

Dominance Versus Leadership in Dog Training

Column Editor

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About This Column

Behavior problems are a significant cause of death (euthanasia) in companion animals. While most veterinary practices are necessarily geared toward the medical aspect of care, there are many opportunities to bring behavior awareness into the clinic for the benefit of the pet, the owner, and ourselves. This column acknowledges the importance of behavior as part of veterinary medicine and speaks practically about using it effectively in daily practice.

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Whether treating separation anxiety, fear aggression, or general unruly behavior in dogs, virtually all veterinary behaviorists, applied animal behaviorists, and dog trainers agree that the solution to better behavior involves teaching the owner to be predictable and trustworthy—in essence, to be a good leader. But does learning to be the leader mean that owners must dominate their dogs? Twenty to 30 years ago, social dominance theory and ideas about wolf behavior in the wild guided dog-training methods, which focused on punishing bad behaviors by using choke chains, pinch collars, and electronic collars because wolves in the wild appeared to gain higher rank through force. Since then, the understanding of dog behavior in relation to wolf behavior has become clearer, and the science of learning has improved our understanding of why animals behave as they do and how their behaviors can be modified. This article discusses traditional training methods based on dominance theory and some of the associated misconceptions, defines dominance and explains why dog behavior should not be based on wolf behavior or animal dominance models, clarifies the difference between leadership and dominance, and shows how leadership can be achieved (even with aggressive dogs) using nonconfrontational methods.

TRADITIONAL DOG TRAINING

My interest in canine behavior began out of necessity more than 20 years ago when my male boxer, Max, started showing aggression. He would growl and snap at anyone who tried to shoo him from the couch or move him out of their path. I responded by taking Max to dog-training class when he was 3 years of age. At our first class, the instructor taught us the common method of teaching a dog to heel, and Max's behavior became markedly worse. As instructed, I hooked Max's long leather leash to the choke chain around his neck, and when he sniffed the grass instead of paying attention to me, I would run at full speed away from him. If he was still sniffing when the leash was almost fully extended, he would get a big yank that would have toppled a smaller dog. This quickly got Max's attention; by the third yank, he had learned to stay by my side. The instructor told me to continue this technique when Max ignored me. By the sixth yank, Max was growling and baring his teeth while aggressively pursuing me to prevent the impending punishment.

Thus began a 7-year power struggle between Max and me. For the next 5 years, I searched everywhere for trainers who could help me with Max's aggressive behavior. I did what they suggested. I learned to give a neck-wrenching yank while standing still by using my hips much like martial artists use theirs when blocking, punching, or kicking. With this technique, I could usually keep Max in line by uttering a sharp "ah" or lightly jerking the leash to remind him of the pain that might occur if he disobeyed.

I went through 10 trainers—all with the philosophy that, like the alpha wolf, I had to remind Max of his lower rank by frequently standing over and bullying him. This

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involved making him perform random behaviors in rapid succession, as would a drill sergeant, and punishing him when the behaviors weren't "up to par." I could also praise him for good behaviors. Unfortunately, he was not that motivated by praise, especially after being punished. Trainers also told me to throw Max (who was 76 lb) on the ground and roll him on his back in an alpha roll when he disobeyed. I was even instructed to address Max's aggression by hitting him on the nose with a foam-covered wooden rod. When this made him more aggressive, I was instructed to hang him from something by his choke chain until he passed out because it was important to win all aggressive encounters. It didn't work. He passed out twice but was still ready to fight when confronted again.

This progression of force was the general recommendation for all dogs that defied their owners or showed aggression, regardless of the cause. If a dog was possessive of food or a toy, owners were told to use a choke chain or pinch or electric collar correction. If a dog growled at another dog, even out of fear, owners were told to correct it. Everything was about forcing the dog to submit to the owner rather than changing the underlying emotional state that drove the behavior. As a result of this thinking, I didn't start to trust Max until he was 10 years of age, when I found high-level obedience competition instructors who understood the science of positive reinforcement, shaping, and chaining. They focused on rewarding good behaviors and clearly teaching these good behaviors in a stepwise fashion. However, it was only a start. Max and I never reached our potential because without specialized training in behavior problems, these trainers could not specifically address the issues that led to aggression.

