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When it comes to cancer and aging, dogs may have the answers we seek

By Melanie D.G. Kaplan | May 24, 2010 |

Last month, **Dr. David Waters**, an expert in the comparative aspects of aging and cancer in pets and people, returned from a 13-state tour to visit the country's oldest Rottweilers.

Waters is executive director of the **Gerald P. Murphy Cancer Foundation**, based at the **Purdue Research Park**, which is home to the **Center for Exceptional Longevity**. Waters and his team have compiled a database with detailed information on 150 Rottweilers who have lived to be at least 13, which is equivalent to a human living to 100. Today, only 15 of those dogs are alive and Waters visited them all.

When I first heard about this tour, I was captivated by the idea of Waters state-hopping, visiting sweet dogs of a certain age. And the novelty of studying dogs in their own environments—not in a laboratory—is refreshing and endearing, to say the least.

But when Waters stopped by to visit me at the end of his tour, I learned that charm is the least of his goals. As loving as these long-lived dogs may be, and as honored as Waters felt to spend time with them in their golden years, his work is serious science. As we sat in my backyard, with my beagle sleeping in the shade, Waters explained the importance of his work—far beyond a wagging tail and wet nose.

Lifestyle decisions can influence adult health outcome. Biologists believe that early life events can influence adult health, including longevity. That's where these oldest living Rottweilers come in handy, because of the compressed lifespan and our ability to collect data on lifestyles. Studies show that longevity is 30 percent genetics, so that's the good news; there's plasticity. That means lifestyle matters. If it were 90 percent genetics, that would mean we're all hardwired, but we're not. That's what we want to explore.

It's easier to create a database of medical histories and lifestyle choices from 13-year-old dogs than 100-year-old humans. Say you ask a 102-year-old woman, "How many servings of fruit and vegetables did you get as a teenager?" She has no idea. But the pet owner knows what her dog has eaten every day. We're the guardians; we're making a lot of their lifestyle choices. I started this database three years ago to track the oldest living Rottweilers in the U.S., and I have the whole life history. Owners filled out a very detailed 15-page questionnaire, so we know the dogs' diets, dietary supplements, vaccination history, lawn chemical exposure, whether there is tobacco use in the house. We know their body weights every week for the first six months of life. We're creating the world's first archive of biological specimens from exceptionally long-lived dogs. So when a scientist 10 years from now has a great idea, he can thaw out samples from dogs I visited two weeks ago.

Like humans, dogs show different paths to successful aging. The only way to understand this is by detailed observation. These dogs I visited are all over the map in terms of frailty, just like humans—one 100-year woman old may be curled up in bed, and the next is on the treadmill and creating her memoirs. Three or four of the dogs are pretty much homebound, while the dog in Virginia walks a mile a day on a country road. Some sleep 20 hours a day, some don't sleep at all if there are interesting things going on. Some climb stairs unassisted. One dog lives with six other Rottweilers and two Boxers. She's 13 and is still the queen bee. I've watched a dog equivalent to a 105-year-old man steal a Frisbee away from a 2-year-old Rottweiler.

Dogs may be able to help us figure out why women live longer than men. This is an idea that is well documented in people but not understood. We know dogs have this female survival advantage, and now we can look at the mechanisms. We think ovaries are part of a system that regulates longevity. But if you remove the ovaries in the first four years of a dog's life, you completely erase the female survival advantage. William Parker published a paper that shows women who kept their ovaries were more likely to live longer. This flies against three to four decades of clinical practice. There's an automatic thing in place: Get rid of the ovaries. But the ovaries are part of a system and an ecology, and when you remove them, don't you think there will be unforeseen consequences? We should pause and consider the upside or downside of mucking around with ovaries.

As we shift in aging research from focusing on longevity to *healthy* longevity, dogs can help us understand how to get there. In the biology of aging field, it used to be a focus on the number of years and months lived. Studies were done on flies, yeast, worms. So you have these lower organisms and you can tweak a gene and see if you can double the lifespan. But now the pendulum swings more toward the number of *healthy* years lived. *Healthspan* means promoting healthy human lifespan. So you need to know the phenotypes relative to healthy human longevity. How's your heart doing? Worms don't have a heart. Can you climb stairs? Worms don't climb stairs. We are trying to better understand the physiology behind successful aging so we can promote overall healthy longevity in pets and people.

Dogs get several of the same cancers we do. We study Rottweilers because they are a popular breed, really smart, great to work with and cancer-prone, like humans. The average Rottweiler lives 8 or 9 years and dies of cancer. Dogs and humans are the only two species that get prostate cancer with any frequency. The most frequent bone cancer of pet dogs, *osteosarcoma*, is the same cancer that strikes teenagers. Dogs also get bladder cancer, melanoma and mouth cancer.

This research brings together cancer scientists and aging scientists, who rarely cross paths. To better understand aging means better understanding the old tissues where most cancers arise. The problem is that most cancer scientists aren't trained in aging, and most aging scientists aren't

trained in cancer. Very few people in these two silos talk to one another. So our approach is that we can be smarter about aging, because that's where the cancers are happening. That's why it's so unique that we're cross-training the next generation of scientists in both cancer and aging.

Observing and studying dogs can teach us more about inflammation. There are people who say aging has a lot to do with inflammation. A word has been coined: *inflammaging*. The theory says that our joints get more inflamed as we get older, and that inflammation contributes to Alzheimer's, cardiovascular disease, cancers and so on. We will be measuring markers of inflammation in the blood samples that we collected from each of the Rottweilers. This will give us a sense of the level of inflammation in these dogs.

These old dogs have figured out something every scientist is trying to figure out. They've changed cancer from a lethal disease to just a nuisance. These dogs are cancer-free. Of the 15 dogs I saw, only one has ever had a cancer, which was diagnosed 17 months ago. But we're finding in autopsy studies [of other dogs in the database] that even though they died from heart failure or kidney disease or were euthanized because of crippling arthritis, these dogs have one or two or three independent cancers they're harboring. But they keep them in check. They've figured out how to suppress them. So "cancer prevention" meaning preventing you from getting any kind of cancer is probably not realistic. A broader definition is preventing it from being lethal.