

Genetic changes in Bronze Age Southern Iberia

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The fortified settlement of La Bastida (Totana, Murcia). This is one of the largest and best excavated settlements of El Argar. Credit: ASOME-UAB

The third millennium BCE is a highly dynamic period in the prehistory of Europe and western Asia, characterized by large-scale social and

political changes. In the Iberian Peninsula, the Copper Age was in full swing in around 2500 years BCE with substantial demographic growth, attested by a large diversity of settlements and fortifications, monumental funerary structures, as well as ditched mega-sites larger than 100 hectares. For reasons that are still unclear, the latter half of the millennium experienced depopulation and the abandonment of the mega-sites, fortified settlements and necropolis.

In southeastern Iberia, one of the most outstanding archaeological entities of the European Bronze Age emerged around 2200 BCE. Known as the El Argar culture, one of the first state-level societies on the European continent, it was characterized by large, central hilltop settlements, distinct pottery, specialized weapons and bronze, silver and gold artifacts, alongside an intramural burial rite.

A new study led by researchers from the Universitat Autònoma de Barcelona and the Max Planck Institutes for the Science of Human History (Jena) and Evolutionary Anthropology (Leipzig) and published in *Science Advances*, explores the relation between dynamic shifts at population scale and the major social and political changes of the third and second millennia BCE by analyzing the genomes of 136 ancient Iberians, ranging from 3000 to 1500 BCE.

Genetic turnover and melting pot

Including published genomes from Iberia, the new study encompasses data from nearly 300 ancient individuals and focuses specifically on the Copper to Bronze Age transition around 2200 BCE.

"While we knew that the so-called 'steppe'-related ancestry, which had spread across Europe during the third millennium BCE, eventually reached the northern Iberian Peninsula around 2400 BCE, we were surprised to see that all prehistoric individuals from the El Argar period

carried a portion of this ancestry, while the Chalcolithic individuals did not," says Max Planck researcher Wolfgang Haak, senior author and principal investigator of the study.



Female (right) and male (left) individuals of burial 38 of the settlement of La Almoloya (Pliego, Murcia). This is one of the richest burials found in an El Argar settlement. Credit: ©ASOME-UAB

The genomic data reveals some of the processes underlying this genetic shift. While the bulk of the genome shows that Bronze Age individuals are a mix of local Iberian Chalcolithic ancestry and a smaller part of

incoming ancestry from the European mainland, the paternally inherited Y chromosome lineages show a complete turnover, linked to the movement of steppe-related ancestry that is also visible in other parts of Europe.

The rich new data from the El Argar sites also show that these two components do not fully account for the genetic make-up of the early Bronze Age societies. "The causes of this disappearance of the previous diversity of the Y chromosome are still very difficult to explain," says Cristina Rihuete Herrada, UAB researcher and co-author of the study.

"We also found signals of ancestry that we traced to the central and eastern Mediterranean and western Asia. We cannot say exactly whether these influences arrived at the same time as the steppe-related ancestry, but it shows that it formed an integrative part of the rising El Argar societies, attesting to continued contacts to these regions," adds Vanessa Villalba-Mouco, postdoctoral researcher and lead author of the study.

UAB researchers already pointed to possible Mediterranean connections when they discovered in 2013 the monumental fortification of the Argaric settlement of La Bastida, in Murcia, to explain the originality of some architectural elements. "The genetic study argues in favor of this hypothesis: the data show that this unknown Mediterranean connection would have been sustained over time until the end of the period of El Argar, around 1500 BCE," says Rafael Micó, UAB researcher and co-author of the study.

Social implications

"Whether the genetic shift was brought about by migrating groups from North and Central Iberia or by climatic deteriorations that affected the eastern Mediterranean around 2200 BCE is the million-dollar question," says co-principal investigator and senior author Prof Roberto Risch from

the Universitat Autònoma de Barcelona. "It would be foolish to think that it can all be explained by a simple, one-factor model. While the temporal coincidence is striking, it is likely that many factors played a role."



Copper Age collective burial of Camino del Molino (Caravaca de la Cruz, Murcia), where a total of ~1300 individuals were buried between 2900-2300 BCE. The image shows the last burial layer, dated between 2500-2300 BCE, from which six individuals have been analysed. Credit: Universidad de Murcia. Fotografía de Francisco Ramos

One of these factors could be pandemics, such as an early form of the

Plague, which has been attested to in other regions of Europe around that time. While not found directly among the tested individuals in southern Iberia, it could be a cause or driver for the movement or disappearance of other groups in the region.

"In any case, we can now conclude that the population movement starting in the eastern European steppe zones around 3000 BCE was not a single migratory event, but required over four centuries to reach the Iberian Peninsula and another 200 years to appear in present-day Murcia and Alicante," adds Risch.

The archaeological record of the El Argar group shows a clear break with previous Chalcolithic traditions. Burial rites, for example, changed from communal to single and double burials within the building complexes. Elite burials also indicate the formation of strong social hierarchies. Testing for biological relatedness, the researchers found that males are on average more closely related to other people at the site, indicating that the group was likely patrilineally structured. Such a social organization could explain the stark reduction of the Y-lineage diversity.

"We observe similar patterns of social organization and increasing stratification also in other parts of Early Bronze Age Europe, in fact broadly around the same time and with similar characteristics of early state-like formations. This suggests a structured restart or resetting following some form of crisis or unstable, highly dynamic times," summarizes Haak.

In the research have participated, among others, these institutions: Adelaide University, Danube Private University, Basel University, Fundación Vasca para la Ciencia, Universidad de Valencia, Cape Town University, Universidad de Alicante, Museo Arqueológico de Alicante, Museo Arqueológico Municipal de Lorca, Universidad de Murcia, Harvard Medical School, Harvard University, Howard Hughes Medical

Institute y Universidad de Sevilla.

More information: Vanessa Villalba-Mouco et al, Genomic transformation and social organization during the Copper Age-Bronze Age transition in southern Iberia, *Science Advances* (2021). [DOI: 10.1126/sciadv.abi7038](https://doi.org/10.1126/sciadv.abi7038). www.science.org/doi/10.1126/sciadv.abi7038

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