With the knowledge I have today, the old training techniques seem crude and barbaric. However, at the time, they seemed reasonable. It made sense that because dogs are descended from wolves, we should model our training techniques after what the alpha wolf would do. Although this reasoning seems logical and associated techniques are still commonly advocated among traditional dog trainers, there are many problems with this approach.

HOW DOMESTICATION HAS CHANGED DOGS

There are several problems with the wolf model used by traditional dog trainers. Just as humans are not chimpanzees, dogs are not wolves. Dogs became domesti-

Key Points

- Traditional dog training has relied on the dominance theory, which involves the use of force to modify behavior. Traditional training methods ignore the underlying cause or emotional state driving the undesirable behavior and instead focus on stopping the outward signs. Updated training methods rely on changing the underlying cause and recognizing how the dog is being rewarded for undesirable behaviors so that the rewards can be removed and only desired behaviors are rewarded.
- Dominance is a relationship between individuals that is established by force and aggression to gain priority access to multiple resources, such as food, preferred resting spots, and mates. A dominance-submission training model is irrelevant for most of the behaviors that people want from their animals, such as coming when called, walking calmly on a leash, and generally calm behavior. Consequently, using aggression and the dominance theory to address most undesirable behaviors in dogs is inappropriate.
- Leadership is the ability to influence others to perform behaviors that they would not necessarily perform on their own. Leadership can be achieved through force (dominance) or rewards for appropriate behavior. Updated methods rely on controlling all desired resources and require that the dog sit or lie down calmly and look at the owner to earn each resource as a reward. Leadership is established when an owner can consistently set clear limits for behavior and effectively communicate the rules by immediately rewarding correct behaviors and preventing access to or immediately removing the rewards for undesirable behaviors before they are reinforced.

cated over thousands of years through a process called *self-domestication*.¹ When humans started settling in villages 15,000 years ago, they accumulated trash in dumpsites. Wolves that were genetically less fearful than their counterparts made use of this new food source. Less fearful wolves could scavenge from the dumpsites, whereas their more fearful conspecifics would flee when humans appeared, even if they were miles away. Wolves that had a shorter flight distance (that could tolerate humans being closer) survived better in close proximity to humans than did more fearful wolves. Their offspring inherited this lower level of fear. Over many generations, these dumpsite scavengers developed into a distinct population of dogs that were genetically tamer and more adapted to living near humans than wolves.

Based on a landmark study² on domestication spanning 40 years, we know that selection for tameness leads to many physiologic and behavioral changes in canids. In this study, Dmitry Belyaev and colleagues at the Institute of Cytology and Genetics at Novosibirsk, Siberia, selectively bred wild fur foxes only for tameness. The first generation of foxes was tamer than their parents but still fearful and dangerous to handle. By the 35th generation, 80% of the fox population was docile and eager to establish human contact. These foxes whimpered to attract human attention, licked the experimenters' faces, and even fought among themselves for access to the experimenters. They were also physiologically different. Their adult corticosteroid levels were one-fourth those of wild foxes, their adrenocortical response to acute stress was tempered, and their serotonin (a neurotransmitter that inhibits aggressive behavior) levels were higher. Overall, the domesticated foxes were tamer, less aggressive, and less reactive to stressful stimuli. In addition, behaviorally and physiologically, they were paedomorphic (they tended to retain juvenile traits).^{1,3} They had shorter skulls, many had floppy ears like those of puppies, and they behaved more like puppies. Canid pups generally bark and vocalize more than adults. They also more readily investigate new objects and individuals and form social bonds with unfamiliar individuals, even of different species. Similarly, the domesticated foxes readily sought attention from and bonded to the experimenters despite relatively little handling.

