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Araştırma Makalesi / Research Article

Zoonotic Diseases in Veterinary Medicine and Their Importance for Public Health

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Abstract

According to the World Health Organization (WHO) definition, any disease or infection that is naturally transmitted from vertebrate animals to humans or from humans to animals is called zoonotic. Public health is a health approach that is equipped with a holistic health perspective and interacts with scientists from various disciplines and is effective. This study was conducted to reveal the importance of zoonotic diseases in veterinary medicine and public health. Sources around the world and in Turkey regarding the importance of zoonotic diseases in terms of veterinary medicine and public health were reviewed and Google Scholar, Pubmed, YÖK National Thesis Center and Web of Science databases were scanned. Veterinary public health, a branch of preventive medicine, has a field of practice in which epidemiological studies are particularly emphasized. Veterinarians make significant contributions to public health by working in various fields such as protecting animal health, ensuring their welfare, conducting biomedical research and obtaining safe food by raising safe livestock. Zoonotic diseases pose a number of risks to human and animal health. However, these risks can be reduced or even prevented by taking various measures. Among these measures, personal hygiene and disinfection practices have a very important place.

Keywords: Disease, health, public, veterinary, zoonotic

1. Introduction

The term zoonosis is derived from the Greek words "zoon" meaning "animal" and "nosos" meaning "disease". According to the World Health Organization, zoonoses refer to diseases or infections that are naturally transmitted from vertebrate animals to humans or from humans to animals (Rahman et al., 2020). Zoonoses can be bacterial, viral, fungal and parasitic, depending on their source. The source of transmission may occur through direct or indirect contact of humans with infected animals or animal products, or through vectors. Three out of every four diseases that have emerged in recent years are zoonotic diseases (Teke, 2023). According to the World Health Organization (WHO) definition, any disease or infection that is naturally transmitted from vertebrate animals to humans or from humans to animals is called zoonotic (Anonymous, 2023). Table 1. lists important zoonotic diseases (Rahman et al., 2020).

Table 1. Important zoonotic diseases

Bacterial	**Viral**	**Fungal**	**Parasitic**
Anthrax	Rabies	Aspergillosis	Trichinellosis
Tuberculosis	Avian Influenza	Dermatomycosis	Toxoplasmosis
Brusellosis	Newcastle disease	Histoplasmosis	Giardiosis
Leptospirosis	Crimean-Congo Hemorrhagic Fever		Hydatid cyst
Tularemi	Rift Valley Fever		Cryptosporidiosis
Aktinomycosis	Ebola		Fasciolosis
Bordotellosis	AIDS		Amoebic dysentery
Clostridial enfections	Hantavirüs enfection		
Campylobacteriosis	Sars COV2		
Salmonellosis	MERS COV		
Vibriosis			
Pastorellosis			
Lyme			

Public health is a health approach that is equipped with a holistic health perspective and interacts with scientists from various disciplines and is effective. Today, those working in the field of public health include nurses, midwives, physicians, dentists, veterinarians, veterinary health technicians and technicians, industrial hygienists, environmental experts, epidemiologists, laboratory workers, social workers, health educators, statisticians, information technology specialists, health engineers, There are entomologists, lawyers and some other professionals when necessary. Integration with veterinary services is of critical importance in the fight against infectious diseases (Öztoprak et al., 2015). This study was conducted to reveal the importance of zoonotic diseases in veterinary medicine and public health.

2. Materials and Methods

Sources around the world and in Turkey regarding the importance of zoonotic diseases in terms of veterinary medicine and public health were reviewed and Google Scholar, Pubmed, YÖK National Thesis Center and Web of Science databases were scanned. This academic study was created by making use of the literature found.

3. Results and Discussion

Veterinary Public Health is a discipline that covers a wide range of study areas of veterinary medicine such as microbiology, virology, parasitology, pathology, nutritional hygiene, environmental hygiene, toxicology (Marabelli and Caporale, 2003).

