

Disease Conditions in Cats and Dogs Diagnosed at the Post-Mortem Laboratory of the Faculty of Veterinary Medicine, Universiti Putra Malaysia between 2005 and 2015

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ABSTRACT

Keeping pets is a growing trend in Malaysia. This retrospective study involves data analysis of cases of dogs and cats submitted to the Post-Mortem Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia between 2005 and 2015. A total of 37 disease conditions were diagnosed among dogs with septicaemia (10.2%), mammary gland tumor (8.4%) and canine distemper (7.9%) were significantly ($p < 0.05$) more frequently diagnosed. In cats, a total of 27 disease conditions were diagnosed with traumatic injuries (19.5%), feline infectious peritonitis (15.1%) and sporotrichosis (12%) were significantly ($p < 0.05$) more frequent. Poor awareness among pet owners towards the health requirements of their pets is a main reason for the above.

Keywords: Post-mortem, common, health problems, diseases, dogs, cats

INTRODUCTION

Keeping pets such as dogs, cats, fish, reptiles and birds has become a growing trend

worldwide making the death of pet animals an important issue. One of the ways to identify the cause of death of pet animals is by post-mortem examination (Weber et al., 2008). This method of examination provides an opportunity to undertake a thorough examination of dead animals (Berglund et al., 2003).

There are limited studies on the common health problems and their associated pathological changes in cats and dogs. This study was designed to identify the common health problems

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based on pathological examinations on local dogs and cats presented to the Post-Mortem Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia (UPM). This study also describes the pathological changes associated with the common health problems observed in cats and dogs.

MATERIALS AND METHODS

Data Collection

Case records at the Post-Mortem Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia between 2005 and 2015 were selected. These included the records of necropsy, biopsy and disposal cases involving dogs and cats. Only those cases with a confirmatory diagnosis were included in this study. Details on the identity, age, history, and clinical health history that lead to death, the gross lesions, histological changes and associated laboratory results were analysed.

Data Analysis

The data was analysed using Statistical Packages for the Social Sciences (SPSS) version 22. The data was categorical and non-continuous, thus non-parametric test was used in data analysis. All tests were done at 95% confidence interval level. Subsequently, Pearson's chi-square test was used to determine the occurrence rate of all diseases and to identify the prevalence of the three most common diseases in both dogs and cats.

Histopathology

Following analysis of the records, the three most common diseases in dogs and cats were identified. Ten representative cases for each of the three common diseases of dogs and ten common diseases of cats were randomly selected. Paraffin blocks were collected from the Histopathology Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia and were subjected to routine histopathology slide preparation. The blocks were sectioned at 4 µm using a microtome (Reichert-Jung 2045 Multicut Rotary Microtome, Canada) and were then subjected to routine staining using Harris' Haematoxylin and Eosin (H&E).

All tissue sections were viewed with the Olympus CX31 upright microscope which was attached to Olympus U-CAM3 and Hpx2301 monitor. The associated histopathological changes were identified and described for each disease. Gross lesions were noted following analyses of records.

RESULTS

Disease Prevalence among Dogs

A total of 762 cases among dogs were selected and subjected to data analysis. A total of 35 diagnoses were made (Figure 1). The three most common health problems among dogs were septicaemia (10.2%), mammary gland tumor (8.4%) and canine distemper (7.9%). They were diagnosed significantly ($p < 0.001$) more frequent than the remaining 32 diseases among dogs (Figure 1).

Gram-negative bacteria were the most common cause of septicaemia (66%), followed by a mixture of Gram-positive and Gram-negative (15%), while Gram-positive bacteria were involved in only 1% of the septicaemic cases of dogs. The involvement of Gram-negative bacteria in canine septicaemia was significantly ($p < 0.01$) higher than Gram-positive bacteria.

The common gross and histopathological lesions that were observed in cases of septicemia were multiple organ congestion including the spleen, liver, lungs (Figure 2(a)), kidney and gastrointestinal tract. Haemorrhagic spleen and haemorrhagic suppurative gastroenteritis (Figure 2(b)) were also reported.

