Ankara Üniv Vet Fak Derg, **67**, 101-105, 2020
DOI: 10.33988/ auvfd.570289

## Case Report / *Olgu Sunumu*

# Spontaneous toxoplasmosis in a chicken

**Ayhan ATASEVER[1,a], Görkem EKEBAŞ[1,b,✉], Duygu YAMAN GRAM[1,c]**

[1] Erciyes University, Faculty of Veterinary Medicine, Department of Pathology, Kayseri, Turkey.
[a]ORCID: 0000-0002-6327-1604; [b]ORCID: 0000-0001-9094-677X; [c]ORCID: 0000-0003-2404-0384

✉Corresponding author: gorkemekebas@gmail.com
Received date: 26.05.2019- Accepted date: 20.09.2019

**Abstract:** The carcasses of three 1-year-old, Leghorn chickens were presented for necropsy; one of the chickens was told to have shown neurological signs before death. At necropsy, meningeal and cerebral hyperemia were observed in the carcass that had neurological symptoms, and diarrhea was evident in the other two chickens. Histopathological examination revealed nonsuppurative meningoencephalitis, myositis in skeletal and cardiac muscles, and focal nonsuppurative hepatitis, and nephritis. Bradyzoites and tachyzoites were present in the meninges and brain. The present case is the first report of *Toxoplasma gondii* infection in a chicken in Turkey.
**Keywords: C**hicken, histopathology, *Toxoplasma gondii.*

### Bir tavukta doğal toksoplazmozis olgusu

**Özet:** Bu çalışmanın materyalini nekropsi yapılması amacıyla getirilen ve bir tanesi sinirsel semptom göstererek ölen, bir yaşlı üç adet beyaz Leghorn ırkı ölü tavuk oluşturdu. Nekropside sinirsel semptom göstererek ölen tavukta meninksler ve beyinde hiperemi, diğer iki tavukta diyare dışında herhangi bir patolojik bulguya rastlanmadı. Dokulardan alınan örneklerin histopatolojik muayenesinde nonsuppuratif meningoensefalitis, iskelet ve kalp kasında myozitis, fokal nonsuppuratif hepatitis ve nefritis görüldü. Meninksler ve beyinde bradizoit ve serbest takizoitler gözlendi. Histopatolojik incelemeler sonucunda toksoplazmozis olarak tanımlanan bu olgu Türkiye'de tavuklarda bildirilen ilk vakadır.
**Anahtar sözcükler:** Histopatoloji, tavuk, *Toxoplasma gondii.*

Toxoplasmosis is a systemic protozoal disease caused by the intracellular protozoan *Toxoplasma gondii* that infects multiple mammalian, poultry and wild bird species (9, 14, 18, 19). In addition to naturally occurring toxoplasmosis cases in domestic birds, experimental studies have been carried out in many species such as white quails, Japanese quails, chickens, broilers, pigeons, turkeys, and pheasants (2, 3, 7, 8, 14). *Toxoplasma gondii* has a subclinical course in many avian species. The prevalence of *T. gondii* in naturally infected poultry varies greatly (5, 10, 12, 18). Studies reported that the prevalence in caged and free-range chickens were 30-50% and 100%, respectively (10, 20). Soil contamination with oocysts excreted by infected cats is an important factor in the development of disease in free-range poultry (10). Several seroprevalences (1, 16) and experimental studies (2, 3, 8, 14) have been conducted with domestic and wild avian species in Turkey. In this article, we describe the histopathological features of a *T. gondii* infection in a chicken from a family backyard farm consisting of 15 free-range Leghorn chickens.

Carcasses of three 1-year-old, Leghorn chickens were presented for a necropsy. One of the chickens had shown partial hind limb paresis and torticollis before death and the other two had shown non-specific clinical signs, including diarrhea. Additionally, presence of cats and their contact with chicken in the family backyard farm was reported by the animal owner. At necropsy, no macroscopic lesion was observed except meningeal and cerebral hyperemia in the carcass with neurological symptoms. Necropsy of the two other chickens revealed watery intestinal content. Collected tissue samples were fixed in 10% neutral formalin. After 48-hour fixation, tissue specimens were processed routinely and sectioned at 5 μm. After staining with hematoxylin and eosin (H&E), slides were examined under a light microscope (Olympus, BX51). Histological examination of the brain revealed edema, hyperemia and hemorrhages while

