Get the Facts about Pain Relievers for Pets

Your 8-year-old yellow Lab Tinker Bell just came in from the backyard and you notice she's limping on one of her back legs. You check the medicine cabinet in your bathroom to see what medications you have that may help her feel better. You see bottles of aspirin, ibuprofen, naproxen, and acetaminophen—all pain relievers for people. You also have a few tablets of RIMADYL left over from when your other dog had knee surgery. Before reaching for any of the bottles, **STOP** and call your veterinarian. A pain reliever meant for you or even for your other dog may not be right for Tinker Bell and may even hurt her.

Back to the top

Nonsteroidal Anti-Inflammatory Drugs

With the notable exception of acetaminophen, all the medications listed in the introduction are nonsteroidal anti-inflammatory drugs, commonly called NSAIDs. These drugs are widely used in both people and animals for their pain relieving, anti-inflammatory, and anti-fever properties. Veterinarians often prescribe NSAIDS for dogs with osteoarthritis, a condition where cartilage - the protective material that cushions a joint - breaks down over time, causing the bones to rub against each other. This rubbing can permanently damage the joint and cause pain, inflammation, and lameness. Veterinarians also often use NSAIDs to manage pain after surgery in both dogs and cats.

The Science—How NSAIDs Work

Nonsteroidal anti-inflammatory drugs affect substances called prostaglandins that the body releases in response to irritation or injury. When a cell is damaged, an enzyme called cyclooxygenase (COX) is activated. An enzyme is a protein made by the body that speeds up a chemical reaction. The enzyme itself remains unchanged during the reaction. Essential to all body functions, enzymes are very specific—each enzyme stimulates a specific reaction that causes a specific result.

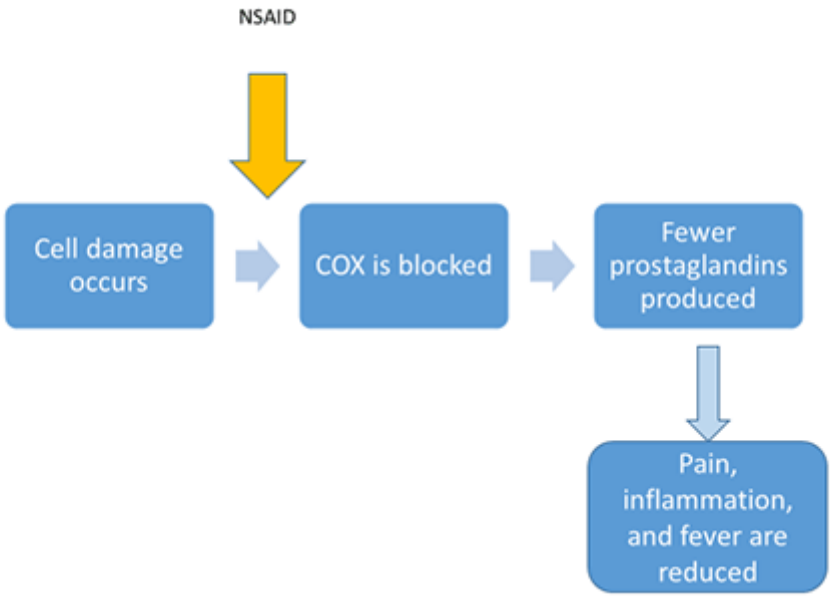
In the case of COX, it stimulates cells to produce several substances, including prostaglandins, after the cells are damaged. This enzyme is present in most body tissues, including the digestive tract (stomach and intestines) and kidneys.

Cell damage occurs → COX is activated → Prostaglandins are produced

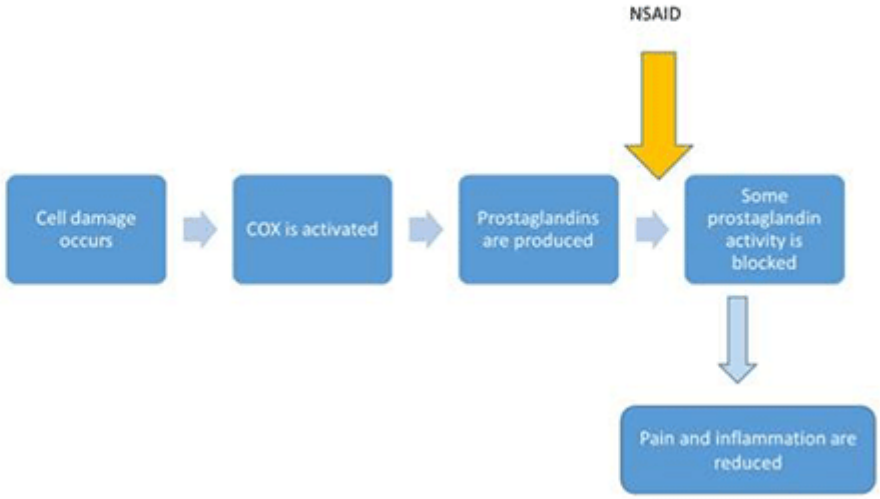
Prostaglandins are present throughout the body and have several important functions. These substances:

- Contribute to pain, inflammation, and fever;
- Protect the lining of the stomach and intestines;
- Help maintain blood flow to the kidneys; and
- Support platelet function (platelets are found in the blood of all mammals and help with blood clotting).

