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# การสำรวจความรู้ และความคิดเห็นของเจ้าของสัตว์เลี้ยงเกี่ยวกับพิษภัยบุหรี่ต่อสุขภาพสัตว์เลี้ยง

**ผ่องศรี ศรีมรกต[1,#] ประเทือง สุดสาคร[2] พรชัย สุวรรณาภิรมย์[3] และคณิน รุจิเสรีกุล[4]**

[1]คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล บางกอกน้อย กรุงเทพมหานคร 10700; [2]สัตวแพทยสมาคมแห่งประเทศไทยในพระบรมราชูปถัมภ์ บางจาก พระโขนง กรุงเทพมหานคร 10260; [3]สัตวแพทยสภา บางคอแหลม กรุงเทพมหานคร 10120; [4]สัตวแพทยสภา นนทบุรี กรุงเทพมหานคร 11000

**บทคัดย่อ:** ควันบุหรี่มือสองเป็นอันตรายต่อสุขภาพของผู้อยู่ใกล้ชิดในฐานะผู้รับควันมือสองและต่อสัตว์เลี้ยง เมื่อคนไทยนิยมนำสุนัขและแมวมาเลี้ยงในบ้าน เสมือนเป็นสมาชิกของครอบครัว แต่ในประเทศไทยยังไม่เคยมีการศึกษาว่าเจ้าของสัตว์เลี้ยงมีการปฏิบัติอย่างไรเพื่อปกป้องสุขภาพสัตว์เลี้ยงจากอันตรายที่เกิดจากบุหรี่ ดังนั้นทีมผู้วิจัยจึงสำรวจความรู้ ความคิดเห็นและการปฏิบัติของเจ้าของสัตว์เลี้ยงเกี่ยวกับพิษภัยบุหรี่ต่อสุขภาพสัตว์เลี้ยง โดยประยุกต์การวิจัยเชิงสำรวจเจ้าของสัตว์เลี้ยงที่คลินิกสัตวแพทย์และร้านเพทชอป ประมาณขนาดกลุ่มตัวอย่างตามตารางมาตรฐาน ได้จำนวน 742 คน เก็บข้อมูลตามสะดวกด้วยแบบสอบถามที่ทีมวิจัยพัฒนาขึ้น ทั้งข้อมูลส่วนบุคคล ความรู้ ความคิดเห็นและการปฏิบัติของเจ้าของสัตว์เลี้ยงเมื่อสัตว์เลี้ยงได้รับพิษภัยบุหรี่ ผลการศึกษาพบว่าเจ้าของสัตว์เลี้ยงสูบบุหรี่ร้อยละ 11.5 ส่วนใหญ่ไม่ทราบว่าควันบุหรี่มือสองมีอันตรายต่อสุขภาพสัตว์เลี้ยงร้อยละ 90.1 และโดยมีความรู้เพียง 1.86 จาก 13 จึงเสนอแนะว่าสัตวแพทย์ควรเป็นต้นแบบผู้ไม่สูบบุหรี่และเผยแพร่ความรู้ให้คนเลี้ยงสัตว์เพื่อกระตุ้นให้ลดหรือเลิกสูบบุหรี่ หรือพยายามลดการสูบบุหรี่ขณะอยู่ใกล้สัตว์เลี้ยงหรือเลิกสูบบุหรี่ แม้ว่าเจ้าของสัตว์เลี้ยงจะมีความรู้เกี่ยวกับพิษภัยนิโคตินไม่มาก แต่ยังนำสัตว์เลี้ยงมาพบแพทย์กรณีที่สงสัยว่าสัตว์เลี้ยงจะได้รับพิษ ซึ่งสนับสนุนว่าสัมพันธภาพที่ดีระหว่างสัตวแพทย์ และเจ้าของสัตว์เลี้ยงมีความสำคัญในการลดความเสี่ยงจากพิษนิโคติน และเสนอแนะว่าควรศึกษาความสัมพันธ์เกี่ยวกับปัจจัยแวดล้อมอื่นๆ เพิ่มเติมต่อไป

