

Progestin-Based Non-Surgical Contraception in dogs and cats: A National Survey of Practices among Thai Veterinarians

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Abstract

This cross-sectional study aimed to assess the current use of progestins as contraceptives in dogs and cats and to evaluate veterinarians' awareness of related complications across Thailand. A total of 724 veterinarians participated, predominantly female (66.3%) and aged 31-40 years (49.6%), with most working in Bangkok and its metropolitan area (52.6%) and having 6-15 years of experience in small animal practice (46.4%). Approximately 6.8% of respondents (49/724) reported using injectable progestins, mainly in female dogs (87.8%) and cats (83.7%), but also in male dogs (18.4%) and cats (14.3%). Veterinarians using progestins were mostly male (59.2%), with an average age of 42 years and 15 years of experience. Veterinarians currently using progestins averaged 42.3 years of age (range: 29-65 years) and 15.7 years of experience in small animal practice (range: 3-38 years). Their average age (OR = 1.136) and years of experience (OR = 1.147) were significantly higher compared to non-users ($P < 0.05$). The highest proportion of progestin users was in the North (1:4.9), followed by the Northeast (1:9.8) and the South (1:13.5). Concerns included pyometra (59.4%), cystic endometrial hyperplasia (47.9%), and mammary gland tumors (43.1%) as moderate to major effects, while diabetes mellitus was seen as a neutral effect of progestins. Veterinarians using progestins expressed fewer concerns about complications compared to non-users ($P < 0.05$). In conclusion, this nationwide survey suggests that factors associated with the use of progestins include veterinarians' gender, age, years of experience, as well as the gender of animals and geographical regions within Thailand. There is a clear need for improved resource allocation to ensure accurate information, promote caution, and address misconceptions among veterinarians, para-veterinarians, and pet owners, especially in the northern, northeastern, and southern regions.

Keywords: canine, contraception, feline, progesterone

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Introduction

For decades, injectable contraceptives (progestins or progestogens) such as megestrol acetate (MA), medroxyprogesterone acetate (MPA), and proligestone (PROL) have been synthesized and used to manage reproduction in dogs and cats. Medroxyprogesterone acetate and PROL are available as injectable forms, whereas MA is available as an oral medication (in pill or syrup form), which has a much shorter duration of action. In Thailand, MPA became popular in the 1980s for postponing estrus, thereby helping control the dog and cat population and reduce the prevalence of rabies (Meesomboon, 1985). Administering exogenous hormones down-regulates sex hormone production via the hypothalamic-pituitary axis, temporarily suppressing fertility by inhibiting follicle growth and ovulation (Beijerrink *et al.*, 2006). Research has shown that PROL is less progestogenic than MPA or MA, thereby lowering the risk of overstimulating mammary and uterine tissues (Vanos and Oldenkamp, 1978; Asa, 2018). However, the relatively high cost of PROL has been a major concern for pet owners, resulting in its less frequent use and unavailability in some countries, including Thailand.

The most concerning side effect of synthetic progestins is cystic endometrial hyperplasia (CEH) (Bhatti *et al.*, 2007), which increases secretory activity and fluid accumulation, potentially leading to mucometra, hydrometra, or pyometra depending on the bacterial infection (De Bosschere *et al.*, 2001). Other side effects include fibroadenomas, which can develop into malignant tumors (Rao *et al.*, 2009), as well as weight gain, polydipsia, glucose intolerance, and diabetes mellitus (DM) (Capel-Edwards *et al.*, 1973; Mansfield *et al.*, 1986; Selman *et al.*, 1994; Selman *et al.*, 1997). Additionally, using progesterone during pregnancy can lead to prolonged pregnancy, delayed parturition, and/or dystocia in both dogs and cats (Romagnoli, 2009). Despite concerns about using progestins, they can be more economical than surgical sterilization, particularly when factoring in preoperative and postoperative care costs. Over the past decade in Thailand, awareness of progestins as contraceptives has increased. However, cases of pyometra and mammary gland tumors due to chronic progestin use in dogs and cats continue to be observed in practice.

