Characterization of Additional STR Loci for Possible U.S. Core Expansion:
D12S391, D1S1656, D2S441, D10S1248, D22S1045, and SE33

Poster #40 at 21st International Symposium on Human Identification, San Antonio, TX, October 11-14, 2010

Email: john.butler@nist.gov
Phone: 301-975-4049

John M. Butler, Carolyn R. Hill, Kristen Lewis O'Connor, David L. Duewer, and Margaret C. Kline

National Institute of Standards and Technology (NIST), 100 Bureau Drive MS 8312, Gaithersburg, MD 20899-8312

In November 2009, the European Union adopted five new autosomal short tandem repeat (STR) loci as part of their expanded European Standard Set (ESS). These new ESS STR loci, which include D12S391 [1], D1S1656 [2], D2S441 [3], D10S1248 [3], and D22S1045 [3], were selected based on discussion over the past few years within the European Network of Forensic Science Institutes (ENFSI) [4,5]. In the past year, Promega Corporation and Applied Biosystems have released new STR kits to enable coverage of these additional loci as well as the highly polymorphic locus SE33 [6,7].

Using three different STR kits (PowerPlex® ESX 17, PowerPlex® ESI 17, and AmpFlSTR® NGM), we have studied the allelic variation in over 1440 U.S. population samples [8]. We have also reviewed the literature to find all known variants of these STR loci. Understanding the variation in these additional STR loci across U.S. populations is important because they are being considered as possible candidates for expanding the U.S. core loci in order to enable future international DNA data sharing. Chromosomal location, sequence information, allele frequencies, and power of discrimination are shown for each of these additional autosomal STR loci. In addition, the probability of identity with different sets of loci are illustrated in order to help assess the benefits of adding additional loci to the current 13 CODIS core loci.

	U.S.			Europe			
	PP16	Identifiler	MiniFiler	ESX/ESI17	NGM	SEfiler	SGM Plus
13 CODIS loci	TPOX	TPOX					
	CSF1PO	CSF1PO	CSF1PO				
	D5S818	D5S818					
	D7S820	D7S820	D7S820				
	D13S317	D13S317	D13S317				
7 ESS loci - before April 2009	FGA	FGA	FGA	FGA	FGA	FGA	FGA
	vWA	vWA		vWA	vWA	vWA	vWA
	D3S1358	D3S1358		D3S1358	D3S1358	D3S1358	D3S1358
	D8S1179	D8S1179		D8S1179	D8S1179	D8S1179	D8S1179
	D18S51	D18S51	D18S51	D18S51	D18S51	D18S51	D18S51
	D21S11	D21S11	D21S11	D21S11	D21S11	D21S11	D21S11
	TH01	TH01		TH01	TH01	TH01	TH01
	D16S539	D16S539	D16S539	D16S539	D16S539	D16S539	D16S539
		D2S1338	D2S1338	D2S1338	D2S1338	D2S1338	D2S1338
		D19S433		D19S433	D19S433	D19S433	D19S433
Adopted 5 loci to expand to 12 ESS loci				D12S391	D12S391		
				D1S1656	D1S1656		
				D2S441	D2S441		
				D10S1248	D10S1248		
				D22S1045	D22S1045		
				SE33		SE33	
	Penta D						
	Penta E						

U.S. is looking to expand the core loci (18-20 total) to provide more international overlap

23 unique loci

Alleles shaded in gray are the same size and cannot be distinguished from one another without sequence information (i.e., would be binned together during STR typing)

Summary Information

Relative Variability of the 23 STR Loci in Commercial Kits

(rank ordered by Probability of Identity (sum of square of observed genotype frequencies))

STR Locus	Alleles Observed	Genotypes Observed	H(obs)	PIC	P_I (all samples) n = 1426	P_I (Cauc) n = 455	P_I (Af Am) n = 439	P_I (Hisp) n = 334	P_I (Asian) n = 198
SE33	58	341	0.9383	0.9424	**0.0063**	0.0071	0.0104	0.0086	0.0116
Penta_E*	20	113	0.8779	0.8992	0.0175	0.0272	0.0200	0.0244	N/A
D2S1338	13	73	0.8752	0.8818	0.0221	0.0280	0.0212	0.0298	0.0334
D1S1656	17	99	0.8871	0.8806	**0.0229**	0.0206	0.0319	0.0297	0.0444
D18S51	23	102	0.8696	0.8694	0.0263	0.0310	0.0285	0.0304	0.0530
D12S391	24	120	0.8654	0.8646	**0.0279**	0.0238	0.0366	0.0337	0.0438
FGA	29	111	0.8702	0.8599	0.0299	0.0386	0.0299	0.0271	0.0453
Penta_D*	16	70	0.8733	0.8486	0.0360	0.0585	0.0281	0.0529	N/A
D21S11	32	98	0.8331	0.8300	0.0399	0.0489	0.0397	0.0473	0.0558
D19S433	16	83	0.8100	0.7987	0.0534	0.0813	0.0374	0.0619	0.0712
D8S1179	11	48	0.7966	0.7965	0.0553	0.0661	0.0652	0.0634	0.0433
vWA	11	42	0.8000	0.7863	0.0624	0.0696	0.0594	0.0785	0.0811
D16S539	9	30	0.7812	0.7650	0.0723	0.0971	0.0710	0.0771	0.0922
D13S317	9	30	0.7749	0.7637	0.0724	0.0793	0.1317	0.0520	0.0699
D7S820	12	35	0.7826	0.7627	0.0745	0.0626	0.0924	0.0928	0.0922
TH01	9	27	0.7518	0.7578	0.0752	0.0894	0.0999	0.0910	0.1254
D2S441	14	46	0.7777	0.7490	**0.0807**	0.0867	0.0992	0.1076	0.1020
D10S1248	12	41	0.7812	0.7458	**0.0828**	0.0975	0.0681	0.1060	0.0873
D3S1358	11	31	0.7489	0.7309	0.0904	0.0726	0.1062	0.0919	0.1355
D22S1045	11	45	0.7567	0.7305	**0.0935**	0.1253	0.0557	0.1688	0.1070
D5S818	9	34	0.7225	0.7033	0.1057	0.1459	0.0983	0.1317	0.0804
CSF1PO	10	33	0.7567	0.7024	0.1071	0.1327	0.0806	0.1250	0.1120
TPOX	10	30	0.6830	0.6549	0.1351	0.1812	0.0872	0.1525	0.2022

N=1426 U.S. population samples *(*Penta D & Penta E from 647 subset) using PowerPlex 16, ESI 17, and Identifiler, data generated at NIST*