**คำสำคัญ:** พิษภัยบุหรี่ ความรู้และความคิดเห็น เจ้าของสัตว์เลี้ยง

[#]ผู้รับผิดชอบบทความ

*E-mail address*: pongsri.sri@mahidol.ac.th

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# Surveillance of Knowledge, and Opinion among Pets Owner on Tobacco Effect on Pets' Health

**Pongsri Srimoragot[1,#], Pratuang Sudsakorn[2], Phornchai Suwannaphirom[3], and Kanin Ruchisereekul[4]**

[1]Faculty of Nursing, Mahidol University, Bangkok-noi, Bangkok, 10700, Thailand; [2]The Thai Veterinary Medical Association, BangJark, Prakhanong, Bangkok 10260 Thailand; [3]Veterinary Council of Thailand Committee, Bangkholeaum, Bangkok 10120, Thailand; [4]The Veterinary Council of Thailand Committee, Nonthaburi 11000, Thailand

**Abstract:** The survey was carried out to explore pet owners' knowledge, opinions, and practices regarding nicotine toxicity or secondhand smoke (SHS), and to compare the differences between knowledge and opinions between pet owners who are non-smokers and who are currently smokers. Seven hundred and forty-two participants were recruited in the study. Among these, only 11.5% were smokers with the mean knowledge score at approximately 1.86 out of 13. Interestingly, around 90.1% never realized about the harmfulness of this substance. They suggested that veterinarians should play an important role on being a model to quit smoking and provide information of this harzardous compound. Moreover, most of the owners would try reducing tobacco used while living near pets and/or start quitting smoking. Although the low knowledge score, pet owner still brought their pets to animal hospital in suspected cases. This information supported that the veterinarian-pet owner relationship is important in order to reduce risk of the nicotine and SHS toxicity. Further studies are needed to investigate other related environmental factors in associated with this issue.

**Keywords:** Tobacco effect, knowledge and opinion, pets' owners, secondhand smoke

[#]Corresponding author

*E-mail address*: pongsri.sri@mahidol.ac.th

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## Introduction

Smokings is one of the serious public health issues globally. Either tobacco or cigarettes used, nicotine, the most abundant hazardous substance, would deteriorate the smokers' health. Directly exposure to nicotine can harmfully cause cancers, artherosclerosis, alveolar emphysema, bronchoconstriction, gastroesophageal reflux disorder, immuno-suppression, chronic kidney disease, and other systemic dysregulations (Ogle et al., 1993; Sopori et al., 1998; Halimi et al., 1998; Lien et al., 2011; Lee and Cooke, 2011; Wassenaar et al., 2013; Mishra et al., 2015). The same negative effects of nicotine on pets' health. In Thailand, the

numbers of smokers are still high. According to the World Health Organization (WHO), the percentage of adult using tobaccos or cigarettes were approximately 20% (WHO, 2019). In addition, the same report also revealed that the number of youth smokers were around 15% of the population. This information supported that smokings are still commonly found in the country.

Today's way of life of people in the big cities, especially in Bangkok, prefers to raise animals. Apart from being petted, some families treat their companions as one of the members (Chalamwong, 2009). According to the World Organization of Animal's Health (OIE), the population of the dogs and cats in Thailand were around 8.2 million and 2.5 million, respectively (OIE, 2020). Regardless of the stray dogs and cats, the number of owned pets is abundant. Pet owner plays a vital role on their pet's health. The relativity between owners and their pets is the most significant factor to prolong the animal life expectancy, and vice versa (Pipatkarn et al., 2016). However, the standard pet ownership education program in Thailand had never been established. Therefore, it is common that a number of sick pets with an unknown cause are left untreated. One of the possible silence threats is the nicotine intoxication and secondhand smoke (SHS) from the smoking owners. A report revealed that the more smoking of the owners, the high incidence of the nicotine toxicity in their pets (Bertone-Johnson et al., 2007). Nicotine ingestion could be accidentally occurred, especially, in dogs. The toxicated patient would exhibit several clinical signs, including gastrointestinal and neurological symptoms (Vig, 1990; Hackendahl and Sereda, 2004). Furthermore, chronic expose to secondhand smoke may possibly induce respiratory problems in animals, such as oropharyngeal damage, bronchitis, asthma, and cancers (Reif et al., 1992; Reif et al., 1998; Campbell, 2017; Bertone et al., 2002; Pérez et al., 2014; Lin et al., 2018; Lin et al., 2020). When pet exposes to nicotine toxicity or secondhand smoke it will show irritable signs such as difficult breathing, asthmatic attack, vomiting, confusing, etc. In this situation, pet is not be able to stay far away from its' owner and forces to inhale the contaminated air together. In order to establish a guideline to prevent the pets from the toxicity of nicotines and SHS, examination on the relationship between the owners and their smoking events should be evaluated (Milberger et al., 2009). Hence, the objectives of the study were to investigate the knowledge and opinions of the pet owners, and to compare the factors between those smoking-free and the smokers. We believe that this would further improve the lifestyle of the smoking owners and reduce the risk of these smoking issues.