lymphocytic infiltration and fibrin deposition were seen over meninges (Figure 1A, 1B). There were irregularly-shaped necrotic areas in the substantia grisea, particularly in the occipital and temporal lobes. Edema, gliosis large haemorrhage areas (Figure 1C), and perivascular cuffing by lymphocytes (Figure 1D) were also observed in the brain parenchyma. Approximately 2x5 µm, elongated, banana-shaped structures resembling *T. gondii* tachyzoites (Figure 2A, 2B) and perivascular and meningeal-located bradyzoites were present in the surroundings of necrotic foci (Figure 2C-F). The presence of lymphocyte-rich mononuclear cell infiltration was noted among myocardial and skeletal muscle fibers (Figure 3A, 3B). Focal hemorrhage and hyperemia of the liver and kidneys accompanied mononuclear cell infiltrations, predominantly composed of lymphocytes (Figure 3C, 3D). The other two chickens were examined microscopically and no pathological findings associated with toxoplasmosis were observed.

Although clinical disease is rarely seen in chickens, they are one of the most sensitive domestic species for *T. gondii* infection (6, 11). Contamination occurs by ingesting sporulated oocytes that are spread to the environment by the feces of cats (17). Due to their ground-feeding behaviour, free-range chickens are more susceptible to contaminated food and water than caged chickens (15). In this report, we describe histopathologically diagnosed toxoplasmosis in a Leghorn chicken referred for necropsy. Researchers have reported that contact with the feces of infected cats in the small backyard farms may increase the possibility of contamination with oocysts (15, 17). In the present case, the information from the animal owner suggests that toxoplasmosis in chickens might have been transmitted from cat feces.