Domestication has also led to social changes in dogs. For instance, although wolves live in tightly knit family units called *packs*, free-ranging dogs exhibit more variability in social behaviors, with many dogs living in small, loosely structured groups that may be temporary rather than stable pack-like groups.⁴ Along with less rigid grouping, dogs have a tempered drive to attain high rank. At Wolf Park in Indiana, where unrelated wolves live in small packs in captivity, status is often gained opportunistically. Whereas dogs tend to show clear signs (e.g., posturing) that they are vying for higher status, signs of imminent attack in wolves are often subtle and even absent. Each interaction between wolves is a way for one wolf to test another for weakness. As a result, the lowest ranked wolf in a pack may attack an alpha wolf during play if it suspects that the alpha wolf is ill or weak. Thus the lowest ranked wolf may opportunistically attain the alpha position.⁵ Along with a less rigid hierarchy, dogs also have a less ritualized communication system. Wolf packs in the wild consist of an alpha male and alpha female, which are

the breeding pair, and their offspring, which are lower ranked. Status is regularly displayed through ritualized greeting in which subordinates routinely approach the alpha wolves in a submissive manner, crouching with their tails low, licking their lips, and rolling over and exposing their bellies to the higher-ranked individual (submissive roll). The alpha wolves stand with their heads high and tails raised. However, in multidog households, even when a dominant–subordinate relationship clearly exists as shown by ritualized displays over valued resources, lower-ranking dogs do not routinely greet higher-ranking dogs in a manner that displays rank. In addition, the postures that dogs can show vary by breed. More paedomorphic breeds (those resembling the juvenile stages of wolf development), such as the Cavalier King Charles spaniel, have a smaller communicative repertoire than breeds that physically resemble adult wolves.⁶

DOMINANCE

In addition to the changes in dogs due to domestication, there are several reasons that the dominance model is a poor choice for dog training. First, a relationship based on dominance is established by force or aggression to gain priority access to multiple resources, such as food, preferred resting spots, and mates.^{7,8} Therefore, a dominance–submission model is irrelevant for most of the behaviors that people want from their dogs, such as coming when called or walking calmly on a leash. A dog that fails to consistently perform desired behaviors is not trying to gain a higher rank; that is, its undesirable behaviors are not motivated by the desire to become dominant in a relationship. Consequently, the use of aggression and the dominance theory to address these misbehaviors is inappropriate.

Second, it is important to realize that an actual dominance–submission relationship exists only when one individual consistently submits to the other. Once a dominant–submissive relationship has been established, it is reinforced through warning postures and ritualistic aggressive and submissive displays rather than full-blown fighting. In the most stable relationships, the submissive individual automatically defers to the dominant individual in the absence of threatening postures by the dominant individual. However, in less stable relationships or relationships in which the dominant individual is not confident about its ability to maintain a higher rank, continued aggressive displays occur. Thus people who rely on dominance to train their dogs may need to regularly threaten them with aggressive displays or repeatedly use physical force. It is important to be aware that even when an indi-

vidual can clearly establish dominance over another, in many species, a dominant rank within a group is often relatively short lived, typically lasting only several years or through one breeding season. High rank is repeatedly tested and can be maintained only as long as the top-ranking individual is physically strong enough to win the aggressive encounters. Thus people may not be able to retain their rank. In a family, children and elderly people can rarely establish high rank through force and are especially at risk of being injured if they attempt to do so.

Third, although dominant individuals gain priority access to resources, they usually must be present to retain the resource. Subordinate individuals commonly sneak access to resources (e.g., mates, food) when the dominant individual is not present. These subordinate individuals are not attempting to gain a higher rank; they are only finding an alternative way to obtain a reward. In terms of human–pet interactions, this highlights the fact that establishing dominance over a dog does not address its behavior in the absence of, or at a distance from, the dominant individual.

Fourth, humans seek more than just priority access to resources when they are present to defend them; humans seek leadership—the ability to influence their pets to perform behaviors that they would not necessarily perform otherwise. For instance, people may want their pets to consistently come when called, to remain lying down when commanded to do so from across the room, or to stop barking at squirrels or startling sounds in the house. Humans can sometimes gain leadership through force but can also do so by rewarding desirable behavior. In relationships between dogs, dominance is usually the only way to obtain a high rank, whereas humans have a choice in their relationships with dogs.

