Milk enabled massive steppe migration
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Dental calculus removed from the teeth of this individual showed evidence of dairy consumption. Credit: Egor Kitov, Samara Valley Project

The long-distance migrations of early Bronze Age pastoralists in the Eurasian steppe have captured widespread interest. But the factors behind their remarkable spread have been heavily debated by archaeologists. Now, a new study in *Nature* provides clues regarding a critical component of the herders' lifestyle that was likely instrumental to their success: dairying.

From the Xiongnu to the Mongols, the pastoralist populations of the Eurasian steppe have long been a source of fascination. Amongst the earliest herding groups in this region were the Yamnaya, Bronze Age pastoralists who began expanding out of the Pontic-Caspian steppe more than 5000 years ago. These Bronze Age migrations resulted in gene flow across vast areas, ultimately linking pastoralist populations in Scandinavia with groups that expanded into Siberia.

Just how and why these pastoralists traveled such extraordinary distances in the Bronze Age has remained a mystery. Now a new study led by researchers from the Max Planck Institute for the Science of Human History in Jena, Germany has revealed a critical clue and it might come as a surprise. It appears that the Bronze Age migrations coincided with a simple but important dietary shift—the adoption of milk drinking.

The researchers drew on a humble but extraordinary source of information from the *archaeological record*—they looked at ancient tartar (dental calculus) on the teeth of preserved skeletons. By carefully removing samples of the built-up calculus, and using advanced molecular methods to extract and then analyze the proteins still preserved within this resistant and protective material, the researchers were able to identify which ancient individuals likely drank milk, and which did not.

Their results surprised them. "The pattern was incredibly strong," observes study leader and palaeoproteomics specialist Dr. Shevan Wilkin, "The majority of pre-Bronze Age Eneolithic individuals we tested—over 90% - showed absolutely no evidence of consuming dairy. In contrast, a remarkable 94% of the Early Bronze Age individuals had clearly been milk drinkers."

The researchers realized they had uncovered a
significant pattern. They then further analyzed the
data in order to examine what kind of milk the
herders were consuming. "The differences between
the milk peptides of different species are minor but
critical," explains Dr. Wilkin. "They can allow us to
reconstruct what species the consumed milk comes
from." While most of the milk peptides pointed to
species like cow, sheep and goat, which was not
surprising in light of the associated archaeological
remains, calculus from a couple of individuals
revealed an unexpected species: horse.

"Horse domestication is a heavily debated topic in
Eurasian archaeology," notes Dr. Wilkin. One site
where early Central Asian milk drinking had been
proposed was the 3500-year-old site of Botai in
Kazakhstan. The researchers tested calculus from
couple of Botai individuals, but found no evidence
of milk drinking. This fits with the idea that
Przewalskii horses—an early form of which were
excavated from the site—were not the ancestors of
today’s domestic horse, as shown by recent
archaeogenetic study. Instead, horse domestication
—and the drinking of horse milk—likely began about
1500 kilometers to the west in the Pontic Caspian
steppe.

"Our results won't make everyone happy, but they
are very clear," says Professor Nicole Boivin, senior
author of the study and Director of the Department
of Archaeology at the MPI Science of Human
History. "We see a major transition to dairying right
at the point that pastoralists began expanding
eastwards." Domesticated horses likely had a role
to play too. "Steppe populations were no longer just
using animals for meat, but exploiting their
additional properties —milking them and using them
for transport, for example," states Professor Boivin.

What precise critical advantage milk gave remains
to be investigated. But it is likely that the additional
nutrients, rich proteins, and source of fluids in a
highly arid environment would have been critical to
survival in the harsh and open steppe. "What we
see here is a form of cultural revolution," says Dr.
Wilkin, "Early Bronze Age herders clearly realized
that dairy consumption offered some fundamental
benefits and once they did, vast steppe expansions
of these groups across the steppe became
possible."

**More information:** Dairying enabled Early Bronze
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Lead author Dr. Shevan Wilkin sampling dental calculus
in the clean lab of the Max Planck Institute for the
Science of Human History. Credit: Shevan Wilkin