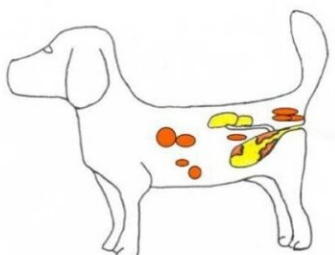
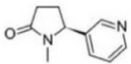








Exposure to cigarette smoke found to increase cancer risk in dogs

January 3 2024, by Brittany Steff

<p>Clinical Problem: Despite improved therapy and longer survival, bladder cancer is still ultimately lethal in most dogs.</p>  <p>Study Objective: Identify modifiable host and environmental risk factors for the cancer in order to learn how to prevent it.</p>	<p>Methods: Subjects: 120 Scottish terriers in a 3-year bladder cancer screening study (Dhawan et al., <i>Frontiers in Oncology</i>, 2022).</p>    <p>Urine cotinine</p>   <p>Screening, PE, pet owner questionnaire every 6 mo.</p>	<p>Results: Factors significantly associated with bladder cancer risk in multivariable model:</p>   <p>(1) living with cigarette smokers and cotinine in the urine, (2) living near a marsh, (3) history of UTIs.</p> <p>Conclusion: Pet owners are encouraged to not smoke, to avoid cigarette smoke, and to seek timely management of UTIs in their dogs.</p>
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Graphical Abstract. Credit: *The Veterinary Journal* (2023). DOI: 10.1016/j.tvjl.2023.106044

Dogs are humans' best friends. Need to quickly locate a bomb? There's a dog for that. Can't see very well? There's a dog for that. Searching for a lost hiker in the mountains or survivors in an earthquake, diagnosing illness, comforting the bereft—there are dogs for every need.

They are even helping humans track down the causes of cancer. A new study links [cigarette smoke](#) exposure to an exponentially higher rate of bladder cancer in Scottish terriers. By assessing individual dogs and studying their medical history, scientists are beginning to untangle the question of who gets cancer, why, and how best to detect, treat, and prevent cancer.

Led by Purdue veterinarian Deborah Knapp, a team of researchers tracked a cohort of 120 Scottish terriers over a three-year period. In a paper published in [The Veterinary Journal](#), they found that dogs exposed to cigarette smoke were six times more likely to develop bladder cancer than those that were not.

Knapp is a Purdue Distinguished Professor of Comparative Oncology, the Dolores L. McCall Professor of Veterinary Medicine, director of Purdue's Evan and Sue Ann Werling Comparative Oncology Research Center, and a program co-leader in the Purdue Institute for Cancer Research.

"Cancer is a combination of what you are born with—your genetics—and what you are exposed to—your environment," Knapp said. "In this case, we studied these dogs for years at a time, and then we went back and asked, 'What was different between those that developed cancer and those that did not develop cancer? What were the [risk factors](#)?'"

Scottish terriers, famous for being presidential pets to presidents George W. Bush and Franklin D. Roosevelt, "Jock" in Disney's "Lady and the Tramp," and the cutest Monopoly game token, are also notable for a less cheerful reason: They develop bladder cancer at a rate 20 times higher than that of other [dog breeds](#). When Scotties and other dogs develop bladder cancer, it is often an aggressive form similar to muscle-invasive bladder cancer in humans.

Knapp's team studied 120 Scotties, assessing their health, environment, food, activity, locations, and anything they could think of that might affect their cancer risk. The goal was both to figure out what could prevent a heartbreaking and often fatal cancer in this breed but also to use that information to see what might affect cancer in other dogs and even humans. Dogs make an excellent study species because they live alongside humans, sharing food, bedding, housing, atmosphere, and almost everything else.

"We know that Scotties' genetics play a huge role in making them vulnerable to cancer," Knapp said. That strong genetic signal tied to cancer helps researchers isolate other factors that affect the likelihood of any dog, or human, getting cancer, and to do so with smaller numbers of dogs.

"If we were to do this study with mixed breeds of dogs, it would take hundreds and hundreds of dogs to uncover this same risk, which is probably there, just more difficult to discern because those dogs are not already inclined genetically to get bladder cancer."

The researchers, with the help of Purdue alumna, veterinarian, and Scottish terrier breed champion Marcia Dawson, wanted to study cancer in Scotties to help the dogs themselves and to see what that research might reveal about canine and human risk factors overall.

When a dog (or human) is exposed to tobacco smoke, either by breathing it or by licking clothes saturated with the scent, their body takes up the chemicals in the smoke and eliminates them through the urine. This leads to cancer in the [urinary tract](#) but also offers a way to assess smoke exposure. The researchers analyzed the dogs' urine for a nicotine metabolite and cotinine, and its presence indicated the dog had been exposed to significant amounts of tobacco smoke.

Any time [tobacco smoke](#) is present in the same room as a dog, the dog breathes in the smoke. However, some dogs also had cotinine in their urine when their owners did not smoke. In that case, the dog could have been exposed away from the home. Or it may be that their owners visited places where others were smoking and returned home with smoke on their clothes.

"If someone goes out to a smoky concert or party, then comes home and their dog hops up on their lap to snuggle with them, the dog can be exposed to the particulate material in smoke through the person's clothing," Knapp said.

The results are not all black and white. Not all the dogs who were around smokers got cancer, and some dogs who were not around the smoke still got cancer. This is also true in humans. Half of human bladder cancer is due to smoking, but not all smokers develop bladder cancer. This discovery gives the Purdue team the opportunity to study how the combined effects of the genetics inherited from the parents plus environmental exposures lead to cancer.

Knapp stresses that this discovery is a new one. Dog owners, who almost universally want the best for their dogs and wish their dogs would live to be 100, certainly did not knowingly put their dogs at risk of [cancer](#) by smoking around them. However, with this new information, they may be able to protect their pets better going forward.

In another interesting finding, the researchers did not uncover a link between lawn chemicals and [bladder cancer](#), which had been found in previous studies.

"That's likely because we are working with pet owners who are aware of the risk of lawn chemicals, so they took precautions to keep the dogs safe, like not treating parts of the lawn where the dog tends to be or

keeping the dogs off the lawn for longer," Knapp said. "That is encouraging! People love their pets. There are people taking steps to keep their dogs healthier."

That new and encouraging result means there are further things humans can do to protect dogs. They can reduce the amount of smoke around the dog by quitting smoking or by smoking outside away from the dog and changing clothes before they come back inside from a smoky environment and snuggling their dog.

"What we hope pet owners will take from this is that if they can reduce the exposure of their dogs to smoke, that can help the dogs' health," Knapp said. "We hope they stop smoking altogether, both for their health and so they will continue to be around for their dogs, but any steps to keep smoke from the [dogs](#) will help."

More information: D.W. Knapp et al, Association between cigarette smoke exposure and urinary bladder cancer in Scottish terriers in a cohort study, *The Veterinary Journal* (2023). [DOI: 10.1016/j.tvjl.2023.106044](#)

Provided by Purdue University

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