

Mitochondrial DNA Analysis of Jomon Skeletons From the Funadomari Site, Hokkaido, and Its Implication for the Origins of Native American

Noboru Adachi,^{1*} Ken-ichi Shinoda,² Kazuo Umetsu,³ and Hirofumi Matsumura⁴

¹*Department of Legal Medicine, Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi, Yamanashi, Japan*

²*Department of Anthropology, National Museum of Nature and Science, Tokyo, Japan*

³*Department of Experimental and Forensic Pathology, Faculty of Medicine, Yamagata University, Yamagata, Japan*

⁴*Department of Anatomy, Sapporo Medical University, Sapporo, Japan*

KEY WORDS ancient DNA; single nucleotide polymorphisms; Amplified product-length polymorphisms; haplogroup

ABSTRACT Ancient DNA recovered from 16 Jomon skeletons excavated from Funadomari site, Hokkaido, Japan was analyzed to elucidate the genealogy of the early settlers of the Japanese archipelago. Both the control and coding regions of their mitochondrial DNA were analyzed in detail, and we could securely assign 14 mtDNAs to relevant haplogroups. Haplogroups D1a, M7a, and N9b were observed in these individuals, and N9b was by far the most predominant. The fact that haplogroups N9b and M7a were observed in Hokkaido Jomons bore out the hypothesis that these haplogroups are the (pre-) Jomon contribution to the modern Japanese mtDNA pool. Moreover, the fact that Hokkaido Jomons shared haplogroup D1 with Native Americans

validates the hypothesized genetic affinity of the Jomon people to Native Americans, providing direct evidence for the genetic relationships between these populations. However, probably due to the small sample size or close consanguinity among the members of the site, the frequencies of the haplogroups in Funadomari skeletons were quite different from any modern populations, including Hokkaido Ainu, who have been regarded as the direct descendant of the Hokkaido Jomon people. It appears that the genetic study of ancient populations in northern part of Japan brings important information to the understanding of human migration in northeast Asia and America. *Am J Phys Anthropol* 138:255–265, 2009. © 2008 Wiley-Liss, Inc.

Currently, it is widely accepted that there were two distinct populations from the Asian mainland that contributed to the formation of the modern Japanese: indigenous Neolithic Jomon and Aeneolithic Yayoi immigrants (Hanihara, 1991). It is generally agreed that Yayoi people came to Japan from mainland Asia about 1,700–2,800 years ago. However, the exact timing and geographical origin of the Jomon migration remains uncertain.

During the last glacial period, Japan is considered to have been connected to the Eurasian continent by a land bridge through Hokkaido and Sakhalin islands. During this period, the southern islands of Japan were separated from Hokkaido and mainland Asia by the Tsugaru Strait and Korea Strait, respectively even during the last glacial maximum (Ono, 1995; Fujio, 2002). Although Paleolithic Japanese had water craft capable of crossing at least 30 km of open sea (reviewed by Oda, 2002), the northern land bridge was still the most direct route for the entry of Paleolithic people into Hokkaido.

The existence of this possible route of migration is supported by abundant archaeological evidence. During the Japanese Upper Paleolithic, distinctive types of stone implements, including knife-shaped tools, points, and microblades are present. In Hokkaido, the earliest evidence of human occupation appears about 22,000 years BP. Inada (2001) pointed out that the cores excavated from some of the oldest sites in Hokkaido (Shimaki site and Gifu 2 site) show some similarity to those excavated from Maljta site in Siberia. Moreover, microblade tools,

including the distinctive form made using the “Yubetsu technique,” appear to have been introduced from Siberia at around 20,000 years BP (reviewed by Inada, 2001). Similar tools did not appear in Honshu (the main island of Japan) until 16,000–14,000 years BP (Sagawa, 1995; Fujio, 2002; Oda, 2003). This dispersal may have been facilitated by climatic conditions, and the associated fall in sea levels, at glacial maximum. Between 20,000 and 14,000 years ago, the Tsugaru Strait, which is currently as narrow as 19 km, would have become extremely shallow and an ice bridge may have connected Hokkaido and Honshu in winter (Fujio, 2002; Kawamura, 2007). Taking their maritime skills into account, it would have been relatively easy for Paleolithic Japanese to cross the Tsugaru Strait.

Grant sponsor: The Ministry of Education, Science, Sports and Culture, Japan; Grant number: 17107006.

*Correspondence to: N. Adachi, Department of Legal Medicine, Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi, 1110 Shimo-Kato, Chuo 409-3898, Yamanashi, Japan. E-mail: nadachi@yamanashi.ac.jp

Received 29 February 2008; accepted 15 July 2008

DOI 10.1002/ajpa.20923

Published online 24 October 2008 in Wiley InterScience (www.interscience.wiley.com).