ESTABLISHING LEADERSHIP WITHOUT FORCE

Updated methods of establishing leadership rely on controlling all the resources that motivate the pet and using them to reward the pet for appropriate behavior. There are variations of this method, which has been called *nothing in life is free*, *no free lunch*, or *the learn-to-earn program*. This method stresses rewarding desirable behaviors and removing the rewards for bad behaviors. For instance, the dog can first be taught to sit and look at the owner for treats (i.e., kibble from its daily amount of food). When the dog is hungry, the owner should stand completely still with food hidden in his or her hand and wait for the dog to sit; the owner should not use a verbal

cue or hand signal or touch the dog. When the dog sits, the owner should immediately give it the treat. Once the dog understands that it must choose to sit to receive a treat, the dog should be required to sit and stay to earn its daily food allowance and when it wants to be petted, go outside, or play fetch. By requiring this behavior, the owner teaches the dog self-control and to look to the owner for permission to access a desired resource. There is not a battle of wills between the dog and owner. Instead, the dog is taught a new way to receive all the resources that it used to take freely and that inappropriate behaviors are not rewarded.

Once the owner has decided on the rules, he or she must communicate them to the dog by immediately (i.e., within 1 second) reinforcing correct behaviors as they occur. In addition, the owner must prevent the dog from receiving rewards for undesirable behaviors. For instance, when dogs want to be petted, they frequently jump on their owners rather than sit calmly and look at their owners. When a dog jumps on its owner, the owner must deny it attention by holding completely still or turning his or her back to the dog and then standing still, so it is clear to the dog that it is not receiving attention. Once the dog sits, the owner must immediately, and then intermittently, reward it so that it learns to remain seated. If the owner pets the sitting dog and it stands, the owner must immediately remove attention from the dog to avoid unintentionally rewarding it for excited, uncontrolled behavior. If the owner sits on the floor and allows the dog on his or her lap without requiring that it first sit and wait for a cue, the owner is rewarding uncontrolled behavior. The dog must earn attention by sitting calmly every time it wants attention. The owner must consistently reward appropriate behaviors until they become habits.

Leadership is established when the owner can set clear limits for the dog's behavior and can effectively communicate the rules by always rewarding correct behaviors as they occur while preventing or immediately removing the rewards for undesirable behaviors before they are accidentally reinforced. The owner must reward the desired behaviors frequently enough that they become habits. When owners can meet these criteria, their dogs will consider them to be predictable, dependable, and trustworthy. Rather than complying out of fear, dogs can choose to follow human direction because doing so leads to rewards. This model reflects a good understanding of the underlying cause of improper canine behavior and can lead to a strong dog–owner bond.

(continues on p. 432)

Clinical
Snapshot

#2

ANSWERS &
EXPLANATIONS

(Case presentation on p. 396)

1. The castor bean plant (*Ricinus communis*).
2. The toxic principle is ricin—a toxalbumin that inhibits protein synthesis, leading to cellular necrosis.^{1,2}
3. The prognosis is guarded. A mortality rate of 9% has been reported in dogs that have ingested the plant.¹ The treatment is supportive, consisting of induction of emesis for recent ingestion; administration of activated charcoal, intravenous fluids, and gastrointestinal protectants; and treatment of seizures and renal or hepatic failure, as necessary.²



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Understanding Behavior

(continued from p. 417)

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Baytril®

(enrofloxacin)

Antibacterial Tablets For Dogs and Cats

BRIEF SUMMARY:

Before using Baytril Tablets, please consult the product insert, a summary of which follows:

CAUTION:

Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian.
Federal law prohibits the extralabel use of this drug in food-producing animals.

INDICATIONS:

Baytril® (brand of enrofloxacin) Antibacterial Tablets are indicated for the management of diseases associated with bacteria susceptible to enrofloxacin. Baytril Antibacterial Tablets are indicated for use in dogs and cats.

CONTRAINDICATIONS:

Enrofloxacin is contraindicated in dogs and cats known to be hypersensitive to quinolones.

Dogs: Based on the studies discussed under the section on Animal Safety Summary, the use of enrofloxacin is contraindicated in small and medium breeds of dogs during the rapid growth phase (between 2 and 8 months of age). The safe use of enrofloxacin has not been established in large and giant breeds during the rapid growth phase. Large breeds may be in this phase for up to one year of age and the giant breeds for up to 18 months. In clinical field trials utilizing a daily oral dose of 5.0 mg/kg, there were no reports of lameness or joint problems in any breed. However, controlled studies with histological examination of the articular cartilage have not been conducted in the large or giant breeds.