Many NSAIDs work by blocking COX, so fewer prostaglandins are produced:



Other NSAIDs work by blocking some activity of certain prostaglandins:



By either blocking COX or blocking some activity of certain prostaglandins, NSAIDs reduce ongoing pain and inflammation in animals. But because these drugs also interfere with the other positive functions of prostaglandins, they can cause side effects, some of which are serious.

Side Effects

Some of the most common side effects of NSAIDs in animals reported to FDA's Center for Veterinary Medicine are:

- Vomiting;
- Decreased to no appetite;
- Decreased activity level; and
- Diarrhea.

Other reported side effects in animals include stomach and intestinal ulcers, stomach and intestinal perforations (holes in the wall of the stomach or intestines), kidney failure, liver failure, and death.

The side effects of NSAIDs are mainly seen in the digestive tract, kidneys, and liver.

The Digestive Tract (Stomach and Intestines)

Nonsteroidal anti-inflammatory drugs can cause side effects in the digestive tract both directly and indirectly. The direct effects are related to the drugs' physical properties. Many NSAIDs become trapped in the stomach and are also slightly acidic, so they directly irritate the stomach lining.

The indirect effects are due to NSAIDs either preventing the body from making prostaglandins or blocking the protective activity of these substances. Remember, besides decreasing pain, inflammation, and fever, prostaglandins also protect the lining of the stomach and intestines. When fewer prostaglandins are produced or some of their activity is blocked, the entire digestive tract may be more prone to damage. This can lead to ulcers and perforations in the stomach and intestines.

Giving an animal two NSAIDs at the same time, or an NSAID with a steroid such as prednisone, increases the risk of side effects in the digestive tract and should be avoided.

Kidneys

During periods of decreased blood flow to the kidneys—such as when an animal is dehydrated, under anesthesia, or has kidney disease—prostaglandins cause the arteries going to the kidneys to open. This helps keep blood flowing to these vital organs. Because NSAIDS prevent the production of prostaglandins or block some prostaglandin activity, these drugs can reduce blood flow to the kidneys, possibly causing kidney damage and leading to sudden-onset kidney failure.

NSAIDs should be used cautiously in animals that may already have kidney disease or other conditions that cause reduced blood flow to the kidneys, like dehydration and shock. If an NSAID is used around the time of surgery, intravenous (IV) fluids are generally recommended before, during, and after anesthesia to maintain blood flow to the kidneys, hopefully reducing potential kidney complications.

Liver

The side effects of NSAIDs on the liver can be divided into two categories: (1) dose-dependent toxicity; and (2) dose-independent toxicity.

As the name implies, dose-dependent liver toxicity is related to the dose—the higher the dose of the NSAID, the worse the liver damage. Dose-dependent liver toxicity is typically caused by a massive NSAID overdose, such as a dog eating an entire bottle of his owner's ibuprofen. (The **ASPCA Animal Poison Control Center (http://www.aspca.org/pet-care/animal-poison-control)** **(http://www.fda.gov/AboutFDA/AboutThisWebsite/WebsitePolicies/Disclaimers/default.htm)**receives hundreds of calls each year involving dogs and cats that accidentally eat nonsteroidal anti-inflammatory drugs.)

Dose-independent liver toxicity can occur at any dose, even the correct one, and is an unpredictable and rare reaction where the patient's liver has an abnormal sensitivity to the NSAID.

NSAIDs should be used cautiously in animals that may already have liver disease. For a dog starting on an NSAID for long-term use for osteoarthritis, it's good to closely monitor his or her liver function by checking bloodwork during the early stages because most NSAID-associated liver damage occurs within the first three weeks.

Back to the top

FDA-Approved NSAIDs for Pets

FDA has approved several nonsteroidal anti-inflammatory drugs for dogs to control pain and inflammation associated with osteoarthritis; and to control pain and inflammation after soft tissue and orthopedic surgery. [Orthopedic pertains to bones and muscles; soft tissue is everything else. Repairing a dog's torn ACL (anterior cruciate ligament) in her knee is an orthopedic surgery; removing a ball from a dog's stomach is a soft tissue surgery.]

