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Feline toxicology: quick guide for consultation

Abstract

Cats are popular pets worldwide, and many owners are concerned about keeping their cats healthy and happy. However, many cat owners are unaware of the risks associated with using over-the-counter medications, which can lead to pet poisoning. Poisoning can occur when owners give their cats medications that have not been prescribed by a veterinarian or when prescribed medications are not administered correctly. Symptoms of poisoning in cats may include vomiting, diarrhea, lethargy, seizures, and even death. To prevent poisoning in cats, it is essential for owners to understand the importance of following veterinarian instructions when administering medications. Additionally, owners should be cautious when administering human medications to their cats, as many human medications are toxic to animals. Cat owners should also be aware of signs of poisoning in their pets and seek immediate medical help if they suspect their cat has ingested an inappropriate medication. Therefore, cat owners should be aware of the risks associated with using over-the-counter medications and take measures to prevent their pets from being poisoned. Medication administration for cats should only be done under the care of a veterinarian, and owners should always monitor their pets for signs of poisoning. In this sense, the objective was to construct a quick and scientific guide for consultation on the main toxic agents known to cause feline poisoning and indicate possible antidotes and treatments. To accomplish this goal, an integrative literature review was carried out, seeking important information for the toxicologist veterinarian in updated articles and books.

Keywords: toxicology, poisoning, treatment, prevention, feline

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Introduction

Administering medication without veterinary guidance is a common practice among feline owners, especially of domestic cats in Brazil. According to data from a 2021 survey by World Atlas, the United States has the highest number of pet cats with 76.5 million, followed by China with 53 million cats. Russia ranks third with 12.75 million cats, Brazil is in fourth place with 12.5 million cats, and France is in fifth place with 9.5 million cats. Medicating cats without veterinary guidance can lead to intoxication and health complications.. Scientific literature has highlighted the risks associated with the misuse of medications in felines, including the occurrence of skin tumors, sporotrichosis infection;[1] feline infectious peritonitis, and mammary tumors.

Studies published by Huffman; Villalba and Provenza,[2,3]discussed the physiological and metabolic differences between humans and animals and the risks associated with usage of human medication in animals. The study highlights that animals have differences in the absorption, distribution, and metabolism of medications when compared to humans, which can lead to serious toxic effects.[2,3]

Another study published in 2020 by Tsuchiya et al.[4] evaluated the safety and efficacy of medication use in pets and highlighted the importance of considering metabolic and physiological differences between species when prescribing medication for animals.[4]

In 2014, Caloni et al.[5] reported cases of intoxication in animals due to administration of human medications, highlighting the importance of avoiding such drugs in animals and always consulting a veterinarian.[5]

These are just a few examples of scientific studies that highlighted the risk of using human medications in animals. In this sense, consulting a veterinarian is essential to ensure the safe and proper use of medications – especially in felines. It is important to emphasize the need to consult a veterinarian for proper dosage and administration of medications, in order to prevent possible health risks to felines.

Thus, this review aims to provide an updated analysis on the risks and benefits of administering medications without veterinary supervision in felines, with a special focus on preventing intoxication and promoting a more conscious and responsible approach to the health treatment of these animals.

Material and methods

The compilation of this study involved a bibliographic survey of scientific material obtained in the following databases in the last 40 years: was conducted: US National Library of Medicine - National Institutes of Health (PubMed), Virtual Health Library (Latin American and Caribbean Literature in Health Sciences - LILACS), Web of Science, and Google Scholar. The MeSH terms used in the search were "cats", "intoxication", "medications", and "diagnosis" in both Portuguese and English languages.

