Rakhigarhi and Ancient DNA: What Genetics Can — and Cannot — Tell Us

An evidence review of one Harappan genome and the population models built around it

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Direct answer. The published Rakhigarhi genome shows that one Mature Harappan woman carried ancestry related to an ancient Iranian-related lineage and deeply rooted South Asian hunter-gatherers, without detectable Steppe-pastoralist ancestry. Together with wider ancient-DNA evidence, it informs population history; it cannot identify the Indus language, ethnicity, religion, or the genetic diversity of millions of Harappans.

Contents

1 Scope and evidentiary method

This review reads the Rakhigarhi genome alongside the large South and Central Asian ancient-DNA dataset and archaeological context. It distinguishes direct observations, model-dependent inferences and questions that genetics cannot answer.

2 Archaeological and sampling context

Rakhigarhi is a major Harappan urban site in Haryana. The genome designated I6113 came from a Mature Harappan cemetery. Researchers screened 61 individuals; preservation permitted genome-wide analysis from only one, making both the achievement and the sampling limit central to interpretation.

3 Authentication and statistical comparison

Ancient-DNA authentication relies on molecular damage patterns, contamination estimates and repeated sampling. Population relationships are then tested with allele-sharing statistics and admixture models against available reference genomes. Model labels are shorthand for genetic similarity, not literal peoples or homelands.

4 Ancestry profile of I6113

I6113 can be modelled as a mixture of a deeply diverged Iranian-related lineage and ancestry related to ancient South Asian hunter-gatherers. The genome lacked detectable Steppe-pastoralist ancestry and the Anatolian-farmer-related signal found in sampled western farming populations.

5 Relation to the Indus-periphery cline

The Rakhigarhi individual fitted a gradient previously identified among eleven individuals from sites in cultural contact with the Indus world. Her secure Harappan context supports use of this ancestry profile in models of later South Asian population formation, while heterogeneity across the civilisation remains unknown.

6 Migration, farming and chronology

The data argue against large-scale descent of I6113 from the sampled western Iranian farming groups and are compatible with Steppe-related gene flow occurring after the Mature Harappan horizon. Farming origins remain an archaeological and archaeobotanical question as well as a genetic one; technologies can diffuse without population replacement.

7 Interpretive boundaries

One genome cannot identify the average Harappan ancestry profile, exclude minority migrants, or assign language, script, ethnicity, caste, polity or religion. Conclusions about a civilisation spanning a large region and many centuries require broader, chronologically controlled sampling.

8 Evidence assessment

Strong	I6113 is an authenticated genome from a Mature Harappan cemetery and lacks detectable Steppe-pastoralist ancestry.
Probable	An Indus-periphery-related ancestry profile contributed substantially to many later South Asian populations.
Model-dependent	Exact ancestry proportions, source labels and dates of mixture depend on reference samples and statistical assumptions.
Unresolved	Harappan-wide genetic diversity, the Indus language, and relationships between ancestry and social identity.

9 Conclusion

The Rakhigarhi genome transformed discussion because it placed direct genetic evidence inside a Harappan archaeological context. Its strongest contribution is a constrained ancestry result for one individual and its fit with wider regional models. The responsible conclusion is precise: ancient DNA illuminates population relationships and change, while language, identity and civilisation-wide diversity remain open questions.

References

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This paper is an evidence review for public scholarship.

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