Comparisons of Probability of Identity for Locus Sets

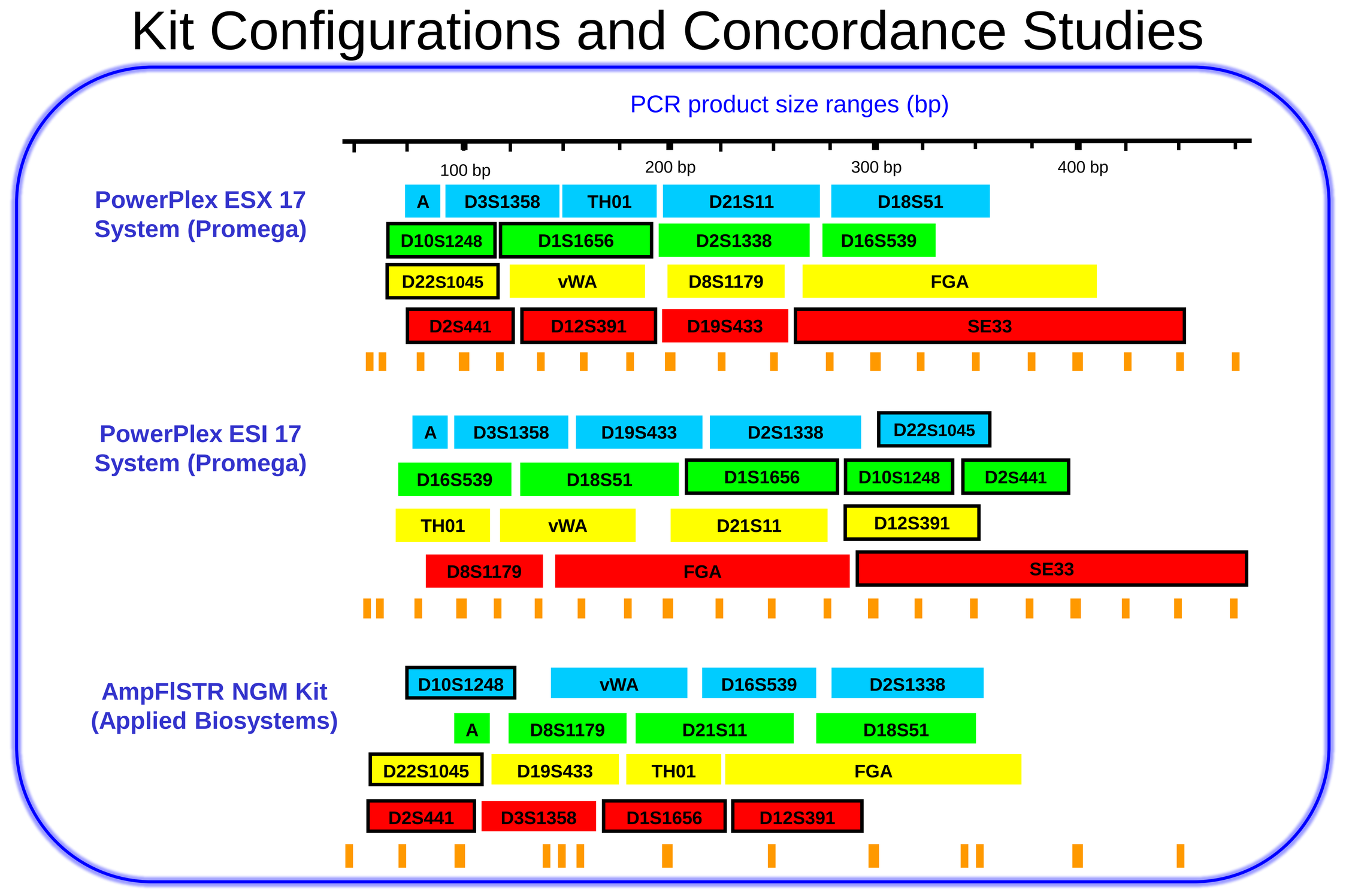
Set of Loci	# STRs	P_I (all samples) n = 1426	P_I (Cauc) n = 455	P_I (Af Am) n = 439	P_I (Hisp) n = 334	P_I (Asian) n = 198
current CODIS	13	4.40E-16	2.95E-15	8.29E-16	1.51E-15	8.65E-15
Identifiler	15	5.20E-19	6.72E-18	6.57E-19	2.79E-18	2.05E-17
PowerPlex 16	15	2.77E-19	4.70E-18	4.65E-19	1.95E-18	8.65E-15
NGM	15*	4.04E-19	2.88E-18	5.77E-19	5.64E-18	4.00E-17
ESI/ESX 17	16*	2.54E-21	2.05E-20	6.02E-21	4.85E-20	4.66E-19
Extended US1	18	3.25E-22	7.12E-21	2.47E-22	5.36E-21	1.96E-20
Extended US2	19	7.46E-24	1.47E-22	7.87E-24	1.59E-22	8.70E-22
Extended US3	20	4.68E-26	1.05E-24	8.22E-26	1.37E-24	1.01E-23

*vWA removed for statistical calculations due to LD with D12S391

Potential of 10 orders of magnitude improvement

Extended US1 = CODIS 13 + D2S1338, D19S433 + D2S441, D10S1248, D22S1045
Extended US2 = CODIS 13 + D2S1338, D19S433 + D2S441, D10S1248, D22S1045 + D1S1656
Extended US3 = CODIS 13 + D2S1338, D19S433 + D2S441, D10S1248, D22S1045 + D1S1656 + SE33

Kit Configurations and Concordance Studies



Disconcordance observed during testing 1443 samples

	D12S391	D1S1656	D2S441	D10S1248	D22S1045	SE33
ESX	-	__, 15.3 1x	**9.1**, 10/11/12	-	**15**, 16/17	19, __ 1x
ESI	-	**14**, 15.3	**9.1**, 10/11/12	-	**15**, 16/17	19,**25.2**
NGM	-	**14**, 15.3	__, 10/11/12 7x	-	__, 16/17 4x	n/a

D2S441 allele 9.1 (occurs primarily in Asian samples) involves the insertion of a G just prior to the TCTA repeat, which disrupts the NGM forward primer annealing. For D22S1045, a G→T mutation 15 bases upstream of the repeat impacts the NGM forward primer (Promega has added a degenerate primer with their ESX kit to overcome this primer binding site mutation).

Disclaimer

Points of view are those of the authors and do not necessarily represent the official position or policies of the US Department of Justice. Certain commercial equipment, instruments and materials are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology nor does it imply that any of the materials, instruments, or equipment identified are necessarily the best available for the purpose.