Results

Metabolic characteristics of domestic cats

Domestic cats have unique metabolic characteristics that are adapted to their carnivorous diet. Metzger et al.[6] in 2005 compared the metabolism of carnivores, omnivores, and herbivores, and this comparison showed that carnivores have a more efficient metabolism in the absorption and utilization of proteins and fats, while herbivores have a more efficient metabolism in the digestion of fibers.[6] Furthermore[8,9] showed that the metabolic adaptations of carnivores in relation to feeding and fasting make their metabolism more flexible and capable of quickly adapting to changes in the diet.[7–9]

Another important factor to consider when examining feline energy metabolism is oxidative stress. In 2006, Kienzle[10] and colleagues published a study comparing the metabolism of carnivores and

herbivores in relation to oxidative stress and endogenous antioxidants. They showed that carnivores have a more efficient metabolism that protects against oxidative stress, which may be related to their protein and fat-rich diet.[10]

The research published in the journal PNAS, "Comparative analysis of the domestic cat genome reveals genetic signatures underlying feline biology and domestication",[11] which performed a comparative analysis of the domestic cat genome, and revealed positively selected genes that were enriched for lipid metabolism, which support adaptations to a hypercarnivorous diet.[11] Cats have a higher requirement for protein in their diet than other domestic mammals, which has been attributed to adaptation to a hypercarnivorous diet and subsequent loss of the ability to regulate amino acid catabolism.[11–13] The hyperproteic diet requirement in cats is a consequence of the lack of regulation of aminotransferases which are enzymes responsible for nitrogen metabolism and the urea cycle. In addition, they have mandatory needs for dietary nutrients that are not essential for other mammals, such as taurine and arginine, which result from low activities of two enzymes and depend on a diet based solely on animal tissues to meet their specific and unique nutritional requirements.[14]

Regarding glucose metabolism, there is substantial differentiation in nutrient metabolism in carnivorous species compared to non-carnivores. These differences can lead to the development of diabetes and insulin resistance in non-carnivores,[8] As shown by Wernimont et. al,[15] which indicates that domestic cats fed a high-protein, low-carbohydrate diet had a lower risk of obesity and diabetes mellitus.[15]

With regard to hepatic metabolism, two studies investigated differences of drug metabolism in dogs, cats, and humans, and focusing on liver enzymes that are important in the drug metabolization process.[10,11] These studies showed that liver enzyme activity in dogs and cats differs significantly from those in humans, which may affect drug metabolism in these species, and that differences in drug metabolism between species are important for the safety and efficacy of treatment in Pets.[11,16]

The above studies mentioned that three drugs in particular: metronidazole, furosemide and propofol showed significant drug metabolism differences in dogs, cats and humans with dogs and cats showing notable differences compared to humans. These differences may be related to food and gastrointestinal anatomy of carnivores.

Other studies discussed differences in drug metabolism in dogs, cats and humans, including differences in absorption, distribution, metabolism and excretion, highlighting that physiological differences between species can affect the efficacy and safety of drugs used in these animals, and concluded that it is important for veterinarians to consider these differences when prescribing and administering medication to pets.[17–20]

Toxicity of drugs and xenobiotics for cats

Cats are popular pets around the world and are frequently exposed to drugs and xenobiotics, including household chemicals, plants and foods, however, many of these agents can be toxic to these animals, resulting in adverse health effects.

Cats are particularly sensitive to certain drugs due to their limited ability to metabolize and excrete these compounds.

In this sense, poisoning in cats can be caused by a variety of chemical compounds, including drugs and xenobiotics. According to AAHA (2018),[21] medicines for human use are responsible for about 50% of cases of poisoning in cats, and many of these cases could have been avoided if the owners had stored the medicines out of reach of their pets, or had not given medication to their pet without veterinary recommendation.[22]

Most human medications, including nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and tricyclic antidepressants, are toxic to cats.[23,24] Misusing these medications in cats can result in serious problems, including kidney failure, liver damage, and even death.[22,24]

Xenobiotics such as insecticides, cleaning chemicals, and toxic plants can also pose a risk to cats.[25] Contact with these compounds can cause a variety of symptoms, including breathing problems, vomiting and diarrhea.[26,27]

In addition, there are a number of foods that are toxic to cats, including onions, garlic, grapes and chocolate.[27,28] These foods can cause gastrointestinal problems, kidney failure and even death.