## Materials and Methods

### Sample and sampling technique

The cross-sectional study survey research was applied on customers who visited small animal clinics, hospitals or pet shops distributed

throughout Thailand during July 2019 until February 2020. Recently, more than 3,000 clinics were legally registered under the Department of Livestock Development (DLD), Thailand. The sampling method was estimated based on Krejcie and Morgan table (Krejcie and Morgan, 1970). Seven hundred and forty-two volunteer were recruited in this study.

**Questionnaires and the protection of human right**

Questionnaires were including the demographic profiles of the pet owners, their smoking behaviors, their knowledge and opinions about the nicotine toxicity and SHS in pets, and their motivation on quitting smoking. The content of the questionnaires was validated by three expert veterinarians. The reliability and the protection of human right in the study were approved by the Institutional Review Board of Mahidol University (COA No. MUCIRB 2019/120.1807).

**Statistical analysis**

Demographic information of participants obtained from the questionnaire was analyzed using descriptive statistics, including, standard mean, deviations, frequency, and percentage. Comparison of knowledge, opinions, about nicotine toxicity or SHS in pets, between smokers and non-smokers, was analyzed using independent t-test. Statistical significance was considered at *p*-value less than 0.05.

## Results

A total 742 volunteers were included in the study. Of these, only 514 pets were in charged, which were including 230 cats (54.6%) and 184 dogs (43.7%). The other pet owners had no experience on nicotine toxicity or secondhand smoke impact to their pets. So they could not share any information regarding nicotine toxicity or secondhand smoke. Then skipped giving information on this part of questionnaire.

Pet owner knowledge about nicotine intoxication and SHS. Result reveals that most of owners did not know the symptoms and information of this issue. The average score of the participants in the study was 1.86 $\pm$ 3.54 out of 13 questions. The most common answer was that the intoxicated pets may vomit (20.9%), following by the lethality effect (16.2%) and confusion (15.4%) induced by the substance. The least answers from the participants were hearing disability in pets (9.7%) and the enhance survival rate after supportive treatment for over 4 hours (9.7%) (table 1).

Pet opinion on the nicotine toxicity in pets found that the first rank answer asked the veterinarians to be a role model by avoid smoking while working with animals (69.13 $\pm$ 39.23%). The following suggestions were also involved with the veterinarian roles to inspire pet owner to quit smoking (68.88 $\pm$ 38.65%) and to educate owners about nicotine toxicity in pets (68.52 $\pm$ 38.88%), respectively. They also suggested that veterinarians should give some

