Scientists put a pox on dog cancer

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Researchers report that myxoma – a pox virus that afflicts rabbits but not humans, dogs or any other vertebrates so far studied – infects several different types of canine cancer cells in cell culture while sparing healthy cells. The study adds to the evidence that viruses or modified viruses will emerge as relatively benign cancer treatments to complement or replace standard cancer therapies.

The new study, reported in the *American Journal of* Veterinary Research , is unique in that it focused on spontaneously occurring cancers in dogs. This allowed the researchers to avoid a common practice: testing viral therapies on mice or rats with induced human cancers. Such animals must be immunosuppressed to prevent their immune systems from rejecting the foreign tissue, complicating the results.

Treating cancers with viruses could offer several advantages over standard cancer therapies, said University of Illinois veterinarian and pathobiology professor Amy MacNeill, who led the new study. Many cancers have impaired anti-viral defenses, which allow viruses to target tumors while sparing healthy cells. And under the right conditions, infection with an oncolytic (cancer-killing) virus exterminates cancer cells and elicits an anti-cancer immune response without spurring a harmful inflammatory response, she said. Chemotherapy and radiation kill healthy cells along with cancer cells and radiation can cause abrupt cell death that spurs inflammation and pain, she said.

"Ideally, what would happen is the virus would get into a few cancer cells, cause cell death and then spread to the other tumor cells nearby,"

she said.

Recent studies have shown that oncolytic viral therapies can be used successfully in conjunction with traditional approaches, MacNeill said.

"There was a study in cats where they removed the tumor surgically and then they put a viral therapy in the area where the tumor had been removed," she said. The animals that received the viral therapy had significantly less regrowth of the cancer than those that weren't exposed to the virus after surgery.

"Other studies (1, 2, 3, 4) have shown that once you've eliminated a cancer with an oncolytic virus, if you re-challenge that animal with the same cancer cells, they don't develop tumors," MacNeill said. Viral infection of the cancer cells appears to train the immune system to better recognize the cancer, she said.

In the new study, the researchers wanted to see if spontaneously occurring cancers in dogs were responsive to infection with a virus that is not a pathogen in humans or dogs. They found that cancerous and healthy canine cells respond as human cells do to myxoma infection: The virus invades cancer cells and leaves healthy cells alone. The team also showed that a version of the myxoma virus with a single gene deleted was four times better at killing cancer cells than the unmodified virus. The deleted gene codes for a protein that hinders cell death in infected cells.

More preliminary tests are needed and researchers have many more years of tests and trials ahead, but if all goes well they will eventually test the virus or a modified version of the virus in dogs with cancer, MacNeill said.

"We wanted to make sure that the dog cells were like the human cells

because we want to use these viruses not only to cure dogs of cancer but also to use the dogs as better models for humans with cancer," she said. "People are beginning to see the logic of this approach. These dogs have spontaneous tumors just like humans, they're living in the same environment as humans, they're exposed to the same carcinogens in the water if there are any and they sometimes even share our food."

She calls this approach a "win-win" for dogs and humans.

"This way we can test the therapy in dogs while at the same time treating them," she said. "Other researchers can take our results and use them to develop therapies for human patients."

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