*Short communication*

# Prevalence and Distributions of Feline Immunodeficiency Virus and Feline Leukemia Virus Infections in Bangkok and Its Vicinity, Thailand During 2013-2014

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***Abstract***

Feline immunodeficiency virus (FIV) and Feline leukemia virus (FeLV) are known as pathogens associated with chronic diseases in cat. This present study determined the prevalence of FIV and FeLV infections in Bangkok and its vicinity, including Nonthaburi and Pathumthani, during April 2013-March 2014 in owned cats. A total of 777 serum or plasma samples were submitted to a private veterinary laboratory in Bangkok. The prevalence of FIV infection, FeLV infection and co-infection was 5.4% (42/777), 16.5% (128/777) and 3.5% (27/777), respectively. The infections were detected all year round, with higher prevalence of FeLV infection. In addition, geographical analyses revealed that FIV and FeLV infections were widely spread in Bangkok and its surrounding areas with similar patterns of geographical distribution. The information provided updated the epidemiological information and will be useful for the development and monitoring of disease management and control.

**Keywords:** Bangkok**,** feline immunodeficiency virus, feline leukemia virus, geographical distribution, prevalence

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## Introduction

Feline immunodeficiency virus (FIV) and Feline leukemia virus (FeLV) are pathogens in cat and belong to the family *Retroviridae*. FIV and FeLV are closely related but the clinical outcomes are different depending on disease stages. FeLV and FIV infections are endemic worldwide and associated with feline chronic diseases. In North America, the reported prevalence of FIV, FeLV and co-infections was 2.5, 2.3, and 0.3%, respectively (Levy et al., 2006). The geographical distribution of FIV and FeLV during 2000-2011 indicated that both diseases were widely distributed in the United States (Chhetri et al., 2013). In Asia, FIV and FeLV infections were also reported in Vietnam and Malaysia (Bande et al., 2012; Nakamura et al., 2000). In Thailand during May and July 2009, the prevalence of FIV and FeLV infections was 20.1 and 24.5%, respectively (Sukhumavasi et al., 2012). Updated information on the prevalence and geographical distribution are crucial for monitoring of disease management and control strategy for FIV and FeLV infections in the future. The aim of this study was to conduct a retrospective study to determine the prevalence of FIV and FeLV infections in Bangkok and its vicinity during 2013-2014.

## Materials and Methods

***Animal samples:*** This study was retrospectively conducted from 777 serum or plasma samples of owned cats from 500 veterinary clinics and hospitals in Bangkok and its vicinity, including Nonthaburi and Pathumthani provinces, submitted to a private laboratory (VET CENTRAL LAB, Bangkok, Thailand) during April 2013 to March 2014. The samples were kept at 4$^{o}$C before delivering to the laboratory for testing of FIV and FeLV infections. The test was requested by a veterinarian who primarily suspected FIV and/or FeLV infection by history and physical examination or routine checking. Additionally, geographical information on the cats' residential areas was collected from the available in-house laboratory database.

***Determination of FIV and FeLV infections :*** The presence of FeLV circulating antigens and FIV-specific antibodies in the samples was determined using a commercial test kit (Anigen Rapid FIV Ab/FeLV Ag Test Kit, Korea), based on immunochromatographic assay according to the manufacturer's protocol. Double-positive result was identified as co-infection of both viruses. The reported sensitivity for FIV and FeLV tests were 88.9% and 40.0%, respectively. The reported specificity for FIV and FeLV tests were 99.7% and 100.0%, respectively (Sand et al., 2010).

***Data analysis:*** Percentage of the infection was demonstrated in respective month during April 2013-March 2014. Relation between area and evidence of the infection was performed on a map of Bangkok and its vicinity by using ArcGIS 10.0 software (ESRI, Redlands, CA).