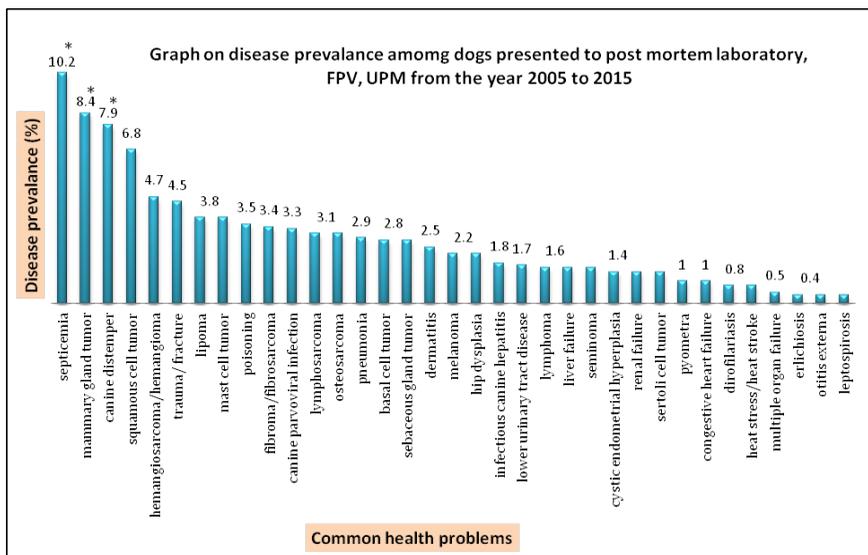


Figure 1. Prevalence of disease and health problems among dogs presented to the Post-mortem Laboratory between 2005 and 2015. Chi-square test, $X^2 (34, N=762) = 513.552$. *indicates significant difference at $p < 0.001$

A total of 64 cases for dogs were diagnosed as mammary gland tumor. The most common type was the mammary gland carcinoma accounting for 37 cases (57.8%), followed by 3 cases (4.7%) of mammary gland adenoma, and a case (1.6%) of mammary gland adenocarcinoma. However, a total of 23 cases (35.9%) were unclassified. Thus, the mammary gland carcinoma was significantly more common than other types of canine mammary gland tumours [$X^2 (3,$

$N=64) = 73.6, p < 0.05$]. Among the 64 cases of mammary gland tumour, 78.1% ($n=50$) involved intact dogs and 84% ($n=42$) of these intact dogs were above 4 years old.

The common gross lesion observed in mammary gland tumour was the presence of masses at the ventral abdomen, which was observed in 58 cases (90.6%) while the remaining 6 cases (9.8%) were from biopsy cases with incomplete reports. On the other hand, histopathological examination

revealed the loss of tubular structure of the mammary gland (Figure 2(c)) and the presence of pleomorphic cells. In mammary gland adenoma, the lesions included loss of myoepithelium of the mammary gland (Figure 2(d)).

There was a total of 60 (7.9%) canine distemper cases. Among these, 91.7% (n=55) involved young dogs of less than 1 year old. The common lesion in canine distemper included cephalic congestion

with malacia, oedema and anoxic neurons (Figure 2(e)). Pulmonary congestion and oedema (Figure 2(f)), and mucosal petechiation of the gastrointestinal tract were frequently reported. Hyperkeratosis of the nose and footpads were also noticed. Based on the provided history, many of these dogs experienced central nervous system manifestation such as ataxic gait and depression.

