

## FOR THE RECORD

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# Y-Chromosomal STR Haplotypes in Two Endogamous Tribal Populations of Karnataka, India

**POPULATION:** Approximately 5.0 mL of blood sample was collected from a total of 150 men belonging to two tribal populations of coastal Uttar Kannada district of Karnataka, with their informed written consent. Both the populations are endogamous and they belong to the Dravidian linguistic family. Halakki is a tribal group having a population size of *c.* 3383. They claim that they originally belong to Gujarat and Rajasthan, and migrated through Andhra Pradesh to Karnataka. Kunabhi is also a tribal population, *c.* 35,214 in number. They were hunters and gatherers but presently they practice agriculture.

**KEYWORDS:** forensic science, Y-STR haplotypes, Dravidian tribe, Kunabhi, Halakki, Karnataka, DNA typing, population genetics, DYS19, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS385a,b

DNA was isolated from the above samples using protocols described elsewhere (1). About 1–2 ng of DNA samples were used to amplify 9 Y-STR loci (DYS19, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS385a,b) in a multiplex reaction, following the amplification condition described by Redd et al. (2).

Amplicons were analyzed in a capillary-based ABI 3700 automated DNA Analyzer (Perkin Elmer, Foster City, CA) using GS ROX 500 as a size standard.

A total of 101 haplotypes were observed among 150 samples (Table 1). There were no haplotypes sharing between the Halakki

TABLE 1—Y chromosomal minimal haplotype (minHt.) observed in Halakki and Kunabhi populations of Karnataka, India.

| Ht. | DYS19 | DYS389I | DYS389II | DYS390 | DYS391 | DYS392 | DYS393 | DYS385a | DYS385b | Halakki | Kunabhi |
|-----|-------|---------|----------|--------|--------|--------|--------|---------|---------|---------|---------|
| 1   | 10    | 13      | 29       | 22     | 10     | 11     | 14     | 15      | 18      | 2       |         |
| 2   | 12    | 13      | 28       | 23     | 10     | 11     | 15     | 13      | 16      | 1       |         |
| 3   | 12    | 14      | 29       | 24     | 10     | 10     | 15     | 13      | 16      | 1       |         |
| 4   | 12    | 14      | 30       | 22     | 10     | 11     | 13     | 12      | 15      | 1       |         |
| 5   | 12    | 14      | 30       | 22     | 10     | 10     | 13     | 13      | 16      | 7       |         |
| 6   | 12    | 14      | 29       | 23     | 10     | 10     | 13     | 13      | 16      | 1       |         |
| 7   | 12    | 14      | 29       | 23     | 10     | 10     | 13     | 13      | 16      | 1       |         |
| 8   | 12    | 14      | 29       | 23     | 10     | 11     | 13     | 13      | 18      | 5       |         |
| 9   | 12    | 14      | 29       | 22     | 10     | 10     | 13     | 13      | 17      | 1       |         |
| 10  | 12    | 13      | 28       | 22     | 10     | 12     | 15     | 13      | 15      | 1       |         |
| 11  | 10    | 13      | 28       | 22     | 10     | 11     | 14     | 13      | 16      | 1       |         |
| 12  | 12    | 13      | 31       | 22     | 11     | 11     | 13     | 13      | 17      | 1       |         |
| 13  | 12    | 14      | 29       | 22     | 10     | 11     | 13     | 13      | 15      | 1       |         |
| 14  | 12    | 14      | 29       | 23     | 10     | 10     | 13     | 13      | 16      | 2       |         |
| 15  | 12    | 14      | 30       | 22     | 12     | 10     | 13     | 13      | 17      | 1       |         |
| 16  | 13    | 14      | 29       | 23     | 10     | 11     | 15     | 12      | 17      | 1       |         |
| 17  | 11    | 14      | 29       | 23     | 9      | 11     | 13     | 13      | 15      | 6       |         |
| 18  | 11    | 14      | 30       | 22     | 10     | 12     | 14     | 14      | 17      | 1       |         |

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TABLE 1—Continued.

