

The Strange Phenomenon of the Growing Canine Brain

When animals are domesticated, their brains typically decrease in size. And that has been the case with the brains of dogs over the past thousands of years. But researchers have recently discovered something they can't fully explain and it's not related to breed or the tasks dogs perform.

Analysis by Dr. Karen Shaw Becker

STORY AT-A-GLANCE

- When animals are domesticated, brain size typically decreases, a phenomenon known as the “domestication effect”
- As a consequence of domestication, dogs’ brains became significantly smaller, with the absolute brain size of wolves more than 24% higher than that of dogs
- Dogs may be defying this phenomenon, as research shows their brains are getting larger
- Researchers from Hungary and Sweden used data from 865 dogs spanning 159 breeds, along with 48 wolves, finding that dogs’ brains got larger the more distantly related they were to wolves
- It’s possible dogs’ human family lives may be involved, as living in a more complex social environment encourages positive selection of cognitive abilities, which occurs via increased brain size

When animals are domesticated, brain size typically decreases, a phenomenon known as the “domestication effect.” Brain regions involved in sight, sound and smell may get smaller, and it’s believed that once the reduction in size occurs, it’s irreversible — even if a species re-establishes itself in the wild.¹

There may be some exceptions to this rule, however. The American mink, whose brain shrunk after domestication, regained much of its brain size when the once-domesticated animals became feral.²

Dogs, too, it appears, may be gaining back some of their once-larger brain size, but for entirely different reasons than minks. Dogs’ brains may be getting larger because of their close ties to humans — not in spite of it.

Domesticated Dogs Have Smaller Brains Than Wolves

Genetic data confirms that dogs are descendants of Eurasian grey wolves, and early humans and **wolves** were known to share resources and territories dating back hundreds of thousands of years.

Skeletal changes suggestive of dog domestication have been discovered dating back to the Aurignacian period some 43,000 to 26,000 years ago, and by 16,000 to 12,000 BP (before present), domestic dogs were known to exist in Western Europe, Asia and North America, with purposeful burials of dogs also occurring at this time.

Still, researchers wrote in the *Journal of Archaeological Science*, “The beginning of this domestication process ... remains a point of debate, with purported originations ranging from 15,000 to over 40,000 BP.”³

It's believed that wolves may have become integrated into human society because canids fulfilled important functions in the daily life of Paleolithic people, helping them with hunting and other work, offering protection and, just as they do today, providing a source of faithful companionship.

But as a consequence of domestication, dogs' brains became significantly smaller, with the absolute brain size of wolves more than 24% higher than that of dogs.⁴ Evolutionary biologist László Zolt Garamszegi with the Ecological Research Centre in Hungary told Phys.org:⁵

"The likely reason for this is that the lives of domesticated species are simpler compared to those of their wild counterparts. In the safe environment provided by humans, there is no need to fear predator attacks or hunt for food. Therefore, there is no need to sustain the energetically costly large brain, and the freed-up energy can be directed towards other purposes, such as producing more offspring, which is important for domesticated animals."

The size gap may be closing once again, however, as research published in *Evolution* found dogs' brains are growing larger.⁶

Dogs' Brains Are Getting Bigger

Researchers from Hungary and Sweden used data from 865 dogs spanning 159 breeds, along with 48 wolves to analyze brain size, hypothesizing that they may find differences among breeds based on their functional breed categories — i.e., a working dog expected to perform complex tasks may have a larger brain than a lapdog.

No such association was found, however. Instead, they found that dogs' brains got larger the more distantly related they were to wolves. "Neither functional category, skull shape, longevity, nor litter size was associated with relative brain size, which implies that selection for performing specific tasks, morphology, and life history does not necessarily influence brain size evolution in domesticated species," the team concluded, adding:⁷

"Interestingly, we identify a pattern of an increase in relative brain size with greater genetic distance from wolves. This suggests that, after the initial decrease in brain size upon domestication, subsequent intentional selection of specific traits through selective breeding favored brain size increases. Therefore, some selection for increased brain size has been continuously occurring in dogs."

Are Dogs' Human Families Involved in Their Growing Brains?

While the researchers noted they can only speculate about why dogs may be growing bigger brains, one possibility is the "social brain hypothesis." This suggests that living in a more complex social environment encourages positive selection of cognitive abilities, which occurs via increased brain size.⁸

"The social interactions between dogs and humans could have contributed to the increase in brain size observed in dog breeds that are distantly related to the wolf," the researchers explained.⁹ Study author Enikő Kubinyi added that along with more complex social environments, exposure to urbanization and expectations to follow rules may also be involved in dogs' growing brains.¹⁰

There are other commonly seen effects in domesticated animals as well. In the 1800s, Charles Darwin noticed that domesticated animals have specific features that set them apart from their wild counterparts. In addition to being more tame, they also tend to have floppier ears, white patches on their fur, curlier tails and smaller heads and snouts.

This phenomenon, known as “domestication syndrome,” was long thought to be the result of human intervention. In fact, in 1959 the “Russian farm-fox experiment” took place, in which Russian researchers attempted to create domesticated foxes.

By specifically selecting only the friendliest foxes to breed, the animals began to show marked changes within 10 generations, including not only wagging their tails at people but also physical changes indicative of domestication: more folded ears, curlier tails, smaller heads and changes in fur color.¹¹

Further, **calmer, friendlier animals** have fewer neural crest cells, which are stem cells that can grow other cells, including stem cells. “When that manifests itself in ears,” Lee Dugatkin, an evolutionary biologist at the University of Louisville, told the New York Times, “you have ears that don’t stand up as straight because they don’t have as much cartilage.”¹² The increase in brain size uncovered by the Evolution study may be yet one more unexpected change that occurred during domestication. As Kubinyi noted:¹³

“The domestication of dogs began approximately twenty-five thousand years ago, but for ten thousand years, dogs and wolves did not differ in appearance. Many ancient breeds, such as sled dogs, still resemble wolves today. However, the transition to settlement, agriculture, pastoralism, and the accumulation of wealth offered various tasks for dogs, requiring guard dogs, herding dogs, hunting dogs, and even lap dogs.

However, a significant portion of the distinct-looking breeds known today has only emerged since the industrial revolution, primarily in the last two centuries, as dog breeding has become a kind of hobby. The results show that the breeding of modern dog breeds has been accompanied by an increase in brain size compared to ancient breeds.”

Sources and References

^{1,2} [Royal Society Open Science July 5, 2023](#)

³ [Journal of Archaeological Science Volume 115, March 2020, 105092](#)

^{4,6,7,8,9} [Evolution Volume 77, Issue 7, July 2023, Pages 1591–1606](#)

^{5,10,13} [Phys.org May 12, 2023](#)

¹¹ [Chicago Tribune August 7, 2018](#)

¹² [New York Times January 10, 2019](#)