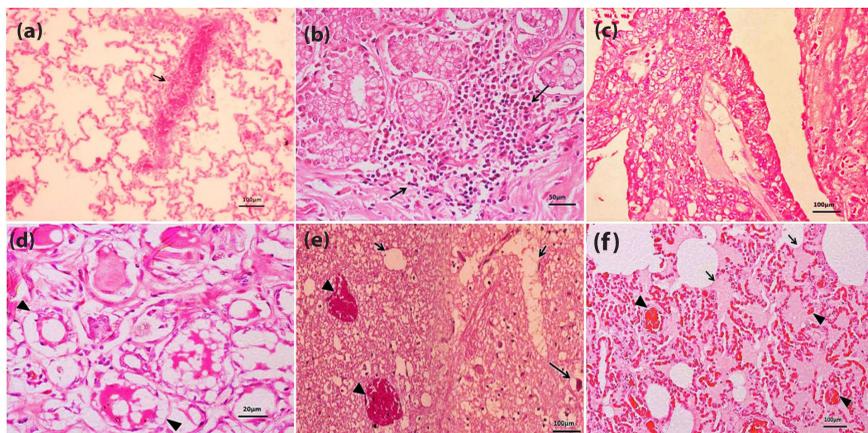


Figure 2. (a) Severe pulmonary congestion of a blood vessel (arrow) and interalveolar capillaries (H&E, 100x magnification, bar = 100 μ m). (b) Suppurative gastritis with mixture of macrophages and neutrophils (arrows) in the mucosa of stomach (H&E, 400x magnification, bar = 50 μ m). (c) Mammary gland carcinoma showing complete loss of tubular structures (H&E, 100x magnification, bar = 100 μ m). (d) Loss of myoepithelial surrounding the mammary gland tubules (arrowheads) (H&E, 400x magnification, bar = 20 μ m). (e) Severe congestion of the brain (arrowheads), accompanied by generalised mild to moderate spongiosis (short arrow) and anoxic neuron (long arrow) (H&E, 100x magnification, bar = 100 μ m). (f) Severe pulmonary oedema with generalised pulmonary congestion (arrowheads) and thickening of interalveolar septa (arrow). (H&E, 100x magnification, bar = 100 μ m)

Disease Prevalence among Cats

A total of 866 cases among cats were analysed, resulting in 27 health problems being diagnosed (Figure 3). The three most common health problems among cats were traumatic injury (19.5%), feline infectious peritonitis (FIP) (15.0%) and sporotrichosis

(12%). They were diagnosed more frequently ($p<0.001$) than the remaining 24 diseases (Figure 3).

Road traffic accidents appeared to be the most frequent cause of traumatic injuries (96 cases, 56.8%), followed by the high-rise syndrome (39 cases, 23.1%), blunt object

trauma (15 cases, 8.9%) and fighting (10 cases, 5.9%). Traumatic injuries of unknown cause involved 9 cases (5.3%). The road traffic accident was significantly high among the traumatic injury of cats [$X^2(4, N=169) = 200.8, p<0.05$]. The gross lesions observed in traumatic injuries included spinal injury with transected spinal, head trauma with brain haemorrhages, multiple fractures, herniation, haemoabdomen, haemothorax and contusion. Histopathological examination was done in cases of traumatic injury.

The second most common health problem among cats was feline infectious peritonitis (130 cases; 15%). It appeared that effusive FIP was more frequently observed (90 cases, 69.2%) followed by the dry form (28 cases, 21.5%) and the mixed form (13 cases, 10.0%). The effusive form was significantly more frequent compared

with the other two forms [$X^2(2, N= 131) = 114.5, p<0.01$]. Among the affected cats with effusive form, 75.6% ($n=68$) involved cats between 4 months and 2 years old.

The effusive form of FIP resulted in ascites, hydrothorax and thickening of the wall of small intestine with hemorrhagic mucosa. Histopathology revealed pulmonary vasculitis (Figure 4(a)) and focal pulmonary necrosis (Figure 4(b)). The non-effusive form showed pulmonary and hepatic pyogranuloma. The affected liver was firm with fibrins adhesion. Congestive non-suppurative meningitis (Figure 4(c)) and hydropericardium were also observed. On the other hand, the mixed form involved combination of both effusive and non-effusive forms. The frequently observed lesions were ascites and multifocal diffuse pyogranuloma in multiple organs.

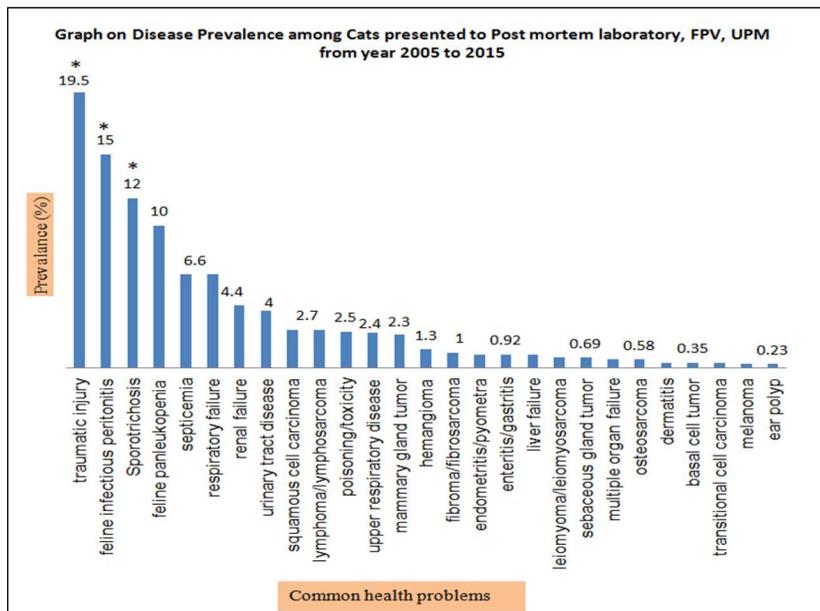


Figure 3. Graph on disease prevalence among cats presented to Post-mortem Laboratory, Faculty of Veterinary Medicine, UPM between 2005-2015. Chi-square test, $X^2(26, N=866) = 1150.1$. * indicates significant difference at $p<0.001$

Sporotrichosis was the third most frequent health problems among cats with reported 104 cases (12%). The common lesion observed in the affected cats was the

non-healing wound. Histology revealed the presence of spores either freely or within the macrophages within the non-healing wounds (Figure 4(d)).