D12S391

Chr 12: 12.450 Mb

51 observed alleles

Allele (Repeat #)	Promega ESX 17	Promega ESI 17	ABI NGM	Repeat Structure $[AGAT]_n[GAT]_{0-1}(AGAC)_m[AGAT]_{0-1}$	Reference
14	130 bp	291 bp	230 bp	$[AGAT]_{8}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)
15	134 bp	295 bp	234 bp	$[AGAT]_{8}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
16	138 bp	299 bp	238 bp	$[AGAT]_{9}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
17 (a)	142 bp	303 bp	242 bp	$[AGAT]_{10}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
17 (b)	142 bp	303 bp	242 bp	$[AGAT]_{11}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)
17.1	143 bp	304 bp	243 bp	Not published	Hill *et al.* (2010)
17.3	145 bp	306 bp	245 bp	$[AGAT]GAT[AGAT]_{8}(AGAC)_{7}AGAT$	Phillips *et al.* (1998)
18	146 bp	307 bp	246 bp	$[AGAT]_{11}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
18.1	147 bp	308 bp	247 bp	Not published	Hill *et al.* (2010)
18.3	149 bp	310 bp	249 bp	$[AGAT]GAT[AGAT]_{9}(AGAC)_{7}AGAT$	Phillips *et al.* (1998)
19	150 bp	311 bp	250 bp	$[AGAT]_{12}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
19.1	151 bp	312 bp	251 bp	Not published	Hill *et al.* (2010)
19.2	152 bp	313 bp	252 bp	Not published	Berti *et al.* (2010)
19.3 (a)	153 bp	314 bp	253 bp	$[AGAT]GAT[AGAT]_{10}(AGAC)_{7}AGAT$	Phillips *et al.* (1998)
19.3 (b)	153 bp	314 bp	253 bp	$[AGAT]_{5}GAT[AGAT]_{7}(AGAC)_{7}$	Phillips *et al.* (1998)
19.3 (c)	153 bp	314 bp	253 bp	$[AGAT]_{5}GAT[AGAT]_{7}(AGAC)_{6}AGAT$	Phillips *et al.* (2010)
20 (a)	154 bp	315 bp	254 bp	$[AGAT]_{13}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
20 (b)	154 bp	315 bp	254 bp	$[AGAT]_{11}(AGAC)_{9}$	Lareu *et al.* (1996)
20 (c)	154 bp	315 bp	254 bp	$[AGAT]_{10}(AGAC)_{9}AGAT$	SRM 2391b
20 (d)	154 bp	315 bp	254 bp	$[AGAT]_{12}(AGAC)_{7}AGAT$	SRM 2391b
20.1	155 bp	316 bp	255 bp	Not published	Hill *et al.* (2010)
20.3	157 bp	318 bp	257 bp	Not published	Phillips *et al.* (1998)
21 (a)	158 bp	319 bp	258 bp	$[AGAT]_{14}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
21 (b)	158 bp	319 bp	258 bp	$[AGAT]_{12}(AGAC)_{9}$	Lareu *et al.* (1996)
21 (c)	158 bp	319 bp	258 bp	$[AGAT]_{12}(AGAC)_{8}AGAT$	Phillips *et al.* (2010)
21 (d)	158 bp	319 bp	258 bp	$[AGAT]_{13}(AGAC)_{7}AGAT$	Phillips *et al.* (2010)
21 (e)	158 bp	319 bp	258 bp	$[AGAT]_{11}(AGAC)_{10}$	SRM 2391b
22 (a)	162 bp	323 bp	262 bp	$[AGAT]_{15}(AGAC)_{6}AGAT$	Lareu *et al.* (1996)
22 (b)	162 bp	323 bp	262 bp	$[AGAT]_{12}(AGAC)_{10}$	Lareu *et al.* (1996)
22 (c)	162 bp	323 bp	262 bp	$[AGAT]_{11}(AGAC)_{11}$	Phillips *et al.* (2010)
22 (d)	162 bp	323 bp	262 bp	$[AGAT]_{13}(AGAC)_{9}$	SRM 2391b
22.2	164 bp	325 bp	264 bp	Not published	Hill *et al.* (2010)
22.3	165 bp	326 bp	265 bp	$[AGAT]_{3}GAT[AGAT]_{10}(AGAC)_{9}$	Phillips *et al.* (2010)
23 (a)	166 bp	327 bp	266 bp	$[AGAT]_{14}(AGAC)_{8}AGAT$	Lareu *et al.* (1996)
23 (b)	166 bp	327 bp	266 bp	$[AGAT]_{14}(AGAC)_{9}$	Lareu *et al.* (1996)
24 (a)	170 bp	331 bp	270 bp	$[AGAT]_{15}(AGAC)_{8}AGAT$	Lareu *et al.* (1996)
24 (b)	170 bp	331 bp	270 bp	$[AGAT]_{14}(AGAC)_{9}AGAT$	Lareu *et al.* (1996)
24 (c)	170 bp	331 bp	270 bp	$[AGAT]_{15}(AGAC)_{9}$	Lareu *et al.* (1996)
24 (d)	170 bp	331 bp	270 bp	$[AGAT]_{14}(AGAC)_{10}$	Phillips *et al.* (2010)
24 (e)	170 bp	331 bp	270 bp	$[AGAT]_{13}(AGAC)_{11}$	SRM 2391b
24.2	172 bp	333 bp	272 bp	$[AGAT]_{12}AT[AGAT]_{6}(AGAC)_{6}$	Phillips *et al.* (2010)
24.3	173 bp	334 bp	273 bp	Not published	Hill *et al.* (2010)
25 (a)	174 bp	335 bp	274 bp	$[AGAT]_{16}(AGAC)_{8}AGAT$	Lareu *et al.* (1996)
25 (b)	174 bp	335 bp	274 bp	$[AGAT]_{16}(AGAC)_{9}$	Lareu *et al.* (1996)
25.2	176 bp	337 bp	276 bp	$[AGAT]_{12}AT[AGAT]_{7}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)
26 (a)	178 bp	339 bp	278 bp	$[AGAT]_{17}(AGAC)_{8}AGAT$	Lareu *et al.* (1996)
26 (b)	178 bp	339 bp	278 bp	$[AGAT]_{17}(AGAC)_{9}$	Lareu *et al.* (1996)
26.2 (a)	180 bp	341 bp	280 bp	$[AGAT]_{12}AT[AGAT]_{8}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)
26.2 (b)	180 bp	341 bp	280 bp	$[AGAT]_{14}AT[AGAT]_{6}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)
27	182 bp	343 bp	282 bp	$[AGAT]_{18}(AGAC)_{8}AGAT$	Phillips *et al.* (2010)
27.2	184 bp	345 bp	284 bp	$[AGAT]_{15}AT[AGAT]_{6}(AGAC)_{5}AGAT$	Phillips *et al.* (2010)

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
14	1	0.0	0.1			
15	148	5.1	8.0	4.0	3.5	4.3
16	106	3.7	6.3	1.0	2.3	3.7
17	327	11.3	14.6	9.2	12.5	6.7
17.1	4	0.1	0.4			
17.3	29	1.0	0.4		1.8	1.2
18	616	**21.3**	**27.0**	**24.5**	**17.4**	17.4
18.1	1	0.0	0.1			
18.3	34	1.2	0.3		2.4	1.3
19	447	15.5	14.7	17.3	12.4	**19.6**
19.1	7	0.2	0.7			0.1
19.3	14	0.5	0.3	0.2	0.5	0.7
20	390	13.5	10.7	19.1	11.1	17.3
20.1	2	0.1	0.2			
20.3	1	0.0				0.1
21	296	10.3	6.6	9.2	12.6	12.5
22	200	6.9	4.0	7.4	10.0	6.3
22.2	1	0.0				0.1
23	141	4.9	3.3	3.7	6.7	5.2
24	72	2.5	1.2	1.2	4.9	1.6
24.3	1	0.0		0.2		
25	33	1.1	0.9	1.7	1.5	0.6
26	9	0.3		0.7	0.2	0.6
27	6	0.2		0.5	0.1	0.4

2N= 2886

D12S391/vWA Genomic Proximity

Chromosome 12: vWA at 6.093 Mb and D12S391 at 12.450 Mb

D12S391 is located 6.36 Mb from vWA on the short arm of chromosome 12. In a recent study involving phased father/son pairs, we detected linkage disequilibrium between D12S391 and vWA suggesting that a non-random association of alleles is occurring making it improper to use the product rule between these loci. Thus, **single-locus genotype probabilities for D12S391 and vWA should not be multiplied to determine the overall STR profile probability**. Rather the combined haplotype frequencies of D12/vWA diplotypes should be used or one locus excluded in the final profile probability calculations. For more information, see K.L. O'Connor *et al.* (2010) Linkage disequilibrium analysis of D12S391 and vWA in U.S. population and paternity samples. *Forensic Sci. Int. Genet. (in press).*