Table 1: Some FDA-Approved Nonsteroidal Anti-Inflammatory Drugs for Dogs

Active Ingredient	Brand Names
Carprofen	RIMADYL, NOVOCOX,* VETPROFEN,* CARPRIEVE,* QUELLIN,* CARPROFEN*
Deracoxib	DERAMAXX
Firocoxib	PREVICOX
Grapiprant	GALLIPRANT
Meloxicam	METACAM, LOXICOM,* MELOXIDYL,* MELOXICAM*

Active Ingredient	Brand Names
Robenacoxib	ONSIOR (for a maximum of 3 days)

*Indicates an FDA-approved **generic (/AnimalVeterinary/GuidanceComplianceEnforcement/ComplianceEnforcement/UnapprovedAnimalDrugs/ucm249392.htm)** copy.

All NSAIDs for dogs are given either by mouth (oral) or by injection.

Unlike the other NSAIDs listed in the above table, ONSIOR (robenacoxib) is not approved for long-term use in dogs with osteoarthritis. It should only be used for a maximum of 3 days to control pain and inflammation after soft tissue surgery.

Only two NSAIDs are FDA-approved for cats: meloxicam (sold under the brand names METACAM, MELOXICAM,* and LOXICOM*) and robenacoxib (sold under the brand name ONSIOR).

Meloxicam is approved for cats as a one-time-only injection to control pain and inflammation after spaying, neutering, and orthopedic surgery; the injection is given under the cat's skin before surgery.

Robenacoxib is also approved for cats to control pain and inflammation after spaying, neutering, and orthopedic surgery. The drug should be used once daily for no more than three days, and is available as either a tablet given by mouth or an injection given under the cat's skin.

Currently, no NSAIDs are approved for long-term use in cats. More than one dose of meloxicam in cats can cause kidney failure or death, and the effects of long-term use of other NSAIDs in cats are unknown. Cats are more sensitive than dogs to the side effects of NSAIDs because they aren't able to break down the drugs as well.

All FDA-approved NSAIDs for dogs and cats are by a veterinarian's prescription only.

Benefits

A main benefit of an FDA-approved nonsteroidal anti-inflammatory drug for dogs or cats is that it has been shown to be safe and effective in that species when used according to the label. Pain relievers for people don't have the same assurances of safety and effectiveness in pets.

A second main benefit is that the label for an FDA-approved NSAID for dogs or cats is written *specifically for that species*. The label includes all the information veterinarians need to use the drug safely and effectively *in that species*.

A Balancing Act—Benefits versus Risks

FDA-approved nonsteroidal anti-inflammatory drugs offer pain relief for many dogs with osteoarthritis. These drugs also help veterinarians effectively manage pain after surgery in both dogs and cats. Yet, there are risks.

NSAIDs account for a large number of adverse drug events reported to FDA's Center for Veterinary Medicine. Adverse drug events are undesired side effects associated with a drug.

If you consider the two most common populations of pets that receive NSAIDs, you can see why there are so many reported side effects:

- Dogs with osteoarthritis. These dogs are usually older and often have another disease in addition to osteoarthritis, such as kidney or liver disease.

- Surgery patients. These dogs and cats were recently under anesthesia which reduces blood flow to the kidneys.

Risk Reduction

All drugs can cause side effects. FDA's Center for Veterinary Medicine tries to reduce the risks of side effects associated with NSAIDs by working with drug companies to write clear, thorough drug labels for veterinarians and **Client Information Sheets (/AnimalVeterinary/ResourcesforYou/AnimalHealthLiteracy/ucm335765.htm)** for owners.

Every oral NSAID approved for dogs and cats has an accompanying **Client Information Sheet** for veterinarians to give owners the *first time* the prescription is filled and *each time* it's refilled. This sheet summarizes important safety information about the drug and serves as an easy reference for you at home.

The label of every approved injectable NSAID for pets has a section called "Information for Dog Owners" or "Information for Cat Owners." Before using the drug in your pet, your veterinarian should discuss the information in this section with you.

Back to the top

Over-the-Counter Pain Relievers for People—Are They Safe for Pets?

Dogs are Not Small People.

Tinker Bell's owner isn't alone. When owners see their dog or cat limping or showing other signs of pain, they often think about giving their pet an over-the-counter pain reliever for people. But even if data show an NSAID is safe and effective in people, the drug may not be safe and effective in dogs because the drug may:

- Last longer;
- Have a higher absorption rate in the stomach and intestines; and
- Reach higher blood levels.

Cats are Not Small People or Small Dogs.

You have to be even more careful with cats. Compared to other species, cats have a reduced ability to break down NSAIDs.

These differences may lead to toxic effects in pets, such as ulcers and perforations in the digestive tract as well as liver and kidney damage.