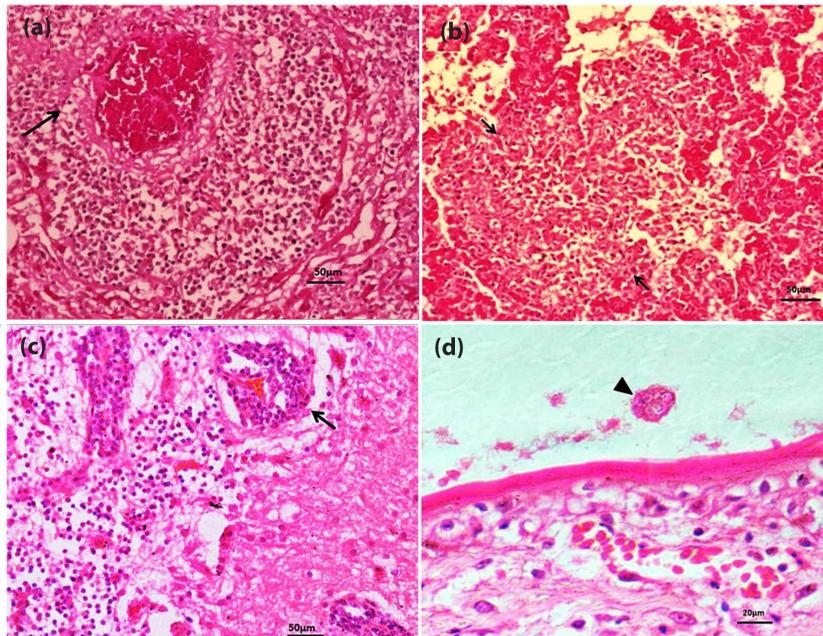


Figure 4. (a) Pulmonary vasculitis (arrows) and pulmonary congestion in effusive FIP (H&E, 400x magnification, bar= 50 μ m). (b) Pulmonary focal necrosis (arrows) (H&E, 400x magnification, bar = 50 μ m). (c) Histopathological section of the brain showing numerous infiltrations of inflammatory cells mostly neutrophils indicating suppurative meningitis and vasculitis (arrow) (H&E, 400x magnification, bar = 50 μ m). (d) Non-healing wound showing spores of *Sporotrix schenckii* (arrowhead) within a macrophage (H&E, 1000x magnification, bar = 20 μ m).

DISCUSSION

In this study, septicaemia is the most common health problem among dogs and the fifth most common for cats. This is in agreement with previous reports (Koenig, 2011; Ramachandran 2014). Bacteriological culture revealed frequent involvement of Gram-negative bacteria, as previously report by Svanbom (1979). The Gram-negative

bacteria produce potent endotoxins, leading to dilation of blood vessels in various organs and eventually sepsis (Ramachandran, 2014). Similarly, septicaemia is among the important diseases that cause death in humans (Bone et al., 1997).

Most cases of septicaemia reported in this study revealed inflammatory reaction in the mucosa of either stomach

or small intestinal. This indicates that most septicaemic cases in dogs originated from the gastrointestinal tract (Deitch et al., 1987). In veterinary practice, animals are generally administered with antibiotics to prevent and treat septicaemia, causing lysis of the Gram-negative bacteria and the release of high amount of endotoxin, leading to death caused by endotoxin shock (Remick, 2007; Ramachandran, 2014). Septicemia can also originate from external injuries such as contaminated fight wound or cuts and also pyothorax, peritonitis, pneumonia or ulcerative gastritis (Lefort et al., 2011)

An earlier study reported that mammary gland tumour was the most common tumour in female dogs (Brigitte et al., 2012). This study supported those findings and found the high prevalence of mammary gland tumour among dogs in Malaysia was possibly due to low awareness on the importance of neutering pets.

