Origin of dromedary domestication discovered

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Dromedaries have always been used for transportation in deserts. Credit: Raziq Kakar

Dromedaries have been used for transportation for over 3,000 years. But it was not known where they were first domesticated or which genetic

structure was selected in the process. A team of researchers including Pamela Burger of Vetmeduni Vienna now identified the origin of the domesticated dromedary and showed that the dromedaries, unlike other domesticated animals, have maintained extensive gene flow in the modern population. The study is published in the journal *PNAS*.

The dromedary, the one-humped Arabian camel, plays an important role in the countries of North Africa. For thousands of years, the people of North Africa and Asia have used the animal for the transportation of people and goods. It was fundamental to the development of human societies in inhospitable environments. Dromedaries are the largest domesticated livestock species.

A constant companion with many unknowns

"Many open questions remain with regard to the dromedary's domestication and evolutionary history," explains Pamela Burger from the Research Institute of Wildlife Ecology at Vetmeduni Vienna. "We have managed to turn the wild dromedary into a domesticate, but we don't know how and where domestication began and what effect it has had on today's animals."

During the domestication process, people usually breed the animals by selecting those parts of the genotype that bring the most benefit. The team around Burger has shown for the first time that this was not the case with the dromedary. Dromedaries exhibit an enormous genetic diversity despite the fact that breeding usually results in a low genetic diversity. This makes dromedaries different from other animals domesticated through breeding.

Dromedaries maintain high genetic diversity

Burger and her team collected samples from nearly 1,100 extant dromedaries and compared these with archaeological samples from wild and early-domesticated animals. Using DNA analysis, the researchers determined that the dromedary's genetic diversity is directly related to its use as a transport animal. The forth-and-back movement of the caravans brings different dromedary populations in contact with each other. This leads to a regular gene flow and the maintenance of the genetic diversity. An isolated group is rare. Only one population in East Africa deviated from the genetic diversity of the other dromedaries. This group, however, has been isolated for some time due to geographic obstacles and cultural barriers.

Ancient DNA reveals origin of domesticated dromedary

The regular gene flow reflects a genetic diversity that is usually found only in wild animals. But it makes it difficult to determine the wild form from which today's dromedary is descended and, therefore, where it was domesticated.

Burger and her team succeeded in answering this question. The group of researchers analysed up to 7,000-year-old DNA from bones of wild and early-domesticated dromedaries and compared the samples with the genetic profiles of modern dromedary populations from around the world. For the first time, it was possible to identify the Southeast Arabian Peninsula as the region of first domestication. "Our results appear to confirm that the first domestication of wild dromedaries occurred on the southeast coast. This was followed by repeated breeding of wild dromedaries with the early-domesticated populations," Burger explains. The wild ancestor of today's dromedary had a geographically limited range and went extinct around 2,000 years after the first domestication.

More information: Ancient and modern DNA reveal dynamics of domestication and cross-continental dispersal of the dromedary, Faisal Almathen, DOI: 10.1073/pnas.1519508113 , www.pnas.org/content/early/2016/05/04/1519508113

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