ADVERSE REACTIONS:

Dogs: Two of the 270 (0.7%) dogs treated with Baytril® (brand of enrofloxacin) Tablets at 5.0 mg/kg per day in the clinical field studies exhibited side effects, which were apparently drug-related. These two cases of vomiting were self-limiting.

Post-Approval Experience: The following adverse experiences, although rare, are based on voluntary post-approval adverse drug experience reporting. The categories of reactions are listed in decreasing order of frequency by body system.

Gastrointestinal: anorexia, diarrhea, vomiting, elevated liver enzymes
Neurologic: ataxia, seizures

Behavioral: depression, lethargy, nervousness

Cats: No drug-related side effects were reported in 124 cats treated with Baytril® (brand of enrofloxacin) Tablets at 5.0 mg/kg per day for 10 days in clinical field studies.

Post-Approval Experience: The following adverse experiences, although rare, are based on voluntary post-approval adverse drug experience reporting. The categories of reactions are listed in decreasing order of frequency by body system.

Ocular: Mydriasis, retinal degeneration (retinal atrophy, attenuated retinal vessels, and hyperreflective tapeta have been reported), loss of vision. Mydriasis may be an indication of impending or existing retinal changes.

Gastrointestinal: vomiting, anorexia, elevated liver enzymes, diarrhea
Neurologic: ataxia, seizures

Behavioral: depression, lethargy, vocalization, aggression

For medical emergencies or to report adverse reactions, call 1-800-422-9874.

ANIMAL SAFETY SUMMARY:

Dogs: Adult dogs receiving enrofloxacin orally at a daily dosage rate of 52 mg/kg for 13 weeks had only isolated incidences of vomiting and inappetence. Adult dogs receiving the tablet formulation for 30 consecutive days at a daily treatment of 25 mg/kg did not exhibit significant clinical signs nor were there effects upon the clinical chemistry, hematological or histological parameters. Daily doses of 125 mg/kg for up to 11 days induced vomiting, inappetence, depression, difficult locomotion and death while adult dogs receiving 50 mg/kg/day for 14 days had clinical signs of vomiting and inappetence.

Adult dogs dosed intramuscularly for three treatments at 12.5 mg/kg followed by 57 oral treatments at 12.5 mg/kg, all at 12 hour intervals, did not exhibit either significant clinical signs or effects upon the clinical chemistry, hematological or histological parameters.

Oral treatment of 15 to 28 week old growing puppies with daily dosage rates of 25 mg/kg has induced abnormal carriage of the carpal joint and weakness in the hindquarters. Significant improvement of clinical signs is observed following drug withdrawal. Microscopic studies have identified lesions of the articular cartilage following 30 day treatments at either 5, 15 or 25 mg/kg in this age group. Clinical signs of difficult ambulation or associated cartilage lesions have not been observed in 29 to 34 week old puppies following daily treatments of 25 mg/kg for 30 consecutive days nor in 2 week old puppies with the same treatment schedule.

Tests indicated no effect on circulating microfilariae or adult heartworms (*Dirofilaria immitis*) when dogs were treated at a daily dosage rate of 15 mg/kg for 30 days. No effect on cholinesterase values was observed.

No adverse effects were observed on reproductive parameters when male dogs received 10 consecutive daily treatments of 15 mg/kg/day at 3 intervals (90, 45 and 14 days) prior to breeding or when female dogs received 10 consecutive daily treatments of 15 mg/kg/day at 4 intervals: between 30 and 0 days prior to breeding, early pregnancy (between 10th & 30th days), late pregnancy (between 40th & 60th days), and during lactation (the first 28 days).

Cats: Cats in age ranges of 3 to 4 months and 7 to 10 months received daily treatments of 25 mg/kg for 30 consecutive days with no adverse effects upon the clinical chemistry, hematological or histological parameters. In cats 7-10 months of age treated daily for 30 consecutive days, 2 of 4 receiving 5 mg/kg, 3 of 4 receiving 15 mg/kg, 2 of 4 receiving 25 mg/kg and 1 of 4 nontreated controls experienced occasional vomiting. Five to 7 month old cats had no side effects with daily treatments of 15 mg/kg for 30 days, but 2 of 4 animals had articular cartilage lesions when administered 25 mg/kg per day for 30 days.

