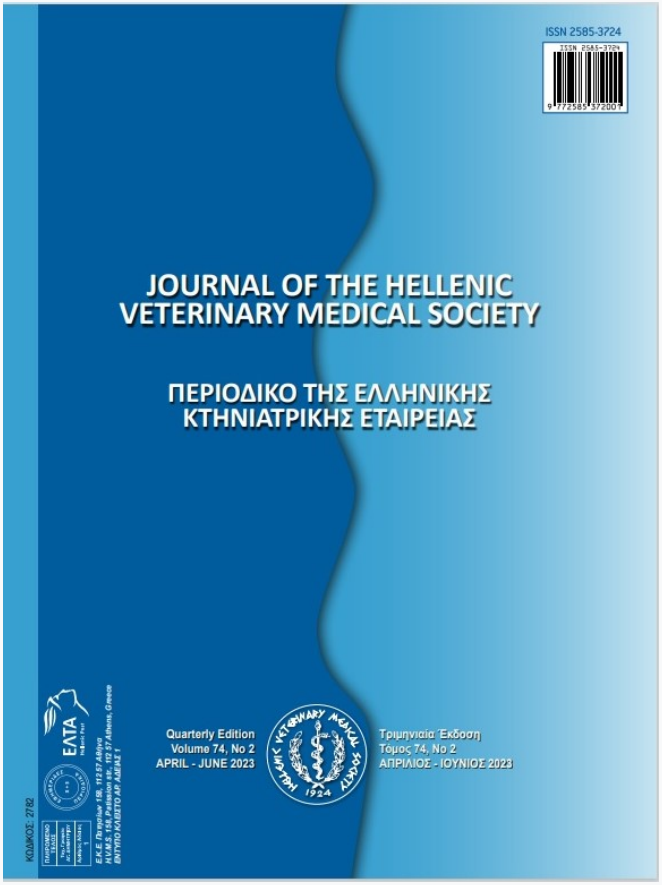
Journal of the Hellenic Veterinary Medical Society

Vol 74, No 3 (2023)



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doi: 10.12681/jhvms.30680

To cite this article:

Mavromati, J., & Mehmedi, B. (2023). Monitoring cases of pyrethroid intoxications in cats in Tirana region, Albania during 2016-2020. *Journal of the Hellenic Veterinary Medical Society*, *74*(3), 6023–6028. https://doi.org/10.12681/jhvms.30680

J HELLENIC VET MED SOC 2023, 74 (3): 6023-6028
ΠΕΚΕ 2023, 74 (3): 6023-6028

Research article
Ερευνητικό άρθρο

Monitoring cases of pyrethroid intoxications in cats in Tirana region, Albania during 2016-2020

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ABSTRACT: Pyrethroids are synthetic insecticides which are being widely used to control fleas and ticks in household pets. However, their use extends to pest control as well. Products used worldwide to protect pets are in liquid form and comprise spot-ons, shampoos, and spray. Close attention should be paid to proper usage of such insecticides in pets, particularly in cats. As already indicated by many studies, accidental or improper usage of such products can trigger severe health problems even proving fatal in cats. The objective of the current paper is to undertake a retrospective study of a total number of 47 cases suffering from pyrethroid intoxication in cats across several clinics in Tirana, Albania during the period 2016-2020. Records from the veterinary clinics were closely scrutinized with only specific cases of pyrethroid intoxication being included for the purposes of this study. The main clinical signs which were noticed in 47 cats included symptoms such as tremor/muscle fasciculation (37 cats; 76.6%), seizures (18; 38.3%), hyperaesthesia (19; 40.43%), ptyalism (13; 27.66%), ataxia (11; 23.4%), mydriasis (10; 21.28%). Out of 47 cases, 7 or 14.9 % of the treated cats did not survive. The outcome was solid after rapid interventions in 31 (65.96%) cats with the exception of 2 cats which did not survive dispide receiving treatment. Whereas as many as 16 (34.04%) of cats, having being taken late to the clinics, survived upon receiving treatment, while as few as 5 cats (31.25%) died. **Awareness** campaign targeting pet owners, owner education, appropriate product labelling and consultations with veterinarians may help eliminate this problem in the future.