**Table 1** Statistical analysis about the knowledge of pet owners on nicotine intoxication and secondhand smoke in pets

| | Symptoms of intoxicated pets | No or Not sure | | Yes | | Order |
|---|---|---|---|---|---|---|
| | | Frequency | % | Frequency | % | |
| 1 | Vomiting | 522 | 70.4 | 155 | 20.9 | 1 |
| 2 | Shivering | 574 | 77.4 | 97 | 13.1 | 5 |
| 3 | Confusion | 557 | 75.1 | 114 | 15.4 | 3 |
| 4 | Abnormal hearing | 599 | 80.7 | 72 | 9.7 | 10 |
| 5 | Visual interference | 582 | 78.4 | 90 | 12.1 | 7 |
| 6 | Lethality | 549 | 74.0 | 120 | 16.2 | 2 |
| 7 | Cats are more susceptible than dogs | 578 | 77.9 | 93 | 12.5 | 6 |
| 8 | Higher survival rate when receive supportive treatment over 4 hours post-nicotine exposure | 596 | 80.3 | 72 | 9.7 | 10 |
| 9 | Distinguished from strychnine poisoning | 582 | 78.4 | 86 | 11.6 | 9 |
| 10 | Level of serum nicotine or its derivative should be evaluated | 578 | 77.9 | 90 | 12.1 | 7 |
| 11 | Oral activated charcoal should be given | 578 | 77.9 | 89 | 12.6 | 8 |
| 12 | Gastric acidosis would prevent nicotine absorption | 581 | 78.3 | 86 | 11.6 | 9 |
| 13 | Adequate fluids administration would eliminate nicotine toxicity via urination | 567 | 76.4 | 98 | 13.2 | 4 |
| | Mean $\pm$ S.D. (Range) | 1.86 $\pm$ 3.54 (0 - 13) | | | | |

advice on avoiding smoking in the house (38.37 $\pm$ 39.71%) as well as while living with pets (68 $\pm$ 39.86%). Interestingly, only 52.38 $\pm$ 37.12% realized about nicotine toxicity in pets (table 2).

The intention of smoking owners about pet's health and related to the used of tobacco or cigarette. Around 23.5% of participants (84 individuals) would try avoiding smoking while living with their pets and 22% additionally intended to quit smoking within 3 months. Delightfully, many of the participants were going to stop smoking immediately by asking guidance from either physician (17.6%), or veterinarians (13.7%). However, more than 5.6% of the

**Table 2** Descriptive statistics of pet owners' opinion on nicotine toxicity and SHS in pets

| | Opinions (0-100; 0 as disagree, 100 as agree) | Average | S.D. | Order |
|---|---|---|---|---|
| 1 | Pets may possibly expose to nicotine toxicity. | 52.38 | 37.12 | 10 |
| 2 | Pets should be prevented from SHS. | 66.34 | 39.32 | 9 |
| 3 | Veterinarians should suggest owners to avoid smoking while living with their pets. | 68.00 | 39.86 | 5 |
| 4 | Veterinarians should encourage owners to avoid smoking in the house. | 68.37 | 39.71 | 4 |
| 5 | Veterinarians should guide pet owners to quit smoking. | 67.86 | 38.87 | 6 |
| 6 | Veterinarians should educate owners about the nicotine toxicity in pets. | 68.52 | 38.88 | 3 |
| 7 | Veterinarians should be a role model for the owners as non-smokers. | 69.13 | 39.23 | 1 |
| 8 | Providing information about nicotine toxicity may inspire owners to quit smoking. | 68.88 | 38.65 | 2 |
| 9 | For non-smoking pet owners, guidelines for smoking visitors are required in the house. | 67.82 | 38.64 | 7 |
| 10 | Veterinarians can advise pet owners to quit smoking. | 66.50 | 38.80 | 8 |
| | **Total** | 605.25 | 361.69 | |

smokers would still disregard the issue and continue smoking. Interestingly, 27.93% of participants need further useful information before making the decisions (table 3).

Similarly, most owners would stop smoking in the house (49.7%), following by understanding the SHS toxicity (42.1%) and trying not to smoke besides their pets (40.8%). The least chosen choice from the participants were giving the antidotes to their pets (24.9%), following by continuously taking care until they are stable (26.7%) (table 4).

For comparison between knowledge of smoker and non-smoker pet owners, the understanding of the nicotine toxicity and SHS in pets by the non-smokers ($1.92 \pm 3.58$) were higher than the smokers ($0.88 \pm 2.30$), significantly ($p < 0.001$). In contrast, the opinion score between two groups did not show any statistically different ($p = 0.06$) (table 5).