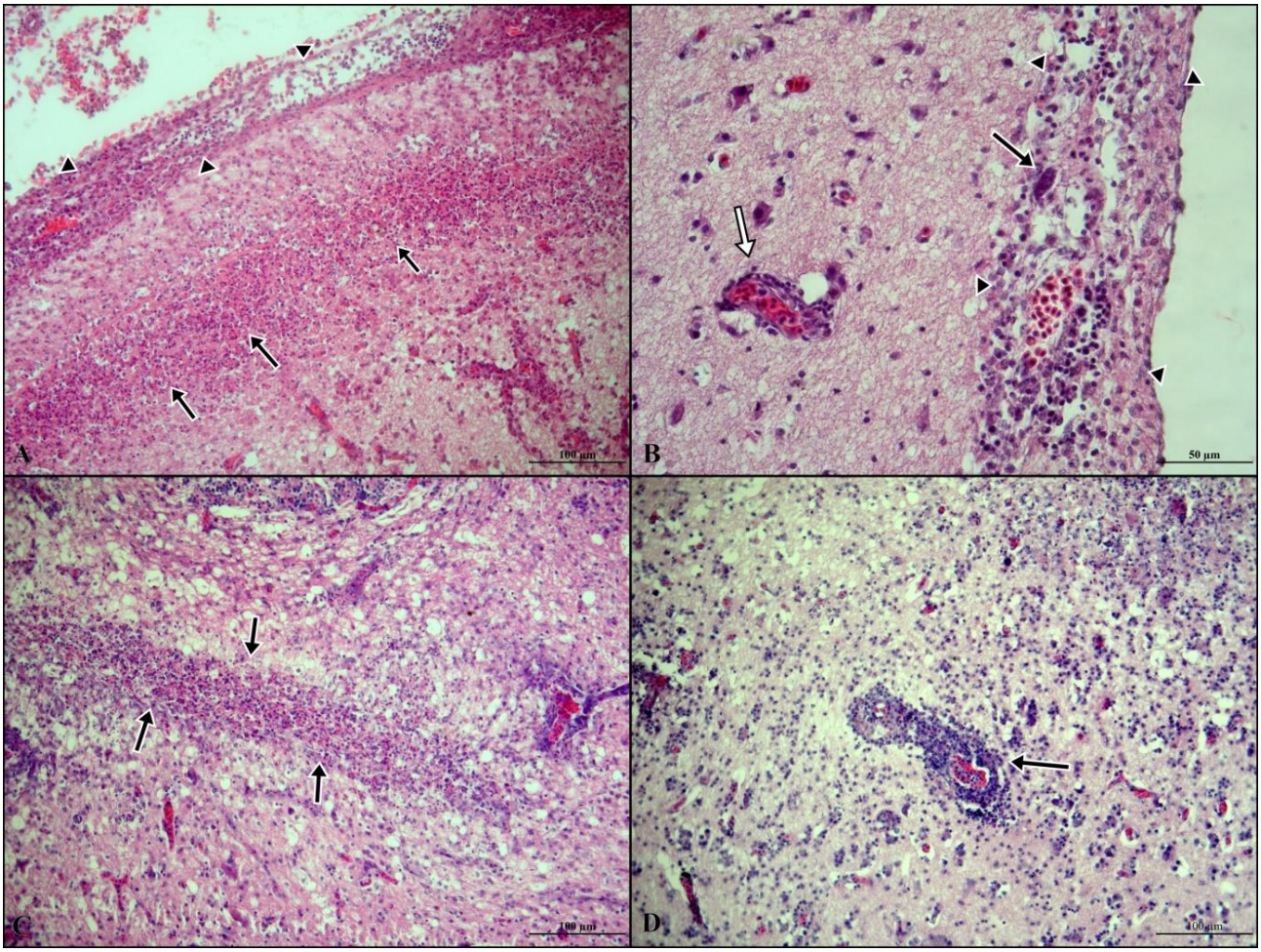


**Figure 1. A.** Large necrosis areas (arrows) in the brain parenchyma and meningitis (arrowheads), H&E, Scale bar: 100µm **B.** Perivascular cell infiltration (white arrow), meningitis (arrowheads) and bradyzoite cysts (black arrow) H&E, Scale bar: 50µm, **C**. Edema and necrotic areas in the brain parenchyma (arrows) H&E, Scale bar: 100µm, **D.** Perivascular lymphocytic cell infiltrations (perivascular cuffing formation) in the brain parenchyma (arrow), H&E, Scale bar: 100µm, chicken.

