



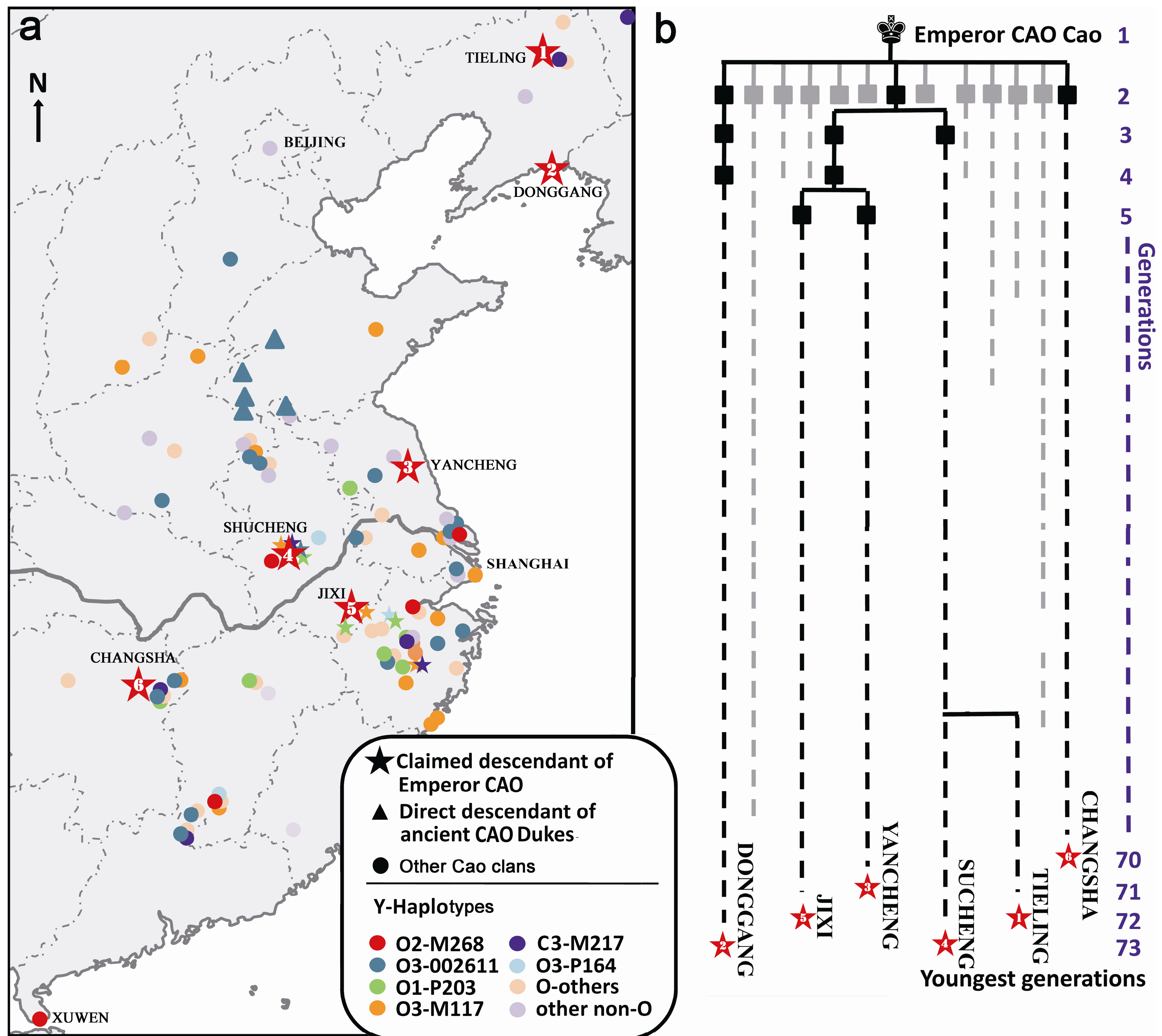
# Validating the authenticity of the pedigrees of Chinese Emperor CAO Cao of 1,800 years ago

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## Abstract

Deep pedigrees are of great value for studying the Y chromosome evolution. However, the authenticity of the pedigree information requires careful validation. Here, we validated some deep pedigrees in China with full records of 70-100 generations spanning over 1,800 years by comparing their Y chromosomes. The present clans of these pedigrees claim to be descendants of Emperor CAO Cao (155AD-220AD). Haplogroup O2-M268 is the only one that is enriched significantly in the claimed clans ( $P=9.323 \times 10^{-5}$ ,  $OR=12.72$ ), and therefore, is most likely to be that of the Emperor. Moreover, our analysis showed that the Y chromosome haplogroup of the Emperor is different from that of his claimed ancestry of the earlier CAO aristocrats (Haplogroup O3-002611). This study offers a successful showcase of the utility of genetics in studying the ancient history.

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Y chromosome haplotype distribution among the CAO clans in East China (a) and the deep pedigree validated (b).

Clans are classified into three groups: Claimed Clans of Emperor Cao (★), Unclaimed Cao clans (▲ & ●), and General population of other surnames (not marked on the map).

Haplotypes	Number of Clans in the clan groups			P value for Pairwise Comparisons		OR between claimed group and reference group [95% CI]
	Claimed group	Unclaimed group	General populations	Unclaimed group vs. General group <sup>a</sup>	Claimed group vs. reference group <sup>b</sup>	
O2-M268	6	5	22	0.801	<b>9.32 × 10<sup>-5</sup>*</b>	12.72 [4.22-38.32]
O3-002611	1	21	79	0.384	0.952	0.32 [0.04-2.43]
O1-P203	2	6	65	0.030	0.607	1.02 [0.23-4.62]
O3-M117	3	15	67	0.876	0.408	1.40 [0.39-5.08]
C3-M217	2	5	25	1.000	0.211	2.63 [0.57-12.17]
O3-P164	1	2	13	1.000	0.358	2.51 [0.31-20.34]
Others	0	42	175	0.423	<b>1.000</b>	0

Fisher's exact tests between different clan groups

Reference group is combined by unclaimed group and general populations.

\*,  $P < 0.01$ ; <sup>a</sup>, two-tail test; <sup>b</sup>, right-tail test.