Doses of 125 mg/kg for 5 consecutive days to adult cats induced vomiting, depression, incoordination and death while those receiving 50 mg/kg for 6 days had clinical signs of vomiting, inappetence, incoordination and convulsions, but they returned to normal.

Enrofloxacin was administered to thirty-two (8 per group), six- to eight-month-old cats at doses of 0, 5, 20, and 50 mg/kg of body weight once a day for 21 consecutive days. There were no adverse effects observed in cats that received 5 mg/kg body weight of enrofloxacin. The administration of enrofloxacin at 20 mg/kg body weight or greater caused salivation, vomiting, and depression. Additionally, dosing at 20 mg/kg body weight or greater resulted in mild to severe fundic lesions on ophthalmologic examination (change in color of the fundus, central or generalized retinal degeneration), abnormal electroretinograms (including blindness), and diffuse light microscopic changes in the retina.

DRUG INTERACTIONS:

Compounds that contain metal cations (e.g., aluminum, calcium, iron, magnesium) may reduce the absorption of some quinolone-class drugs from the intestinal tract. Concomitant therapy with other drugs that are metabolized in the liver may reduce the clearance rates of the quinolone and the other drug.

Dogs: Enrofloxacin has been administered to dogs at a daily dosage rate of 10 mg/kg concurrently with a wide variety of other health products including anthelmintics (praziquantel, febantel, sodium disophterol), insecticides (fenitrothion, pyrethrins), heartworm preventatives (diethylcarbamazine) and other antibiotics (ampicillin, gentamicin sulfate, penicillin, diltiazem, dithyostreptomycin). No incompatibilities with other drugs are known at this time.

Cats: Enrofloxacin was administered at a daily dosage rate of 5 mg/kg concurrently with anthelmintics (praziquantel, febantel), an insecticide (propoxur) and another antibacterial (ampicillin). No incompatibilities with other drugs are known at this time.

WARNINGS:

For use in animals only. Do not exceed use of this product in cats has been associated with Retinal Toxicity. In rare instances, 5 mg/kg of body weight per day in cats. Safety in breeding or pregnant cats has not been established. Keep out of reach of children.

Avoid contact with eyes. In case of contact, immediately flush eyes with copious amounts of water for 15 minutes. In case of dermal contact, wash skin with soap and water. Consult a physician if irritation persists following ocular or dermal exposure. Individuals with a history of hypersensitivity to quinolones should avoid this product. In humans, there is a risk of user photosensitization within a few hours after excessive exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight.

For customer service or to obtain product information, including Material Safety Data Sheet, call 1-800-633-3796.

PRECAUTIONS:

Quinolone-class drugs should be used with caution in animals with known or suspected Central Nervous System (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation which may lead to convulsive seizures.

Quinolone-class drugs have been associated with cartilage erosions in weight-bearing joints and other forms of arthropathy in immature animals of various species.

The use of fluoroquinolones in cats has been reported to adversely affect the retina. Such products should be used with caution in cats.

U.S. Patent No. 4,670,444

Bayer HealthCare LLC
Animal Health Division
Shawnee Mission, Kansas 66201 U.S.A.

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Baytril®

(enrofloxacin)

Antibacterial Injectable Solution 2.27%
For Dogs Only

BRIEF SUMMARY:

Before using Baytril 2.27% Injectable (for dogs only), please consult the product insert, a summary of which follows:

DESCRIPTION:

Each mL of injectable solution contains: enrofloxacin 22.7 mg, n-butyl alcohol 30 mg, potassium hydroxide for pH adjustment and water for injection, q.s.

CAUTION:

Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian.

Federal law prohibits the extralabel use of this drug in food-producing animals.

INDICATIONS:

Baytril® (brand of enrofloxacin) Injectable Solution is indicated for the management of diseases in dogs associated with bacteria susceptible to enrofloxacin.

CONTRAINDICATIONS:

Enrofloxacin is contraindicated in dogs known to be hypersensitive to quinolones.