Table 2: Common Over-the-Counter Pain Relievers for People

Active Ingredient	**Some Common Brand Names**
Aspirin	ASCRIPTIN, BAYER, BUFFERIN, ECOTRIN
Ibuprofen	ADVIL, MOTRIN
Naproxen sodium	ALEVE, MIDOL EXTENDED RELIEF, NAPROSYN
Acetaminophen (**not** an NSAID)	TYLENOL

Acetaminophen is *not* a nonsteroidal anti-inflammatory drug and doesn't have much anti-inflammatory activity. **Scientists don't fully understand how acetaminophen works (http://tuftsjournal.tufts.edu/2008/04/professor/01/)**. The drug seems to have more than one mode of action to reduce fever and relieve pain.

Acetaminophen has two main forms of toxicity (http://www.vetstreet.com/care/acetaminophen-toxicity-in-cats-and-dogs) :

- Dose-dependent liver toxicity—meaning the higher the dose, the worse the liver damage—that may lead to liver failure; and
- Red blood cell damage that causes these cells to lose their ability to carry oxygen.

Dogs and cats can develop both forms of acetaminophen toxicity, but cats are more prone to red blood cell damage while dogs are more likely to get liver damage.

Acetaminophen is fatal to cats. Cats should never be given acetaminophen because they lack certain **enzymes** that the liver needs to safely break down the drug.

Back to the top

What Should You Do?

- Before giving **any** NSAID to your dog or cat, **talk with your veterinarian.** Tell him or her if your pet:
  - Has a history of digestive problems, such as stomach or intestinal ulcers, or has had surgery on the stomach or intestines. Even if your pet hasn't had any digestive problems in the past, that doesn't mean he or she has a healthy digestive tract. Dogs and cats can have stomach and intestinal ulcers without showing signs.
  - Is on any other medication. It's not recommended to give two different NSAIDs, or an NSAID and a steroid, at the same time.
- During and after NSAID therapy, monitor your pet for side effects, such as vomiting, diarrhea, bloody or tar-colored stool, decreased appetite, decreased activity level, yellowing of the whites of the eyes, and yellowing of the gums. These signs can occur even in a previously healthy pet. If you notice any side effects, **stop giving the drug and call your veterinarian.**
- If your pet experiences side effects from an NSAID, FDA's Center for Veterinary Medicine encourages you to work with your veterinarian to **report the problem (/AnimalVeterinary/SafetyHealth/ReportaProblem/ucm055305.htm)**.
- Before starting your dog on an NSAID for long-term use for osteoarthritis, ask your veterinarian about performing baseline bloodwork. Talk to your veterinarian about how often to recheck your dog's bloodwork. No NSAID is currently FDA-approved for long-term use in cats.
- Going back to Tinker Bell, you shouldn't give her anything in your medicine cabinet until you talk to your veterinarian.

Back to the top

Resources for You

- **Veterinary Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (/AnimalVeterinary/SafetyHealth/ProductSafetyInformation/ucm055434.htm)**
- **Treating Pain in Your Dog – Keeping Your Best Friend Active, Safe, And Pain Free (/AnimalVeterinary/ResourcesforYou/AnimalHealthLiteracy/ucm196295.htm)**

- **NSAID Labels - Currently Approved Labels for Companion Animal Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/DrugLabels/ucm050105.htm)**
- **FDA Basics Webinar on Advice to Dog Owners Whose Pets Take NSAIDS (/AboutFDA/Transparency/Basics/ucm291745.htm)**
- **Medications for your Pet…Questions for Your Vet (/AnimalVeterinary/ResourcesforYou/AnimalHealthLiteracy/ucm191833.htm)**
- **Pain Medicines for Pets: Know the Risks (/ForConsumers/ConsumerUpdates/ucm373009.htm)**

Back to the top

For More Information

Contact FDA's Center for Veterinary Medicine at either **AskCVM@fda.hhs.gov (mailto:AskCVM@fda.hhs.gov)** or 240-402-7002.

References

- Khan SA, McLean MK. Toxicology of frequently encountered nonsteroidal anti-inflammatory drugs in dogs and cats. *Vet Clin North Am Small Anim Pract* 2012;42:289-306.
- KuKanich B, Bidgood T, Knesl O. Clinical pharmacology of nonsteroidal anti-inflammatory drugs in dogs. *Vet Anaesth and Analg* 2012;39:69-90.
- Lascelles BD, McFarland JM, Swann H. Guidelines for safe and effective use of NSAIDs in dogs. *Vet Ther* 2005;6:237-251.
- Meadows I, Gwaltney-Brant S. The 10 most common toxicoses in dogs. *Vet Med* 2006;101:142-148.
- Plunkett SJ. *Emergency Procedures for the Small Animal Veterinarian*. 2nd ed. London: WB Saunders, 2001.

Back to the top

More in Animal Health Literacy (/AnimalVeterinary/ResourcesforYou/AnimalHealthLiteracy/default.htm)

CVM Kid's Page (/AnimalVeterinary/ResourcesforYou/AnimalHealthLiteracy/ucm136153.htm)