D1S1656

Chr 1: 230.905 Mb

25 observed alleles

Allele (Repeat #)	Promega ESX 17	Promega ESI 17	ABI NGM	Repeat Structure $[TAGA]_4[TGA]_{0-1}[TAGA]_nTAGG[TG]_5$	Reference
8	133 bp	222 bp	171 bp	$[TAGA]_{8}[TG]_{5}$	Phillips *et al.* (2010)
9	137 bp	226 bp	175 bp	$[TAGA]_{9}[TG]_{5}$	Phillips *et al.* (2010)
10 (a)	141 bp	230 bp	179 bp	$[TAGA]_{10}[TG]_{5}$	Lareu *et al.* (1998)
10 (b)	141 bp	230 bp	179 bp	$[TAGA]_{10}TAGG[TG]_{5}$	Phillips *et al.* (2010)
11	145 bp	234 bp	183 bp	$[TAGA]_{11}[TG]_{5}$	Lareu *et al.* (1998)
12 (a)	149 bp	238 bp	187 bp	$[TAGA]_{12}[TG]_{5}$	Lareu *et al.* (1998)
12 (b)	149 bp	238 bp	187 bp	$[TAGA]_{11}TAGG[TG]_{5}$	Lareu *et al.* (1998)
13 (a)	153 bp	242 bp	191 bp	$[TAGA]_{12}TAGG[TG]_{5}$	Lareu *et al.* (1998)
13 (b)	153 bp	242 bp	191 bp	$[TAGA]_{13}[TG]_{5}$	Phillips *et al.* (2010)
13.3	156 bp	245 bp	194 bp	$[TAGA]_{1}TGA[TAGA]_{11}TAGG[TG]_{5}$	Phillips *et al.* (2010)
14 (a)	157 bp	246 bp	195 bp	$[TAGA]_{13}TAGG[TG]_{5}$	Lareu *et al.* (1998)
14 (b)	157 bp	246 bp	195 bp	$[TAGA]_{14}[TG]_{5}$	Phillips *et al.* (2010)
14.3	160 bp	249 bp	198 bp	$[TAGA]_{4}TGA[TAGA]_{9}TAGG[TG]_{5}$	Phillips *et al.* (2010)
15	161 bp	250 bp	199 bp	$[TAGA]_{14}TAGG[TG]_{5}$	Lareu *et al.* (1998)
15.3	164 bp	253 bp	202 bp	$[TAGA]_{4}TGA[TAGA]_{10}TAGG[TG]_{5}$	Lareu *et al.* (1998)
16	165 bp	254 bp	203 bp	$[TAGA]_{15}TAGG[TG]_{5}$	Lareu *et al.* (1998)
16.3	168 bp	257 bp	206 bp	$[TAGA]_{4}TGA[TAGA]_{11}TAGG[TG]_{5}$	Lareu *et al.* (1998)
17	169 bp	258 bp	207 bp	$[TAGA]_{16}TAGG[TG]_{5}$	Lareu *et al.* (1998)
17.1	170 bp	259 bp	208 bp	Not published	Schröer *et al.* (2000)
17.3	172 bp	261 bp	210 bp	$[TAGA]_{4}TGA[TAGA]_{12}TAGG[TG]_{5}$	Lareu *et al.* (1998)
18	173 bp	262 bp	211 bp	$[TAGA]_{17}TAGG[TG]_{5}$	Phillips *et al.* (2010)
18.3	176 bp	265 bp	214 bp	$[TAGA]_{4}TGA[TAGA]_{13}TAGG[TG]_{5}$	Lareu *et al.* (1998)
19	177 bp	266 bp	215 bp	Not published	Asamura *et al.* (2008)
19.3	180 bp	269 bp	218 bp	$[TAGA]_{4}TGA[TAGA]_{14}TAGG[TG]_{5}$	Lareu *et al.* (1998)
20.3	184 bp	273 bp	222 bp	Not published	Gamero *et al.* (2000)

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
8	1	0.0		0.2		
9	5	0.2	0.3		0.2	
9.1	7	0.2		1.5	0.1	
10	614	21.3	8.9	26.0	21.3	**34.8**
11	944	**32.7**	**34.7**	**33.9**	**33.4**	28.4
11.3	138	4.8	4.3	3.0	6.0	4.9
12	304	10.5	17.0	21.0	4.6	3.9
12.3	13	0.5	0.7	0.5	0.5	
13	97	3.4	4.6	3.7	2.9	2.1
13.3	4	0.1	0.4			
14	651	22.6	27.1	9.2	25.2	21.0
14.3	1	0.0	0.1			
15	102	3.5	1.9	0.7	5.5	4.6
16	4	0.1		0.2	0.2	0.1
17	1	0.0				0.1

2N= 2886

D10S1248

Chr 10: 131.093 Mb

13 observed alleles

Allele (Repeat #)	Promega ESX 17	Promega ESI 17	ABI NGM	Repeat Structure $[GGAA]_n$	Reference
7	79 bp	282 bp	73 bp	$[GGAA]_{7}$	Phillips *et al.* (2010)
8	83 bp	286 bp	77 bp	$[GGAA]_{8}$	Coble & Butler (2005)
9	87 bp	290 bp	81 bp	$[GGAA]_{9}$	Coble & Butler (2005)
10	91 bp	294 bp	85 bp	$[GGAA]_{10}$	Coble & Butler (2005)
11	95 bp	298 bp	89 bp	$[GGAA]_{11}$	Coble & Butler (2005)
12	99 bp	302 bp	93 bp	$[GGAA]_{12}$	Coble & Butler (2005)
13	103 bp	306 bp	97 bp	$[GGAA]_{13}$	Coble & Butler (2005)
14	107 bp	310 bp	101 bp	$[GGAA]_{14}$	Coble & Butler (2005)
15	111 bp	314 bp	105 bp	$[GGAA]_{15}$	Coble & Butler (2005)
16	115 bp	318 bp	109 bp	$[GGAA]_{16}$	Coble & Butler (2005)
17	119 bp	322 bp	113 bp	$[GGAA]_{17}$	Coble & Butler (2005)
18	123 bp	326 bp	117 bp	$[GGAA]_{18}$	Coble & Butler (2005)
19	127 bp	330 bp	121 bp	$[GGAA]_{19}$	Coble & Butler (2005)

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
8	2	0.1	0.2			
9	2	0.1	0.2			
10	11	0.4	1.0	0.5		
11	40	1.4	3.6		0.2	0.9
12	213	7.4	14.2	8.4	3.0	3.7
13	778	27.0	22.9	**30.7**	29.1	27.1
14	873	**30.2**	**27.4**	26.2	**30.8**	**35.7**
15	568	19.7	19.1	20.8	19.6	19.9
16	311	10.8	8.9	9.9	13.9	9.5
17	79	2.7	2.4	3.2	3.0	2.5
18	6	0.2	0.1	0.2	0.1	0.4
19	3	0.1			0.2	0.1