This national survey study aimed to investigate veterinarians' experiences with using progestins as contraceptives in dogs and cats, as well as their awareness of potential complications. By identifying usage patterns and concerns, we can more effectively allocate resources to provide accurate information, promote caution, and address any misconceptions within the veterinary and pet owner communities.

Materials and Methods

The survey received approval from the Research Ethics Review Committee for Research Involving Human Participants, Group I, Chulalongkorn University, Thailand (No.185/2021). To design a reliable sample size representing each region of

Thailand, data on the number and distribution of registered animal hospitals nationwide were obtained from the Department of Livestock Development (DLD), Thailand. The survey was conducted both on-site at animal hospitals and online using Google Forms (Google LLC, Mountain View, California, USA), with distribution through social media platforms including Facebook (Meta Platforms, Inc., Menlo Park, California, USA) and Twitter (Twitter, Inc., San Francisco, California, USA).

The questionnaires consisted of multiple-choice, Likert scale, and open-ended questions, covering the respondents' demographics, including gender, age, working region, and years of experience in the small animal field. Consent was obtained for the use of collected data, excluding participants' names, for the study. Respondents were asked about their attitudes towards various aspects, with sub-questions tailored to specific species and genders in some instances. Detailed information on the questionnaires can be found in Supplementary S1. The survey was conducted from August 2022 to December 2022. Data were stored in Microsoft Excel (Office 365) (Microsoft Corp., Redmond, WA, USA) and analyzed descriptively using SPSS version 28 for Windows (IBM Inc., Chicago, IL, USA). Kolmogorov-Smirnov test was used for normality test. Fisher's exact test was employed to assess the association between sex, species, and progesterone use. Friedman's test was used to determine the differences in agreement scores for each potential complication associated with progestin use. The Mann-Whitney test was used to compare the usage of progestins among veterinarians and the impact of complications from contraception injections on veterinarians' opinions. Univariate binary logistic regression was employed to determine if age and years of experience in small animal practice were associated with the use of progestins, considering a $P < 0.05$ as significant.

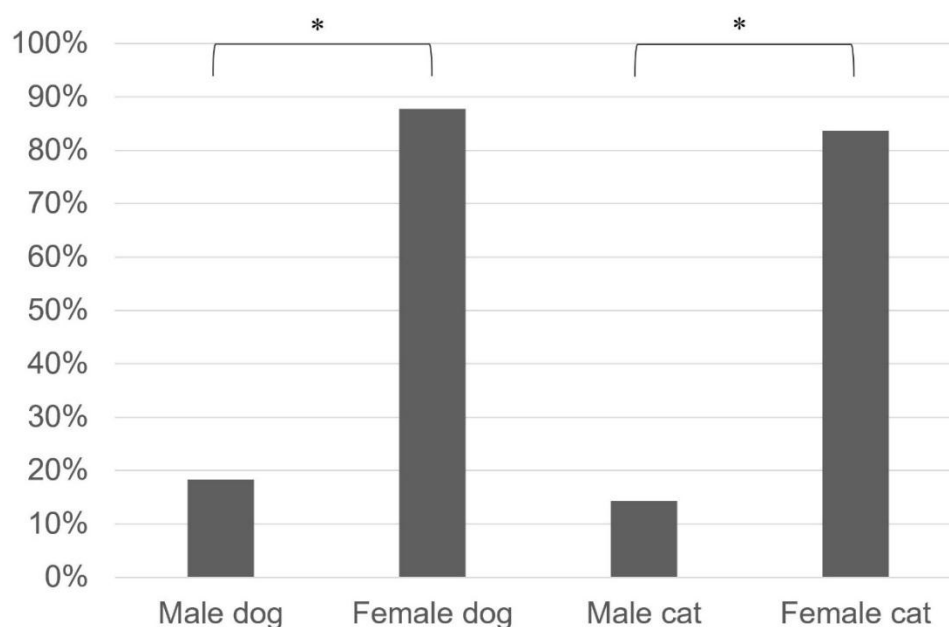
The population size was based on the number of licensed veterinarians in Thailand, as reported by the Veterinary Council (10,448 licensed veterinarians as of May 2022). Using the Yamane formula and aiming for an acceptable sampling error (e) of $\pm 5\%$, the study required a minimum of 385 participants.

