Short Communication

Prevalence of feline immunodeficiency virus & feline leukemia virus in clinically healthy cats in Khon Kaen province

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Abstract

FIV and FeLV infections are mostly studied among clinically sick cats; therefore, results may deviate from the true prevalence in a whole population. By using a commercially available kit, the infections were observed in 216 clinically health client-owned cats in Khon Kaen province, Thailand. A cross-sectioned study was undertaken to estimate the presence of FIV and FeLV infections in the cats which underwent health checkup from October 2016 to January 2017. The prevalence of FIV-antibody positive and FeLV-antigenic cats were 6.1% and 3.1%, respectively, and co-infection was not identified. The updated information provides necessary guidelines for veterinarians to provide preventive plan(s) for their clients.

Keywords: cat, feline immunodeficiency virus, feline leukemia virus, Khon Kaen, prevalence

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Introduction

Two feline retroviruses, feline immunodeficiency virus (FIV) and feline leukemia virus (FeLV), put infected cats at risk of bone marrow suppression, neoplasia, chronic inflammation and predispose to opportunistic infections. The viruses are distributed widely in domestic cats in many countries including Thailand (Nedumpun et al., 2015; Galdo Novo et al., 2016; Garigliany et al., 2016; Westman et al., 2016). Recently, The World Small Animal Veterinary Association (WSAVA) has recommended vaccination for susceptible cats based on the risk of gaining infections from these viruses (Day et al., 2016).

FIV infects CD4+ T cells, resulting in progressive immunodeficiency disease. FIV-infected cats spread the virus to susceptible cats through bite wounds (virus-contaminated saliva), and from infected queens to their kittens. Within 2-3 weeks after infection, infected cats are in an acute stage with high-titer viremia, transient fever, enlargement of peripheral lymph nodes and leukopenia. After the initial infection, at 3-10 months, the infected cats progress to a chronic asymptomatic stage, with low titer viremia, which often lasts for years and subsequently a terminal stage of immunodeficiency at which the number of CD4+ T cells is markedly decreased. At the terminal stage, opportunistic microbial infections can occur in many different tissues with or without neoplasia (MacLachlan et al., 2016). Antibodies against viral proteins can be detected from 2 weeks after the initial infection and persist throughout the cats' life; thus, they may act as a diagnostic indicator of FIV infection. Recently, the prevalence of FIV infection in cats in Bangkok and its vicinity has been reported at 5.4% (Nedumpun et al., 2015)

The second retrovirus, FeLV, causes a variety of often debilitating disease syndromes. FeLV is transmitted via saliva, blood, milk in a variety of ways vertically and horizontally, direct and indirect contacts, from infected cats to susceptible ones (MacLachlan et al., 2016). The outcome of FeLV infections is dependent on various factors of the virus such as strains, subtype, dose, and its host, e.g. age and immune status. Based on laboratory tests, FeLV-infected cats might be classified into 3 categories as viremia (positive antigen detection) or regressive infection (negative antigen detection, positive cultivation, and positive proviral detection) and in the smallest chance, abortive infection, in which the virus is eliminated by host immune and, as a result, the infected cats show only positive result of antibody detection (Hofmann-Lehmann et al., 2001; Hartmann, 2012). In two recent reports, the FeLV prevalence in sick cats in Bangkok and the vicinity of Thailand in 2009 and 2013-2014 studies was quite close, 16.5% and 24.5%, respectively. But the co-infection of FeLV-FIV and also the prevalence of FIV decreased from 10.1% to 3.5% and 20.1% to 5.5%, respectively (Sukhumavasi et al., 2012; Nedumpun et al., 2015). The difference in FIV prevalence in the two studies probably resulted from the capacities of the commercial test kits used for differentiating antibodies from FIV infection and FIV vaccination (Westman et al., 2015).

All of the retrovirus studies in Thailand were carried out in sick cats in Bangkok and its vicinity (Sukhumavasi et al., 2012; Nedumpun et al., 2015), neither in clinically healthy cats nor other populations. Therefore, this study aimed to estimate the prevalence of FIV and FeLV infections among the potential viral transmitter, clinically healthy cats, in Khon Kaen province, where FIV and FeLV diseases of cats have never been assessed.

