



# PURINA Pro Club

## *Terrier Group Update*

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### Researchers Study Treatment & Genetics of Canine Bladder Cancer

**U**rinary bladder cancer, which most often is invasive transitional cell carcinoma (TCC), is the most common cancer of the urinary tract in dogs. A serious condition that affects a dog's ability to urinate, TCC accounts for more than 90 percent of dog bladder tumors and may affect up to 20,000 to 30,000 dogs a year in the United States. Among affected terrier breeds are Scottish Terriers, West Highland White Terriers and Wirehaired Fox Terriers.

Exactly what causes TCC is not known, but researchers suspect a combination of genetic predisposition and environmental factors are responsible. Deborah Knapp, D.V.M., DACVIM, the Dolores L. McCall Professor of Comparative Oncology at Purdue University School of Veterinary Medicine, and colleagues are working to learn more about the genetic and environmental causes as well as more effective treatments to manage TCC.

In TCC, a malignant tumor develops from the transitional epithelial cells that line the bladder, invading deeper layers of the bladder wall, including the muscle layers. As the tumor grows, it can obstruct the flow of urine either from the kidneys to the bladder or as urine exits the bladder. The tumor also can grow in other parts of the urinary tract and can spread to other areas of the body, including the lymph nodes, lungs and liver.

A diagnosis of TCC requires a tissue biopsy, which can be obtained surgically or nonsurgically through a fiber-

optic scope inserted into the bladder. "We remove a small piece of tissue from the tumor, and a pathologist analyzes it to determine whether it is cancer," Knapp explains. "If it is cancerous, we also learn the type of cancer."

If TCC is diagnosed, then the size and extent of the tumor are determined by radiographs (X-rays), ultrasound or computed tomography (CT) scan. Imaging of the bladder helps to locate the tumor and determine its size. Once the tests are completed, a veterinarian can decide the best way to treat the disease.

#### Improving Treatment Options

Treatment options depend on whether the tumor is localized to the bladder and where the tumor is located inside the bladder. Completed evaluation and treatment of dogs with invasive bladder cancer may range from less than \$1,000 to more than \$5,000, depending on the type, and length and outcome of treatment.

"If the tumor is in part of the bladder where we can remove it surgically, that's what we do," Knapp says. "More often than not, however, it's in part of the bladder where you cannot surgically remove it. Then, we're relying on drugs to shrink the tumor and make it go into remission or at least to keep it from growing."

Two classes of drugs are used to treat canine bladder cancer. One is traditional chemotherapeutic agents and the other is cyclooxygenase (cox) inhibitors. The cox inhibitor that has

received the most study is piroxicam, a non-steroidal, anti-inflammatory pain relief medication. This drug has been noted for its effectiveness when dogs with various forms of spontaneous cancer went into remission while receiving piroxicam for pain control with no other therapy.

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"Both drugs help to prolong a dog's life and help to maintain quality of life," says Knapp. "They can help make the tumor shrink dramatically in some dogs or just keep it from growing in other dogs. Unfortunately, the drugs do not elicit a cure in most dogs."

The median survival time for dogs with TCC being treated with a cox inhibitor alone is 195 days, compared to a median survival time with cox inhibitors plus chemotherapy of 250 days to 300 days. These survival times are averages, thus some dogs will live longer and other dogs will not live as long.

Although progress has been made in the treatment of TCC in dogs, there is much room for improvement, Knapp says. She and other researchers are investigating several aspects of the cancer, including risk factors and causes of bladder cancer, methods for earlier detection and better staging,

#### Recognizing Signs of Canine Bladder Cancer

**T**he signs of canine bladder cancer, or transitional cell carcinoma (TCC), often mimic those of urinary tract infections. Owners should be alert for signs of bladder cancer and take their dog to the veterinarian right away if they notice signs. The sooner a dog receives treatment, the more likely a healthy outcome will occur. Here are the most common signs of bladder cancer:

- Blood in the urine;
- Straining to urinate; and
- Frequent recurring urinary tract infections.

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## Canine Bladder Cancer

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and improved therapy.

Not only a cancer in dogs, bladder cancer affects more than 500,000 people in North America, and more than 14,000 people die annually of the disease in the United States. Canine TCC is almost identical in a number of ways to the more serious form of human bladder cancer, or intermediate- to high-grade, invasive TCC. Similarities include sites of frequency, metastasis and response to medical therapy.

