

## Medication For Ferrets

**Medications can be easier to give to your ferret when you know what possible side effects to expect.**

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A ferret will likely need some veterinary attention in its lifetime. This might include routine care such as vaccines or more complicated care for ailments such as cancer. Vaccines and most medications used in ferret medicine are very safe, but sometimes adverse reactions and side effects occur. Most over-the-counter human pain medications are not safe for ferrets -- some are even deadly. The more you know about what possible side effects to expect, the better. The following information should help you further understand the medications your veterinarian might prescribe.

### Vaccines

Pet ferrets require regular vaccinations for canine distemper and rabies. Only two USDA-approved vaccines are available for ferrets. The first is Merial's Purevax for distemper, and the second is Merial's Imrab-3 for rabies. Both vaccines have a very low rate of allergic reactions, and most reactions are only mild to moderate in severity. These can be easily treated with a cortisone injection and subcutaneous (SQ) fluids.

Only rarely will a ferret experience a serious anaphylactic-type reaction to a vaccination. This type of reaction requires more aggressive treatment with cortisone, epinephrine and intravenous (IV) or SQ fluids. Canine distemper is almost 100 percent fatal to pet ferrets, so the benefit of vaccinating against distemper far outweighs the minor risk of an allergic reaction to the vaccine.

Another, even more rare, possible adverse reaction exists. There have been a few reported cases of fibrosarcomas (tumors) forming at the vaccine injection site. These are malignant and can be fatal. Treatment for them involves surgical removal followed by radiation therapy and aggressive chemotherapy. This is an extremely rare problem, however, and it does not prevent me from vaccinating my own ferrets.

Every ferret is an individual. Your veterinarian will know your ferret's health needs best. If your ferret suffered an adverse reaction after a vaccination, discuss with your veterinarian ways to prevent allergic reactions in the future by pre-treating your pet with cortisone and/or Benadryl. Also, discuss whether or not future vaccinations should occur. In many areas, the law requires that ferrets receive a rabies vaccination.

### Antibiotics

Treatment with antibiotics is very common for pet ferrets at some point during their life. Most of the antibiotics typically used are extremely safe; however, a few must be used with extreme caution in ferrets -- if at all.

Gentamicin is an aminoglycoside antibiotic used primarily for Gram-negative bacterial infections such as E. coli and Salmonella. Gentamicin is infamous for its toxicity to the kidney and the inner ear. The kidney damage (tubular necrosis) is usually reversible once the drug is stopped and the ferret is treated for the kidney damage. The toxicity to the inner ear might cause irreversible damage. This ranges from simple hearing loss to more serious damage with permanent vestibular signs.

Using diuretics such as furosemide and certain antibiotics such as cephalexin with gentamicin might increase the risk of kidney toxicity. Also, using gentamicin in a ferret with renal disease, dehydration or in geriatric ferrets might increase the risk of toxicity.

This inherent toxicity of gentamicin makes its use inappropriate for ferrets. Many eardrops and eyedrops contain gentamicin, and these should be avoided when possible.

Metronidazole is a nitroimidazole antibiotic and antiprotozoal agent used mainly for anaerobic bacteria such as Clostridium and for protozoa such as Giardia. In ferrets it is used mostly for intestinal infections and with other medications for the treatment of Helicobacter infections.

Metronidazole does have some adverse effects including anorexia, nausea, vomiting and diarrhea. With chronic use for Helicobacter treatment, neurological toxicity may become a problem. Signs of neurological toxicity can include ataxia (loss

of muscle control), head tilt, disorientation, tremors and seizures. Fortunately most of these side effects are very uncommon, but the unpleasant taste of metronidazole does cause a lot of stress to a ferret. Therefore amoxicillin together with clarithromycin are my recommended treatments for Helicobacter infections.

Enrofloxacin is a fluoroquinolone antibiotic used primarily for Gram-negative bacterial infections such as E. coli, Salmonella and Pseudomonas. It is a much safer antibiotic than gentamicin, but it does have some adverse effects.

The most common potential problem in dogs is cartilage abnormalities in rapidly growing puppies. Thus, I believe that enrofloxacin should be used with caution in growing ferret kits. Gastrointestinal signs such as vomiting and anorexia are also infrequent problems. The most common problem with enrofloxacin is its bitter taste. Enrofloxacin is also available in eardrops that are safer than gentamicin eardrops.

