Characterization of Additional STR Loci to Benefit Human Identity Testing

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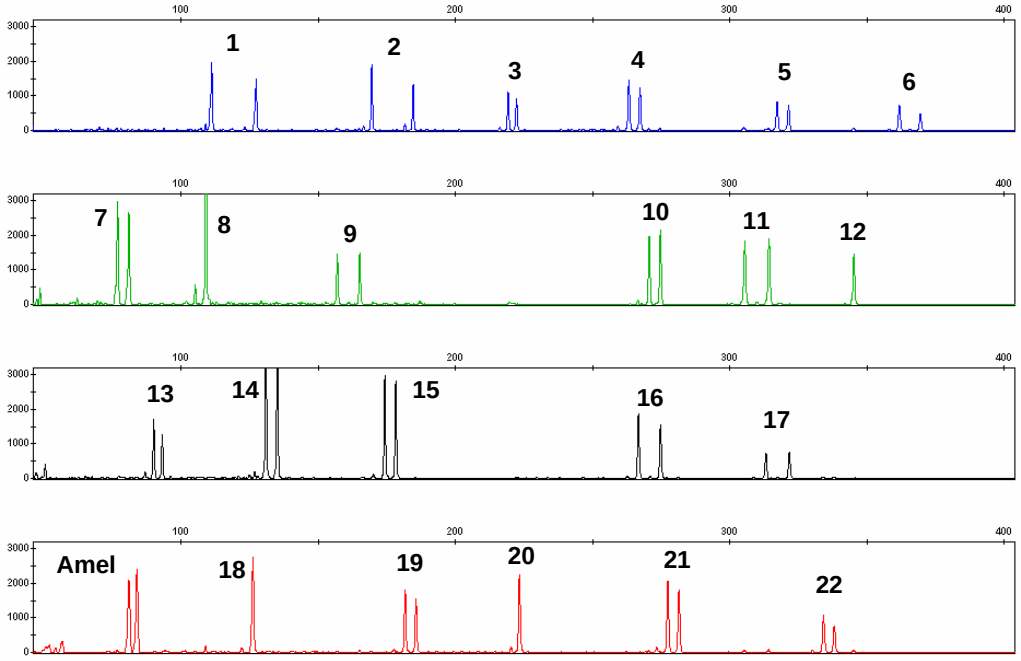
At the present time, the U.S. forensic DNA community has settled on 13 core autosomal short tandem repeat (STR) loci and 11 recommended Y-STR markers for human identity testing. We are evaluating and characterizing additional STR loci in order to benefit missing person investigations and identification of mass disaster victims where limited numbers of biological relatives may be available for kinship analysis and additional genetic markers will be useful.

http://www.cstl.nist.gov/biotech/strbase/newSTRs.htm

Autosomal STR 23plex in development

that amplifies 22 of the 26 miniSTR loci plus the sex-typing marker amelogenin in a single megaplex for rapid reference sample typing.

A total of 26 additional STR markers spanning unused "real-estate" across the 22 autosomes have been characterized so that they may be combined (without conflicting) with the current 13 CODIS core loci that are widely used in DNA databases. These 26 STRs have been developed as reduced size 3plex miniSTRs with product sizes below 140 bp for recovery of information from degraded DNA that can come from missing persons/mass disaster samples. As noted in the figure, work is also underway to construct a single multiplex that combines all of these new loci to enable rapid analysis of reference samples. These new STR loci have been examined in U.S. population samples and sequenced for calibration of allele nomenclature in standard samples.



The 82 Y-STR loci examined thus far

are ranked according to their observed diversity values in our U.S. population samples. We are developing a multiplex with the 6 highlighted loci that should help further resolve common haplotypes not separated by commercially-available Y-STR kits.

Locus (# samples)	# Alleles	Diversity
DYS724 a/b (CD Y) (93)	36	0.9691
DYS464 a/b/c/d (91)	42	0.9646
DYS527 a/b (93)	32	0.9388
DYS710 (93)	17	0.9236
DYS385 a/b (94)	29	0.9179
DYS481 (93)	11	0.8359
DYS449 (90)	12	0.8345
DYS712 (95)	12	0.8340
DYS490 (92)	18	0.8201
DYS504 (94)	9	0.8101
DYS576 (93)	8	0.8046
DYS570 (94)	10	0.8042
YCAII a/b (91)	13	0.7993
DYS557 (93)	7	0.7887
DYS534 (93)	9	0.7882
DYS643 (92)	7	0.7862
DYS458 (94)	8	0.7808
DYS635 (94)	8	0.7779
DYS652 (95)	10	0.7742
DYS650 (95)	10	0.7740
DYS459 a/b (95)	6	0.7680
DYS463 (95)	9	0.7680
DYS447 (91)	9	0.7636
DYS390 (94)	6	0.7632
DYS715 (94)	7	0.7628
DYS532 (94)	7	0.7541
DYS389II (94)	5	0.7447
DYS709 (95)	8	0.7402

Locus	# Alleles	Diversity
DYS456 (94)	5	0.7355
DYS607 (95)	7	0.7355
DYS438 (94)	5	0.7211
DYS19 (94)	5	0.7113
DYS508 (93)	7	0.7106
DYS446 (94)	7	0.7014
DYS448 (94)	6	0.6937
DYS723 (94)	4	0.6891
DYS485 (93)	8	0.6821
DYS522 (94)	4	0.6792
DYS495 (94)	5	0.6747
DYS716 (95)	4	0.6524
DYS452 (93)	7	0.6487
Y-GATA-H4 (94)	5	0.6461
DYS505 (93)	5	0.6454
DYF406S1 (DYS555)	5	0.6421
DYS437 (94)	5	0.6417
DYS439 (94)	4	0.6388
DYS520 (94)	6	0.6381
Y-GATA-A10 (95)	4	0.6336
DYS492 (93)	5	0.6335
DYS444 (88)	6	0.6264
DYS533 (94)	6	0.6264
DYS460 (91)	4	0.5973
DYS392 (94)	7	0.5962
DYS389I (94)	3	0.5692
DYS572 (93)	4	0.5676

Locus	# Alleles	Diversity
DYS462 (95)	6	0.5669
DYS537 (95)	3	0.5648
DYS594 (93)	5	0.5617
DYS391 (94)	4	0.5502
DYS531 (95)	6	0.5357
DYS556 (93)	4	0.5346
DYS721 (95)	4	0.5234
DYS426 (91)	3	0.5221
DYS565 (95)	3	0.5165
DYS578 (95)	3	0.5165
DYS525 (93)	7	0.5157
DYS450 (91)	3	0.5070
DYS632 (94)	2	0.5017
DYS726 (94)	4	0.4907
DYS540 (94)	4	0.4871
DYS393 (94)	4	0.4770
DYS717 (95)	7	0.4531
DYS388 (91)	8	0.4498
DYS719 (94)	6	0.3606
DYS425 (95)	3	0.2278
DYS454 (95)	5	0.1957
DYS645 (95)	3	0.1820
DYS455 (95)	5	0.1781
DYS641 (94)	3	0.1219
DYS434 (95)	3	0.0824
DYS575 (94)	2	0.0213
DYS472 (95)	1	0.0000

We have examined more than 80 Y-STR loci in a common set of 95 U.S. population samples to see which ones will be helpful beyond those already available in commercial kits to aid separation of common haplotypes and closely related individuals. The widely used Yfiler kit examines 17 Y-STR loci (highlighted in blue) and encompasses the 11 recommended Y-STR loci (shown in red font). The six loci highlighted in purple appear to be most promising in terms of haplotype resolution.

Promising loci
Yfiler

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