2N= 2886

D2S441

Chr 2: 68.239 Mb

22 observed alleles

Allele (Repeat #)	Promega ESX 17	Promega ESI 17	ABI NGM	Repeat Structure $[TCTA]_4(TCA)_{0-1}[TCTA]_n[TTTA]_{0-1}[TCTA]_2$	Reference
8	88 bp	347 bp	76 bp	$[TCTA]_{8}$	Coble & Butler (2005)
9	92 bp	351 bp	80 bp	$[TCTA]_{9}$	Coble & Butler (2005)
9.1	93 bp	352 bp	81 bp	$A[TCTA]_{9}$	Hill *et al.* (2010)
10 (a)	96 bp	355 bp	84 bp	$[TCTA]_{10}$	Coble & Butler (2005)
10 (b)	96 bp	355 bp	84 bp	$[TCTA]_{5}TCAA[TCTA]_{4}$	Phillips *et al.* (2010)
10 (c)	96 bp	355 bp	84 bp	$[TCTA]_{5}TCAA[TCTA]_{2}TCTGTCTA$	Phillips *et al.* (2010)
10 (d)	96 bp	355 bp	84 bp	$[TCTA]_{8}TCTGTCTA$	Phillips *et al.* (2010)
11 (a)	100 bp	359 bp	88 bp	$[TCTA]_{11}$	Coble & Butler (2005)
11 (b)	100 bp	359 bp	88 bp	$[TCTA]_{2}TCAA[TCTA]_{8}$	Phillips *et al.* (2010)
11.3	103 bp	362 bp	91 bp	$[TCTA]_{4}TCA[TCTA]_{7}$	Phillips *et al.* (2010)
12 (a)	104 bp	363 bp	92 bp	$[TCTA]_{12}$	Coble & Butler (2005)
12 (b)	104 bp	363 bp	92 bp	$[TCTA]_{5}TCAA[TCTA]_{6}$	Phillips *et al.* (2010)
12.3	107 bp	366 bp	95 bp	$[TCTA]_{4}TCATCCA[TCTA]_{7}$	Phillips *et al.* (2010)
13	108 bp	367 bp	96 bp	Not published	Coble & Butler (2005)
13.3	111 bp	370 bp	99 bp	Not published	Coble & Butler (2005)
14 (a)	112 bp	371 bp	100 bp	$[TCTA]_{11}TTTA[TCTA]_{2}$	Phillips *et al.* (2010)
14 (b)	112 bp	371 bp	100 bp	$[TCTA]_{5}TCAA[TCTA]_{5}TTTA[TCTA]_{2}$	Phillips *et al.* (2010)
14.3	115 bp	374 bp	103 bp	Not published	Coble & Butler (2005)
15	116 bp	375 bp	104 bp	Not published	Coble & Butler (2005)
16 (a)	120 bp	379 bp	108 bp	$[TCTA]_{13}TTTA[TCTA]_{2}$	Phillips *et al.* (2010)
16 (b)	120 bp	379 bp	108 bp	$[TCTA]_{5}TCAA[TCTA]_{7}TTTA[TCTA]_{2}$	Phillips *et al.* (2010)
17	124 bp	383 bp	112 bp	$[TCTA]_{14}TTTA[TCTA]_{2}$	Phillips *et al.* (2010)

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
10	20	0.7	1.5		0.2	0.7
11	148	5.1	4.8	3.5	8.2	2.4
12	235	8.1	6.7	5.4	11.0	7.7
13	267	9.3	9.7	11.9	6.6	10.7
14	412	14.3	**25.7**	7.2	7.8	12.2
14.3	13	0.5	0.9		0.3	0.3
15	485	**16.8**	15.8	**26.2**	**14.9**	15.0
15.3	116	4.0	2.8		6.0	5.4
16	446	15.5	11.7	21.8	14.7	**17.7**
16.3	178	6.2	9.3	1.7	5.5	5.5
17	127	4.4	3.0	7.4	4.8	3.9
17.3	295	10.2	4.7	8.4	12.9	14.9
18	18	0.6	0.3	1.5	0.5	0.6
18.3	103	3.6	2.2	4.7	5.1	2.5
19	1	0.0			0.1	
19.3	21	0.7	0.6	0.2	1.3	0.4
20.3	1	0.0	0.1			

2N= 2886

D22S1045

Chr 22: 37.536 Mb

14 observed alleles

Allele (Repeat #)	Promega ESX 17	Promega ESI 17	ABI NGM	Repeat Structure $[ATT]_n$ ACT $[ATT]_2$	Reference
7	79 bp	306 bp	77 bp	$[ATT]_{4}$ ACT $[ATT]_{2}$	Promega allelic ladders
8	82 bp	309 bp	80 bp	$[ATT]_{5}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
9	85 bp	312 bp	83 bp	$[ATT]_{6}$ ACT $[ATT]_{2}$	Promega allelic ladders
10	88 bp	315 bp	86 bp	$[ATT]_{7}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
11	91 bp	318 bp	89 bp	$[ATT]_{8}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
12	94 bp	321 bp	92 bp	$[ATT]_{9}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
13	97 bp	324 bp	95 bp	$[ATT]_{10}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
14	100 bp	327 bp	98 bp	$[ATT]_{11}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
15	103 bp	330 bp	101 bp	$[ATT]_{12}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
16	106 bp	333 bp	104 bp	$[ATT]_{13}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
17	109 bp	336 bp	107 bp	$[ATT]_{14}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
18	112 bp	339 bp	110 bp	$[ATT]_{15}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
19	115 bp	342 bp	113 bp	$[ATT]_{16}$ ACT $[ATT]_{2}$	Coble & Butler (2005)
20	118 bp	345 bp	116 bp	$[ATT]_{17}$ ACT $[ATT]_{2}$	Promega allelic ladders

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
8	5	0.2	0.6			
10	45	1.6	4.0			1.3
11	390	13.5	14.3	21.8	13.8	7.1
12	64	2.2	4.9	0.2	1.2	1.2
13	12	0.4	0.2		0.5	0.7
14	141	4.9	8.4	0.2	5.2	2.5
15	929	32.2	**25.5**	**31.7**	32.1	**41.5**
16	861	29.8	18.9	22.5	**38.8**	36.5
17	402	13.9	21.0	21.3	7.7	8.6
18	30	1.0	1.6	1.7	0.7	0.4
19	7	0.2	0.6	0.5		