***Keywords*:** monitoring; pyrethroids; cats; spot-on; intoxication.

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Date of initial submission: 13-07-2022
Date of acceptance: 23-12-2022

INTRODUCTION

Pyrethroids occupies an important place among natural and synthetic insecticides which are commonly used to control insects like fleas and ticks in household pets (Wismer, 2003; Sutton et al., 2007; Walters et al., 2016). They are also widely used around our homes in products such as bug sprays and insects intendet for pest control. During the late 20th century pyrethroid insecticide accounted for roughly 30% of the total amount of insecticides used worldwide (Hasibur et al., 2014).

The high toxicity of organochlorid and organophosphor insecticids in animals and human beings, led to the demand to use other insecticids such as synthetic production of pyrethroids. However, caution should be shown in their use since pyrethroids are broadly classified into first and second generation of pyrethroids. The first generations of pyrethroids (Type I) are less toxic to mammals than the second generation of pyrethroids (Type II) (Hasibur et al., 2014).

It is important to highlight that cats are more susceptible to pyrethroids than dogs and often a mere drop of permethrin concentrate (45-65%) is enough to cause an animal's immediate death (Kuo and Odunayo, 2013).

The most widely used products are in liquid form and ready to be used as spot-ons with active ingredients: permethrin, imidacloprid, imidacloprid/ivermectin, fipronil, fipronil/S-methoprene (Suton et al., 2007). Products like shampoos containing permethrin content, sprays with permethrin and diazinon contents; tablets and injectable solutions with lufenuron contents have been found to have gained a foothold in the Albanian market too. During the last decades in many different countries, including Albania, the use of pyrethroids in companion animals has increased significantly (Linnet, 2008; Anadon et al., 2009).

Following oral or dermal absorption, permethrin is metabolized by hepatic microsomal esterases and oxidases, followed by rapid hepatic hydroxylation and conjugation to glucuronides or sulfates (Beasley et al., 1997; Linnet and Dagg, 2004; Kuo and Odunayo, 2013). The feline liver is deficient in the glucuronide-transferase enzyme; therefore cats develop more permethrin toxicosis compared to dogs. Considering this fact, the cat liver is unable to eliminate permethrin, which retains it in the body until it reaches toxic levels (Wismer and Means, 2012).

The permethrin products used in cats contain a low concentration of permethrin between 0.05% to 0.1% (Wismer, 2003), which is in line with this spectra of drug use.

However, permethrin toxicity usually occurs when the owners applies the spot-on intended for dogs to the cats (Wismer and Means, 2012). And in our retrospective study of 47 cases, the intoxication of cats was due to owner's improper use of products that were intended for dogs. In addition, cats that are in close physical contact with a newly-treated dog may also be at risk of toxic exposure (Richardson, 1999). The mechanism of action of pyrethroids essentially relies on allowing a greater influx of Na^+ ions resulting in depolarization of the neuronal membrane (Linnet, 2008) and providing blockages in recovery of impulse. Prolonging the inflow-outflow of Na^+ reduces the field of action potential to block the conduction of nerve impulses. Pyrethroids also affect other voltage-dependent channels such as Ca^{++}, affecting Cl^- ions including GABA-receptors (Linnet, 2008).

The onset of clinical signs is usually within a few hours after exposure, but may be delayed up to 24 hours and in rare cases up to 72 hours (Motomura and Narahashi, 2000; Kuo and Odunayo 2013).

Although the number of cats as household pets has increased over the past years in Albania, there have been no previous studies or publications related to the incidence of cats intoxication by pyrethroids. The aim of the study was to evaluate the status of pyrethroids intoxication in cats, since the pyrethroids use has increased in Albania. The data were collected across veterinary clinics and hospitals in the Tirana region of Albania.

