of zoonotic illnesses in pets. We can make the world a better place for pets and the communities they call home by encouraging multidisciplinary cooperation, emphasizing the need of responsible pet ownership, taking preventative steps, and undertaking thorough research. In addition to reducing the threat of zoonotic infections, adopting this holistic strategy will pave the way for a more robust and interconnected global health management system.

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