Trimethoprim-sulfa is a combination antibiotic that is used for both Gram-positive and Gram-negative bacterial infections. It also effectively treats Coccidia. It is commonly used in ferrets with bladder and prostate infections.

Adverse effects are fairly rare in ferrets, but they might include gastrointestinal distress (such as nausea, vomiting, diarrhea), bone marrow suppression, liver damage, hemolytic anemia and dry eye. The good news about trimethoprim-sulfa is that it is less bitter tasting than enrofloxacin.

Chloramphenicol is a bacteriostatic antibiotic with a wide spectrum of activity against many Gram-positive and Gram-negative bacteria. Chloramphenicol can be toxic to the bone marrow and cause a serious aplastic anemia. Because of the potential for serious bone marrow toxicity, chloramphenicol should not be used routinely in ferrets. In this veterinarian's opinion, chloramphenicol should only be used to treat proliferative bowel disease in ferret kits.

#### Adrenal Medications

Several medications that are used to treat adrenal gland disease in dogs (Cushing's Disease) should not be used in ferrets.

Mitotane is the medication most commonly used to treat dogs with adrenal gland disease. It destroys the cortisol-producing cells in the adrenal glands; however, adrenal gland disease in ferrets differs greatly from the disease in dogs. Ferrets rarely overproduce cortisol, so mitotane does not work well for ferrets with adrenal gland disease. In addition to working poorly, lowering the cortisol level can also lower the blood-glucose level. In ferrets with insulinomas, mitotane might produce dangerously low blood glucose (hypoglycemia) problems. Mitotane is also very expensive, so it is best avoided in ferrets.

Ketoconazole is an imidazole antifungal agent that can also inhibit cortisol production in the adrenal glands. Because it can inhibit cortisol production, ketoconazole is useful in treating dogs with adrenal gland disease. Ketoconazole does not work well in adrenal ferrets, and it might produce hypoglycemia problems in ferrets with insulinomas. Ketoconazole is also expensive, so it is best avoided in ferrets.

Trilostane is a new drug for the treatment of adrenal gland disease in dogs. Trilostane works by inhibiting an enzyme necessary to making adrenal hormones and cortisol. Unfortunately it also increases the progesterone level. In dogs this does not seem to cause a problem; in adrenal ferrets, however, this will worsen the situation. Progesterone is one of the adrenal hormones that ferrets overproduce. Thus trilostane should be avoided in ferrets.

The best medications for adrenal gland disease treatment in ferrets are leuprolide acetate and/or melatonin, which are both safe and effective. Deslorelin acetate is a new veterinary medication that also appears to be safe and effective for treating ferrets with adrenal gland disease.

#### Insulinoma Medications

Insulinoma is the most common cancer in ferrets. Insulinomas over-secrete insulin and cause a low blood-sugar level. Prednisolone and diazoxide are commonly used to medically manage ferrets with insulinomas.

Prednisolone is a synthetic glucocorticoid used to elevate the blood glucose level. Unfortunately prednisolone also has some side effects, especially with long-term use. After long-term administration most ferrets will develop a "pred belly." Prednisolone causes fat to be redistributed to the abdomen and the sides of the neck. Prednisolone at high doses can sometimes cause a stomach ulcer. Fortunately stomach ulcers from prednisolone are rare. Even more rare is the development of diabetes from long-term use of prednisolone. Common side effects include fluid and sodium retention. This is usually not a problem unless the ferret also has a heart problem. In addition prednisolone might make the ferret resistant to some chemotherapy drugs.

Diazoxide directly inhibits insulin secretion from the pancreas. Diazoxide also stimulates epinephrine release and inhibits the uptake of glucose by the cells. All of this helps to elevate the blood-glucose level.

Diazoxide does have some side effects. The most common side effects include anorexia, vomiting and/or diarrhea. Other possible side effects include raising the heart rate and fluid and sodium retention. Again this is usually not a problem unless the ferret also has a heart problem.

#### Heart Medications

Many older ferrets develop heart disease. Three medications are commonly used to control heart disease. In general all three are quite safe, but be aware of some possible side effects.

Enalapril is an angiotensin-converting enzyme (ACE) inhibitor. It is used as a vasodilator to treat heart disease. Enalapril is quite safe, but it might cause anorexia, vomiting and diarrhea. Potentially, hypotension (low blood pressure) and kidney dysfunction could occur. The newer ACE inhibitor benazepril might be a slightly safer choice.

Furosemide is a diuretic that is often used to increase the excretion of water, sodium, potassium and chloride in ferrets with heart problems. Although rare, furosemide might cause dehydration and low potassium levels if overdosed.

