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'Doctor dogs' diagnose cancer by sniffing it out

STUDY COULD LEAD TO ELECTRONIC NOSE

By Linda Goldston
Mercury News

SAN ANSELMO - In Africa, giant rats have been trained to sniff out tuberculosis in humans and land mines in fields. In England, dogs have identified bladder cancer. In Georgia, wasps have detected bombs.

So perhaps it should come as no surprise that researchers in Marin County were able to train dogs to detect lung and breast cancer in breath samples from people with 88 to 99 percent accuracy, according to a study released last week.

Could doctor dogs be on the medical horizon?

At the very least, researchers said, the studies show that cancer cells emit chemicals or molecules that are different from those in normal cells, and more research is needed to determine just what those chemicals are -- and whether they could help doctors find cancers earlier.

"The challenge now is if technology can jump over the bar the dogs have set," said Michael McCulloch, research director for the private, non-profit Pine Street Foundation in San Anselmo, which conducted the lung and breast cancer research.

Questions to be answered are: "What is it dogs are smelling, and can chemical analysis match the dogs in terms of specificity and sensitivity?" McCulloch said. "Then the pathway will likely lead to an 'electronic nose.'"

For now, very little is known about the chemicals dogs apparently are detecting in diseased cells or how the dog's olfactory system is able to pick up on them. Previous studies had shown that dogs can detect skin and bladder cancer.

Ultimately, the Pine Street Foundation study "means there's something we can now key into that might allow for early detection of cancer," said Thomas Schoenfeld, research associate professor of physiology at the University of Massachusetts Medical School, who has studied the olfactory systems of rodents.

"Dogs have opened the door," he said.

McCulloch and his colleagues had followed the other studies involving biological detection tools -- as opposed to machines. Their goal was to determine if dogs could distinguish between breath samples from people with lung or breast cancer and those from healthy people.

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The study, which will be published in the March issue of the medical journal Integrative Cancer Therapies, is the first to test whether dogs can detect cancer by sniffing samples of exhaled breath collected in tubes.

The canine "diagnostic tools" -- two Portuguese water dogs and three Labrador retrievers - were borrowed from their local owners and Guide Dogs for the Blind. The dogs were trained for about three weeks using the "click and reward" method.

When the dogs successfully detected which tubes held breath samples from cancer patients they heard a click and received a food reward. The dogs were trained to sit or lie down when they detected a diseased sample.

After conducting more than 12,200 separate "dog/breath sample interactions," researchers reported the dogs had an 88 percent accuracy rate in detecting breast cancer and a 99 percent accuracy rate in detecting lung cancer.

"For us, it's about giving cancer patients hope and options," said Nicholas Broffman, executive director of the foundation. "One way you give patients options is through early detection."

The foundation, which conducts research and provides education on alternative cancer treatments, is actively seeking funding for additional research and already has planned a project with researchers in Florida and Maine to study what types of chemicals the dogs are detecting in cancer cells.

"We'd love to find a Silicon Valley venture capitalist who sees the commercial applications of an 'electronic nose,'" Broffman said. "We're not proprietary. We want to make this research as widely available as possible."

There were a few surprises after the study was completed.

Two of the dogs that had been trained for the study spontaneously reacted to people on the street, and one of them may have saved the life of a dog trainer at a dog show.

"Our dog sat down at a dog show at a time when the dog was supposed to stand up," said McCulloch. "That person went to her doctor and learned she had a melanoma."

Maria Frianeza of Pinole owns the other dog, Kobi, and said he has gone up to people in a park or on the street and barked or lay down, as he did during the study. For now, Frianeza has chosen not to say anything to the people.

"We're not sure how to handle it ethically yet," she said, though she is sure of how she feels about Kobi's participation in the Pine Street study.

"It's a huge honor," she said. "I just hope something great comes out of it."

Thousands of miles away in Africa, however, at least one researcher is wondering why all the fuss about the use of dogs as diagnosis tools.

Bart Weetjens, director of the Apopo research center at the University of Sokoine in Morogoro, Tanzania, has spearheaded the use of giant pouched rats to detect land mines and, more recently, TB.

Last month, the rats, which took about three months to train, "were able to indicate 20 patients based on their samples provided by hospitals in Dar es Salaam," he said in an e-mail. "These patients had been missed by microscope, but rats found them." All 20 people are now being treated.

The use of that same species of rat to sniff out land mines has been so successful in Mozambique that 10 other countries have decided to start using the rats as mining-detecting technology, he said. The rats, though the size of a small cat, are too light to trigger the land mines.

"Vapor detection is relatively unexplored but certainly promising," Weetjens said.

The use of wasps to detect explosives has been successful enough for researchers to seek a patent for a handheld wasp-containing device that could be used at airports and public buildings.

But some researchers plan to stick with dogs.

"You can train a wasp in a few hours, but it's dead in the next week," said James Walker, director of the Florida State University Sensory Research Institute.

"And you can't put him on a leash."

IF YOU'RE INTERESTED

A copy of the dog study is available on the foundation's Web site at www.pinestreetfoundation.org. For more information on the tuberculosis- and mine-detecting rats, see www.herorot.org. For information on cancer-detection studies with dogs



Jim Gensheimer / Mercury News

Maria Frianeza and Richard Rios with their cancer detecting dog, Kobi, at the Pine Street Foundation in San Anselmo, Calif.

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