Materials and Methods

The study design and sampling procedure were approved by Animal Care and Use Committee, Khon Kaen University (ACUC-KKU-41/2559). Blood samples were collected from 216 cats from 162 houses presented at Veterinary Teaching Hospital, Khon Kaen University, from October 2016 to January 2017, either for vaccination or spaying surgery purposes. Health status of the cats was evaluated with history of illness records and general physical examination by veterinarians who recorded medical status of the cats from respective owners. None of the cats examined in this study had been tested for retrovirus infections and never had FIV vaccination.

The blood samples were taken from the cephalic veins and were tested immediately for antibodies to FIV and antigen of FeLV by using a commercially available lateral flow immunochromatography test kit, Witness ™ FeLV-FIV. The diagnostic sensitivity (Se) and specificity (Sp) of FIV infection was 98% and 100%, respectively, whereas Se and Sp for testing of FeLV infection was 57% and 98%, respectively (Westman et al., 2015; Westman et al., 2017). The test was performed and interpreted as per manufacturer's instructions. To eliminate any contamination from maternal antibodies in cats younger than six months, all kittens with positive FIV were excluded from the prevalence estimation.

Results and Discussion

Study population: The tested cats came from 162 households in Khon Kaen city. Eighty-six cats were the only cat in their houses and had the chance to meet cats outside. The total number of multi-cat households were 76 and only cats in 21 houses of these were entirely herd sampled. There were 120 females and 96 males of cats examined, of which 22 were castrated males, 16 spayed females, 74 intact males and 104 intact females. Forty-seven percent of the cats were domestic cross-bred cats; while the others were Thai (21%), Persian (19%) and other breeds of cats (13%). The cat ages ranged from one month to 10 years, with a median of five months and an average of one year.

Among the 216 blood samples examined, 17 showed positive antibodies to FIV as analyzed by the test kit, and none of the FIV-seropositive cats examined had FeLV antigen. However, four FIV-seropositive cats were younger than six months old, thus they were excluded from the calculation of FIV prevalence. These seropositive kittens probably either gained the anti-FIV antibodies via colostrum from their queen or were FIV-infected. However, none of the cats in the same

house were FIV vaccinated. Thus, if the detected antibodies resulted from maternal immunity, then this would suggest a true infection in a queen. The infective status of seropositive kittens should be confirmed by another independent test for modality or re-tested at an older age. Our results showed that the overall FIV prevalence in cats in Khon Kaen province at individual level was 6.1% (13/212) and at household level was 7.5% (12/161).

Among the 13 FIV-seropositive cats, five cats came from multi-cat households. Since FIV is mainly transmitted directly between cats, the ratio of cohabiting FIV-positive to FIV-negative cats is an important factor in the risk of disease transmission. Although Lister (2014) was unable to identify any new FIV infections among seronegative cats that were housed with FIV-positive cats for years, the author still suggested that feline behaviors, neutered status, viral strain and low intensity might be the factors which led to the unsuccessful detection of any transmission in the studied populations. Additionally, housing cats in large numbers could cause stress in cats because of the fight for individual space. Therefore, in this study, the un-sampled cats which lived in the same environment still had a great chance to be FIV-seropositive cats. Thus, the detected individual prevalence of 6.1% in our study is potentially much greater in the population.

The FeLV antigen detection in our study revealed that the individual compared to household prevalence of FeLV was 3.7% (8/216) and 4.3% (7/162), respectively. The youngest cats detected with FeLV antigen with positive FIV antibody were two months old. Interestingly, two FeLV-antigenic cats, aged five months and three years, were vaccinated and had a booster with a killed FeLV vaccine a few months before the blood sampling was done. Both cats had never been tested for FeLV infection prior to any vaccination. Since there was no information on the interference of the killed vaccine virus in the antigen test, our results showed the individual prevalence of FeLV-antigenic cats at 3.7%.