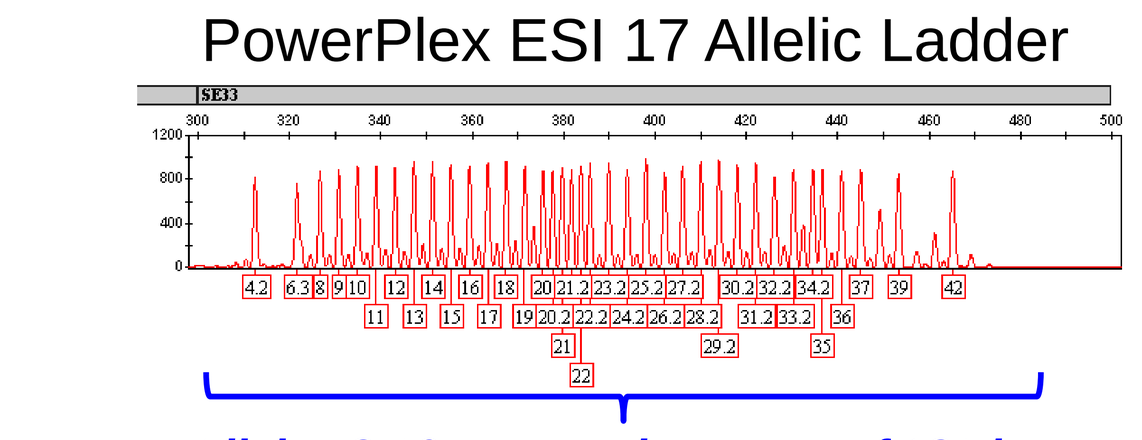
2N= 2886

SE33

Chr 6: 88.987 Mb

171 observed alleles

PowerPlex ESI 17 Allelic Ladder



Alleles 3-49 span a size range of 184 bp

U.S. Population Data

Hill *et al.* (2010) *FSI Genetics, in press*

Allele	Total #	Total %	Populations, % AfAm	Asian	Cauc	Hisp
6.3	1	0.0				0.1
7	1	0.0	0.1			
8	1	0.0				0.1
10.2	1	0.0	0.1			
11	1	0.0			0.1	
11.2	2	0.1	0.2			
12	11	0.4	0.3		0.5	0.4
12.2	4	0.1	0.2			0.3
13	31	1.1	1.1		1.5	1.0
13.2	9	0.3	1.0			
14	85	2.9	5.1	0.2	2.5	2.4
14.2	10	0.3	0.4		0.4	0.3
15	102	3.5	3.9	1.2	3.9	3.9
15.2	8	0.3	0.3			0.7
16	144	5.0	4.8	4.7	4.0	6.7
16.2	5	0.2	0.3		0.1	0.1
16.3	2	0.1				0.3
17	205	7.1	9.3	4.0	6.2	7.3
17.2	1	0.0	0.1			
17.3	5	0.2	0.1		0.2	0.3
18	268	9.3	12.1	5.0	7.2	**11.0**
18.3	1	0.0			0.1	
19	249	**8.6**	**12.2**	6.2	6.6	8.0
19.2	8	0.3		0.2	0.4	0.4
20	216	7.5	10.9	9.2	5.4	4.8
20.2	20	0.7	0.3	1.2	1.1	0.3
21	108	3.7	4.6	6.7	2.4	2.7
21.2	48	1.7	1.1	1.7	2.4	1.3
22	42	1.5	1.3	1.7	1.5	1.3
22.2	65	2.3	0.4	3.2	3.8	1.9
23	12	0.4	0.6	1.0	0.2	0.1
23.2	91	3.2	2.2	4.2	4.3	2.1
24	1	0.0			0.1	
24.2	74	2.6	1.3	6.2	2.2	2.5
25.2	110	3.8	2.7	6.9	4.0	3.1
26	1	0.0	0.1			
26.2	163	5.6	6.1	5.2	4.3	7.1
27	1	0.0				0.1
27.2	225	7.8	4.3	**10.4**	**9.5**	8.6
27.3	2	0.1				0.3
28	2	0.1	0.1	0.2		
28.2	180	6.2	4.4	7.9	7.4	6.1
28.3	2	0.1	0.1		0.1	
29	1	0.0		0.2		
29.2	147	5.1	2.7	5.7	6.3	6.3
29.3	1	0.0		0.2		
30	1	0.0				0.1
30.2	111	3.8	1.6	3.2	5.8	4.6
31	3	0.1	0.1		0.2	
31.2	52	1.8	1.5	2.5	2.2	1.3
32	1	0.0			0.1	
32.2	25	0.9	0.4	0.7	1.3	0.9
33	2	0.1			0.1	0.1
33.2	11	0.4	0.3		0.5	0.4
34	9	0.3	0.3		0.7	
34.2	1	0.0			0.1	
35	1	0.0	0.1			
36	2	0.1	0.2			

2N= 2886

Acknowledgments: Funding support from the National Institute of Justice through interagency agreement 2008-DN-R-121 to the NIST Office of Law Enforcement Standards. We thank Promega Corporation for supplying the PowerPlex ESI 17 and ESX 17 kits and Applied Biosystems for supplying the AmpFlSTR NGM kits used for concordance testing purposes.

References

[1] Lareu, M.V., et al. (1996) A highly variable STR at the D12S391 locus. *Int. J. Legal Med.* 109: 134-138.
[2] Lareu, M.V., et al. (1998) Sequence variation of a hypervariable short tandem repeat at the D1S1656 locus. *Int. J. Legal Med.* 111: 244-247.
[3] Coble, M.D. & Butler, J.M. (2005) Characterization of new miniSTR loci to aid analysis of degraded DNA. *J. Forensic Sci.* 50: 43-53.
[4] Gill, P., et al. (2006) The evolution of DNA databases-Recommendations for new European STR loci. *Forensic Sci. Int.* 156: 242-244.
[5] Gill, P., et al. (2006) New multiplexes for Europe-amendments and clarification of strategic development. *Forensic Sci. Int.* 163: 155-157.
[6] Moller, A. & Brinkmann, B. (1994) Locus ACTBP2 (SE33): sequencing data reveal considerable polymorphism. *Int. J. Legal Med.* 106: 262-267.
[7] Butler, J.M., et al. (2009) The single most polymorphic STR locus: SE33 performance in U.S. populations. *Forensic Sci. Int. Genet. Suppl. Ser.* 2: 23-24.
[8] Hill, C.R., et al. (2010) Concordance and population studies along with stutter and peak height ratio analysis for the PowerPlex® ESX 17 and ESI 17 Systems. *Forensic Sci. Int. Genet.* (in press).
[9] Rolf, B., et al. (1997) Sequence polymorphism at the tetranucleotide repeat of the human beta-actin related pseudogene H-beta-Ac-psi-2 (ACTBP2) locus. *Int. J. Legal Med.* 110: 69-72.

Where allele sequence information is available, repeat motif patterns from Rolf *et al.* (1997) have been used as shorthand to indicate the numbers of AAAG, AG, or AAAAAG repeats that are present