Digoxin is the other commonly used heart medication. Digoxin helps to strengthen the heart contraction, increase the amount of blood that is pumped out of the heart, and reduce the heart rate. Side effects from digoxin are related to the dose. At high doses digoxin might cause heart arrhythmias and make the heart disease worse. Pimobendan is a new veterinary product that is safer than digoxin and might be the better medication to use to strengthen the heart contraction.

#### Inflammatory Bowel Disease

Prednisolone and azathioprine are used to control inflammatory bowel disease. Side effects from prednisolone have already been covered.

Azathioprine is a very potent immunosuppressive agent. Because azathioprine suppresses the immune system, it could make ferrets more susceptible to infections, but the main concern with azathioprine is bone marrow suppression. Damage to the pancreas and to the liver can also occur. I prescribe azathioprine only if prednisolone and diet changes do not control the signs of inflammatory bowel disease.

#### Chemotherapy

Chemotherapy is a balancing act. Enough of the medication must be given to kill the cancer cells without doing too much damage to the normal cells. Chemotherapy is most commonly used to treat ferrets with lymphoma and occasionally for ferrets with insulinomas. There are many medications and chemotherapy protocols for lymphoma.

Most protocols use multiple drugs at different time intervals to achieve remission. The most commonly used agents are doxorubicin, streptozocin, cyclophosphamide, vincristine and asparaginase. If begun at the same time as chemotherapy, prednisolone can be used in combination with these chemotherapy drugs or by itself for palliative treatment of lymphoma. Prednisolone might cause resistance to the chemotherapy drugs only if it is used previous to those drugs.

Doxorubicin must be given by IV administration. It is extremely damaging to tissues if administered SQ or intramuscularly (IM). The most serious adverse effect is heart damage. The heart damage can cause severe and fatal congestive heart failure. Other serious problems might include bone marrow suppression, nausea, vomiting and immediate allergic reactions. Most veterinary oncologists recommend using Benadryl prior to doxorubicin to prevent allergic reactions. It has been suggested to give vitamin E and C to help prevent damage to the heart and to use melatonin to help prevent damage to the bone marrow.

Streptozocin is another chemotherapy agent that must be given by IV administration because it is extremely toxic to the tissues if giving SQ or IM. The main concern with streptozocin is acute kidney failure, which can be fatal. Most veterinary oncologists recommend giving IV fluids before and after streptozocin to help prevent kidney damage. Other adverse effects are nausea, vomiting, liver damage and bone marrow suppression.

Cyclophosphamide is a chemotherapy agent that can be given either by IV or orally. It can be used orally with prednisolone as a palliative treatment for lymphoma. Cyclophosphamide is generally safe, but it might cause bone marrow suppression, nausea, vomiting, diarrhea and damage to the urinary bladder.

Vincristine has to be administered by IV. Vincristine is generally safe, but it might cause bone marrow suppression, liver damage, constipation, hair loss and seizures. It is primarily used in aggressive lymphoma protocols.

Asparaginase can be given either by IM or SQ. This drug is most useful in inducing remission of lymphoma. Allergic reactions to asparaginase are common, so Benadryl is recommended prior to giving asparaginase. Other possible adverse effects include pancreatitis, liver damage and blood clotting defects.

As you can see all of these chemotherapy drugs have some serious potential side effects, so close monitoring for toxicity is crucial to a successful outcome. Over-The-Counter Products Over-the-counter human products that should never be used include ibuprofen, acetaminophen and aspirin. Ibuprofen can cause serious and usually fatal toxicity in ferrets. Ibuprofen does damage to the kidneys, gastrointestinal tract and platelets.

Gastrointestinal signs such as stomach ulcers can happen as soon as two to six hours after ingestion of ibuprofen. Kidney signs and kidney failure can happen in one to five days; seizures are also possible. Ferrets, like cats, have a hard time metabolizing acetaminophen, so toxicity is common with acetaminophen. Thus acetaminophen should not be used in ferrets. Aspirin can cause stomach ulcers in ferrets, so avoid it.

#### Friend or Foe

Your understanding of the possible side effects of a medication increases the likelihood of a successful outcome for your ferret. Medications can be a powerful ally in maintaining the health of your ferret, but only if you use them wisely. As you now know, with ferret medications there are good ones (enrofloxacin), bad ones (gentamicin) and fatal ones (ibuprofen).

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