Agents that are considered as toxic for domestic cats can be classified into several categories, one of the most common categories being drugs and medications. As mentioned earlier, some medications can have toxic effects in cats, such as low-dose cyclophosphamide, doxorubicin, and methimazole.[29,30]

Environmental toxins are another category of toxic agents that can affect cats. For example, aflatoxin B1 in food can be toxic to cats.[31] Additionally, household chemicals such as cleaning agents, insecticides, and rodenticides can be toxic to cats if ingested.[29]

It is important to report that anesthetics are never completely devoid of toxicity and the induction of anesthesia inevitably poses a risk to life in general – regardless whether the patient is healthy or ill. According to a study by risk of anesthesia-related death in cats is approximately 0.24%, which highlights the importance of careful patient selection and monitoring during anesthesia. Likewise, another study of[32] found that the risk of anesthesia-related death in dogs is approximately 0.05%, with higher risks associated with certain breeds and underlying health conditions.

Table 1 below summarizes scientific work from the current review:

HMM; Greensmith,[108] A possible treatment after oral intake of toxic compounds is activated charcoal, which can prevent the absorption of such substances in dogs and cats. Activated charcoal is a safe and effective toxin-binding substance that can prevent systemic absorption of various toxic compounds in dogs and cats, including medications, plants, and chemicals. It has high porous surface and adsorption area, which allows it to bind to toxic substances in the gastrointestinal tract and eliminate them through the feces, preventing their absorption in the body. In addition, activated charcoal is relatively inexpensive, easy to administer, and has few side effects.

Therefore, here we have provided up-to-date information on the names of the substances that pose risk, their therapeutic indication, the toxicity and the reference in relation to cats. It is important to consider the potential toxic effects of these substances on cats and use them with caution, especially when using highly toxic chemotherapy drugs.

Discussion

Cats are popular pets in Brazil and, like other animals, can be exposed to toxic agents. Several scientific articles have recently been published with the aim of providing updated information on toxic agents in cats in Brazil.

A study published in 2021 investigated the exposure of cats to toxic agents in a city in the suburbs of São Paulo. Blood samples from 106 cats were analyzed and it was found that more than 80% of them had exposure to at least one toxic agent, such as pesticides and heavy metals. These results indicate the need for preventive measures to minimize the exposure of these animals to toxic agents.[109]

A second study, published in 2020, evaluated the effects of toxic plants ingestion in cats. Cases of plant poisoning in cats treated at a veterinary hospital in São Paulo were analyzed. Among the most common toxic plants were the Lily, the Sword-of-St. George, and the Me-no-one-can plant (Dieffenbachia picta). The most frequent symptoms were vomiting, diarrhea and anorexia, and in more severe cases renal failure may occur. This study underscores the importance of keeping toxic plants out of the reach of cats and seeking immediate veterinary care immediately in case of suspected poisoning.[90,94,97]

Another study conducted by researchers from Paraná aimed to identify the most common toxic agents, clinical signs and therapeutic approaches used in cases of poisoning of domestic cats in Brazil. The study was conducted by analyzing data collected from the medical records of cats seen in veterinary clinics in different regions of the country. The results indicated that pesticides and toxic plants were the main causes of poisoning in cats, corresponding to about 50% of cases. The most frequent clinical signs were vomiting, diarrhea and anorexia, followed by neurological and respiratory signs in more severe cases.[110]

The therapeutic approaches used by veterinarians included supportive measures such as hydration and correction of electrolyte disturbances, as well as specific therapies to neutralize or eliminate toxic substances. The authors stressed the importance of preventive measures, such as keeping toxic substances out of the reach of cats, and of a clinical evaluation and immediate veterinary treatment in case of suspected intoxication.[111–145]

Conclusion

There are significant differences in drug metabolism in carnivores compared to other animals, including humans.

Domestic cats possess unique metabolic characteristics that are adapted to their carnivorous diet, and their nutritional requirements are known differ from those of other mammals.

It is important to provide cats with a diet that meets their specific nutritional needs to maintain their health and prevent disease.

Cat owners should be aware of the risks associated with exposure to medications and xenobiotics. If owners suspect that their cat has been exposed to a toxic product, they should immediately seek veterinary assistance.

Here we provide up-to-date information on the toxic agents to which cats may be exposed in Brazil and emphasize the importance of preventive measures to minimize exposure. It is essential that cat owners are aware of these risks and work together with their veterinarians to ensure the health and well-being of their pets.

In addition, it is important that veterinarians and animal health professionals are aware of metabolic differences and consider them when prescribing and administering medications to dogs and cats.

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Conflicts of interest

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