Veterinary public health, a branch of preventive medicine, is a branch of preventive medicine, where epidemiological studies are especially emphasized. It has a wide application area. Veterinarians make significant contributions to public health by working in various fields such as protecting animal health, ensuring their welfare, conducting biomedical research, and obtaining safe food by raising safe livestock (Zinsstag et al., 2011). The understanding of veterinary public health dates back historically to ancient Egyptian times. During this period, the clergy of that time researched methods of healing diseases without distinguishing between humans and animals (Omurtag Korkmaz and Doğruer, 2019). Therefore, the integration of human and animal health has continued since ancient times and actually formed the basis of a single understanding of medicine. As a scientific advance, Rudolf Virchow's identification of Trichinella spiralis as a zoonosis through his helminthology studies and William Osler's subsequent establishment of veterinary pathology supported the emergence of comparative medicine from the 19th century (Cardiff et al., 2008). With the increase in human population, living spaces outside cities have expanded and people have interacted with more wildlife, animals and the diseases they carry. This situation has increased the potential for the spread of zoonotic diseases such as AIDS, Ebola, West Nile virus, avian influenza, bovine spongiform encephalopathy and SARS. Today, medical and veterinary communities continue to collaborate on this important issue, maintaining the interdisciplinary integrative influence established by pioneers in the field of public health such as Wirchow, Osler and Schwabe (Zinsstag et al., 2011). As a reflection of this influence, environmental health is also included in the concept of single medicine. A single health approach has been developed by incorporating Thus, the one health approach, which includes issues such as environmental awareness, food safety and the spread of infectious diseases, has brought different perspectives to cancer and genetic disease research (Cardiff et al., 2008). It is clearly necessary to evaluate the effects of zoonotic diseases, which are important for public health, on humans and therefore to supervise them by health units. However, it is also essential that such diseases are controlled by veterinarians in the field and on farms (Europea, 2006). While there is a strong cooperation between public health and central veterinary institutes in a limited number of countries such as Denmark, Sweden and the UK, in most European countries the relationship between these service units is weak (Cevizci and Erginöz, 2009). In the research of zoonotic infections, cooperation between professional chambers is carried out within the framework of the "Med-Vet-Net" operating within the scope of the European Union (EU) (Marabelli and Caporale, 2003). This communication network was initiated by the EU's 6th Framework Programme. This framework has identified "Food Quality and Safety" as a priority area. In this context, the Medicine-Veterinary-Network brought together 16 participants from 10 countries, including national veterinary laboratories, central medical reference or public health laboratories established for infectious diseases (Europea, 2006). The roles of veterinarians are diverse in preventing risks to public health. In a study conducted on Salmonella bacteria, issues such as preventive veterinary medicine, quarantine measures, disinfection measures and control of these microorganisms were discussed (Pasmans et al., 2008). Findings showing how public health units in California took action during the global influenza pandemic are presented in a study reporting the benefits of having the necessary aid available in emergencies against epidemics and employing healthcare personnel through a distance education system. (Macario et al., 2007). Brucellosis, a zoonotic disease, can be transmitted to humans through the milk,

body fluids and meat of infected animals. In infected individuals, the disease can generally affect various organs, especially the reproductive system (Avşar, 2012). Serological or bacteriological tests are generally used in the diagnosis of brucellosis. Antibiotic treatment may be effective in early diagnosis. In case of abscess formation, surgical intervention may be required (Araz et al., 2016). In suspected cases of brucellosis, it is necessary to seek medical attention immediately due to its zoonotic character. Trichinellosis is an important zoonotic disease caused by nematodes of the Trichinella genus and is usually transmitted by consumption of raw or undercooked meat. Considering the epidemics worldwide, it is stated that approximately 11 million people may be infected with Trichinella. Although Turkey is among the regions at risk for trichinellosis, no definitive human cases originating from our country have been reported in the period 1977-2004. However, the Trichinella britovi epidemic that occurred in Izmir in 2004 is considered one of the largest epidemics in the world, and it is reported that approximately 1166 people were affected by the disease (Özkoç et al., 2005). Toxoplasmosis is a disease caused by Toxoplasma gondii, a zoonotic systemic infection. This infection occurs in mammals and birds. The final hosts of Toxoplasma gondii are cats and felines, while intermediate hosts include all vertebrate animals, including humans. The agent is generally transmitted through the consumption of oocysts in the feces of cats and felines or foods contaminated with them, as well as ingestion of raw or undercooked meat. It can also be transmitted to humans transplacentally from an infected mother to the fetus, through blood transfusion, or organ transplantation. Toxoplasmosis seropositivity varies between 5% and 90% worldwide. Studies conducted in Turkey reported that the seroprevalence of toxoplasmosis varied between 12% and 65% (Selek et al., 2015). Newcastle disease (ND) is a disease that causes serious economic losses in the poultry industry, and the clinical course is directly related to the pathogenicity of the virus. While velogenic strains cause significant clinical findings and high mortality, the disease caused by mesogenic and lentogenic strains can generally have a milder course. Therefore, determining the pathogenicity of the virus is of great importance in understanding the disease from an epidemiological perspective (Dagman et al., 2008). Cystic Echinococcosis is a zoonotic disease, and the metacestodal form of Echinococcus granulosus has been reported to be the causative agent of Cystic Echinococcosis in various farm animals such as sheep, goats, cattle, buffalos, camels, horses and pigs (Sarıözkan and Yalçın, 2009). Fasciola hepatica is a parasite whose final hosts are ruminants and is an important health problem worldwide due to the productivity losses it causes in cattle and its zoonotic properties in humans. According to studies conducted by various researchers, certain changes occur in blood parameters in animals infected with Fasciola hepatica. The disease caused by this parasite can predispose humans to bleeding and increase the risk of thrombosis. Therefore, tests such as aPTT and PT are needed to determine bleeding tendency. The liver is an organ where clotting factors are produced, and it also produces proteins that prevent clotting and elements of the fibrinolytic mechanism. The liver retains and eliminates activated clotting factors in the circulation. Clinical signs of bleeding are observed in 10-15% of cases with liver disease. Bleeding due to liver disease can occur due to various reasons, such as lack of clotting factors. In people with liver disease, bleeding time may be impaired in 40% of patients. Especially in mild liver diseases such as viral and toxic hepatitis, no significant change in laboratory findings is usually observed. A common condition in cases of liver disease is prolonged bleeding time. Additionally, the presence of cholestasis