Repeat Motif Patterns

Allele (Repeat #)	ABI SEfiler	Promega ESX 17	Promega ESI 17	5' flanking AAAG	AG	AAAG	AG	central repeat AAAG	AAAAAG	AG	AGAAAG	AAAG	AAAAAG	AAAG	3' flanking G	AAGG	AAAG/ANAG	AG	Reference
3	197 bp	258 bp	300 bp																STRBase
4.2	203 bp	264 bp	306 bp																PP-ESI ladder
6.3	212 bp	273 bp	315 bp	2	1	3	1	7	0	0	0	0	0	0	0	0	3	1	Rolf *et al.* (1997)
7	213 bp	274 bp	316 bp																Lászik *et al.* (2001)
7.3	216 bp	277 bp	319 bp	2	1	3	1	8	0	0	0	0	0	0	0	0	3	1	Dauber *et al.* (2004)
8	217 bp	278 bp	320 bp																PP-ESI ladder
8.1	218 bp	279 bp	321 bp																Lászik *et al.* (2001)
9 (a)	221 bp	282 bp	324 bp	2	1	3	1	9	0	0	0	0	0	0	1	0	3	1	Dauber *et al.* (2009)
9 (b)	221 bp	282 bp	324 bp	2	1	3	1	9	0	0	0	0	0	0	1	1	2	1	Kline et al. (2010)
9.2	223 bp	284 bp	326 bp																Lászik *et al.* (2001)
10	225 bp	286 bp	328 bp																PP-ESI ladder
10.2	227 bp	288 bp	330 bp	2	1	0	0	18	0	0	0	0	0	0	1	0	3	1	Dauber *et al.* (2009)
10.3	228 bp	289 bp	331 bp																Urquhart *et al.* (1993)
11	229 bp	290 bp	332 bp																PP-ESI ladder
11.2	231 bp	292 bp	334 bp	2	1	0	0	15	0	0	0	0	0	0	1	0	3	1	Dauber *et al.* (2004)
12	233 bp	294 bp	336 bp	2	1	3	1	12	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
12.2	235 bp	296 bp	338 bp	2	1	3	0	13	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
13	237 bp	298 bp	340 bp																PP-ESI ladder
13.2	239 bp	300 bp	342 bp	2	1	3	0	14	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997), Kline *et al.* (2010)
13.3	240 bp	301 bp	343 bp																Poetsch *et al.* (2010)
14 (a)	241 bp	302 bp	344 bp	2	1	3	1	14	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
14 (b)	241 bp	302 bp	344 bp	2	1	3	1	14	0	0	0	0	0	0	1	1	2	1	Kline et al. (2010)
14.1	242 bp	303 bp	345 bp																Poetsch *et al.* (2010)
14.2	243 bp	304 bp	346 bp	2	1	3	0	15	0	0	0	0	0	0	1	0	3	1	Kline *et al.* (2010)
14.3	244 bp	305 bp	347 bp																
15	245 bp	306 bp	348 bp	2	1	3	1	15	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
15.2	247 bp	308 bp	350 bp																Lászik *et al.* (2001)
16 (a)	249 bp	310 bp	352 bp	2	1	3	1	16	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
16 (b)	249 bp	310 bp	352 bp	2	1	3	1	16	0	0	0	0	0	0	1	1	2	1	Kline *et al.* (2010)
16.1	250 bp	311 bp	353 bp																Berti *et al.* (2010)
16.2	251 bp	312 bp	354 bp																Lászik *et al.* (2001)
16.3	252 bp	313 bp	355 bp																Egyed *et al.* (2005)
17	253 bp	314 bp	356 bp	2	1	3	1	17	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
17.2	255 bp	316 bp	358 bp																Lászik *et al.* (2001)
17.3	256 bp	317 bp	359 bp																Lászik *et al.* (2001)
18	257 bp	318 bp	360 bp	2	1	3	1	18	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
18.2	259 bp	320 bp	362 bp	2	1	3	1	9	1			8	0	0	1	1	2	1	Dauber *et al.* (2009)
18.3	260 bp	321 bp	363 bp																Egyed *et al.* (2005)
19 (a)	261 bp	322 bp	364 bp	2	1	3	1	19	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
19 (b)	261 bp	322 bp	364 bp	2	1	3	1	19	0	0	0	0	0	0	1	1	2	1	Kline *et al.* (2010)
19.2	263 bp	324 bp	366 bp	2	1	3	1	10	1	0	0	8	0	0	1	1	2	1	Rolf *et al.* (1997)
19.3	264 bp	325 bp	367 bp																Berti *et al.* (2010)
20 (a)	265 bp	326 bp	368 bp	2	1	3	1	20	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
20 (b)	265 bp	326 bp	368 bp	2	1	3	1	20	0	0	0	0	0	0	1	1	2	1	Kline *et al.* (2010)
20.2	267 bp	328 bp	370 bp	2	1	3	1	11	1	0	0	8	0	0	1	1	2	1	Rolf *et al.* (1997)
20.3	268 bp	329 bp	371 bp																
21	269 bp	330 bp	372 bp	2	1	3	1	21	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
21.1	270 bp	331 bp	373 bp																
21.2 (a)	271 bp	332 bp	374 bp	2	1	3	1	9	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
21.2 (b)	271 bp	332 bp	374 bp	2	1	3	1	11	1	0	0	9	0	0	1	1	2	1	Rolf *et al.* (1997)
21.2 (c)	271 bp	332 bp	374 bp	2	1	3	1	7	0	7	0	11	0	0	1	1	2	1	Kline *et al.* (2010)
22 (a)	273 bp	334 bp	376 bp	2	1	3	1	22	0	0	0	0	0	0	1	0	3	1	Rolf *et al.* (1997)
22 (b)	273 bp	334 bp	376 bp	2	1	3	1	21	0	0	0	0	0	0	1	1	3	1	Kline *et al.* (2010)
22.2 (a)	275 bp	336 bp	378 bp	2	1	3	1	7	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
22.2 (b)	275 bp	336 bp	378 bp	2	1	3	1	8	0	5	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
22.2 (c)	275 bp	336 bp	378 bp	2	1	3	1	9	1	0	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
22.2 (d)	275 bp	336 bp	378 bp	2	1	3	1	10	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
22.2 (e)	275 bp	336 bp	378 bp	2	1	3	1	11	1	0	0	10	0	0	1	1	2	1	Rolf *et al.* (1997)
22.2 (f)	275 bp	336 bp	378 bp	2	1	3	1	12	1	0	0	9	0	0	1	1	2	1	Rolf *et al.* (1997)
22.3	276 bp	337 bp	379 bp																Poetsch *et al.* (2010)
23	277 bp	338 bp	380 bp																Lászik *et al.* (2001)
23.2 (a)	279 bp	340 bp	382 bp	2	1	3	1	7	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (b)	279 bp	340 bp	382 bp	2	1	3	1	8	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (c)	279 bp	340 bp	382 bp	2	1	3	1	9	1	0	0	13	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (d)	279 bp	340 bp	382 bp	2	1	3	1	10	0	3	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (e)	279 bp	340 bp	382 bp	2	1	3	1	10	1	0	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (f)	279 bp	340 bp	382 bp	2	1	3	1	11	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
23.2 (g)	279 bp	340 bp	382 bp	2	1	3	1	12	1	0	0	10	0	0	1	1	2	1	Rolf *et al.* (1997)
24	281 bp	342 bp	384 bp																Lászik *et al.* (2001)
24.2 (a)	283 bp	344 bp	386 bp	2	1	3	1	5	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (b)	283 bp	344 bp	386 bp	2	1	3	1	7	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (c)	283 bp	344 bp	386 bp	2	1	3	1	8	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (d)	283 bp	344 bp	386 bp	2	1	3	1	10	1	0	0	13	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (e)	283 bp	344 bp	386 bp	2	1	3	1	11	1	0	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (f)	283 bp	344 bp	386 bp	2	1	3	1	12	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
24.2 (g)	283 bp	344 bp	386 bp	2	1	3	1	6	1	0	0	16	0	0	1	1	3	1	U134C-->T -- Kline *et al.* (2010)
25	285 bp	346 bp	388 bp																Lászik *et al.* (2001)
25.2 (a)	287 bp	348 bp	390 bp	2	1	3	1	9	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (b)	287 bp	348 bp	390 bp	2	1	3	1	10	0	0	1	14	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (c)	287 bp	348 bp	390 bp	2	1	3	1	10	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (d)	287 bp	348 bp	390 bp	2	1	3	1	11	1	0	0	13	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (e)	287 bp	348 bp	390 bp	2	1	3	1	12	1	0	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (f)	287 bp	348 bp	390 bp	2	1	3	1	14	1	0	0	10	0	0	1	1	2	1	Rolf *et al.* (1997)
25.2 (g)	287 bp	348 bp	390 bp	2	1	3	1	9	1	0	0	15	0	0	1	1	2	1	D75C-->T -- Kline *et al.* (2010)
25.2 (h)	287 bp	348 bp	390 bp	2	1	3	1	6	1	0	0	17	0	0	1	2	2	1	U134C-->T -- Kline *et al.* (2010)
