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SÁNDOR HEGEDŰS

Figure 1 | A late Avar-period male grave also containing a horse and horse harness. Using genomic and archaeological evidence from Avar burial sites such as this, Gnecchi-Ruscone *et al.*[1] reconstructed large family trees to gain insights into how this medieval society was organized.

Ancient genetics

Family lines and political shifts in the Avar empire

Lara M. Cassidy

Genetic pedigrees spanning nine generations uncover the social organization of a nomadic empire that dominated much of central and eastern Europe from the sixth to the early ninth century. **See p.376**

Have you ever tried to draw your family tree? If so, you'll know how quickly things become unwieldy — with each generation back, first-hand knowledge diminishes as the number of branches increases exponentially. Nevertheless, perceived genealogy is a prominent shaper of human identity. Societies around the world and throughout history have found diverse ways to tame this mass of branches into coherent narratives that can be used to guide rules of kinship, marriage, inheritance and group membership. On page 376, Gnecchi-Ruscone *et al.*[1] reconstruct vast pedigrees spanning 300 people across 9 generations using ancient DNA sampled from Avar-period burial sites. With these, they deftly unravel the organizing principles of this medieval society.

For more than five millennia, the Eurasian Steppe has been home to nomadic herders who have more than once changed the course of world history[2]. Although these pastoralists were sparsely distributed across the grasslands, the high mobility afforded to them by domestic horses allowed far-flung family units to assemble quickly into tribes on the basis of genealogical bonds, both real and perceived. Tribes could coalesce into larger, but inherently transient, confederations that launched repeated invasions of settled peoples. The Avars were one such group. Marching into the Carpathian Basin of central Europe in AD 567–68, they went on to establish a 250-year

empire that stretched east to the Black Sea.

Previously, members of the same research team traced the genetic origins of the Avars to the Mongolian plains[3]. This finding agreed with historical sources that identified the Avars as remnants of a nomadic empire called the Rouran Khaganate, which was destroyed by the Turks around AD 552. However, the Avars show great diversity in their ancestry. Now equipped with a sample size that is almost ten times larger than their previous data set – an impressive 424 individuals from 4 cemeteries – Gnecchi-Ruscone and colleagues revisit Avar origins. In doing so, they find that the simple models of admixture that are so often deployed in ancient-genomics studies, which describe populations as a mixture of two or three ancestries, are a poor fit for nomadic empires.

Remarkably, each burial community produced a distinct genetic profile that, if sampled in isolation, would lead to different conclusions about Avar ancestry. This serves as a useful reminder that medieval ethnogenesis (the formation of ethnic groups) was a complicated process and that interpretations based on limited sampling should be taken with caution.

West of the River Tisza in modern Hungary, in what was the empire's power centre, lie the burials of elites, whose graves are richly furnished with gold and silver grave goods and whose ancestry derives almost entirely from east Asia. East of the river at the cemetery of Rákóczifalva, burial customs differ. Graves with horses and harnesses are common (Fig. 1), and the buried population is a mix of western and eastern Eurasian ancestries. The authors infer that much of this mixing took place in the centuries before the Avar period, perhaps among diverse tribes of the Pontic–Caspian region of the western steppe, who then joined the Avars on their westward march. The Avar empire also absorbed local populations in the Great Hungarian Plain; one low-status burial group from the eighth century is mostly European in origin.

Although ancestry was variable across the Avar realm, kinship practices seem to have been strikingly consistent. The authors provide compelling evidence for a rigid patrilineal system, in which children belong to their father's family and ancestry is traced from father to son. The advantage of emphasizing a single genealogical line is that group membership becomes unambiguous. A handful of pedigree studies in the past five years have characterized patrilineal systems in prehistoric Europe[4–6], but none on the scale that was described in this study.

Gnecchi-Ruscone *et al.* exhaustively sampled entire cemeteries rich with archaeological information, including burial locations and customs, grave goods, radiocarbon dates and dietary habits. An abundance of parent–child and sibling pairs provided the building blocks from which vast pedigrees could be built with high confidence. It is easy to get lost in the intricacies of these family histories, but across many generations, broad trends emerge.

A central feature of this society is female mobility. In the largest pedigrees both east and west of the river, the authors found that mothers were almost always without their parents and parents were without their adult daughters, with almost no exceptions. This suggests that Avar women left their homes to join their husband's communities, which might have provided some social cohesion between distinct patrilineal clans.

Using state-of-the-art approaches to identify distant relatives on the basis of shared genomic segments, the authors further found that genealogical connections between cemeteries are often mediated by women. Networks of distant genealogical links could also hold the key to unpacking Avar origins when more ancient DNA data from across the steppe become available. With 60,000 Avar burials known in the Carpathian Basin[7], there is the potential to achieve astounding resolution of ancestry throughout the empire in years to come.

"Networks of distant genealogical links could also hold the key to unpacking Avar origins."

Across the pedigrees, there was a conspicuous absence of children born to related parents, even to distant relatives. To explain this, the authors point to historical accounts of steppe peoples who forbade marriage between male-line relatives closer than five to nine generations. However, it could be argued that oral knowledge of female-line genealogy was also important for Avars. Daughters did not take husbands from among their mothers' or grandmothers' kin.

The authors identified many individuals with multiple reproductive partners. Polygamy (having multiple marriage partners), serial monogamous marriages and extramarital relations are all possible explanations. However, two cases of men with multiple older female partners, all middle-aged at death, makes a good argument for polygyny (having multiple wives). By contrast, most of the cases of women with multiple partners were apparent levirate unions, in which a widow would marry the son or brother of the deceased. This is a common custom in pastoralists who practise patriliny, both providing for widows and obliging them to fulfil marriage contracts that are conditional on them bearing male heirs.

Against this backdrop, one woman who had two unrelated male partners stands out. She sits at the centre of a striking transformation in Rákóczifalva. In the latter half of the seventh century, the cemetery's dominant patrilineage was replaced with another, accompanied by changes in diet and burial customs. This woman, the mother of half-brothers from each lineage, linked the old family with the new. What was her involvement in this realignment of power? There are no definite answers, but Gnecchi-Ruscone *et al.* will certainly fire up imaginations as to what can be achieved with ancient DNA. Lost political histories are now retrievable.

This study is part of a broad push in the field of archaeogenetics to better characterize the diversity of kinship systems that have existed through time. One fundamental question is why certain systems become favoured over others. For example, pastoralists are well-known for their propensity for patriliny[8].

It is argued that moveable wealth – that is, herds of animals – favours male-biased inheritance. In fact, the authors use historical accounts and anthropological studies of steppe pastoralists to bolster their own interpretations. This is a valid exercise, although it raises the question of how heavily researchers should impute from recorded sources, especially if they are asking how and why systems have changed from past to present.

The Avar empire collapsed around AD 800, but interest in the identity of these people endures. Gnecchi-Ruscone *et al.* remind us that this identity can never be captured by a simple set of modelled genetic ancestry components. Rather, it might be found, in part, in the tangled genealogies that lie underneath, and the Avars' own conceptualization of these family histories.

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The author declares no competing interests.
This article was published online on 24 April 2024.