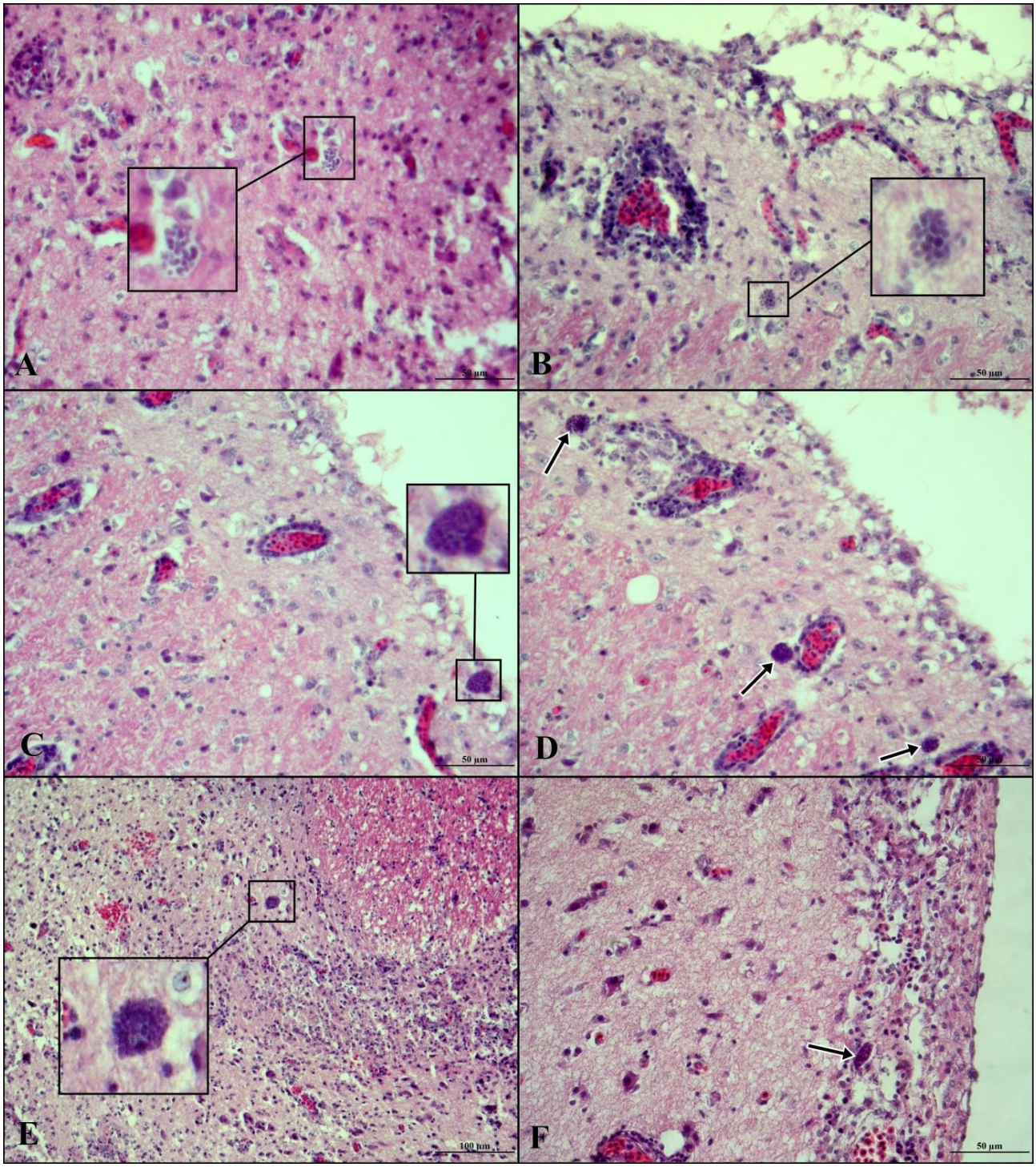


**Figure 2. A.** The appearance of free tachyzoites in the brain parenchyma, H&E, Scale bar: 50µm; **B.** The appearance of bradyzoites in the brain parenchyma, H&E, Scale bar, 50µm, **C.** The appearance of bradyzoites in brain parenchyma, H&E, Scale bar: 100µm, **D.** Perivascular forms of bradyzoites in the brain parenchyma (arrow), H&E, Scale bar: 50µm, **E.** Bradyzoites in the periphery of the necrotic area in brain parenchyma, H&E, Scale bar: 100µm, **F.** The appearance of bradyzoites (arrow) in meninges, HxE, Scale bar: 50µm.