MATERIALS AND METHODS

The data for this study were collected from the veterinary clinics and hospitals in Tirana region, Albania during the period 2016-2020. The diagnosis for permethrin intoxication in cats was based on exposure history, development of associated signs and given anamnesis from the owners found in veterinary records of the clinics in Tirana region. In the given anamnesis the owners have reported that they have used products which were intended for dog use, thus not being aware of the consequences they would cause in cats. In Table 1, we present the total number of cats admitted to veterinary clinics for treatment. Cats which

were poisoned by pyrethroids and came early to veterinary clinics (2-6 hours), were subjected to first treatment which consists of such protocols as thorough body wash with running water and neutral shampoo for the removal of pyrethroids taken in the form of spot-ons, charcoal l-5 g/kg b.w orally and 0.5 g/kg b.w laxatives such as magnesium sulfate or sodium sulfate 10% were also used. In the case of cats which were diagnosed by heavy intoxication, veterinarians applied symptomatic therapy; Benzodiazepines drugs to counteract and normalize tremor/muscle fasciculation and seizures. In 17 cats the benzodiazepine, diazepam was administered slowly intravenously 0.25mg/kg. While in 11 cases diagnosed with cat intoxication, Barbiturate drugs were used, Phenobarbital in doses 2-4mg/kg intravenously every 12 hours. In all monitored cases in Tirana clinics, the veterinarians continued to administer supportive fluid therapy to the cats

Table1 1. The total number of cats admitted to clinics for treatment

Years	No. of treated cats	No. of dead cats	% of treated cats
2016	4	1	25%
2017	7	2	28.57%
2018	10	2	20%
2019	13	1	7.69%
2020	13	1	7.69%
Total	**47**	**7**	**14.89%**

RESULTS

The main clinical signs observed in 47 cats intoxicated with pyrethroids in the clinics were: tremor/muscle fasciculation (37 cats; 76.6%), seizures (18; 38.3%), hyperaesthesia (19; 40.43%), ptyalism (13; 27.66%), ataxia (11; 23.4%) and mydriasis (10; 21.28%). Other clinical signs including anorexia, vomiting, anxiety, hypothermia, hiperthermia, tachichardia, tachipnoea were also recorded.

In Figure 1 are shown the results of our on-going monitoring process. We have divided the cases according to the arrival time of animals to the clinic for purposes of treatment. Out of 47 cases, 7 or 14.9 % of the treated cats did not survive the treatment. Whereas, 31 of them (65.96%) were brought early to the clinic within 2-12 hours after their first exposure to source of intoxication and they received immediate treatment. The mortality rate in these cases was fixed at 6.45%. On the other hand, 16 cats (34.04%) which were taken late to the clinic within 24-72 hours after their first exposure to the source of intoxication also received immediate treatment but the mortality rate was at 31.25%.

Based upon the results in Table 2, one can conclude that in May and June were reported the highest number of cases of cat intoxication with figures standing at 11 and 9 cases respectively.

Intoxication in cats during spring was fixed at 31.91%, with moderate increases during summer at 40.42%. Moreover, it could be inferred that the number of intoxications begin to decrease during autumn by 23.41% with barely 2 cases being reported in winter specifically in December.

