

# Most modern horses are descendants of recently imported oriental stallions

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This photograph shows a person riding a Lipizzan stallion. They perform in the Spanish Riding School in Vienna. Credit: Spanische Hofreitschule Wien

Researchers who have analyzed the Y chromosomes of more than 50 horses representing 21 breeds have found that the paternal lines of nearly all modern horses trace to stallions brought to Europe from the Orient over the last 700 years. The findings reported in *Current Biology* on June 29 reveal the overwhelming influence of breeding schemes driven by strong selection on males.

With the genetic genealogies in hand, it's now possible to elucidate the origin and relationship of any stallion line in detail, the researchers say.

"Apart from stallion lines in Northern European breeds, all stallion lines detected in other modern breeds derive from more recently introduced Oriental ancestors," says Barbara Wallner at the University of Veterinary Medicine, Vienna. "Our data therefore illuminate the enormous impact modern horse breeding strategies—characterized by strong selection of males and the import of Oriental stallions—during the past few hundred years had on Y chromosome diversity."

Y chromosomes are passed down from fathers to their sons. This inheritance pattern makes the Y chromosome a good place to look for clues about the unique history of males of a species. In the new study, the researchers focused on a portion of the Y chromosome that is passed down from one generation to another faithfully. Any changes to that portion of the Y chromosome are the result of new mutations.



This photograph shows a Lipizzan stallion named Conversano Sessana, born in 2001. The Y sequence that is needed as a template to detect variants in any horse is generated from a stallion of this breed. Credit: Spanische Hofreitschule Wien

"Since random mutations accumulate over time, males who originate from a common patrilineal ancestor will share a particular collection of Y chromosome mutations," Wallner explains, forming what's known as a haplogroup.

It had been difficult to reconstruct the history of stallions before because there is extremely low diversity in the Y chromosomes of modern [horses](#) to start. The researchers got around that problem by using deep, next-generation DNA sequencing, allowing them to pick up on even the smallest changes.

Their analysis of the 52 Y [chromosomes](#) showed that the paternal lineages of various modern horses split much more recently than the domestication of the species, which goes back more than 5,000 years. Apart from a few private Northern European haplotypes, all modern horse breeds included in the study clustered into a roughly 700-year-old haplogroup, transmitted to Europe by the import of Oriental stallions, they report. The haplogroup includes two major subgroups (or clades): the Original Arabian lineage from the Arabian Peninsula and the Turkoman horse lineage from the steppes of Central Asia.





This photograph shows a person riding a Lipizzan stallion. They perform in the Spanish Riding School in Vienna. Credit: Spanische Hofreitschule Wien

By linking the Y chromosome lineages with genealogical information derived from written records, the researchers say it's now possible to define Y haplotypes for certain founder stallions. Using this approach, they unraveled the origin of English Thoroughbreds, tracing them to Turkoman founder stallions.

"Our results pave the way for a fine-scaled genetic characterization of stallion lines, which should become routine in the near future," Wallner says.

The researchers say they now plan to create a global Y chromosome

phylogeny to include stallion lineages from more rural horses, which most likely lack any recent Oriental influence.

**More information:** *Current Biology*, Wallner et al.: "Y Chromosome Uncovers the Recent Oriental Origin of Modern Stallions"

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