| Ht. | DYS19 | DYS389I | DYS389II | DYS390 | DYS391 | DYS392 | DYS393 | DYS385a | DYS385b | Halakki | Kunabhi |
|-----|-------|---------|----------|--------|--------|--------|--------|---------|---------|---------|---------|
| 19  | 11    | 14      | 30       | 23     | 10     | 13     | 13     | 12      | 17      | 1       |         |
| 20  | 13    | 15      | 31       | 24     | 10     | 14     | 13     | 14      | 17      | 5       |         |
| 21  | 12    | 15      | 30       | 22     | 11     | 11     | 13     | 13      | 17      | 1       |         |
| 22  | 13    | 13      | 29       | 22     | 10     | 10     | 13     | 13      | 16      | 1       |         |
| 23  | 13    | 14      | 28       | 25     | 10     | 12     | 13     | 13      | 18      | 2       |         |
| 24  | 11    | 13      | 31       | 22     | 10     | 12     | 13     | 13      | 19      | 1       |         |
| 25  | 12    | 15      | 31       | 23     | 10     | 11     | 13     | 13      | 17      | 1       |         |
| 26  | 13    | 14      | 29       | 22     | 10     | 10     | 14     | 13      | 17      | 1       |         |
| 27  | 12    | 12      | 29       | 23     | 10     | 12     | 15     | 13      | 16      | 1       |         |
| 28  | 11    | 15      | 29       | 22     | 10     | 10     | 13     | 12      | 19      | 2       |         |
| 29  | 12    | 13      | 30       | 22     | 10     | 10     | 13     | 11      | 15      | 1       |         |
| 30  | 10    | 13      | 31       | 23     | 11     | 12     | 13     | 12      | 17      | 1       |         |
| 31  | 12    | 13      | 30       | 22     | 10     | 10     | 13     | 12      | 19      | 1       |         |
| 32  | 12    | 12      | 29       | 22     | 11     | 13     | 13     | 12      | 16      | 2       |         |
| 33  | 11    | 12      | 30       | 23     | 10     | 10     | 13     | 9       | 11      | 1       |         |
| 34  | 12    | 13      | 29       | 23     | 11     | 10     | 13     | 13      | 18      | 2       |         |
| 35  | 11    | 12      | 31       | 22     | 10     | 14     | 13     | 11      | 15      | 1       |         |
| 36  | 10    | 13      | 30       | 21     | 11     | 10     | 13     | 14      | 18      | 2       |         |
| 37  | 12    | 12      | 31       | 22     | 10     | 11     | 13     | 13      | 18      | 1       |         |
| 38  | 11    | 14      | 30       | 22     | 11     | 10     | 13     | 10      | 14      | 2       |         |
| 39  | 12    | 12      | 29       | 23     | 11     | 12     | 13     | 11      | 15      | 1       |         |
| 40  | 10    | 14      | 30       | 21     | 10     | 10     | 13     | 11      | 15      | 1       |         |
| 41  | 12    | 12      | 29       | 21     | 10     | 10     | 13     | 15      | 19      | 1       |         |
| 42  | 10    | 13      | 30       | 23     | 10     | 12     | 13     | 11      | 15      | 1       |         |
| 43  | 12    | 13      | 29       | 22     | 11     | 12     | 13     | 13      | 19      | 2       |         |
| 44  | 12    | 12      | 30       | 21     | 10     | 10     | 13     | 14      | 17      | 1       |         |
| 45  | 10    | 14      | 28       | 22     | 11     | 12     | 13     | 17      | 18      | 1       |         |
| 46  | 12    | 12      | 30       | 23     | 10     | 10     | 13     | 13      | 18      | 1       |         |
| 47  | 10    | 15      | 31       | 22     | 11     | 12     | 13     | 12      | 21      | 1       |         |
| 48  | 12    | 12      | 30       | 23     | 9      | 11     | 13     | 13      | 21      | 1       |         |
| 49  | 13    | 15      | 29       | 22     | 11     | 13     | 11     | 14      | 17      |         | 1       |
| 50  | 15    | 15      | 30       | 24     | 11     | 12     | 13     | 9       | 11      |         | 1       |
| 51  | 15    | 15      | 30       | 24     | 12     | 13     | 12     | 10      | 18      |         | 1       |
| 52  | 15    | 15      | 22       | 25     | 12     | 13     | 13     | 10      | 16      |         | 1       |
| 53  | 16    | 14      | 26       | 22     | 12     | 14     | 13     | 11      | 14      |         | 2       |
| 54  | 15    | 13      | 29       | 22     | 11     | 12     | 13     | 12      | 17      |         | 1       |
| 55  | 16    | 15      | 23       | 24     | 12     | 12     | 13     | 11      | 18      |         | 1       |
| 56  | 13    | 15      | 31       | 24     | 12     | 13     | 13     | 11      | 19      |         | 1       |
| 57  | 14    | 15      | 28       | 24     | 13     | 12     | 13     | 12      | 16      |         | 1       |
| 58  | 15    | 15      | 29       | 24     | 11     | 13     | 11     | 13      | 15      |         | 1       |
| 59  | 15    | 15      | 30       | 24     | 12     | 13     | 12     | 13      | 16      |         | 1       |
| 60  | 15    | 14      | 21       | 23     | 10     | 12     | 13     | 13      | 16      |         | 1       |
| 61  | 15    | 14      | 27       | 22     | 11     | 13     | 12     | 13      | 16      |         | 1       |
| 62  | 14    | 13      | 30       | 23     | 11     | 13     | 13     | 8       | 21      |         | 1       |
| 63  | 15    | 15      | 22       | 24     | 12     | 12     | 12     | 14      | 15      |         | 1       |
| 64  | 14    | 15      | 30       | 25     | 11     | 13     | 13     | 14      | 15      |         | 1       |
| 65  | 14    | 15      | 28       | 24     | 13     | 13     | 13     | 8       | 19      |         | 1       |
| 66  | 14    | 15      | 30       | 24     | 11     | 13     | 13     | 13      | 17      |         | 1       |
| 67  | 16    | 15      | 30       | 25     | 11     | 13     | 12     | 13      | 16      |         | 1       |
| 68  | 16    | 14      | 24       | 23     | 10     | 13     | 13     | 12      | 17      |         | 1       |
| 69  | 15    | 14      | 27       | 22     | 12     | 13     | 12     | 9       | 11      |         | 1       |
| 70  | 14    | 15      | 29       | 23     | 12     | 13     | 13     | 14      | 16      |         | 1       |
| 71  | 15    | 14      | 25       | 22     | 12     | 13     | 11     | 12      | 16      |         | 2       |
| 72  | 15    | 16      | 31       | 25     | 11     | 13     | 13     | 12      | 12      |         | 1       |
| 73  | 15    | 15      | 28       | 24     | 12     | 13     | 13     | 12      | 16      |         | 2       |
| 74  | 14    | 14      | 31       | 25     | 11     | 13     | 13     | 14      | 15      |         | 1       |
| 75  | 15    | 15      | 29       | 22     | 11     | 13     | 13     | 13      | 16      |         | 6       |
| 76  | 16    | 14      | 24       | 24     | 11     | 13     | 12     | 12      | 16      |         | 3       |
| 77  | 15    | 13      | 30       | 23     | 12     | 14     | 12     | 13      | 17      |         | 3       |
| 78  | 15    | 14      | 30       | 25     | 11     | 13     | 13     | 13      | 16      |         | 3       |
| 79  | 15    | 15      | 29       | 23     | 11     | 13     | 12     | 13      | 13      |         | 1       |
| 80  | 16    | 14      | 28       | 22     | 12     | 13     | 13     | 13      | 16      |         | 1       |
| 81  | 15    | 15      | 29       | 23     | 11     | 13     | 13     | 14      | 15      |         | 1       |
| 82  | 14    | 16      | 30       | 22     | 11     | 14     | 13     | 13      | 17      |         | 2       |
| 83  | 15    | 15      | 31       | 24     | 11     | 13     | 11     | 13      | 17      |         | 1       |
| 84  | 16    | 15      | 29       | 24     | 12     | 13     | 13     | 12      | 16      |         | 1       |
| 85  | 14    | 15      | 27       | 23     | 11     | 13     | 13     | 9       | 14      |         | 1       |
| 86  | 15    | 15      | 29       | 25     | 11     | 14     | 13     | 8       | 16      |         | 1       |
| 87  | 13    | 16      | 25       | 22     | 12     | 13     | 12     | 12      | 20      |         | 3       |
| 88  | 15    | 16      | 26       | 25     | 11     | 13     | 13     | 10      | 20      |         | 2       |
| 89  | 15    | 16      | 29       | 22     | 12     | 12     | 13     | 10      | 16      |         | 1       |
| 90  | 14    | 16      | 26       | 25     | 11     | 13     | 12     | 10      | 19      |         | 2       |
| 91  | 15    | 16      | 28       | 22     | 11     | 14     | 13     | 11      | 13      |         | 1       |