## Results and Discussion

In total, 777 serum or plasma samples were submitted for the diagnosis of FIV and FeLV infections by the commercial test kit. The prevalence of FIV, FeLV and co-infections in each month is shown in Table 1. The overall prevalence of FIV, FeLV, and mixed infections during the study period was 5.4% (42/777), 16.5% (128/777) and 3.5% (27/777), respectively. The percentage of FeLV positive cases was higher than that of the FIV infection. Our result was in concordance with the previous report of Sukhumavasi et al. (2012), which showed higher prevalence of FeLV infection. In addition, in comparison with previous reports in other countries, the prevalence of both diseases in Southeast Asia was higher than that in Canada, Mexico and North America (Table 2). Moreover, our data indicated that both FIV and FeLV were widely distributed in Bangkok and its vicinity (Fig 1).

**Table 1** Prevalence of FIV, FeLV and co-infections in cats in Bangkok and its vicinity during April 2013-March 2014 (n = 777)

| Month | Year | Prevalence of positive sample* | | |
|---|---|---|---|---|
| | | FIV | FeLV | co-infection |
| 4 | 2013 | 3/70 (4.3) | 12/70 (17.1) | 2/70 (2.9) |
| 5 | 2013 | 0/44 (0) | 8/44 (18.2) | 1/44 (2.3) |
| 6 | 2013 | 1/69 (1.4) | 14/69 (20.3) | 0/69 (0) |
| 7 | 2013 | 2/69 (2.9) | 11/69 (15.9) | 0/69 (0) |
| 8 | 2013 | 5/56 (8.9) | 8/56 (14.3) | 2/56 (3.6) |
| 9 | 2013 | 2/55 (3.6) | 9/55 (16.36) | 2/55 (3.6) |
| 10 | 2013 | 3/56 (5.4) | 8/56 (14.3) | 3/56 (5.4) |
| 11 | 2013 | 3/57 (5.3) | 9/57 (15.8) | 2/57 (3.5) |
| 12 | 2013 | 4/52 (7.7) | 10/52 (19.2) | 1/52 (1.9) |
| 1 | 2014 | 5/79 (6.3) | 12/79 (15.2) | 1/79 (1.3) |
| 2 | 2014 | 3/67 (4.4) | 10/67 (14.9) | 8/67 (11.9) |
| 3 | 2014 | 11/103 (10.7) | 17/103 (16.5) | 5/103 (4.9) |
| **Overall prevalence** | | **42/777 (5.4)** | **128/777 (16.5)** | **27/777 (3.5)** |

*Number of positive/number of tested samples (% positive)

**Table 2** Prevalence of FIV, FeLV and co-infections previously reported in Southeast Asia, Europe and North America

| Country | Duration | Number of tested cats | Prevalence of infection (%) | | | References |
|---|---|---|---|---|---|---|
| | | | FIV | FeLV | Co-infection | |
| Thailand | 2013-2014 | 777 | 5.4 | 16.5 | 3.5 | Current study |
| Thailand | 2009 | 746 | 20.1 | 24.5 | 10.1 | Sukhumavasi et al., 2012 |
| Thailand | 2003 | 115 | 6 | 5 | - | Litster & Nilkumhang, 2004 |
| Thailand | 1998 | 653 | - | 0.9 | - | Nilkumhang et al., 1988 |
| Thailand | 1998 | 145 | 32.1 | - | - | Pusoonthornthum et al., 1998 |
| Thailand | 1994 | 28 | 40 | - | - | Nilkumhang et al., 1994 |
| Malaysia | 2010 | 368 | 12.2 | 31.3 | 4.3 | Bande et al., 2012 |
| Vietnam | 2000 | 50 | 22 | 0 | - | Nakamura et al., 2000 |
| N. America | 2004 | 18,038 | 2.5 | 2.3 | 0.3 | Levy et al., 2006 |
| Mexico | 2013 | 227 | 7.5 | 2.5 | - | Ortega-Pacheco et al., 2014 |
| Canada | 2007 | 11,114 | 4.3 | 3.4 | 0.5 | Little et al., 2009 |