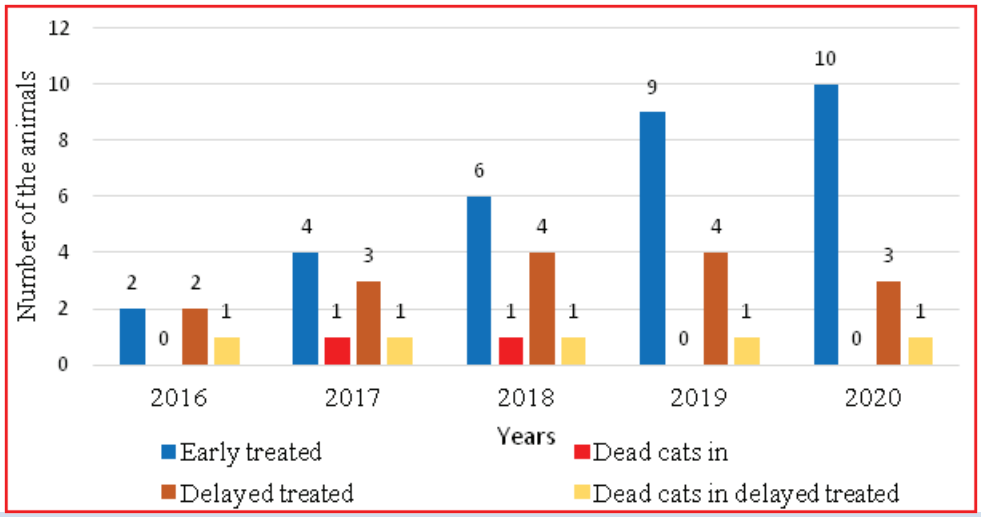

Figure 1. Number of dead cats resulting from early and late treatment

Table 2. Number of intoxicated cats by months with pyrethroids, year 2016-2020.

Months	No. of cats treted according the month years 2016-2020					Total	% to total
	2016	2017	2018	2019	2020		
January	-	-	-	-	-	-	0
February	-	-	-	-	-	-	0
March	-	-	-	1	-	1	2,13%
April	-	-	-	1	2	3	6,38%
May	2	2	3	2	2	11	23,41%
June	1	2	3	3	-	9	19,15%
July	-	1	1	1	2	5	10,64%
August	-	-	1	1	3	5	10,64%
September	1	1	1	2	-	5	10,64%
October	-	1	-	1	2	4	8,51%
November	-	-	1	-	1	2	4,25%
December	-	-	-	1	1	2	4,25%
Total	**4**	**7**	**10**	**13**	**13**	**47**	**100%**

DISSCUSION

These are considered to be the first cases of cat intoxication reported in Albania. It is important to highlight that our results, as presented in Figure 1, are fully congruous with the findings of other authors; with clinical signs usually starting within the first three hours after coming into contact with the source of intoxication, but they may appear as late as 72 hours after coming into the first contact (Merola and Dunayer, 2006; Linnet, 2008; Kuo and Odunayo, 2013).

Despite the fact that most products sold in Albania are labeled by their manufacture, it is often the case for the labels to be in such a small print that reading them is difficult enough for owners to read the information. Another important point is that sometimes pet owners do not consult with veterinarians prior to the drug use, a failure which results in mistakes being made in the selection of drugs administered in cats to combat ectoparasites. Similar results have been reported by a study in Australia (Malik and Dunayer, 2010) to the effect that permethrin toxicosis cases do occur when using insecticide products purchased straight in supermarkets or pet stores. The clinical signs observed and monitored in our study are similar to the those by Linnett (2008) and Kelmer (2020). It should be stressed that the clinical signs depend largely on the type of pyrethroid being administered to the animals, the time of arrival at the clinics, the breed and age of cats. Information from the AERP Vet records showed 26 cases of adverse experience with permethrin exposures in cats were reported, where three-quarters of cats developed permethrin toxicity after the owner inappropriately applied the canine spot-on product (Webster, 2001). In 2000 the Veterinary Medicines Directorate's Suspected Adverse Reaction Surveillance Scheme (SARSS) in the United Kingdom reported 18 incidents of suspected adverse reactions in 27 cats, which had been exposed to canine permethrin spot-on products. Two of the 18 incidents (11%) involved close physical contacts between treated dogs and cats (Gray, 2000).

The mortality rates, observed in Tirana, were fixed at 14.89 which are comparable to the findings of other studies in England, with figures at 37% of affected cats with permethrin toxicosis which died when referring to the VMD England information (Gray, 2000). Whereas a survey carried out in Australia in 2010 found a total of 166 cases of death being reported (Malik Dunayer, 2010).