Result

In 2022, there were 3,182 animal hospitals registered with the DLD. The highest concentration of these hospitals was in the Bangkok Metropolitan region (38.1%), followed by the Northeast (14.3%) and the East (11.1%) (Table 1). A total of 724 Thai veterinarians participated in this study. Most respondents were female (66.3%), aged 31-40 years (49.6%), worked in Bangkok and its metropolitan area (52.6%), and had 6-15 years of experience in small animal practice (46.4%), as shown in Table 2. The survey was distributed nationwide. The proportion of respondents in each region corresponded to the proportion of animal hospitals in each region of Thailand, ensuring representative sampling.

Table 1 Distribution of registered animal hospitals in Thailand, as recorded by the Department of Livestock Development in 2022, along with survey participants and the number of respondents currently using progestins, categorized by regions in Thailand.

Regions	The number of animal hospitals (%)	The number of respondents (%)	The number of progestin users (%)	The proportion of progestin users
Total	3,182 (100%)	724 (100%)	49 (100%)	1:14.8
Bangkok Metropolitan	1,213 (38.1%)	381 (52.6%)	18 (36.7%)	1:21.2
Central	286 (9.0%)	29 (4.0%)	1 (2.0%)	1:29
East	352 (11.1%)	96 (13.3%)	4 (8.2%)	1:24
North	395 (12.4%)	54 (7.5%)	11 (22.4%)	1:4.9
Northeast	456 (14.3%)	128 (17.7%)	13 (26.5%)	1:9.8
South	315 (9.9%)	27 (3.7%)	2 (4.1%)	1:13.5
West	165 (5.2%)	9 (1.2%)	0	N/A

**Figure 1** The percentage of veterinarians administering progestin injections to male and female dogs and cats in Thailand. Asterisks denote significant differences between genders ($P<0.05$).

Approximately 6.8% (49/724) of respondents reported experience using injectable contraceptive agents (progestins). The average age of veterinarians currently using progestins was 42.3 years, with a range of 29 to 65 years (Table 3). These veterinarians had an average of 15.7 years of work experience in the small animal field, ranging from 3 to 38 years (Table 3). Both the average age (OR = 1.136) and years of experience (OR = 1.147) of veterinarians who used progestins were significantly higher than those who did not (Table 3). Most of them were male veterinarians (59.2%, 29/49), followed by female veterinarians (38.8%, 19/49) and non-binary veterinarians (2.0%, 1/49).

The highest proportion of respondents with experience using progestins was in the North of Thailand (1:4.9), followed by the Northeast (1:9.8) and the South (1:13.5) (Table 1). The use of injectable progestins was significantly higher ($P<0.05$) in female animals compared to males, with 87.8% (43/49) in female dogs and 83.7% (41/49) in female cats (Figure 1). Notably, synthetic progestins were also administered to male animals, with 18.4% (9/49) of veterinarians using them in male dogs and 14.3% (7/49) using them in male cats (Figure 1).

Thai veterinarians ($n=724$) expressed concerns about several potential side effects, including pyometra, CEH, mammary gland tumors, and DM. The most significant concern was pyometra, reported by 59.4% (430/724) of respondents, followed by CEH (47.9%, 347/724) and mammary gland tumors (43.1%, 312/724). Mean (\pm SD) agreement scores for each potential complication were calculated, with values assigned as follows: no effect = 1, minor effect = 2, neutral effect = 3, moderate effect = 4, and major effect = 5, as shown in Table 4. Differences in the total mean (\pm SD) agreement scores for potential complications of using progestins in dogs and cats were observed (Table 4). Pyometra was ranked as the most major side effect (4.53 ± 0.67) among respondents, followed by CEH (4.09 ± 0.80), mammary gland tumors (4.03 ± 0.88), and DM (3.21 ± 0.75) (all; $P<0.001$), although no significant difference between CEH and diabetes mellitus was found ($P>0.05$). Veterinarians who utilized progestins had significantly fewer concerns ($P<0.05$) regarding the complications associated with progestin use compared to those who did not use them (Table 4).