along with liver disease may impair intestinal absorption of vitamin K, leading to vitamin K deficiency, resulting in both PT and aPTT prolongation. This condition is a disorder frequently observed in children (Yalçınkaya and Başbuğ, 2022). Rabies is a disease caused by the Lyssa virus from the Rhabdoviridae family. This zoonotic, acute and infectious disease based on RNA virus can occur in all warm-blooded animals, including humans. Rabies is a disease that is commonly seen in domestic animals such as dogs, cats, cattle, sheep, goats and horses, as well as in wild animals such as foxes, wolves, jackals, and rodents such as mice, squirrels, ferrets and hamsters. It is known that insect-eating and blood-sucking bats play an important role in the spread of the disease. Rabies virus is usually transmitted to humans through the bite of infected animals and usually infects the central nervous system within 20-90 days, leading to encephalomyelitis, which is almost always fatal. Due to its high mortality, prevention is of great importance. Pre-exposure prophylaxis is applied to people working in professions that pose a constant risk of rabies, and post-exposure prophylaxis is applied in case of suspected bite or contact. Annually, 10-12 million people worldwide receive post-exposure prophylaxis for rabies. Rabies has been eradicated in countries such as the UK, Japan, Belgium, Finland, France, Norway, Portugal, Spain, Switzerland and Sweden; However, between 40,000 and 70,000 cases of rabies are seen annually in Asia and Africa. India, Bangladesh, Pakistan and Nepal are the countries with the highest incidence. A decrease in human rabies cases has been observed in Turkey; However, there has been no decrease in the incidence of rabies-risk contact, and approximately 100,000 people are administered prophylaxis after rabies-risk contact annually. In 2005, the incidence of rabies risk contact was reported as 211.36 per hundred thousand (152,317 cases) (Cesur and Olgun, 2014). Tularemia is a zoonotic disease that is caused by Francisella tularensis and can occur in different clinical forms. No cases of human-to-human transmission have been reported so far (Ataman-Hatipoğlu et al., 2017). Tularemia was first reported in Turkey in 1936. Although this disease can be seen in all regions, it occurs more frequently in places where potable and potable water is inadequate, especially in the West-Central Black Sea, Marmara and Central Anatolia regions. Women's infection rates were found to be higher than men. It is thought that this situation is due to the fact that women are exposed to more dirty water during their housework or profession. In 2011, tularemia cases in Turkey reached their peak with 2151 cases. However, in 2017, this number decreased and fell to 476 according to the data of the General Directorate of Public Health (Hasanoğlu et al., 2020). Crimean-Congo Hemorrhagic Fever is a disease characterized by nausea, high fever, diarrhea, headache and various hemorrhagic symptoms. This disease is triggered by a virus from the Nairovirus lineage that is transmitted through tick bites. Cases of this disease have been reported in various parts of the Middle East, Asia, Africa and Eastern Europe. In Turkey, between 2002 and 2003, Crimean Congo cases were detected in some provinces such as Artvin, Amasya, Giresun, Tokat, Gümüşhane and Sivas, especially in the spring and summer months. While this disease is generally more common in adults over the age of 40, the number of cases is lower in children (Oflaz et al., 2008). Anthrax is a zoonotic disease transmitted from animals and animal products. Anthrax is divided into three types, depending on the site of entry into the organism: skin anthrax, pulmonary anthrax and gastrointestinal anthrax. Cutaneous anthrax usually accounts for the majority of epidemic cases. The most dangerous form to use as a biological weapon is pulmonary anthrax. Anthrax is divided into three types depending on the source of contamination: agricultural anthrax, industrial anthrax and laboratory anthrax. The most common form