Regarding the incidence of cat intoxication we notice that it starts in spring particularly in May, which corresponds with the biol ogical cycle of ectoparasites such as fleas, lice, mallophagi, etc. Similar findings were recorded by the VPIS England during a 3-month study with autumn showing figures at approximately 30.9% against the annual total number of permethrin intoxication cases (September 12.4%, October 10.2%, November 8.3%) (Suton et al, 2007) respectively. Whereas in Tirana during autumn we witnessed figures at 23.41% against the annual total number of pyrethroids intoxication (September 10.64%, October 8.5% and November 4.25% respectively).

The therapy administrated in these cases consisted

of a group of sedative and anticonvulsive drugs soofing effects on muscle tremor and seizures. The therapy being applied targeted of supportive fluid therapy used across the Tirana clinics which is in line with other studies (Valentine 1990; Linnet, 2008; Davis, 2012; Wellman et al., 2012; Kuo and Odunayo, 2013; Peacock et al., 2015). The treatment protocol consisted in administration of a group of Benzodiazepin drugs (Diazepam®- Profarma in ampules 10 mg/2mL), and Barbiturate group (Phenobarbital, Luminal®-Profarma, in ampules 200mg/2 mL). Both diazepam and phenobarbital have been used as a symptomatic treatment for muscle tremors and seizures in other studies as well (Fernandez et al., 2011; AAHA/AAFP, 2013; Bates, 2016; Kerlmer et al., 2020).

In all cases cats received supportive fluid therapy in order to normalize fluids, hyperthermia and dehydration with an implied significance in protecting the kidneys as well (Davis, 2012; Fettiplace et al., 2015; Haworth and Smart, 2012; Kuo and Odunayo 2013; Linnet, 2008;).

CONCLUSIONS

From the above data we can conclude that pyrethroid intoxications are a real problem that should be seriously dealt with in Albania. An awareness campain is needed to properly inform pet owners of the kind of products they should use for purposes of controlling parasites in cats. First of all, the owners will have to read carefully the instruction manual about drugs which contain pyrethroids, and if such a drug is allowed to be administered in cats. In addition, the owners will have to read and implement the instructions with the appropriate amounts applied as they do appear on the label. Products which are labeled for "dogs only" should never be used on cats. Veterinarians will have to do an accurate diagnosis by take atantion carefully at the medical history by observing clinical signs, and setting a differential diagnosis apart from other intoxications particularly from organophosphorus, carbamates, herbicides and molluscicides. Advice should be dispensed to pet owners to carefully monitor the behavior of cats in cases when spot-on, shampoos, collars, sprays or even powders containing pyrethroids are being applied. They should be asked in advance if they have more than one pet, if they do, they will have to separate the animals after treatment in order to prevent intoxication.

REFERENCES

AAHA/AAFP (2013) Fluid Therapy Guidelines for dog and cats in the Implementation Toolkit USA.

Anadón A, Martínez-Larrañaga MR, Martínez MA (2009) Use and abuse of pyrethrins and synthetic pyrethroids in veterinary medicine: Vet J 182, 7-20.

Bates N (2016) Lipid infusion in the management of poisonin. Vet Rec, 179, 1-22.

Beasley VR, Dorman DC, James FD, Stephen DG, Woshner V (1997) A Systems Affected Approach to Veterinary Toxicology. Urbana University of Illinois college of Veterinary Medicine.178-180.

Davis H, Jensen T, Johnson A (2012) in AAHA/AAFP Fluid Therapy Guidelines for Dogs and Cats. *J Am AnimHospAssoc* 2013; 49:149-159

Fernandez AL, Lee JA, Rahilly L, Hovda L, Brutlag AG, Engebretsen K (2011) Use of intravenous lipid emulsion as an antidote in veterinary toxicology. J Vet Emerg Crit Care 21 4:309-320.