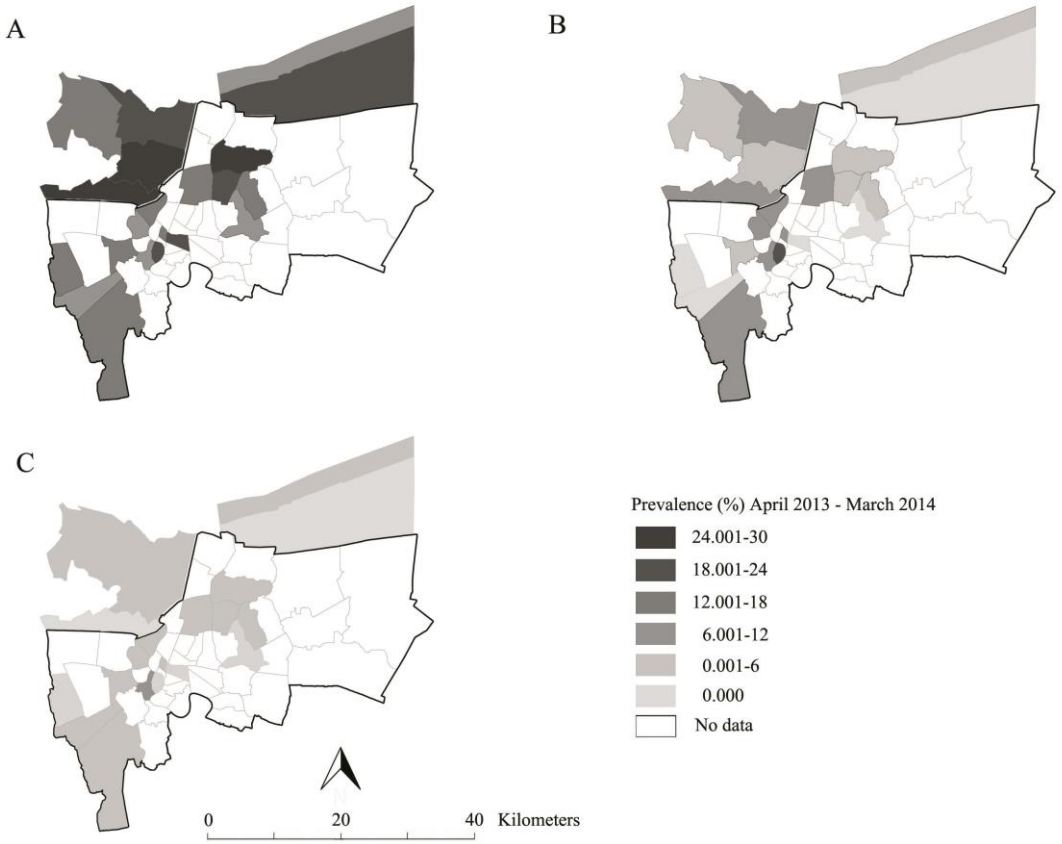


**Figure 1** Prevalence of feline leukemia virus (A), feline immunodeficiency virus (B), and co-infections of FeLV and FIV (C) in Bangkok (bold outline) and its vicinity

FIV and FeLV are known to cause viral associated chronic diseases in cats worldwide. Although the recommended gold standard diagnostic assay is western blot for FIV and polymerase chain reaction (PCR) for FeLV, it has been well accepted that commercial test kit can be used for the screening of FIV and FeLV infections (Little, 2011). These commercial test kits detect antibodies specific for FIV p24, core protein and gp40 transmembrane protein, and FeLV p27 antigen. Due to the acceptable specificity of commercial test kit, several studies have used this kit for the investigation of FIV and FeLV positive sample (Sand et al., 2010). Interestingly, the prevalence of FIV and FeLV in Southeast Asia is higher than that reported in Europe and America (Table 2). This might be due to the difference in cat living behavior. Most owned cats in Thailand are allowed to go outside the household, which may increase the risk of contact with infected cats. The higher prevalence of both diseases observed in this study might also relate to the biased sample pool, as the majority of the samples in this study were obtained from cats with history of illness. This could result in higher prevalence rates in the studied samples. It should be noted that annual blood test for FeLV and FIV infections has not been routinely performed in Thailand. Therefore, it would be difficult to obtain the actual prevalence rate in Thai cat population by this retrospective study. In addition, the demographical data and clinical history of the cats in this study were not available as they were not