Canine distemper occurs among dogs that have been not properly vaccinated (Frolich, 2002). Chung et al. (2011) concluded that the main histopathology lesions are lymphoid depletion in the spleen and thymus atrophy, which was not observed in this present study. Greene and Appel (2006) concluded that most cases of canine distemper show acute non-inflammatory lesion in the brain in the form of spongy vacuolation, as observed in this study. Hyperkeratosis of nose and digits is commonly seen in dogs with central nervous signs of delayed response to infection (Greene and Appel, 2006; Martella

et al., 2008) was also reported in this study. Vaccination against canine distemper is categorised as vital suggesting the high prevalence of the disease in Malaysia was possibly the result of lack of vaccination of pets.

Traumatic injury is the most common cause of death among cats compared with dogs. Intact and out-door cats are prone to traumatic injuries (Rochlitz et al., 2004) caused by road traffic accident (Rochlitz et al., 2004) and the USA (Kolata, 1980).

FIP in many parts of the world (Foley et al, 1997) is due to the absence of effective vaccine (Fehr et al., 1997) and availability of effective treatment regimen (Hartmann & Ritz, 2008).

It is interesting to note that sporotrichosis is one of the most common diseases among cats which leads to systemic infection (Barros et al., 2011) and their prolonged treatment with antifungal drugs (Gremiao et al., 2015). Furthermore, its zoonotic potential leads to most owners opting to euthanise the infected pets.

CONCLUSIONS

The most common health problems among dogs are septicemia, mammary gland tumor and canine distemper. On the other hand, traumatic injuries, FIP and sporotrichosis occurred more frequently in cats, which may be prevented through pet vaccinations.

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REFERENCES

- Baker, L. (2015). *Rabies Outbreak in Northern Malaysia Ends after Vaccination and Culling Campaigns*. Global Alliance for Rabies Control. Retrieved from <https://rabiesalliance.org/media/news/rabies-outbreak-in-northern-malaysia-ends-after-vaccination-and-culling-cam>
- Barros, M. B. L., Almeida-Paes, R., & Schubach, A. O. (2011). *Sporothrix Schenckii* and Sporotrichosis. *Clinical Microbiology Revision*, 24(4), 633-654.
- Beineke, A., Puff, C., Seehusen, F., & Baumgärtner, W. (2009). Pathogenesis and Immunopathology of Systemic and Nervous Canine Distemper. *Veterinary Immunology and Immunopathology*, 127(1), 1-18.
- Berglund, B., Steinbock, L., & Elvander, M. (2003). Causes of Stillbirth and Time of Death in Swedish Holstein Calves Examined Post Mortem. *Acta Veterinaria Scandinavica*, 44(3), 111-120.
- Blouin, D. M. (2013). Are Dogs Children Companion or Just Animals? Understanding the Variations in People's Orientation Towards Animals. *Anthrozoös*, 26(2), 279-294.
- Bone, R. C., Grodzin, C. J., & Balk, R. A. (1997). Sepsis: A New Hypothesis for Pathogenesis of the Disease Process. *Chest*, 112(1), 235-243.
- Brigitte, G. J., Maria, R. R., & Juan, M. E. (2012). Presence of Lung Metastases in Bitch Affected by Malignant Mammary Neoplasm in Medellin (Colombia). *Revista MVZ Córdoba*, 17(2), 2983-2990.
- Chung, T. L., Ling, L. C., Brayton, C., Fei, V. P., Shiann, C. W., Szu, W. H., ... & Chen, H. L. (2011). Canine Distemper in Taiwan from 2000 -2009: Co-Infections and the Use of RT-PCR and Immunohistochemistry to Detect Tissue Involvement in Two Groups of Dogs. *International Journal of Applied Research in Veterinary Medicine*, 9(3), 265-277.
- Day, M. J., Horzinek, M. C., Schultz, R. D., & Squires, R. A. (2016). Guidelines for the Vaccination of Dogs and Cats. *Journal of Small Animal Practice*, 57, E1- E45.
- Deitch, E. A., Winterton, J., Li, M., & Berg, R. (1987). The Gut as Aportal of Entry for Bacteremia. *Annals of Surgery*, 205(6), 681-692.
- Fehr, D., Holznagel, E., Bolla, S., Hauser, B., Herrewegh, A., Horzinek, M. C., & Lutz, H. (1997). Placebo-Controlled Evaluation of a Modified Life Virus Vaccine against Feline Infectious Peritonitis: Safety and Efficacy under Field Conditions. *Vaccine*, 15(10), 1101-1109.
- Foley, J. E., Poland, A., Carlson, J., & Pedersen, N. C. (1997a). Risk Factors for Feline Infectious Peritonitis among Cats in Multiple-Cat Environments with Endemic Feline Enteric Coronavirus. *Journal of American Veterinary Medical Association*, 210(9), 1313-18.
- Frölich, K. (2002). Canine Distemper. *European Association of Zoo and Wildlife Veterinarians Transmissible Disease Fact Sheet*, 11, 1-3.
- Ganesan, J., & Sinniah, M. (1993). Occurrence of Human Rabies in Peninsular Malaysia. *Medical Journal of Malaysia*, 48(2), 194-194.
- Gray, P. B., Volsche, S. L., Garcia, J. R., & Fisher, H. E. (2015). The Roles of Pet Dogs and Cats in Human Courtship and Dating. *Anthrozoös*, 28(4), 673-683.

