When and where did humans domesticate wolves?

Abstract

Scientists recently discovered an 18,000-year-old preserved canine puppy. Could this incredible discovery be the earliest dog ever uncovered? And could he help us understand more about the origins of dogs and wolves?

We studied 70 ancient wolf specimens and found some possible answers. Dogs appear to have come from two separate ancient wolf populations. We believe that there are two possibilities for how this could have happened. By analyzing the DNA of ancient wolves, we can better understand wolves and dogs who live today!

Introduction

Have you ever looked at a small dog, like a Chihuahua, and wondered how on earth it could have evolved from wolves? Scientists know that wolves have roamed the planet for hundreds of thousands of years because of fossil evidence. They also know that dogs evolved from gray wolves over 15,000 years ago when people started to domesticate wolves. People domesticated wolves for protection, companionship, hunting, and much more. But scientists are not sure about when and where dog ancestors lived.

In 2018, scientists uncovered a preserved canine (whiskers, fur, and all!) in the permafrost in Siberia. This two-month-old, preserved puppy was nicknamed Dogor. Dogor means friend in the Yakut language of Siberia. Scientists worked out that Dogor lived around 18,000 years ago! Normally, it’s quite easy to tell dogs and wolves apart, but Dogor was a different story. Because of his age, Dogor could be one of the earliest known dogs ever found. He could also be an evolutionary link between dogs and wolves. We wanted to know if this discovery would help answer some questions about the ancestry of both dogs and wolves.

We had three questions:

- Was Dogor a dog or (Dog-or, get it?) a wolf?
- Where and when did wolf domestication happen?
- Was Dogor the ancestor of our present-day dogs?

By examining Dogor’s DNA and the DNA of other ancient wolves and dogs, we could try to answer those questions.
**Methods**

We analyzed 72 ancient wolf samples, including Dogor. Six of the samples had already been analyzed before, while 66 of them were “new” ancient samples. The oldest wolf sample we used was from around 100,000 years ago!

We analyzed bones and teeth from wolves that had been found all over the world (Figure 1). To collect the DNA from ancient bones and teeth, we first need to clean any modern DNA from the outside of the sample. We cleaned our samples with bleach and UV light. We then scraped or drilled off a small piece of the sample and ground it into a fine powder. In the laboratory, we extracted (collected) pieces of DNA from the powder.

Then we used a machine to sequence the DNA. Sequencing is a technique that tells us all the parts that make up an individual’s DNA. Using this information, we were able to study how genetically similar different wolves were to each other.

The age of the samples was also important because some were from just before the last Ice Age ended. Some other samples were from after the Ice Age.

**Results**

By comparing the ancient wolf DNA to the DNA of modern dogs and wolves, we were able to learn more about the ancestry of both dogs and wolves.

- **We concluded that Dogor was a wolf.** His DNA shared the most genetic similarities with ancient Siberian wolves that lived around the same time. Most of today’s wolves share genetic similarities with Ice Age wolves from Siberia. This means that Dogor is an ancestor to many of the wolves that live today!
- Wolves like Dogor who lived towards the end of the...
Ice Age are more genetically similar to each other than to wolves who lived earlier in the Ice Age.

- Dog ancestry appears to have come from two separate ancient wolf populations. Most dogs have more genetic similarities to an Asian source. Yet some dogs also have some genetic similarities to a Middle Eastern source (Figure 2).

It appears that wolf populations were quite well-connected through the late Pleistocene era (the last Ice Age). Many large mammals became extinct during the Ice Age, but wolves did not. They moved across large distances and spread new helpful traits throughout the species, which helped them to survive.

Dogs are more genetically similar to ancient wolves in Asia than to those in Europe. We believe there must have been a domestication process somewhere in Asia. Early dogs from Siberia, the Americas, and northeastern Europe share their origins from this eastern source. However, early dogs in Africa, southern Europe, and the Middle East appear to also have some ancestry from ancient wolves in the Middle East.

This suggests two possibilities:

1. Wolves were domesticated twice, once in Asia and once in the Middle East.
2. Wolves were domesticated once, most likely in Asia, but mixed again with wild wolves.

We can’t be certain which possibility is correct, but our results suggest the largest part of dog ancestry comes from the eastern source.

Figure 2: Dogs’ ancestry proportions and the locations where they were found. Most dogs contained DNA from both the eastern and western sources. However, the eastern source had the most similarities. Some dogs (those with full blue dots) appear to have descended directly from this eastern source.
Conclusion

Our study was the first time the genomes of a large animal has been tracked so closely over 100,000 years! But why is this important? Documenting a species’ DNA over time allows us to watch evolution progress. Our study revealed that different wolf populations were genetically quite similar during the Ice Age. There are more genetic differences between wolf populations today than there ever were in ancient times! This is because of habitat loss and ill-treatment by humans over the last few centuries.

Glossary of Key Terms

- **Ancestry**: an organism’s origin or background. If you’re tracing your ancestry, you’re looking back on relatives from long ago.
- **Domestication**: the process of adapting wild animals and plants for human use and companionship, like humans did to wolves and cats.
- **Evolutionary link**: an intermediate form between two related organisms.
- **Fossil evidence**: physical proof of how organisms evolved over time.
- **Genome**: the complete set of DNA in a cell or organism.
- **Ice Age**: a time period between 115,000 and 11,700 thousand years ago that is characterized by a cold, glacial climate when global temperatures were reduced, and glaciers advanced on the continents.
- **Permafrost**: ground that is completely frozen for long periods of time.
- **Pleistocene era**: a time period between 2.6 million years and 11,700 years ago, including the last Ice Age.
- **Sequencing DNA**: a laboratory technique used to read DNA and all the associated genes that make up a genome.
- **Siberia**: a huge region in Northern Asia.

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Check your understanding

1. What benefits did dog domestication offer early humans?

2. Why is it difficult to pinpoint where exactly wolf domestication occurred?

3. Why do you think understanding the ancestry of dogs is important?

4. Explain how, over time, humans were able to produce a Chihuahua from a gray wolf ancestor.

5. Some wolf populations are currently decreasing around the world. Why do you think declining wolf populations are considered a result of human action? What are some ways in which we humans could help support declining wolf populations?

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