Table 2 Demographic data of survey respondents: number and percentage.

Demographic data	Respondents (%)
Overall	724 (100%)
Gender	
• Male veterinarians	235 (32.5%)
• Female veterinarians	480 (66.3%)
• Non-binary	9 (1.2%)
Age	
• 25-30 years	220 (30.4%)
• 31-40 years	359 (49.6%)
• 41-65 years	145 (20.0%)
Working region	
• Bangkok metropolitan region	381 (52.6%)
• Other regions	343 (47.4%)
Years of experience in small animal practice	
• 0-5 years	277 (38.3%)
• 6-15 years	336 (46.4%)
• >16 years	111 (15.3%)

Table 3 Mean (\pm SD) age and years of working experience of Thai veterinarians categorized by regional distribution, based on current use of Progestins.

Regions	Age (years)	Age (years) of progestin users	Age (years) of progestin non-users	Years of experience	Years of experience with progestin users	Years of experience of progestin non-users
Total	35.1 \pm 7.04	42.3 \pm 8.49 ^a	34.6 \pm 6.63 ^b	8.9 \pm 6.51	15.7 \pm 8.13 ^x	8.4 \pm 6.10 ^y
Bangkok metropolitan	35.5 \pm 7.48	43.4 \pm 10.57 ^a	35.1 \pm 7.09 ^b	9.3 \pm 6.99	18.6 \pm 10.31 ^x	8.8 \pm 6.47 ^y
Central	34.5 \pm 6.32	N/A	34.3 \pm 6.34	9.6 \pm 7.30	N/A	9.4 \pm 7.36
East	32.9 \pm 5.76	38.5 \pm 4.43 ^a	32.6 \pm 5.70 ^b	7.4 \pm 5.57	10.8 \pm 5.32 ^x	7.2 \pm 5.56 ^x
North	36.3 \pm 6.40	40.9 \pm 8.13 ^a	35.1 \pm 5.38 ^b	9.4 \pm 5.23	12.7 \pm 6.10 ^x	8.5 \pm 4.68 ^y
Northeast	36.2 \pm 6.75	43.4 \pm 6.92 ^a	35.4 \pm 6.25 ^b	9.6 \pm 6.11	16.1 \pm 6.40 ^x	8.9 \pm 5.65 ^y
South	32.6 \pm 6.09	41.5 \pm 12.02 ^a	31.9 \pm 5.20 ^a	6.3 \pm 4.93	14.0 \pm 8.49 ^x	5.7 \pm 4.24 ^x
West	30.2 \pm 4.47	N/A	30.2 \pm 4.47	5.0 \pm 4.33	N/A	5.0 \pm 4.33

Superscripts (a,b) indicate significant differences within a row of the average age of respondents in each region ($P < 0.05$). Superscripts (x,y) indicate significant differences within a row of average years of experience of respondents in each region ($P < 0.05$). In the central region, there was only one respondent who used progestins, and in the western region, no progestin user was reported.

Table 4 Mean (\pm SD) agreement scores for potential complications of progestin usage for contraception in dogs and cats (no effect = 1, minor effect = 2, neutral effect = 3, moderate effect = 4, and major effect = 5)

Respondents	Pyometra	Cystic Endometrial Hyperplasia	Mammary gland tumors	Diabetes mellitus
Total	4.53 \pm 0.67	4.09 \pm 0.80	4.03 \pm 0.88	3.21 \pm 0.75
Progestin users	4.16 \pm 0.79 ^a	3.86 \pm 0.88 ^a	3.84 \pm 0.93 ^a	3.04 \pm 0.67 ^a
Progestin non-users	4.56 \pm 0.65 ^b	4.11 \pm 0.79 ^b	4.05 \pm 0.88 ^b	3.22 \pm 0.75 ^b

Superscripts (a,b) indicate significant differences within a column ($P < 0.05$).