- Greene, C. E., & Appel, M. J. (2006). Section 1: Viral, Rickettsial, Chlamydial and Mycoplasma Diseases, Chapter 3: Canine Distemper. In C. E. Greene (Eds.), *Infectious Diseases of Dogs and Cats* (pp. 25-40). St. Louis, Missouri: W.B. Saunders Elsevier
- Gremião, I. D. F., Menezes, R. C., Schubach, T. M. P., Figueiredo, A. B. F., Cavalcanti, M. C. H., & Pereira, S. A. (2015). Feline Sporotrichosis: Epidemiological and Clinical Aspect. *Medical Mycology*, 53(1), 15-21.
- Hartmann, K., & Ritz, S. (2008). Treatment of Cats with Feline Infectious Peritonitis. *Veterinary Immunology Immunopathology*, 123(1), 172-175.
- Koenig, A. (2011). Surviving Sepsis: Does Anything Make a Difference? *American College of Veterinary Sciences*. Athens: University of Georgia.
- Kolata, R. J. (1980) Trauma in Dogs and Cats: An Overview. *Veterinary Clinics of North America: Small Animal Practice*, 10(3), 515-522.
- Lefort, A., Panhard, X., Clermont, O., Woerther, P. L., Branger, C., Mentre, F., ... & Denamur, E. (2011). Host Factors and Portal of Entry Outweigh Bacterial Determinants to Predict the Severity of *Escherichia Coli* Bacteremia. *Journal of Clinical Microbiology*, 49(3), 777-783.
- Majelan, S. (2016, August 16). PAWS UP: Dedicated to saving lives of shelter animals in Malaysia. *Malaysian Digest*. Retrieved from <http://www.malaysiandigest.com/frontpage/282-main-tile/626605-paws-up-dedicated-to-saving-lives-of-shelter-animals-in-malaysia.html>
- Martella, V., Elia, G., & Buonavoglia, C., (2008). Canine Distemper Virus. *Veterinary Clinics Small Animal Practice*, 38(4), 787-797
- Martin, G. S., Mannino, D. M., Eaton, S., & Moss, M. (2003). The Epidemiology of Sepsis in United States from 1997 through 2000. *The New England Journal of Medicine*, 348(16), 1546-1554.
- Pedersen, N. C. (2009). A Review of Feline Infectious Peritonitis Virus Infection: 1963–2008. *Journal of Feline Medicine and Surgery*, 11(4), 225-258.
- Ramachandran, G. (2014). Gram-Positive and Gram-Negative Bacterial Toxin in Sepsis. *Virulence*, 5(1), 213-218.
- Remick, D. G. (2007). Pathophysiology of Sepsis. *The American Journal of Pathology*, 170(5), 1435-1444.
- Rochlitz, I. (2004). Clinical Study of Cats Injured and Killed in Road Traffic Accidents in Cambridgeshire. *Journal of Small Animal Practice*, 45(8), 390-394.
- Rutteman, G. R. (2011). Mammary Tumors in the Dog. *Journal of Clinical Investigation*, 95(5), 1-13.
- Svanbom, M. (1979). Septicemia I. A Prospective Study on Etiology, Underlying Factors and Source of Infection. *Scandinavian Journal of Infectious Diseases*, 11(3), 187-198.
- Weber, M. A., Ashworth, M. T., Risdon, R. A., Hartley, J. C., Malone, M., & Sebire, N. J. (2008). The Role of Post Mortem Investigation in Determining the Cause of Sudden Unexpected Death in Infancy. *Archives of Disease in Childhood*, 93(12), 1048-1053.
- Welsh, R. D. (2003). Sporotrichosis. Zoonotic Update. *Journal of the American Veterinary Medical Association*, 223(8), 1123-1126.