Fettiplace MR, Akpa BS, Rubinstein I, Weinberg G (2015) Confusion about infusion: rational volume limits for intravenous lipid emulsion during treatment of oral overdoses. Ann Emerg Med 66 2:185-188.

Gray A (2000) Permethrin toxicity in cats. Vet Rec 147 19:556.

Haworth MD and Smart L (2012) Use of intravenous lipid therapy in three cases of feline permethrintoxicosis. J Vet Emerg Crit Care 22 6:697-702.

Hasibur R, Al Thbiani A, ShaliniS, Zahid KA, Anand M, Abid AA (2014) Systematic review on pyrethroid toxicity with special reference to deltamethrin. Journal of Entomology and Zoology Studies 2 6:60-70

Kelmer E, Oved S, Abu AW, Chai O, Aroch I, Klainbart S (2020) Retrospective Evaluation of Factors Associated with the Morbidity and Outcome of PermethrinToxicosis in Cats. Israel Journal of Veterinary Medicine, vol 75(3), 142-147.

Kuo K, Odunayo A (2013) Adjunctive therapy with intravenous lipid emulsion and methocarbamol for permethrin toxicity in 2 cats. Treatment of permethrin toxicity with ILE J Vet Emerg Crit Car 23:436-441.

Linnett PJ, Dagg P (2004). The veterinary pharmacovigilance program of the APVMA: Aust Vet J, 83-32.

Linnett PJ (2008) Permethrin Toxicosis in cats. The veterinary pharmaco vigilance program of the APVMA Aust Vet J 86:32-35.

Malik R, Ward MP, Seavers A, Fawcett A, Bell E, GovendirM, Page S (2010) Permethrin spot-on intoxication of cats. Literature review and survey of veterinary practitioners in Australia J Fel Med Surg 12:15-14

Merola V, Dunayer E (2006) The 10 most common toxicoses in cat. Veterinary Medicine 101 6:339-342.

Motomura H, Narahashi T (2000) Temperature dependence of pyrethroid modification of single sodium channels in rat hippocampal neurons. J Membrane Biol 177 1:23-39.

Peacock RE, Hosgood G, Swindells KL, Smart L (2015).A randomized, controlled clinical trial of intravenous lipid emulsion as an adjunctive treatment for permethrintoxicosis in cats. J Vet EmergCrit Care 25:597-605.

Richardson JA (1999) Permethrin Spot-On Toxicoses in Cats. J Vet EmergCrit Car 10 2:103-106.

Sutton NM, Bates N, Campbell A (2007) Clinical effects and outcome of feline permethrin spot-on poisonings reported to the veterinary poisons information service (VPIS) London. Journal of Feline Medicine and Surgery 9:335-339.

Webster CL (2001) Clinical Pharmacology. Quick Look Series in Veter-

inary Medicine
Wismer T (2003).Small Animal Toxicoses - Insecticides. Veterinary Support Personnel Network http://www.vspn.org), Veterinary Information Network Inc Davis CA, 2003.
Wismer T and Means Ch (2012). Toxicology of newer insecticides in small animals. Vet Clin North Am Small AnimPract, 42(2):335-347, vii-viii.
Walters JK, Bowell LE, Green MK, Heumann MA, Karam LE, Morrissey BF, Waltz JE (2016) Pyrethrin and pyrethroidillnesses in the pacific northwest, why are cats still dying from permethrin toxicity?: https://www.vettimes.co.uk.
Wellman ML, Dibartola SP, Kohn CW (2012) Applied physiology of body fluids in dogs and cats. Dibertola SP at fluid electrolyte and acid-base disorders is small animal practice. 4thed St Luis MO: Elsevier Saunders 15, 2-25
Valentine WM (1990) Pyrethrins and pyrethroid insecticides. Veterinary Clinics of North America: Small Animal Practice 20, 375-382.
Profarma, pharmaceutical produser company in Albania. www.profarma.al (2021) [accessed 20 December 2021]