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Dog Poisoning From Ethylene Glycol and The Importance of Early Diagnosis

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Abstract: A study on the intoxicative effect of ethylene glycol in pets has been conducted. Three Albanian cities were monitored, respectively Tirana, Korça, and Shkodra for a two-year period. The data from this study was collected in accordance with a questionnaire prepared in advance, before being processed and analyzed. The main highlighted indicators monitored were: the number of the intoxicated dogs, the number of the dogs who were treated, treatment period, mortality, number of the dogs who were treated each month and season. The number of intoxicated dogs in all three cities was 59, whereas 52 were treated. 19% of the cases ended in death. Korça resulted with the highest rate of treatment, and mortality as well, because of the wide use of the ethylene glycol. In only 32.7% of the cases the dogs were sent immediately to the clinic for treatment. The animals that were sent to the clinic late, resulted with a higher mortality rate (25.7% of the treated animals). The most ethylene glycol poisoning cases happened during the end of spring and the beginning of summer (43 animals), which is related to the end of the frost season, when ethylene glycol is not used any more. Human negligence and a lack of awareness caused the dogs to be in contact with, and get poisoned by, the ethylene glycol solutions. The conclusion of the monitoring is that there is a need to highlight that ethylene glycol intoxications are present in dogs and should be taken in to consideration, because they damage their health.

Keywords: Dogs, Ethylene glycol, Intoxication, Treatment

Introduction

Ethylene glycol poisoning is common in dogs and cats (Thrall et al., 1984; Mueller, 1982) and often is cause of death if the correct diagnosis and specific therapy is not evaluated (Roeland, 1987). The mortality rate in the dog is reported to be from 59% to 70% (Roeland, 1987) and is thought to be even higher in the cat. Intoxication by ethylene glycol is the second most common cause of animal mortality according to the American Association of Poison Control Centers (Hornfeldt & Murphy, 1998). This high incidence is due to the pleasant and attractive taste for dogs and cats and the small amount needed to cause poisoning. Most of the ethylene glycol poisonings are accidental. The incidence of poisoning is also relatively high in humans, approximately 5,000 cases reported in America each year (Litovitz et al., 1997). Most of them are unintentional, and approximately one third of cases occur in children (Litovitz et al., 1997). In some countries, such as Poland, ethylene glycol is the most common cause of poisoning in humans (Sienkiewicz & Kwiecinski, 1992). The first reported case of poisoning from one man's ethylene glycol occurred in 1930 (Anonymous, 1940; Kerstin & Nielson, 1966) but the toxicity of ethylene glycol was not fully understood until 1938 when 76 people died after consuming a syrupy drug containing the active substance sulfanilamide and as adjuvant substance contained 96% diethylene glycol (Geiling & Cannon, 1938). Since then, many cases have been published in people and animals poisoned with ethylene glycol (Thrall et al., 1984; Boermans et al., 1988; Clark et al., 1997).

Intoxications from ethylene glycol (antifreeze) have been very little known in Albania not only to people but also from veterinarians. In some cases in veterinary clinics is suspected of the presence of ethylene glycol poisoning, based on the anamnesis given by dog owners as a result of the negligent antifreeze use, but most of the cases passed without studying the problem more precisely and without settling the final diagnoses.

Starting from the lack of an initial study on the problems that could cause the consumption of antifreeze (ethylene glycol) from the companion animals (dog and cat), this study was further evaluated to provide a more detailed assessment of the situation and to provide further information to the veterinarians as well as citizens.

The importance and scope of this study is related to the first identification of the problem in Albania by bringing interesting theoretical information but also the data of poisoning in some of the Albanian regiona.

Method

The study was done using intoxication cases from ethylene glycol, in three main cities of Albania. Tiranë, Korcë and Shkodër during the 2016-2017 period. The cases from these intoxications were collected in accordance with a questionnaire prepared in advance, before being processed and analyzed. Reconstruction and analysis of these cases were done according to the contemporary literature in relation to these intoxications.

The questionnaire for veterinarians.
1. Have you had any intoxication cases from Ethylene Glycol?
2. How many cases have you had with suspicious clinical signs from Ethylene Glycol?
3. In which season have the most problems occurred?
4. In how many cases were differential diagnoses done?
5. Where has the differential diagnoses been supported regarding to clinics or laboratory analysis?
6. Was there any laboratory analysis done for further assessing suspicious diagnoses, and if so with what methodology?
7. How is the treatment done?
8. What was the result of the medication?
9. Did the citizens have any information for the Ethylene Glycol damage in dogs?
10. What do you recommend as a prevention method?

Results and Discussion

The table nr. 1 shows the number of monitored dogs in some clinics located in the three cities. The total number of animals who received treatment for intoxicated with Ethylene Glycol (antifreeze) are 59 dogs in the three cities studied all together. 52 dogs have been treated and 7 others have not been treated because of the mild nature of their intoxication making the treatment unnecessary.

Table 1. The number of dogs intoxicated from Ethylene Glycol (year 2016-2017)

Clinics	Nr. of dogs suspected to be intoxicated from Ethylene Glycol	Nr. of dogs treated	Mortalities	%
Korçë	26	22	5	23%
Tiranë	21	19	3	16%
Shkodër	12	11	2	17%
Total	59	52	10	19%

Out of the 52 dogs who received treatment, 10 of them died. This number should not go unnoticed. Korca has the highest number of dogs who were treated for antifreeze intoxication, but it also has the highest number of dogs who died. A logical interpretation would be that Korça is a colder geographical region that has a higher use of the antifreeze and dogs are more exposed to it in comparison with Tirana and Shkodra.