Discussion

Progestins have long been used to postpone estrus in female dogs and female cats, offering a temporary, non-surgical method for controlling reproduction (Withers and Whitney, 1967; Beijerrink *et al.*, 2006; Romagnoli, 2015). This approach benefits pets that are unsuitable for surgery due to owner preference, is easier to administer, and is more cost-effective than surgical sterilization. However, progestins are generally recommended only when surgery is not an option and should be used under strict veterinary supervision. In Thailand, the DLD officially announced a population control policy in 2017, advising veterinarians to discontinue contraceptive injections due to rising concerns about pyometra and associated deaths. The policy emphasized surgical sterilization as the primary method for controlling the stray animal population and included labeling animals after sterilization (Hengsaengchai, 2017).

In this study, questionnaires were distributed across all regions of Thailand: central, eastern, northern, northeastern, southern, and western. Due to the high concentration of small animal hospitals recorded by the DLD, the Bangkok metropolitan region was analyzed separately. The Bangkok Metropolitan Region (BMR) includes the five provinces surrounding Bangkok: Samut Prakan, Pathum Thani, Nakhon Pathom, Samut Sakhon, and Nonthaburi. Respondents came from all regions, with the highest number from the Bangkok metropolitan area (52.6%) and the lowest from the western region (1.2%), reflecting the distribution of animal hospitals in the country. In determining the population size for this study, we relied on data from the Veterinary Council concerning the number of licensed veterinarians in Thailand. Employing the Yamane formula and aiming for an acceptable sampling error (e) of $\pm 5\%$, the minimum required number of participants was calculated to be 385 veterinarians. However, our study successfully included 724 Thai veterinarians from

across all regions of Thailand. To our knowledge, this is the first nationwide survey to investigate the current use of progestins as contraceptives in dogs and cats.

Overall, only a small percentage of veterinarians (6.8%, 49 out of 724) reported using progestins as contraceptives in dogs and cats. Although this suggests limited use among Thai veterinarians, it is important to note that progestins might also be used by non-veterinarians, given that the drug can be purchased without a prescription in Thailand. The potential impact of this on animal health risks has yet to be determined. The use of progestins in dogs and cats by non-veterinarians without considering drug indications and contraindications is a significant concern, and it is essential to allocate resources more effectively to provide accurate information, promote caution, and address misconceptions, not only within the veterinary community but also among para-veterinarians and pet owners in Thailand. In addition, among the respondents from each region, the highest proportions of those who had used progestins were in the northern region of Thailand (1 in 4.9), followed by the northeastern region (1 in 9.8), and the southern region (1 in 13.5). This suggests that comprehensive information and resources should also be prioritized for the veterinary communities in these three regions.

The findings indicated that veterinarians currently using progestins tended to be older and have more years of experience in the small animal field compared to those who did not use these contraceptive agents. Specifically, the average age of these veterinarians was 42.3 years, with a range between 29 and 65 years. They also had an average of 15.7 years of work experience, ranging from 3 to 38 years. In this study, the odds ratios (OR) provided a measure of the association between age and experience with the use of progestins. An odds ratio greater than 1 suggests a positive association. Here, an OR of 1.136 for age implied that for each additional year in age, the odds of a veterinarian using progestins increase by 13.6%. Similarly, an OR of 1.147 for years of experience also indicated that for each additional year of experience, the odds of using progestins increase by 14.7%. Both of these associations were statistically significant, indicating there was a meaningful difference in age and experience between veterinarians who used progestins and those who did not. This might suggest that younger veterinarians are less likely to use progestins, potentially due to more recent veterinary education or the increased accessibility of evidence-based learning among the newer generation. Moreover, the gender of veterinarians may influence the use of progestins, as the findings indicated a higher percentage of male veterinarians (59.2%) compared to female veterinarians (38.8%).