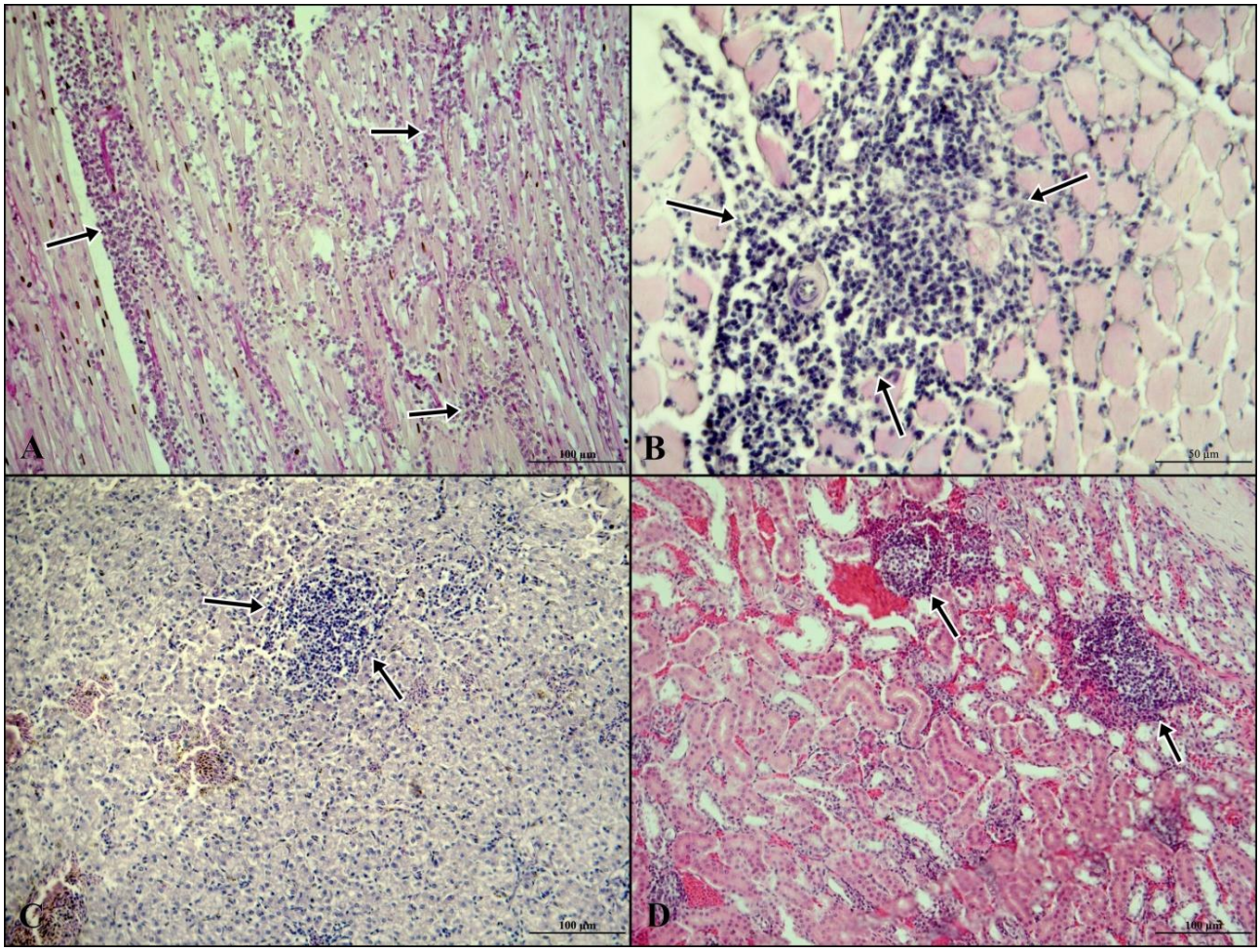


**Figure 3.** Intense lymphocytic cell infiltration among heart (A. Scale bar: 100µm) and skeletal muscle fibers (B. Scale bar: 50µm) (arrows); the areas of focal lymphocytic cell infiltration in liver (C. Scale bar: 100µm) and kidney (D. Scale bar: 100µm) (arrows), H&E.

Nonspecific clinical findings including diarrhea were present in two of the three dead chickens in our case and it was similar with previous reports (2, 13). Immunohistochemistry and histopathological examination are important techniques to confirm the diagnosis of toxoplasmosis (13). Mostly, immunohistochemistry is required in cases where toxoplasmosis cannot be diagnosed histopathologically. An immunohistochemical examination could not be performed in this case because we did not have chicken compatible anti-*T. gondii* antibody, but histopathological examination revealed bradyzoites and tachyzoites of *T. gondii* in brain sections. For the diagnosis of *T. gondii*, organs such as brain, liver, lung, myocardium, small intestine, and spleen (4, 13) should be sampled, and observation of protozoal cysts and tachyzoites is important in definitive diagnosis (4, 6). Necrosis and cell infiltrations in toxoplasmosis are related to inflammation, and necrotic changes have been associated with intracellular proliferation of the parasite (6). In this report, the observation of *T. gondii* bradyzoites and tachyzoites in the brain parenchyma and the presence of necrotic areas and perivascular lymphocytic cuffings enabled us to consider this case as a *T. gondii* infection. The results were consistent with the findings of other researchers who reported meningoencephalitis, myositis, focal hepatitis, and nephritis (4, 6, 13).

In conclusion, this is the first spontaneous case of toxoplasmosis detected during histopathological examination in a one-year-old Leghorn chicken in Turkey. The animal showed no clinical signs and was reported to be in contact with cats before death. Therefore, we aim to drew attention to chickens in contact with cats regarding toxoplasmosis.

## Conflict of Interest

The authors declared that there is no conflict of interest.

## References

1. **Altınöz F, Babür C, Kılıç S** (2007): *Konya yöresinde yumurta tavuklarında Sabin-Feldman boya testi ile Toxoplasma gondii (Nicolle ve Manceaux, 1908)*

*seropozitifliğinin araştırılması*. Turkiye Parazitol Derg, **31**, 4-6.