Table 2. The number of dogs intoxicated and the timing of treatments, during the year 2016-2017

Clinics	Nr. of dogs treated early	% of total	Nr. of dogs treated late	% of total
Korçë	8	36,4%	14	63,6%
Tiranë	6	31,6%	13	68,4%
Shkodër	3	27,3%	8	72,7%
Total	17	32,7%	35	67,3%

In table 2 we have separated the cases according to the timing of the treatment process, from the time of the Ethylene Glycol poisoning to the arrival time of the animal in clinic for treatment. This is mainly done from the anamnesis and clinical signs. From the 52 totally treated dogs, 17 of them (32.7%) have arrived to the clinic early, and their treatment has been done immediately. Initially the treatment has been done with general parenteral medication

Table 3.The number of intoxicated dogs treated, and mortality according to precedence, year 2016-2017

The clinics	Early treated dogs	% of the total	The number of dead dogs	% of deaths	% Nr of late treated dogs	% of the total	Nr of dead dogs	% of deaths
Korça	8	36,4%	1	12,5%	14	63,6%	4	28,4%
Tirana	6	31,6%	0	0	13	68,4%	3	23%
Shkodra	3	27,3%	0	0	8	72,7%	2	25%
Total	17	32,7%	1	5,9%	35	67,3%	9	25,7%

In the above table we immediately recognize that we have more deaths in the animals that have arrived late in the clinic. The mortality goes up to 25.7% of the cases treated with suspicion of Ethylene Glycol intoxication. The animals who were treated early are almost all cured with positive results with the exception of one animal in Korçë that in fact has had other complications in advance.

Table 4. The number of intoxicated dogs according to the season (Ethylene Glycol), year 2016-2017

Seasons	Nr of treated dogs according to the seasons	% of the cases
Spring	23	44,23%
Summer	26	50 %
Autumn	2	3,85%
Winter	1	1,92%
Total	52	100%

From the table above we recognize that 82.7% of the ethylene glycol intoxication cases have occurred at the end of the spring season and at the beginning of the summer season. This is related to the end of the frosting season and with the removal of the ethylene glycol from the vehicles, consequently the contact of the animals with ethylene glycol is increased because the citizens are not careful and do not know the toxic effects that ethylene glycol has to animals. Often the dogs are allowed to lick and take large doses of ethylene glycol freely because there is a lack of consideration for the prevention of contact. Ethylene glycol, having 95% propylene glycol, has a sweet and delicious taste for dogs.

Table 5. The number of the intoxicated dogs separated monthly (ethylene glycol), 2016-2017

Months	Nr of the treated dogs according to the months	% of the cases
January	0	0
February	1	1,92%
March	2	3,85%
April	7	13,45%
May	14	26,92%
June	17	32,70%
July	5	9,61%
August	4	7,70%
September	2	3,85%
October	0	0
November	0	0
December	0	0
Total	52	100%

From the above table, the seasonal character of the ethylene glycol intoxication is reinforced, with the highest occurrences in the months of June (32.7%), May (26.92%), April (13.45%) and July (9.61%). This, as we said above, is related to the removal of the ethylene glycol from the vehicles starting from April until June, as temperatures rise.

Information received from veterinary clinics, shown that over 80% of cases are treated with general therapy including and glucose infusion which is not recommended in the case of poisoning with ethylene glycol (Jacobsen D, 1999, Biba & Mavromati, 2014).

Accurate diagnosis by means of anamnesis, kit, laboratory control and early onset of treatment prior to commencing the formation of oxalate in the kidney is a key to success (Biba & Mavromati, 2014; Adams et al., 1991).

Ethylene glycol intoxications are also described in other animals as well as in humans (Doty et al, 2006; Boermans et al., 1988; Sienkiewicz & Kwiecinski, 1992) Various authors recommend for the treatment of cases of poisoning with ethylene glycol, the use of ethanol or 4-methylpyrazole as well as fomepizole (Jacobsen, 1999; Dial et al, 1994, Baund et al, 1986-87, Baund et al, 1988; Grauer, 1987; Connally et al., 2000)

Conclusion

From prior theoretical work, through the data gathered from the monitored case studies and the conclusions of the questionnaire and the contacts with the clinics in Korçë, Tiranë, and Shkodër, comes the conclusion that ethylene glycol intoxication is evident and must be taken in consideration for the damages that it brings to the animals, particularly in dogs.

The number of intoxicated dogs in all three cities was 59, whereas 52 were treated. 19% of the cases ended in death. Korça resulted with the highest rate of treatment, and mortality as well, because of the wide use of the ethylene glycol. In only 32.7% of the cases the dogs were sent immediately to the clinic for treatment. The animals that were sent to the clinic late, resulted with a higher mortality rate (25.7% of the treated animals). The most ethylene glycol poisoning cases happened during the end of spring and the beginning of summer (43 animals), which is related to the end of the frost season, when ethylene glycol is not used any more. Human negligence and a lack of awareness caused the dogs to be in contact with, and get poisoned by, the ethylene glycol solutions (Antifreeze).

Recommendations

We are recommended the educating of the people and carefully monitoring the removal of ethylene glycol (antifreeze) during end of spring and summer seasons is a necessity which needs the continuing attention of veterinarians.

The careful evaluation from veterinarians regarding the cases related with these ethylene glycol intoxications will lead to an early diagnosis and treatment, minimizing the consequences.

There must be attempts for differential diagnosis from other intoxications. Otherwise we may very often be lead toward general, unspecific treatment, thus increasing the number of deaths due to inefficiency. We are recommended the specific therapy by using ethanol in veterinary clinics for better results, especially to the early diagnosis of dogs and cats.

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