It is difficult to determine the actual prevalence of FeLV in natural cat populations because of the nature of the virus. With respect to *abortive infection*, infected cats have no virus and provirus in blood and can be identified only by antibody detection assay. Alternatively, some cats develop *progressive infection*, whereby the virus replicates continuously and causes various clinical diseases such as anemia and tumors. Identification of viral infected cats at this stage could be done either by immunochromatography, which has a similar detection capacity as antigen ELISA, or by virus isolation (Hartmann et al., 2001; Levy et al., 2017). Around 30-40% of FeLV-infected cats have transient viremia for 2-16 weeks that can establish a latent infection with the production of DNA provirus in bone marrow, identified as *regressive infection*. Regressive FeLV cats produce the provirus for years, which can occasionally turn to productive infection and illness (Helfer-Hungerbuehler et al., 2015). FeLV provirus causes diseases in in-contact naïve cats via saliva and blood, including blood transfusion (Nesina et al., 2015), and in these cases only PCR analyses can detect the regressive form (Torres et al., 2005; Hofmann-Lehmann et al., 2008; Torres et al., 2008). A limitation in our study was not being able to identify abortive or regressively FeLV-infected cats by the described methods. Furthermore, the immunochromatography tools used in studies like this one, either Witness™ or other commercial kits, have its sensitivity below 65% when using provirus PCR as a gold standard (Westman et al., 2017). Thus, the prevalence detected in our study of 3.9% would be a gross underestimate of the true prevalence in the population.

Determining the true prevalence of feline retrovirus infections, even the gold standard methods such as virus isolation and PCR still have limitations due to sample collection and size of sample, processing, and storage together with some circulating virus and variations among laboratories. For clinical cases, taking the age of unhealthy cats into consideration may help direct clinical judgment, but it is still difficult to accurately determine health status. Despite our limitation(s) regarding diagnostic capability, five and three FIV-seropositive and FeLV-antigenic cats were found, respectively, in some multi-cat households where a number of susceptible cats were present. Therefore, comprehensive whole herd testing and regulatory check of the infective status of cats are suggested. Ideally, in multi-cat house, retrovirus-infected cats should be neutered and kept separately indoors. To prevent any opportunistic infection, good hygiene methods for retrovirus-infected cats should be implemented, and food bowls, litter trays, bedding and grooming equipment should be disinfected with a proper antiseptic agent. If the owner would like to bring in a new cat for examination, it is suggested that a 30-day quarantine should be put in practice.

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บทคัดย่อ

ความชุกของการติดเชื้อไวรัสภูมิคุ้มบกพร่องและไวรัสลิวคีเมียในแมวสุขภาพดี ในเขตจังหวัดขอนแก่น

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การศึกษาความชุกของไวรัสภูมิคุ้มบกพร่องและไวรัสลิวคีเมียในแมวโดยมากเป็นการศึกษาในแมวที่มีอาการป่วย ซึ่งอาจจะทำให้ภาพรวมความชุกที่แท้จริงของโรคผิดไป การศึกษาแบบ cross-section นี้ดำเนินการศึกษาในกลุ่มแมวสุขภาพดีจำนวน 216 ตัวที่อาศัยในเขตจังหวัดขอนแก่นโดยใช้ชุดทดสอบสำเร็จ พบความชุกของแอนติบอดีต่อไวรัสภูมิคุ้มบกพร่องและความชุกของแอนติเจนของไวรัสลิวคีเมียอยู่ที่ 6.1% และ 3.1% ตามลำดับ และไม่พบการติดเชื้อไวรัสทั้งสองร่วมกันในกลุ่มแมวศึกษา ข้อมูลที่ได้นี้จะเป็นแนวทางให้สัตวแพทย์วางแผนการป้องกันโรคและควบคุมโรคดังกล่าวแก่เจ้าของแมวในพื้นที่

คำสำคัญ: แมว ไวรัสภูมิคุ้มบกพร่อง ไวรัสลิวคีเมีย แมว ความชุก

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