Scientists Found the Formula to Calculate Your Dog's Actual Age—And It's Not What You Expect

How old is your pup in human years? This method is much more accurate than simply multiplying by 7.

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Scientists have gained insight into the epigenetic clock that controls how **dogs** age and have devised a new formula to pinpoint exactly how old that good boy or girl in your life is.

The researchers studied **DNA** methylation, or chemical modifications to certain DNA segments, within the genomes of 104 labrador retrievers, all ranging between 4 weeks and 16 years of age. It turns out we age in similar ways, the team reports in a study published in **Cell Systems**.

In humans, DNA methylation—the addition of organic compounds called methyl groups to specific segments of our DNA—can reveal the impact of disease, lifestyle, and genetics on our DNA. Using this information, scientists have been able to create an epigenetic **clock**, of sorts, to better understand how we age. Scientists have learned that other animals like mice and wolves experience DNA methylation. Now, they're using this research to understand the process of aging in man's best friend.

Ultimately, certain regions of both the labrador and human genome—areas with high rates of mutation—show similar rates of methylation. A dog's life stages largely sync up with our own; puppies and babies start teething at roughly equivalent ages, for example.

Whether you have a pitbull, pug, or Pembroke Welsh corgi, your pup will reach puberty at around 10 months and will likely die before turning 20. (Yes, it pains us to write that, too.) Scientists have long known that dogs are susceptible to many of the same age-related diseases that we are, such as cancer, arthritis, and heart disease.

The researchers also devised a new way to calculate a dog's age, but it's arguably more complicated than simply multiplying by seven. To calculate the age, you'll have to multiply the natural logarithm of your pup's age by 16 and then add 31. Here's the equation:

16 x ln(your dog's age in human years) + 31

Super simple, right? (The researchers also a included a **handy conversion tool here**.) If you're wondering why your 2-year-old dog clocks in at around 40 human years, it's because his epigenetic clock ticks a bit faster than yours, but slows down as he ages.

The team hopes to expand its research to include additional dog species, and there are plenty of other research teams that are diving into a dog's genome to unlock even more secrets.

Here's a better way to convert dog years to human years, scientists say

Science Magazine Nov 2019: New dog age calculator uses DNA changes to estimate how old your dog is in human years.

Our Scotch collie, Buckaroo, is just shy of 14 years old. Following the long-debunked but still popular idea that one dog year equals seven human years, he's almost a centenarian. (This "formula" may be based on average life spans of 10 and 70 years for dogs and people, respectively.) Now, researchers say they have a new formula (see calculator below) to convert dog years to human years—one with some actual science behind it.

The work is based on a relatively new concept in aging research: that chemical modifications to a person's DNA over a lifetime create what is known as an epigenetic clock. Scientists have built a case that one such modification, the addition of methyl groups to specific DNA sequences, tracks human biological age—that is, the toll that disease, poor lifestyle, and genetics take on our bodies. As a result, some groups have converted a person's DNA methylation status to an age estimate—or even a prediction of life expectancy (worrying ethicists, who say the data could be misused by forensic investigators and insurance companies).

Other species also undergo DNA methylation as they age. Mice, chimpanzees, wolves, and dogs, for example, all seem to have epigenetic clocks. To find out how those clocks differ from the human version, geneticist Trey Ideker of the University of California, San Diego, and colleagues started with dogs. Even though man's best friends diverged from humans early in mammalian evolution, they're a good group for comparison because they live in the same environments and many receive similar healthcare and hospital treatments.

All dogs—no matter the breed—follow a similar developmental trajectory, reaching puberty around 10 months and dying before age 20. But to increase their chances of finding genetic factors associated with aging, Ideker's team focused on a single breed: Labrador retrievers.

They scanned DNA methylation patterns in the genomes of 104 dogs, ranging from 4 weeks to 16 years of age. Their analysis revealed that dogs (at least Labrador retrievers) and humans do have similar age-related methylation of certain genomic regions with high mutation rates; those similarities were most apparent when the scientists looked at young dogs and young humans or old dogs and old humans. Most importantly, they found that certain groups of genes involved in development are similarly methylated during aging in both species. That suggests at least some aspects of aging are a continuation of development rather than a distinct process—and that at least some of these changes are evolutionarily conserved in mammals, Ideker and colleagues report in a preprint posted online at bioRxiv.

"We already knew that dogs get the same diseases and functional declines of aging that humans do, and this work provides evidence that similar molecular changes are also occurring during aging," says Matt Kaeberlein, a biogerontologist at the University of Washington in Seattle, who was not involved with this research. "It's a beautiful demonstration of the conserved features of the epigenetic age clocks shared by dogs and humans."

The research team also used the rate of the methylation changes in dogs to match it to the human epigenetic clock, although the resulting dog age conversion is a bit more complex than "multiply by seven." The new formula, which applies to dogs older than one, says that a canine's human age roughly equals 16 ln(dog age) + 31. (That's the natural logarithm of the dog's real age, multiplied by 16, with 31 added to the total.)

Based on the methylation data, dogs' and humans' life stages seem to match up. For example, a 7-week-old puppy would be equivalent roughly to a 9-month-old human baby, both of whom are just starting to sprout teeth. The formula also nicely matches up the average life span of Labrador retrievers (12 years) with the worldwide lifetime expectancy of humans (70 years). Overall, the canine epigentic clock ticks much faster initially than the human one—that 2-year-old Lab may still act like a puppy but it is middle-aged, the methylation-based formula suggests—and then slows down.

"They've shown that there's a gradual increase in DNA methylation in both species with age," says Steve Austad, an evolutionary biologist and aging expert at the University of Alabama in Birmingham. He doesn't find that especially surprising, but he thinks the technique could reveal far more interesting results if applied to issues like the different life spans among different dog breeds.

That's one goal of Kaeberlein, whose group's new Dog Aging Project (open to all breeds) will include epigenetic profiles of its canine subjects. He hopes to find out why some dogs develop disease at younger ages or die earlier than normal, whereas others live long, disease-free lives.

So, how does our Buckaroo fare? Happily, the epigenetic clock calculation goes in his favor. He's now only 73 in human years—and a spry 73 at that.

What are the sources of the 2 articles above? 1) _____ 2) _____

Which Source takes from the other? _____

What does PM do that might seem deceiving? _____

List three scientific organizations/institutions mentioned in the 2nd article:

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How many are mentioned in the first article? _____

What organization(s) is Matt Kaeberlein associated with? _____

Did he have anything to do with the research for the 2nd article? _____

Why is he included in the article? _____

Are there any ethical concerns mentioned in the article(s)? _____

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