## Discussion

It is undeniable that the pet ownership is significantly correlated to the pet's health. Poor educated owners may, indeed, deteriorate their

**Table 3** Descriptive statistics of the actions of smoking pet owners

| | Action | Order | Frequency | Percentage |
|---|---|---|---|---|
| 1 | Ignorance the issue, continue smoking | 5 | 20 | 5.6 |
| 2 | Try avoiding smoking while living with pets | 1 | 84 | 23.5 |
| 3 | Quit smoking within 6 months to improve their pets' health | 7 | 8 | 2.2 |
| 4 | Quit smoking within 3 months to improve their pets' health | 8 | 3 | 0.8 |
| 5 | Quit smoking within 1 months to improve their pets' health | 6 | 9 | 2.5 |
| 6 | Quit smoking suddenly, with some veterinarians' guidance | 3 | 49 | 13.7 |
| 7 | Quit smoking suddenly, with some physicians' or nurses' guidance | 2 | 63 | 17.6 |
| 8 | Avoid smoking besides pets, plan to quit smoking within 3 months | 4 | 22 | 6.1 |
| 9 | Others (e.g. needs further information, non-smoking area for pets) | | 100 | 27.93 |
| | **Total** | | **358** | **100.0** |

pet's quality of life, intentionally or accidentally (Pipatkarn et al., 2016; Kumprasit and Chantuk, 2020). The survey was the first study to report the aspects and opinions of the pet owners in Thailand about the harmfulness of the nicotine toxicity and SHS in their pets. According to the demographic information of the owners, most of the participants were female (57.7%), and in the middle-age (35.82 $\pm$ 12.89) which were correlated to the previous study that the major population of the dog owners were working women (Milberger et al., 2009). All volunteers recruited in the study were majorly live in the central part of Thailand. However, similar numbers of recruited participants were equally distributed through out every part of the country. The proportion of the pet owners were correlated the surveillance of dog and cat population throughout Thailand which demonstrated that they were abundantly found in the central Thailand (Business Data Processing and Analysis Section, 2018). Reports also revealed that the owned pets were approximately 99.58% (5,549,905 pets) of populations. Focusing on the occupations, findings revealed that the most common job of the owners were being employed or worked in business. A study had previously explained that

**Table 4** Statistical analysis on owners' opinions to prevent nicotine and SHS toxicity in pets.

| | Opinions | Action | Number | % | Order |
|---|---|---|---|---|---|
| 1 | Secondhand smoke effects on pet's health | Do | 75 | 42.1 | 3 |
| | | Don't | 103 | 57.6 | VIII |
| 2 | Guide for quitting smoking | Do | 65 | 34.6 | 4 |
| | | Don't | 123 | 65.4 | V |
| 3 | Guideline to avoid smoking besides pets | Do | 78 | 40.8 | 2 |
| | | Don't | 113 | 59.2 | VII |
| 4 | Avoid smoking in the house | Do | 94 | 49.7 | 1 |
| | | Don't | 95 | 50.3 | IX |
| 5 | Prevention of accidental nicotine intoxication from tobaccos / cigarettes | Do | 70 | 37.8 | 5 |
| | | Don't | 115 | 62.2 | VI |
| 6 | Observe abnormal signs from nicotine intoxication | Do | 61 | 33.5 | 6 |
| | | Don't | 121 | 66.5 | IV |
| 7 | First aid in pets who accidentally intoxicate nicotine | Do | 57 | 31.5 | 7 |
| | | Don't | 124 | 68.5 | III |
| 8 | Continuously provide supportive treatment until pets become stable | Do | 47 | 26.7 | 9 |
| | | Don't | 129 | 73.3 | II |
| 9 | Give an antidote to pets | Do | 43 | 24.9 | 10 |
| | | Don't | 130 | 75.1 | I |
| 10 | Give advice to other smokers while living with pets | Do | 54 | 31.2 | 8 |
| | | Don't | 119 | 38.8 | X |
| 11 | Other suggestions** | | 13 | 43.2 | |

**Including quit smoking, smokes in the reserved areas, veterinarians should educate owners

**Table 5.** Comparison of knowledge and opinions between smoking and non-smoking pet owners.

| | | Frequency | Mean ± S.D. | P-value |
|---|---|---|---|---|
| Knowledge score | Non-smokers | 555 | 1.92 ± 3.58 | < 0.001 |
| | Smokers | 72 | 0.88 ± 2.30 | |
| Opinions | Non-smokers | 426 | 618.30 ± 361.24 | 0.06 |
| | Smokers | 60 | 525.90 ± 347.83 | |

the distinct of the occupations of the owners may affect their attention on their pets significantly (Chalamwong, 2009). We speculated that most of the presented jobs of the pet owners included in the study did not spend much time with their pets in the accommodation; therefore, we inferred that Thailand pet owners may not pay much attention on their pet's detail.