in Turkey is anthrax, usually of agricultural origin. While laboratory-acquired anthrax cases, detected in 1979, are rare, this can lead to lung and skin anthrax outbreaks. While cutaneous anthrax can occur as a result of direct contact during the slaughtering of sick animals, skinning and processing of meat, consuming raw infected animal meat can cause gastrointestinal anthrax and pulmonary anthrax transmitted through inhalation (İnan-Elçin, 2001). In zoonotic anthrax disease, it is essential to approach cases carefully in animals where the disease is suspected. In a case report in 2023, a five-month-old male patient who developed zoonotic pulmonary tuberculosis due to Mycobacterium bovis as a result of raw milk consumption was reported. The patient was admitted to the hospital with a complaint of dry cough without fever, which had continued since birth. Left upper lobe and right pericardial infiltration was detected on chest radiography, and empiric antibiotic treatment was administered with a preliminary diagnosis of pneumonia. However, despite two weeks of antimicrobial treatment, the patient did not show improvement. In the thorax computed tomography examination performed on this situation, tracheomalacia, consolidation in the right upper lobe, a non-obvious mass or consolidation opacity in the left middle lobe of the lung, peribronchial thickening in the basal segment of the lower lobe, and mediastinal lymphadenopathy were detected. The patient was sent to the reference laboratory after fasting gastric juice was collected for three consecutive days for acid-resistant bacillus examination, polymerase chain reaction (PCR) and culture studies. Upon the appropriateness of the clinical findings and the positive result of the PCR test, the patient was started on quadruple antituberculosis treatment. After the treatment, a significant improvement was observed in the patient's radiological and clinical findings. It was determined that the patient, whose Mycobacterium bovis growth was detected in the culture, was fed with raw milk consumption. Therefore, the patient was diagnosed with bovine tuberculosis as a result of his clinical symptoms and Mycobacterium bovis growth in the fasting gastric juice culture (Üstündağ et al., 2023). Today, unpasteurized dairy products continue to be consumed, especially in rural areas. It has been observed that one of the most important steps to protect against zoonotic diseases is to raise people's awareness about not consuming raw milk and undercooked meat.

4. Conclusion

Zoonotic diseases pose a number of risks to human and animal health. However, these risks can be reduced or even prevented by taking various measures. Among these measures, personal hygiene and disinfection practices have a very important place. Among the first precautions that should be taken are individuals at risk of exposure to zoonotic diseases to comply with personal hygiene rules and use protective equipment to minimize the risk of contamination. Coops, stables, animal shelters, slaughterhouses, veterinary clinics; They attract attention as the main places for the transmission of zoonotic disease agents from animal to animal or from animal to human. Therefore, cleaning and disinfection measures should be applied in these areas, complying with the rules and without neglecting them. Personnel working in businesses and clinics should be regularly trained against zoonotic factors, protective equipment should be provided, and personnel should be subject to regular inspections regarding their compliance with hygiene and disinfection rules.

References

Anonymous, 2023. Zoonoses. https://www.who.int/topics/zoonoses/en/ (Date of Access: 01 December 2023).

Araz, C., Özkalaycı, Ö., Camkıran, F.A., Akovalı, N., Topçuoğlu, N., Arslan, G., 2016. A Case of Lumbar Spondyloarthropathy Due to Brucella Infection. *Turkish Clinics,* 14(1): 24-27.

Ataman-Hatipoğlu, Ç., Karakök, T., Cesur, S., Bulut, C., Ata, N., Kaya-Kılıç, E., Kınıklı, S., Demiröz, A.P., 2017, A case of oropharyngeal tularemia. *Middle East Medical Journal*, 9(1): 47-50.

Avşar, K., Kaya, O., Sütçü, R., Cüre M., 2012. Cytokine Levels in Brucellosis Cases. S.D.Ü. *Journal of the Faculty of Medicine*, 19(2): 43-46.

Cardiff, R.D., Ward, J.M., Barthold, S.W., 2008. 'One medicine—one pathology': are veterinary and human pathology prepared?. *Laboratory investigation*, 88(1): 18-26.