TABLE 1—Continued.

| Ht. | DYS19 | DYS389I | DYS389II | DYS390 | DYS391 | DYS392 | DYS393 | DYS385a | DYS385b | Halakki | Kunabhi |
|-----|-------|---------|----------|--------|--------|--------|--------|---------|---------|---------|---------|
| 92  | 13    | 15      | 29       | 22     | 11     | 13     | 13     | 12      | 15      |         | 1       |
| 93  | 14    | 15      | 31       | 25     | 12     | 13     | 11     | 10      | 16      |         | 2       |
| 94  | 14    | 15      | 30       | 22     | 12     | 12     | 13     | 11      | 18      |         | 1       |
| 95  | 15    | 14      | 29       | 22     | 11     | 13     | 12     | 8       | 19      |         | 2       |
| 96  | 13    | 14      | 31       | 25     | 12     | 13     | 13     | 9       | 22      |         | 1       |
| 97  | 15    | 15      | 29       | 22     | 11     | 13     | 13     | 16      | 16      |         | 1       |
| 98  | 16    | 14      | 30       | 24     | 12     | 12     | 12     | 12      | 19      |         | 1       |
| 99  | 16    | 12      | 29       | 22     | 11     | 14     | 13     | 11      | 14      |         | 1       |
| 100 | 13    | 15      | 27       | 23     | 11     | 13     | 13     | 13      | 15      |         | 1       |
| 101 | 15    | 13      | 28       | 22     | 11     | 12     | 11     | 10      | 20      |         | 1       |

and Kunabhi populations, suggesting these two populations maintain strict endogamy, despite both being tribes and residing in the same geographical region. Alleles were designated according to the number of repeats. The allele frequencies were calculated by a simple gene control method. AMOVA analysis was carried out by Arlequin ver.2.00 software (3).

AMOVA analysis of these two studied populations with other Indian populations ((4), our unpublished data) suggest the variation among the populations within groups (1.67%), which although small but is statistically significant. Most of the variation (98.2%) is, however, found between individuals within the populations. Interestingly, locus DYS389II is highly polymorphic in Kunabhi.

The complete dataset is available through electronic mail from the corresponding author at lalji@ccmb.res.in

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