Press Note

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(Strict embargo on the publication of the finds in any media until 11 pm, 5 September 2019)

Rakhigarhi Project of International significance was established in 2011-12. It was headed by Professor Vasant Shinde of Deccan College, Post-Graduate and Research Institute, Deemed University. The Archeological excavations were conducted jointly between Deccan College and the Department of Archeology and Museums, Government of Haryana and Prof. Shinde led the team of excavators. Dr. Niraj Rai, then from the Centre for Cellular and Molecular Biology (CCMB) Hyderabad and Prof. David Reich from Harvard School of Medicine, Boston, USA led the team of Genetic scientists for ancient DNA studies. Rakhigarhi in Hissar District of Haryana, is the largest city of the Harappan Civilization located almost in the middle of the Saraswati basin. Along with settlement, the Cemetery of the Harappans was also excavated and the remains from that were subjected to scientific research, including DNA studies. Though the site was under occupation from Early Harappan (5500 BCE-2600 BCE) to Mature Harappan (2600 BCE 1900 BCE), the cemetery belongs to the Mature (Urban) phase of the Harappan Culture dated from 2500-1900 BCE, based on material remains found in them.

"An Ancient Harappan Genome Lacks Ancestry from Steppe Pastoralists or Iranian Farmers" is the first article on the analysis of DNA samples from the site of Rakhigarhi in the Haryana State of India to be published in the prestigious International Journal Cell at 11 pm on 5 September. First Ancient DNA from the Harappan Civilization city of Rakhigarhi links its People to Modern South Asians. This important research, which will change perspective of not only Indian History but also World History, was being awaited by scholars and common people alike for long. The team consisting of archaeologists and genetic scientists from India and USA has been working on this project for the past three years. The data was collected by the most scientific way with utmost care and hundreds of tests have been carried out on the extracted samples. Researchers have successfully sequenced the first genome of an individual from the Harappan site of Rakhigarhi located in the Saraswati basin. This is the most expensive single aDNA project in the country, which has generated, for the first time, most scientific evidence about the people who initiated domestication and settled way of life in South Asia, authors of the Harappan Civilization and the Vedic people and the ancestry of the modern South Asians. A vigorous analysis of Archeological data and Genome data has been carried out by using the latest research methodologies and instrumentation available in the field. The comprehensive synthesis of both the Archaeological and Genome data we have generated is complementary to each other. This research has established that most of the early developments such as introduction of basic science and technology, settled way of life, domestication of plant and animal, first urban development, etc. were done by the indigenous people of South Asia, which is supported by the following archaeological as well as genetic data:
Archaeological Data

A mainstream view in archaeology and history has been that people from the Fertile Crescent of the Middle East - home to the earliest evidence of farming - spread across the Iranian plateau and from there into South Asia, bringing with them a new and transformative economy system. Some archaeologists and historians have neglected, intentionally or unintentionally, archaeological data from some excavated sites in the subcontinent, which strongly support indigenous development of domestication and settled way of life. The archaeological sites such as Mehrgarh in Baluchistan, Pakistan and Bhirana, Girawad, Mitathal, Farmana, Kunal, etc. in the Saraswati basin in India have provided ample convincing evidence for the indigenous origin and development starting from 7000 BCE. At most of the sites mentioned the different stages of development have been evident in their material culture, culminating and transforming into the Harappan tradition.