absolutely required for submitting the sample to the particular laboratory. Nevertheless, the results from this study are in the same line as previous findings in Asia on the higher prevalence rate of FeLV, FIV and co-infections than the other parts of the world (Table 2). It should be pointed out that the cited works in Table 2 utilized different commercial test kits for determining the seroprevalence of FeLV and FIV among the studies, thus the obtained percentage of prevalence may not be directly compared due to the varied sensitivity and specificity of the implemented tests. However, it has been previously shown that the test kit used in the current study has similar diagnostic accuracy to the commonly available test kit (SNAP-FeLV Antigen/FIV Antibody Test, IDEXX) in the market.

The good efficacy of an inactivated FeLV vaccine has been reported with duration of immunity for at least 1 year (Hoover et al., 1996). Although, there is FeLV commercial vaccine currently available in Thailand, the prevalence of FeLV infected cases has remained high during the past few years. The FeLV vaccine is currently considered as an optional vaccine by the World Small Animal Veterinary Association (Day et al., 2010). Currently, the Thai Society of Feline Practitioners (TSOFP) has recommended FeLV vaccine as a core vaccine for the cats in Thailand. However, FeLV vaccine is still not extensively used by the Thai veterinary practitioners due to the lack of updated information about the prevalence of disease and cost of vaccination. More systematic analysis of the vaccine history should be included in further studies to determine the coverage and effectiveness of FeLV vaccination.

In conclusion, our findings indicate that FIV and FeLV infections are highly endemic in Bangkok and its vicinity. This epidemiological information will raise an awareness of high FeLV and FIV infections in owned cat population, and will be useful for the development and monitoring of disease management and control strategy in the future.

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# บทคัดย่อ

## ความชุกและการกระจายตัวของการติดเชื้อเชื้อไวรัสภูมิคุ้มกันบกพร่องและเชื้อไวรัสลิวคีเมียในแมวในเขตกรุงเทพมหานครและจังหวัดใกล้เคียงในช่วงปี พ.ศ. 2556-2557

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เชื้อไวรัสภูมิคุ้มกันบกพร่อง (Feline Immunodeficiency Virus , FIV) และ เชื้อไวรัสลิวคีเมียในแมว (Feline Leukemia Virus, FeLV) เป็นเชื้อก่อโรคในแมวซึ่งเป็นสาเหตุโน้มนำที่ทำให้เกิดโรคเรื้อรังอื่นๆตามมาภายหลังจากการติดเชื้อ การศึกษานี้เกี่ยวข้องกับความชุกของการติดเชื้อไวรัส FIV และ FeLV ในแมวที่มีเจ้าของภายในเขตกรุงเทพมหานคร นนทบุรี และปทุมธานี ในระหว่างเดือนเมษายนปี 2556 ถึงเดือนมีนาคมปี 2557 จากตัวอย่างซีรั่มหรือพลาสม่าของแมวที่มีเจ้าของจำนวนทั้งสิ้น 777 ตัวอย่างจากคลินิกและโรงพยาบาลสัตว์ ซึ่งถูกส่งมาตรวจที่ห้องปฏิบัติการเอกชนในกรุงเทพมหานคร พบความชุกของการติดเชื้อ FIV, FeLV และการติดเชื้อทั้งสองชนิดร่วมกัน 5.4% (42/777) 16.5% (128/777) และ 3.5% (27/777) ตามลำดับ จากการเก็บข้อมูลในช่วงระยะเวลา 1 ปี พบว่าการติดเชื้อไวรัส FeLV ในกลุ่มตัวอย่างสูงกว่าการติดเชื้อ FIV นอกจากนี้จากการศึกษาการกระจายตัวทางภูมิศาสตร์ของการติดเชื้อไวรัส พบว่าการติดเชื้อไวรัส FIV และ FeLV มีรูปแบบการกระจายตัวที่คล้ายคลึงกัน ข้อมูลจากการศึกษาระบาดวิทยาจะเป็นประโยชน์ในการพัฒนามาตรการในการควบคุมป้องกัน และเฝ้าระวังการเกิดโรคในอนาคตต่อไป

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