There were only 11.5% pet owners who used to smoke and only 3.8% used tobaccos while living with pets. Regarding to World Health Organization report, although the number of the smokers were gradually decreased, more than 38% of male and 4% of female population were still using tobaccos (WHO, 2019). However, some reports demonstrated the higher prevalence of the smoking cat owners (19.6%) and dog owners (16.7%) in other countries (Simoneti et al., 2018). Due to the abundant female participated in this study, we speculated that this may associated with the low prevalence of smoking owners in Thailand. However, reports on related individuals, especially other males in the house, were not assessed in the study. Regarding the numbers if non-smokers, study also reported that most of volunteers in the study never realized the nicotine toxicity and SHS in pets before. Although veterinarians may provide the correct information, the owners in our study believe that the most familiar media to educate this issue was via the television programs. This finding reflected that Thai veterinarians may uncommonly educate their client on this issue. We suggested that the improvement in the veterinary curriculum as well as their relationship to educate pet owners may help reducing the risk of this issue.

Survey also asked the owners about the signs of intoxicated nicotine or SHS in pets. Findings demonstrated that the knowledge score of Thai owners on this issue was very low (1.86 out of 13). Only common signs were noted by owners including vomit, confusion, or causing death. We suggested that the nicotine intoxication signs in pets did not exhibit pathognomonic signs (Vig, 1990; Hackendahl and Sereda, 2004). Therefore, pet owners, as well as veterinarians, may not easily diagnose the accurate illness. Only history taking of the tobaccos or cigarettes used are the key message for the problem. This also strengthen the evidence that pet ownership is very important for monitoring pet's health. Focusing on their aspects and opinions, only half of the owners believed that their pets can possibly cause nicotine toxicity. They also required veterinarians to inform them about the harmfulness of this substances, guidelines for both smokers and non-smokers to control the environmental nicotine level in the house, and suggestions for quitting smoking. These supports our speculation that veterinarian-client relationship plays an important role on this hazardous compound.

Focusing on only smokers' view, most of them considered to reduce smoking while staying with pets. In addition, many would try to quit smoking as well. However, some smoking

owners still disregard the issue and decide to continue this habit. Interestingly, many were still asking for more information including the closed area and suggestions to reduce the environmental nicotine. Findings were correlated to previous study that pet owners would try several strategies to prevent their dogs or cats or exposure to environmental nicotine (Milberger et al., 2009).

Based on the participants' experience, when dealing with nicotine toxicity or related symptoms, the most chosen strategy of them were bringing their pets to the animal hospital. On the other hands, development of the illness induced by SHS may take more than 10 years in dogs or cats (Zierenborg-Ripoll et al., 2017). Upon the suggestions given on this issue, owners would decide to avoid smoking and quit smoking rather than giving the first aid to their pets. Combining this information, it was indicated that the owners recognized their role on help prevent pets on nicotine toxicity and SHS, and believed that veterinarians could better cure their pets during the intoxication.

When comparing between two groups, smokers and non-smokers, the former significantly showed a better knowledge score on nicotine and SHS toxicity. We speculated that one of the reasons in non-smokers may be associated with their awareness on pet's health. Although the study did not show the incidence of the intoxicated pets comparing between groups, we still believed that the pets may exert high risk of the toxicity from the smoke as previously reported (Smith et al., 2017). Since there was no difference in the opinions of the owners on this issue, it demonstrated that the smokers also love their pets as much as the non-smokers; however, the lack of the information about this nicotine toxicity and SHS in pets play an important contribution. Therefore, we still suggest that the client education on the harmfulness of either tobaccos or cigarettes used in pets should be provided to all owners. How do they observe abnormality sign when pet get nicotine toxicity or secondhand smoke such as dyspnea, weakness, vomiting, confusing, or lethargy. And provide first aids to support their pet by stop smoking and bring their pets to fresh air. If the condition is not improved. The pet should be sent to the animal hospital immediately. So as to strengthen their pet health for life long (AVMA, 2020).

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