As anticipated, veterinarians who currently use progestins reported a preference for administering them to female dogs and cats over males. Specifically, 18.4% reported using progestins in male dogs and 14.3% in male cats. In male dogs, progestins have been used to treat benign prostatic hyperplasia (BPH) by lowering androgen levels (Okada *et al.*, 1988), although long-term use is cautioned. While progestin-associated risks such as glucose intolerance and diabetes mellitus have been documented in female dogs (Selman *et al.*,

1994), further investigation is needed to confirm these adverse effects in male dogs. At present, the use of progestins to treat canine BPH is no longer recommended. Progestins are not recommended for male contraception because they do not effectively induce male infertility (Wright *et al.*, 1979). In dogs, subcutaneous administration of MPA at doses of 10 or 20 mg/kg does not adversely affect fertility; however, it can decrease sperm motility and alter sperm morphology and concentration within three days after administration of the higher dose (20 mg/kg) (England, 1997). Furthermore, progestins may be used in male animals for behavioral control, such as reducing aggression, roaming, or urine spraying. However, the use of progestins for behavioral control in male dogs and cats remains controversial, with limited and inconclusive scientific evidence supporting their efficacy (Gerber *et al.*, 1973). Due to the lack of strong evidence, progestins are generally no longer recommended as a method for either reproduction or behavioral control in male dogs and cats.

The survey revealed that Thai veterinarians, regardless of whether they use progestins, were most concerned about pyometra as a major effect, followed by cystic endometrial hyperplasia (CEH) and mammary gland tumors. Diabetes mellitus was considered a moderate effect. However, the agreement scores for potential complications between respondents who experienced and who did not experience using progestins were significantly different in all complications ($P < 0.05$, Table 4), suggesting that veterinarians who utilized contraceptive injections were less aware of the complications associated with progestin use compared to those who did not use them. Alternatively, veterinarians who use progestins may have some awareness of the associated complications but continue to use them due to limited alternative medical options for contraception or economic constraints faced by pet owners. Additionally, our study suggests that there is insufficient communication among veterinarians regarding progestin use in companion animals in Thailand, including its application in male dogs and cats. Our findings indicate that awareness of potential side effects may not be comprehensive across all users. Therefore, future efforts should prioritize enhancing veterinary education and communication, as well as disseminating comprehensive information on contraceptive options. This approach would promote informed decision-making among veterinary practitioners and pet owners.

In Thailand, the reported mortality rate for pyometra was 10.63% (Rungphattanachaikul *et al.*, 2021). A case-control study involving 953 dogs with pyometra and 10,660 control dogs examining the influence of age, parity, hormonal therapy, and breed on the development of pyometra revealed that while estrogen administration increased the risk of pyometra in bitches under 4 years old (OR > 6), no significant risk was associated with progestin treatment when doses, estrous stage, and a single administration were taken into high consideration (Niskanen and Thrusfield, 1998). Additionally, nulliparous bitches had a moderately higher risk of pyometra compared to those

with one or more litters (Niskanen and Thrusfield, 1998). Pyometra has been reported in the middle to old-aged dogs ((Niskanen and Thrusfield, 1998; Poudel, 2020); however, it can also be present in puppies (Lansubsakul *et al.*, 2022).

While progestins can offer a useful, non-surgical method of contraception for dogs and cats, they come with significant health risks and require careful consideration of their misuse and veterinary oversight. The decision to use progestins should be made based on individual circumstances, weighing the benefits against the potential drawbacks and health implications for the animals. Ethical concerns also exist due to the potential adverse health effects of prolonged hormonal treatments. Moreover, effective population control requires a comprehensive approach beyond hormonal contraception, as it alone may not adequately address overpopulation.

In conclusion, this nationwide survey suggests that factors associated with the use of progestins include veterinarians' gender, age, years of experience, as well as the gender of animals and geographical regions within Thailand. The use of progestins in dogs and cats without proper consideration of drug indications and contraindications is a significant concern. This study also emphasizes the need to allocate resources more effectively to provide accurate information, promote caution, and address misconceptions, not only within the veterinary community but also among para-veterinarians and pet owners in Thailand. It is particularly important to prioritize comprehensive information and resources for veterinary communities in the northern, northeastern, and southern regions. Additionally, there is a need for alternative, affordable contraceptive options in Thailand.

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