Based on the studies discussed under the section on Animal Safety Summary, the use of enrofloxacin is contraindicated in small and medium breeds of dogs during the rapid growth phase (between 2 and 8 months of age). The safe use of enrofloxacin has not been established in large and giant breeds during the rapid growth phase. Large breeds may be in this phase for up to one year of age and the giant breeds for up to 18 months. In clinical field trials utilizing a daily oral dose of 5.0 mg/kg, there were no reports of lameness or joint problems in any breed. However, controlled studies with histological examination of the articular cartilage have not been conducted in the large or giant breeds.

ADVERSE REACTIONS:

No drug-related side effects were reported in 122 clinical cases treated with Baytril® (enrofloxacin) Injectable Solution followed by Baytril® Tablets at 5.0 mg/kg per day.

For medical emergencies or to report adverse reactions, call 1-800-422-9874.

ANIMAL SAFETY SUMMARY:

Adult dogs receiving enrofloxacin orally at a daily dosage rate 52 mg/kg for 13 weeks had only isolated incidences of vomiting and inappetence. Adult dogs receiving the tablet formulation for 30 consecutive days at a daily treatment of 25 mg/kg did not exhibit significant clinical signs nor were there effects upon the clinical chemistry, hematological or histological parameters. Daily doses of 125 mg/kg for up to 11 days induced vomiting, inappetence, depression, difficult locomotion and death while adult dogs receiving 50 mg/kg/day for 14 days had clinical signs of vomiting and inappetence.

Adult dogs dosed intramuscularly for three treatments at 12.5 mg/kg followed by 57 oral treatments at 12.5 mg/kg, all at 12 hour intervals, did not exhibit either significant clinical signs or effects upon the clinical chemistry, hematological or histological parameters.

Oral treatment of 15 to 28 week old growing puppies with daily dosage rates of 25 mg/kg has induced abnormal carriage of the carpal joint and weakness in the hindquarters. Significant improvement of clinical signs is observed following drug withdrawal. Microscopic studies have identified lesions of the articular cartilage following 30 day treatments at either 5, 15 or 25 mg/kg in this age group. Clinical signs of difficult ambulation or associated cartilage lesions have not been observed in 29 to 34 week old puppies following daily treatments of 25 mg/kg for 30 consecutive days nor in 2 week old puppies with the same treatment schedule.

Tests indicated no effect on circulating microfilariae or adult heartworms (*Dirofilaria immitis*) when dogs were treated at a daily dosage rate of 15 mg/kg for 30 days. No effect on cholinesterase values was observed.

No adverse effects were observed on reproductive parameters when male dogs received 10 consecutive daily treatments of 15 mg/kg/day at 3 intervals (90, 45 and 14 days) prior to breeding or when female dogs received 10 consecutive daily treatments of 15 mg/kg/day at 4 intervals: between 30 and 0 days prior to breeding, early pregnancy (between 10th & 30th days), late pregnancy (between 40th & 60th days), and during lactation (the first 28 days).

DRUG INTERACTIONS:

Concomitant therapy with other drugs that are metabolized in the liver may reduce the clearance rates of the quinolone and the other drug.

Enrofloxacin has been administered to dogs at a daily dosage rate of 10 mg/kg concurrently with a wide variety of other health products including anthelmintics (praziquantel, febantel), insecticides (pyrethrins), heartworm preventatives (diethylcarbamazine) and other antibiotics (ampicillin, gentamicin sulfate, penicillin). No incompatibilities with other drugs are known at this time.

WARNINGS:

For use in animals only. The use of this product in cats may result in Retinal Toxicity. Keep out of reach of children.

Avoid contact with eyes. In case of contact, immediately flush eyes with copious amounts of water for 15 minutes. In case of dermal contact, wash skin with soap and water. Consult a physician if irritation persists following ocular or dermal exposure. Individuals with a history of hypersensitivity to quinolones should avoid this product. In humans, there is a risk of user photosensitization within a few hours after excessive exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight.

For customer service or to obtain product information, including Material Safety Data Sheet, call 1-800-633-3796.

PRECAUTIONS:

Quinolone-class drugs should be used with caution in animals with known or suspected Central Nervous System (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation which may lead to convulsive seizures.

Quinolone-class drugs have been associated with cartilage erosions in weight-bearing joints and other forms of arthropathy in immature animals of various species.

The use of fluoroquinolones in cats has been reported to adversely affect the retina. Such products should be used with caution in cats.

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