These are very early days for peer-reviewed research, but studies have established that some dogs, after intensive training, can indeed detect many types of cancer — breast, ovarian, lung, prostate, thyroid, colorectal, melanoma — from a variety of biological samples, including breath, urine, plasma and blood.

The daunting challenge now is to replicate those studies. Then, scientists must figure out how to translate dogs' diagnostic skill into clinically useful, standardized protocols that can be scaled up from study samples of a few dozens or hundreds to the millions who are screened for cancer each year.

"We can do it," says Dina Zaphiris, a dog trainer and CEO of the In Situ Foundation, a Chico, California-based nonprofit organization dedicated to training cancer-sniffing dogs. "We've trained our dogs to be 90 percent accurate in sensitivity (detecting the cancer) and specificity (not alerting to false positives). They're doing what machines can't do."

Why would scientists take a chance on an animal that can, like any living being, be unpredictable?

It's because a dog's sense of smell is so profound that it's like a superpower: Dogs have approximately 300 million odor receptors, compared with 6 million, at best, in humans. They also have a second smelling apparatus, the "vomeronasal organ," a patch of sensory cells near the back of their nasal cavity that's dedicated to detecting pheromones, moisture-borne odor particles unique to each species that carry signals such as sexual readiness. A dog's anatomy allows it to sniff pretty much continuously, separating air into one stream for respiration and into another stream for smelling. Proportionally, the section of a dog's brain devoted to analyzing smells is 40 times larger than that section in humans. Estimates vary, but scientists think that a dog's sense of smell may be 10,000 to 100,000 times better than ours.

It's difficult to wrap your mind around a sense that powerful. We humans live in a vision-dominated reality. To translate the difference in smelling power into visual terms, imagine that we humans can only perceive light and dark in two dimensions through a pinhole while dogs see thousands of shapes and shades in 3-D Technicolor. Scientists also like to use this vision analogy: It's as if we can see a third of a mile away, while dogs can see 3,000 miles away.

Add to this that current methods of cancer detection, alas, are often hit-or-miss. In many cases, symptoms don't appear

DINA ZAPHIRIS, founder and CEO of the In Situ Foundation — which trains dogs to sniff out cancer — poses with (from left) Stewie, Linus and Leo. Among them, the dogs have the ability to detect breast, lung, ovarian and orolaryngeal cancers.