At the site of Mehrgah, in the earliest (lowermost) level, it is evident that the Neolithic farmers began experimentation of domestication of plant and animals. Crops like wheat and barley and some pulses and oil seeds and animals like cattle, sheep and goats were domesticated. They began to build small rectangular or square rooms of mud and wattle and daub, which were connected to each other, for dwelling and storage purposes. No pottery was introduced in the earliest level dated to 7000 BCE. These early settlers developed skill to produce crafts like beads and pendants, carpentry tools, stone objects for domestic use, etc. They also started importing raw materials like shell and semi-precious stone required to make some jewelry from far off places through trade links. In the subsequent stages crude handmade and ill-fired pottery was introduced along with the continuity in the craft activities and traditions. Metallurgy and some of the Harappan elements like seals and terracotta art were developed gradually. With every stage of development refinement and advancement in the technologies used is evident. Pottery, which was handmade and crude in the early stage gradually attained classical stage due to the advancement in the manufacture and firing technologies. Similar development is noticed in their structural activities. In the early stage only small mud and wattled-and-daub square structures introduced. Gradually size of the structures and open spaces began to increase and a modicum of planning was adopted, which gradually grew into a full-fledged well developed town planning during the Harappan Civilization around 2500 BCE. This important archaeological evidence is sure and robust indicator that the indigenous people of this region were responsible for the introduction of domestication, settled way of life, development of basic sciences and technologies (I prefer to term it as Indian Knowledge System), first urbanization in the middle of third millennium BCE, etc. In case people had migrated from other regions like Middle East or Central Asia, we would not have found evidence of either origin or such gradual cultural growth. Similarly, the migrants would have brought with them their cultural traditions and implanted in South Asia and would not have wasted their time in the innovation of completely new cultural elements here.

Excavations at archaeological sites of Bhirana, Kunal, Girawad, Farmana, Rakhigarhi and Mitathal located in the Saraswati basin are very significant mainly from the point of view of understating development of the Harappan traditions and cultural elements and urbanization. These excavations have pushed back the date of the Harappan culture to the middle of sixth millennium BCE. At all
these sites there is convincing evidence of the gradual growth in the Harappan cultural elements leading to urbanization in the middle of the third millennium BCE. The urban phase of the Harappan Culture is termed as the Harappan Civilization or Indus-Saraswati Civilization. The Harappans in the Saraswati basin began very modest life-style. They started building and living in circular huts or what is called pit-dwellings. Each family owned a cluster of 5-6 huts, one or two of which were meant for dwelling, one as kitchen and one for storage. From circular pit-dwelling, gradually they shifted to over-ground either rectangular or square structures and also introduced typical Harappan bricks in proper ratio. They introduced most scientific construction method (today it is called English Bond), which is found being used all over the globe even today. Small rectangular houses located haphazardly in early stage, were gradually replaced by large complexes arranged in a linear pattern. The Harappans began to build bathrooms, latrines and drainage and gradually introduced a full-fledged town planning in the middle of the third millennium BCE. Similar growth story is evident in their ceramic assemblage. The early ceramic was hand-modelled, crude, ill-fired but with typical Harappan forms and designs. The Harappans gradually introduced slow-turned table and fast wheel for the manufacture of the pottery, specialized close kilns for perfect firing and introduced classical and unique Harappan forms such as perforated jar, globular pot and jar, dish-on-stand, beaker, bowl, etc. In the middle of the third millennium BCE the ceramic industry was perfected and it attained classical Harappan pottery status. Similar development is visible in other crafts too.

The Harappan Civilization (2500-1900 BCE) was contemporary to the Mesopotamian and Egyptian Civilizations and they had regular trade contact with each other. The Harappan Civilization that laid the foundation of the Indian culture had different philosophy compared to their contemporaries. The Harappans have contributed immensely to the history of the world. They are pioneers in the development of well-planned cities and towns with perfect drainage and sewage pattern, introduced scientific construction methods, textile and silk industry, Ayurveda and Yoga sciences, scientific agriculture system and tools, etc. They were peace loving people. Basic technologies and sciences developed to manufacture a variety of tools, Jewelry, domestic objects, textile, etc. continued and are in use even today and they are relevant to the South Asian Society. The South Asians have not forgotten some of the traditional Harappan agriculture system, food habits, housing pattern, health science, etc.