Cesur, M., Olgun, N., 2014. Knowledge, attitudes and behaviors about rabies disease of cases admitted to hospital with complaints of suspected rabid animal attack. *Acıbadem University Journal of Health Sciences*, (2): 135-140.

Cevizci, S., Erginöz, E., 2009. Veterinary public health services for public health and evaluation of opportunities in this field. *Fırat University Health Sciences Veterinary Journal*, 23(1): 65-71.

Dagman, A., Güleç, M., Günaydın, E., Coşar, M., 2008. Pathotyping of Newcastle Disease viruses isolated from domestic and wild birds. *Etlik Journal of Veterinary Microbiology*, 19(1): 19-26.

Europea, C., 2006. Multidisciplinary collaboration in veterinary public health. *Ann Ist Super Sanità*, 42(4): 397-400.

Hasanoğlu, İ., Bilgiç, Z., Kaya Kalem, A., Kayaaslan, B., Eser, F., Güner, R., 2020. An Important Disease for Our Country in the Etiology of Lymphadenopathy: Tularemia. *Ankara Medical Journal*, 4: 993-999.

İnan-Elçin, Ö., 2001. Potential Hazard: Anthrax. *Sted*, 10: 366-370.

Macario, E., Benton, L. D., Yuen, J., Torres, M., Macias-Reynolds, V., Holsclaw, P., Jones, M. C., 2007. Preparing public health nurses for pandemic influenza through distance learning. *Public Health Nursing*, 24(1): 66-72.

Marabelli, R., Caporale, V., 2003. The role of official veterinary services in dealing with new social challenges: animal health and protection, food safety, and the environment. *Revue scientifique et technique-office international des epizooties*, 22(2): 363-383.

Oflaz, B., Kanmaz, G., Özbayramoğlu, E., Şaylı, T., Güven, A., Uysal G., 2008. Oral ribavirin treatment in a pediatric patient with crimean-congo hemorrhagic fever. *Turkish Clinics Journal of Pediatrics*, 17(4): 309-312.

Omurtag Korkmaz, B.İ., Doğruer, Y., 2019. Overview of veterinary public health. In: Ceylan ZG (Ed), *Turkish Clinics*, 1st edn., Ankara, pp. 1-7.

Özkoç, S., Delibaş, S.B., Akısü, Ç., 2005. Application of western blot technique in the diagnosis of trichinellosis. *Turkish Journal of Parasitology*, 29(1): 26-30.

Öztoprak, D., Serpen, A., Aksakoğlu, G., 2015. Veterinary public health's place in zoonosis control. *Journal of Continuing Medical Education*, 24(3): 114-124.

Pasmans, F., Blahak, S., Martel, A., Pantchev, N., 2008. Introducing reptiles into a captive collection: the role of the veterinarian. *The Veterinary Journal*, 175(1): 53-68.

Rahman, T., Sobur, A., Islam, S., Ievy, S., Hossain, J., El Zowalaty, M.E., Rahman, A.T., Ashour, H.M., 2020. Zoonotic diseases: etiology, ımpact and control. *Microorganisms*, 8(9):1405.

Sarıözkan, S., Yalçın, C., 2009. Estimating the production losses due to cystic echinococcosis in ruminants in Turkey. *Veterinary parasitology*, 163(4): 330-334.

Selek, M.B., Bektöre, B., Baylan, O., Özyurt, M., 2015. Serological investigation of Toxoplasma gondii in pregnant women and patients with suspected toxoplasmosis in a tertiary education hospital between 2012 and 2014. *Turkish Journal of Parasitology*, 39(3): 200-204.

Teke, A., 2023. Hygiene measures and disinfection methods applied against zoonotic diseases. *Academic Meat and Milk Institution Journal*, 5: 22-30.

Üstündağ, G., Şahin, A., Yılmaz-Yazıcı, Y., Kara-Aksay, A., Biçmen, C., Belkaya, S., Yılmaz, D., 2023. An ınfant diagnosed with zoonotic pulmonary tuberculosis due to mycobacterium bovis. *Microbiology bulletin*, 57(3): 473-480.

Yalçınkaya, E., Başbuğ, O., 2022. Coagulation profiles in naturally ınfective cattle with fasciola hepatica. *Journal of Health Sciences Institute*, 7(3): 160-164.

Zinsstag, J., Schelling, E., Waltner-Toews, D., Tanner, M., 2011. From "one medicine" to "one health" and systemic approaches to health and well-being. *Preventive veterinary medicine*, 101(3-4): 148-156.

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