2. **Bianeifiori F, Rondini C, Grelloni V, et al** (1986): *Avian toxoplasmosis: Experimental infection of chicken and pigeon*. Comp Immunol Microbiol Infect Dis, **9**, 337-346.
3. **Boch J, Rommel M, Weiland G, et al** (1966): *Experimentelle Toxoplasma-infectionen bei Legehennen*. Berl Munch Tierarztl Wochenschr, **79**, 352-355.
4. **Casagrande RA, Pena HF, Cabral AD, et al (**2015): *Fatal systemic toxoplasmosis in Valley quail (Callipepla californica).* Int J Parasitol Parasites Wildl, **4**, 264-267.
5. **Devada K, Anandan R, Dubey JP** (1998): *Serologic prevalence of Toxoplasma gondii in chickens in Madras, India*. J Parasitol, **84**, 621-622.
6. **Dubey JP, Lappin MR** (2015): Toxoplasmosis and neosporosis. 806-821. In: CE Greene (Ed), Infectious Diseases of the Dog and Cat. Elsevier Saunder, St. Louis, Missouri.
7. **Dubey JP, Ruff MD, Camargo ME, et al** (1993). *Serologic and parasitologic responses of domestic chickens after oral inoculation with Toxoplasma gondi oocysts*. Am J Vet Res, **54**, 1668-1672.
8. **Dubey JP, Ruff MD, Kwok OCH, et al** (1993): *Experimental toxoplasmosis in bobwhite quail (Colinus virginianus).* J Parasitol, **79**, 935-936.
9. **Dubey JP** (2002): *A review of toxoplasmosis in wild birds*. Vet Parasitol, **106**, 121-53.
10. **Dubey JP** (2010): *Toxoplasma gondii infections in chickens (Gallus domesticus): prevalence, clinical disease, diagnosis and public health significance*. Zoonoses Public Health, **57**, 60-73.
11. **Dubey JP, Webb DM, Sundar N, et al** (2007): *Endemic avian toxoplasmosis on a farm in Illinois: clinical disease, diagnosis, biologic and genetic characteristics of Toxoplasma gondii isolates from chickens (Gallus domesticus), and a goose (Anser anser)*. Vet Parasitol, **148**, 207-212.
12. **El-Massary A, Mahdy OA, El-Ghaysh A, et al** (2000): *Prevalence of Toxoplasma gondii antibodies in sera of turkeys, chickens, and ducks from Egypt*. J Parasitol, **86**, 627-628.
13. **Jones KH, Wilson FD, Fitzgerald SD, et al** (2012): *A natural outbreak of clinical toxoplasmosis in a backyard flock of guinea fowl in Mississippi*. Avian Dis, **56**, 750-753.
14. **Kaneto CN, Costa AJ, Paulillo AC, et al** (1997): *Experimental toxoplasmosis in broiler chicks*. Vet Parasitol, **69**, 203-210.
15. **Millar PR, Alves FM, Teixeira VQ, et al** (2012): *Occurrence of infection with Toxoplasma gondii and factors associated with transmission in broiler chickens and laying hens in different raising systems.* Pesqui Vet Bras, **32**, 231-236.
16. **Muz MN, Kılınç ÖO, İşler CT** (2015): *Bazı yabani kuşların beyin dokularında Toxoplasma gondii ve Neospora caninum'un moleküler tanısı*. Kafkas Univ Vet Fak Derg, **21**, 173-178.
17. **Ruiz A, Frenkel JK** (1980): *Intermediate and transport hosts of Toxoplasma gondii in Costa Rica*. Am J Trop Med Hyg, **29**, 1161-1166.
18. **Siim JC, Biering-Sorensen U, Moller T** (1963): *Toxoplasmosis in domestic animals*. Adv Vet Sci, **8**, 335-337.
19. **Tenter AM, Heckeroth AR, Weiss LM** (2000): *Toxoplasma gondii: from animals to humans.* Int J Parasitol, **30**, 1217-1258.
20. **Zhu J, Yin J, Xiao Y et al** (2008)**:** *A sero-epidemiological survey of Toxoplasma gondii infection in free-range and caged chickens in northeast China.* Vet Parasitol, **158**, 360-363.