**Genetic Data**

The genetic data comes mainly from the skeletal remains very securely and scientifically excavated from the Harappan cemetery at Rakhigarhi. The Harappans usually buried human dead in a separate cemetery, and in the case of Rakhigarhi it is located roughly one km to the west of their main city. The team of excavators took utmost precaution while excavating the cemetery to prevent any contamination. Each burial was excavated separately, which was immediately documented and the skeletal remains packed in silver foil and sent to the Deccan College lab for scientific cleaning and sampling. The skeletal remains were carefully cleaned by trained scholars in the Deccan College laboratory by taking proper precaution and then selected samples were transported to the aDNA lab of the Centre for Cellular and Molecular Biology (CCMB) in Hyderabad for sampling. Dr. Niraj
Rai used clean room to collect samples mainly from the petrous bone and prepared two libraries of each sample. The prepared libraries were first analyzed and sequenced by Dr. Rai in India. The second set of the libraries was then provided to Dr. David Reich from the Harvard Medical School, Harvard University for further sequencing, analysis and cross-checking. As the signature of the DNA in the Harappan human bones was weak, Dr. Reich carried out hundreds of different tests and finally succeeded obtaining signature of DNA from a few skeletal remains. Hot fluctuating climates like those found in many parts of lowland South Asia are detrimental to the preservation of DNA. So despite importance of the Harappan Civilization, it has been impossible until now to sequence DNA. However, one of the skeletal remains from Rakigarhi provided very strong signature, which has thrown new light on who are the Harappan people and their relations with the contemporary world as well as modern people of South Asia.

The DNA results of Rakigarhi samples were compared with the modern population of South Asia. In order to check Harappan people’s relation with their contemporaries from the Steppe region and Iran comparative DNA analysis was undertaken with samples from two important archaeological sites namely Gonur in Turkmenistan, Central Asia and Sahr-i-Sokhta from Iran.

The Genome evidence is completely complementary to the Archaeological evidence related to the population.

Conclusions

There were many theories about the genetic origin of the people of the Harappan Civilization. “They could resemble Southeast Asian hunter-gathers or they could resemble Neolithic Iranians farmers or they could even resemble Steppe pastoralists. Sir Mortimer Wheeler, one of the excavators of the site of Harappa in Pakistan even proposed that the Harappans were Dravidians and they were killed by the invading Aryans- these all were plausible hypotheses and myths prior to the ancient DNA findings.

1. The ancient DNA results completely reject the theory of Steppe pastoral or ancient Iranian farmers as source of ancestry to the Harappan population. This research also demolishes the hypothesis about mass human migration during Harappan time from outside the South Asia or even before.

2. The hunter-gathers in South Asia have independent origin and they are the authors of the settled way of life in this part of the world. They do not contain any genome from either Steppe region or ancient Iranian farmers. The genetic continuity from hunter-gatherer to the modern times is visible in the DNA results. The same hunter-gatherer communities developed into agricultural communities around 7000 BCE and they are the authors of the Harappan Civilization that was founded in the middle of the third millennium BCE. The genetic identity remained the same throughout but the development in the material culture continued as an ongoing cultural process resulting into the transformation from hunter-gathers to the agriculture communities and from rural culture to urban civilization.
3. This important breakthrough research completely sets aside the Aryan Migration/Invasion Theory. The skeletal remains found in the upper part of the Citadel area of Mohenjo daro belonged to those who died due to floods and not massacred by the Aryans as hypothesized by Sir Mortimer Wheeler. The Aryan Invasion Theory is based on very flimsy ground.

4. This research also establishes the fact that the Vedic culture was developed by the indigenous people of South Asia. Our premise that the Harappans were the Vedic people thus has received strong corroborative scientific evidence based on ancient DNA studies.

5. This research for the first time established the fact that the people of the Harappan Civilization are the ancestor of the most of the population of South Asia. For the first time this research indicates that there is a movement of the people from east to west. The Harppan people's presence is evident at sites like Gonur in Turkmenistan and Sahr-i- Saldita in Iran. As the Harappans traded with Mesopotamia, Egypt, Persian Gulf and almost all over South Asia, there is bound to be movement of the people resulting into a mixed genetic history. India had heterogeneous population right from the beginning of settled life and all of them have contributed to the development of this region.

6. The idea of farming in South Asia did not come with the people from Middle East. It was developed by the indigenous people of South Asia. There is a hint that the South Asian ancient farmers began to move towards Middle East. Probably the idea of settled life and domestication went from South Asia to the Middle East and not the vice versa.

Note of Caution:

The Harappans built a complex and cosmopolitan ancient civilization and there was undoubtedly variation in it that we cannot detect by analyzing a single individual. The insights that emerge from just this single individual demonstrate the enormous promise of ancient DNA studies of South Asia. They make it clear that future studies of much larger numbers of individuals from variety of archaeological sites and locations has the potential to transform our understanding of the deep history of the subcontinent.