"It is entirely possible that important information learned from dogs with bladder cancer will lead to improved outlook for humans with bladder cancer," Knapp says.

Understanding the causes of bladder cancer will allow development of strategies to prevent its occurrence. "If we can prevent bladder cancer, it will be more effective than trying to treat it once it develops," she says.

### Understanding Potential Causes

Although bladder cancer is relatively uncommon in dogs, comprising 1 percent to 2 percent of all canine cancers, Scottish Terriers have an 18- to 20-fold increased risk for TCC. Meanwhile, West Highland White Terriers and Wirehaired Fox Terriers have a three- to five-fold increased risk. Weight and gender may play a role in the development of bladder cancer as obese female dogs make up the highest risk group.

In a case-control study conducted by Knapp and colleagues at Purdue

University, certain environmental factors were identified that can cause increased risk for bladder cancer. Dogs exposed to lawns treated with herbicides and insecticides may be at risk, for example. Not surprisingly, Knapp recommends that owners of dogs considered at high risk for developing TCC

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keep dogs away from treated lawns or gardens. Old-style flea dips also have been identified as an environmental risk for TCC. A more recent case control study of Scottish Terriers showed that newer, spot-on flea treatments containing fipronil do not increase the risk for bladder cancer.

The study also led to "an intriguing finding regarding diet and reduced cancer risk. We learned that dogs that consumed vegetables at least three days a week had a reduction in their risk of bladder cancer," Knapp says. The

most commonly consumed vegetable by dogs in the study was carrots.

Efforts to define the causes of canine TCC continue. Working with Elaine Olander, Ph.D., and research colleagues at the Section of Comparative Genetics at the National Human Genome Research Institute, part of the National Institutes of Health, Knapp hopes to determine the heritable or genetic factors that lead to bladder cancer or increase the risk of bladder cancer. The AKC Canine Health Foundation is funding the research, which includes several breeds of dog.

"All of the breeders and owners we have spoken to about the research are extremely supportive and enthusiastic about participating in the study," says Dana Mosher, sample coordinator at the National Human Genome Research Institute. "All genetic and contact information collected for an individual dog remains confidential. We will not disclose participants or a dog's pedigree, health information or any other data from the DNA sample with any breeder, club personnel, the American Kennel Club or AKC Canine Health Foundation.

By participating in the research, owners and breeders are not only potentially helping to extend survival and improve quality of life for dogs with bladder cancer, they also are helping the outcome for people who develop bladder cancer. If a genetic mutation can be found for canine bladder cancer, it is possible that breeders will one day be able to selectively breed dogs to eradicate the cancer in their bloodlines. ■

## Owners May Enroll Dogs with Bladder Cancer in Research

Two research studies are being conducted to learn more about canine bladder cancer. In one study, Deborah Knapp, D.V.M., DACVIM, the Dolores L. McCall Professor of Comparative Oncology at Purdue University School of Veterinary Medicine, and Elaine Olander, Ph.D., head of the Section of Comparative Genetics at the National Human Genome Research Institute, are collaborating to determine the genetic risk factors for canine bladder cancer, or transitional cell carcinoma (TCC). Blood samples from Scottish Terriers and West Highland White Terriers with TCC are needed.

Dogs should be more than 5 years old and not have any cancer other than TCC. Owners whose dogs meet the criteria may contact Dana Mosher, samples coordinator at the National Human Genome Research Institute, at (301) 451-9390 or by e-mail at [mosherd@mail.nih.gov](mailto:mosherd@mail.nih.gov) for a sample kit. Information on contributing blood and tissue samples also is available at [www.vet.purdue.edu/pcop/blood.html](http://www.vet.purdue.edu/pcop/blood.html).

In the second study, Knapp and colleagues at Purdue University in West Lafayette, Ind., aim to identify more effective treatment for TCC once it has formed. Dogs that participate in the treatment studies live at home with their owners and must travel to the Purdue University School of Veterinary Medicine for regular examinations and treatments.

"For most of the trials we do, the dog would have to come to Purdue for multiple visits spaced out at four- to 12-week intervals," Knapp says. "I realize that for some people this is not feasible. But if they live near us and they think their dog may have bladder cancer, we welcome them to contact us." Please visit the Web site at [www.vet.purdue.edu/pcop.html](http://www.vet.purdue.edu/pcop.html) for information.

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