

Agriculture and parting from wolves shaped dog evolution, study finds

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The researchers studied the genetics of 100 dingoes to understand the evolutionary trail. Credit: Rob Davis/Kimberley Land Council

(Phys.org)—Part of the ancient mystery of the makeup of the modern Western dog has been solved by a team led by researchers at the University of California, Davis, School of Veterinary Medicine.

Several thousand years after [dogs](#) originated in the Middle East and Europe, some of them moved south with ancient farmers, distancing themselves from native [wolf populations](#) and developing a distinct [genetic profile](#) that is now reflected in today's canines.

These findings, based on the rate of [genetic marker](#) mutations in the dog's Y chromosome, supply the missing piece to the puzzle of when ancient dogs expanded from Southeast Asia. The study results are published online this month in the journal [Molecular Biology and Evolution](#).

"Our findings reconcile more than a decade of apparently contradictory archaeological and genetic findings on the geographic origins of the dogs," said Ben Sacks, lead study author and director of the Canid Diversity and [Conservation Group](#) in the Veterinary Genetics Laboratory at the UC Davis School of Veterinary Medicine.

Considerable [archaeological evidence](#) indicates that the first dogs appeared about 14,000 years ago in Europe and the Middle East, while dogs did not appear in Southeast Asia until about 7,000 years later. Scientists have been puzzled, though, because growing [genetic evidence](#) suggests that modern Western dogs, including modern European dogs, are derived from a Southeast Asian population of dogs that spread throughout the world.

The problem: If dogs originated in Europe, why does genetic evidence suggest that modern European dogs are originally from Southeast Asia? Sacks and his team think they've found the answer.

"Data from our study indicate that about 6,000 to 9,000 years ago, during what is known as the [Neolithic age](#), ancient farmers brought dogs south of the Yangtze River, which runs west to east across what is now China," Sacks said.

"While dogs in other parts of Eurasia continued to readily interbreed with wolves, the dogs that moved into Southeast Asia no longer lived near wolves, and so they developed a totally different evolutionary trajectory, influenced by the agriculture of Southeast Asia," he said.

"Those ancient dogs apparently underwent a significant evolutionary transformation in southern China that enabled them to demographically dominate and largely replace earlier western forms."

To calculate when the modern European and Southeast Asian dogs diverged, the researchers calculated the mutation rate of genetic markers on the [Y chromosome](#) in a sample of 100 Australian dingoes, a dog population known to have appeared about 4,200 years ago. Knowing the rate at which these genetic mutations occur, the researchers were able to backtrack through history and estimate the point when dogs of Eurasia and Southeast Asia parted company as being roughly 7,000 years ago.

"So, in a sense, both of the original hypotheses are true: Dogs did originate in Europe and the Middle East, but modern dogs trace their ancestry most recently to the East and specifically Southeast Asia," Sacks said.

He noted that a study, led by evolutionary geneticist Erik Axelsson from Uppsala University in Sweden and published in the January issue of the journal *Nature*, suggests a distinction between dogs and wolves can be seen in their ability to digest starch, strongly suggesting an evolutionary adaptation to human farmers.

"Both studies fit together nicely, although our research teams differ on when we suspect modern dogs developed the ability to digest starch," Sacks said. "The other group suggested that diet-related change happened at the outset of dog origins, at which time humans were still hunter-gatherers."

"In contrast, we hypothesize that the starch adaptation occurred much later in Southeast Asia, once agriculture—rice farming in this case—had become the major mode of subsistence for humans," he said.

Sacks said that the UC Davis-led study also shines light on the origin of dingoes, the wild dogs of Australia.

Data from the study suggest that New Guinea singing dogs and Australian dingoes reflect a dispersal of dogs, possibly from Taiwan, that was independent of the movement of dogs throughout the islands of Southeast Asia. The island dogs appear to have originated in mainland Southeast Asia, rather than Taiwan, he said.

The possibility of Taiwan being the origin of an independent migration for these dogs Down Under is intriguing but will require further research to confirm, Sacks said.

Provided by UC Davis

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