25.3	288 bp	349 bp	391 bp																Berti *et al.* (2010)
26	289 bp	350 bp	392 bp																Lászik *et al.* (2001)
26.2 (a)	291 bp	352 bp	394 bp	2	1	3	1	8	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (b)	291 bp	352 bp	394 bp	2	1	3	1	9	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (c)	291 bp	352 bp	394 bp	2	1	3	1	10	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (d)	291 bp	352 bp	394 bp	2	1	3	1	11	0	0	1	14	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (e)	291 bp	352 bp	394 bp	2	1	3	1	11	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (f)	291 bp	352 bp	394 bp	2	1	3	1	14	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
26.2 (g)	291 bp	352 bp	394 bp	2	1	3	1	6	1	0	0	18	0	0	1	1	3	1	U134C-->T -- Kline *et al.* (2010)
27	293 bp	354 bp	396 bp																Lászik *et al.* (2001)
27.2 (a)	295 bp	356 bp	398 bp	2	1	3	1	8	0	0	1	18	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (b)	295 bp	356 bp	398 bp	2	1	3	1	8	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (c)	295 bp	356 bp	398 bp	2	1	3	1	9	0	0	1	17	0	0	1	3	0	1	Rolf *et al.* (1997)
27.2 (d)	295 bp	356 bp	398 bp	2	1	3	1	10	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (e)	295 bp	356 bp	398 bp	2	1	3	1	11	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (f)	295 bp	356 bp	398 bp	2	1	3	1	12	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (g)	295 bp	356 bp	398 bp	2	1	3	1	12	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (h)	295 bp	356 bp	398 bp	2	1	3	1	13	0	0	1	13	0	0	1	3	0	1	Rolf *et al.* (1997)
27.2 (i)	295 bp	356 bp	398 bp	2	1	3	1	13	1	0	0	13	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (j)	295 bp	356 bp	398 bp	2	1	3	1	15	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
27.2 (h)	295 bp	356 bp	398 bp	2	1	3	1	7	0	9	0	15	0	0	1	1	3	1	U134C-->T -- Kline *et al.* (2010)
27.3	296 bp	357 bp	399 bp																Hill *et al.* (2010)
28	297 bp	358 bp	400 bp	2	1	0	0	14	1	0	0	16	0	0	1	1	2	1	Dauber *et al.* (2009)
28.2 (a)	299 bp	360 bp	402 bp	2	1	3	1	8	1	0	0	19	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (b)	299 bp	360 bp	402 bp	2	1	3	1	9	0	0	1	18	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (c)	299 bp	360 bp	402 bp	2	1	3	1	9	0	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (d)	299 bp	360 bp	402 bp	2	1	3	1	9	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (e)	299 bp	360 bp	402 bp	2	1	3	1	10	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (f)	299 bp	360 bp	402 bp	2	1	3	1	11	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (g)	299 bp	360 bp	402 bp	2	1	3	1	12	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (h)	299 bp	360 bp	402 bp	2	1	3	1	13	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (i)	299 bp	360 bp	402 bp	2	1	3	1	14	1	0	0	13	0	0	1	1	2	1	Rolf *et al.* (1997)
28.2 (j)	299 bp	360 bp	402 bp	2	1	3	1	14	1	0	0	13	0	0	1	3	0	1	Rolf *et al.* (1997)
28.2 (k)	299 bp	360 bp	402 bp	2	1	3	1	16	1	0	0	11	0	0	1	1	2	1	Rolf *et al.* (1997)
28.3	300 bp	361 bp	403 bp	2	1	3	1	10	1	0	0	12	+A	4	1	1	2	1	Dauber *et al.* (2009)
29	301 bp	362 bp	404 bp	2	1	0	0	15	1	0	0	16	0	0	1	1	2	1	Dauber *et al.* (2009)
29.2 (a)	303 bp	364 bp	406 bp	2	1	3	1	8	1	0	0	20	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (b)	303 bp	364 bp	406 bp	2	1	3	1	9	0	0	1	19	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (c)	303 bp	364 bp	406 bp	2	1	3	1	9	1	0	0	19	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (d)	303 bp	364 bp	406 bp	1	1	3	1	10	1	0	0	19	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (e)	303 bp	364 bp	406 bp	2	1	3	1	11	0	5	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (f)	303 bp	364 bp	406 bp	1	1	3	1	11	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (g)	303 bp	364 bp	406 bp	2	1	3	1	11	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (h)	303 bp	364 bp	406 bp	2	1	3	1	12	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (i)	303 bp	364 bp	406 bp	2	1	3	1	13	0	0	1	15	0	0	1	3	0	1	Rolf *et al.* (1997)
29.2 (j)	303 bp	364 bp	406 bp	2	1	3	1	13	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (k)	303 bp	364 bp	406 bp	2	1	3	1	14	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (l)	303 bp	364 bp	406 bp	2	1	3	1	16	1	0	0	12	0	0	1	1	2	1	Rolf *et al.* (1997)
29.2 (m)	303 bp	364 bp	406 bp	2	1	3	1	11	1	0	0	17	0	0	1	1	2	1	D41-TTG-deletion -- Kline *et al.* (2010)
29.3	304 bp	365 bp	407 bp																Hill *et al.* (2010)
30	305 bp	366 bp	408 bp																Lászik *et al.* (2001)
30.2 (a)	307 bp	368 bp	410 bp	2	1	3	1	11	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
30.2 (b)	307 bp	368 bp	410 bp	2	1	3	1	12	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
30.2 (c)	307 bp	368 bp	410 bp	1	1	3	1	12	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
30.2 (d)	307 bp	368 bp	410 bp	2	1	3	1	13	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
30.2 (e)	307 bp	368 bp	410 bp	2	1	3	1	14	1	0	0	15	0	0	1	1	2	1	Rolf *et al.* (1997)
30.2 (f)	307 bp	368 bp	410 bp	2	1	3	1	15	1	0	0	14	0	0	1	1	2	1	Rolf *et al.* (1997)
31	309 bp	370 bp	412 bp																Lászik *et al.* (2001)
31.2 (a)	311 bp	372 bp	414 bp	1	1	3	1	9	1	0	0	22	0	0	1	1	2	1	Rolf *et al.* (1997)
31.2 (b)	311 bp	372 bp	414 bp	1	1	3	1	10	1	0	0	21	0	0	1	1	2	1	Rolf *et al.* (1997)
31.2 (c)	311 bp	372 bp	414 bp	2	1	3	1	12	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
31.2 (d)	311 bp	372 bp	414 bp	2	1	3	1	13	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
31.2 (e)	311 bp	372 bp	414 bp	2	1	3	1	14	1	0	0	16	0	0	1	1	2	1	Rolf *et al.* (1997)
32	313 bp	374 bp	416 bp																Lászik *et al.* (2001)
32.1	314 bp	375 bp	417 bp																
32.2 (a)	315 bp	376 bp	418 bp	2	1	3	1	13	1	0	0	18	0	0	1	1	2	1	Rolf *et al.* (1997)
32.2 (b)	315 bp	376 bp	418 bp	2	1	3	1	14	1	0	0	17	0	0	1	1	2	1	Rolf *et al.* (1997)
33 (a)	317 bp	378 bp	420 bp	2	1	2	1	10	1	0	0	12	1	9	1	1	2	1	Rolf *et al.* (1997)
33 (b)	317 bp	378 bp	420 bp	2	1	3	1	10	1	0	0	11	1	9	1	1	2	1	Rolf *et al.* (1997)
33.2 (a)	319 bp	380 bp	422 bp	1	1	3	1	10	1	0	0	23	0	0	1	1	2	1	Rolf *et al.* (1997)
33.2 (b)	319 bp	380 bp	422 bp	2	1	3	1	12	1	0	0	20	0	0	1	1	2	1	Dauber *et al.* (2004)
34	321 bp	382 bp	424 bp	2	1	3	1	9	1	0	0	13	1	9	1	1	2	1	Rolf *et al.* (1997)
34.2	323 bp	384 bp	426 bp	2	1	3	1	13	1	0	0	20	0	0	1	1	2	1	Dauber *et al.* (2004)
35	325 bp	386 bp	428 bp																PP-ESI ladder
35.2	327 bp	388 bp	430 bp	1	1	3	1	13	1	0	0	22	0	0	1	1	2	1	Rolf *et al.* (1997)
36 (a)	329 bp	390 bp	432 bp	2	1	3	1	10	1	0	0	14	1	9	1	1	2	1	Rolf *et al.* (1997)
36 (b)	329 bp	390 bp	432 bp	2	1	3	1	12	1	0	0	10	1	11	1	1	2	1	Dauber *et al.* (2009)
36.2	331 bp	392 bp	434 bp																Lászik *et al.* (2001)
37	333 bp	394 bp	436 bp	2	1	3	1	9	1	0	0	16	1	9	1	1	2	1	Rolf *et al.* (1997)
38	337 bp	398 bp	440 bp																
39	341 bp	402 bp	444 bp																PP-ESI ladder
39.2	343 bp	404 bp	446 bp																Lászik *et al.* (2001)
41	349 bp	410 bp	452 bp																
42	353 bp	414 bp	456 bp																PP-ESI ladder
44	361 bp	422 bp	464 bp																Delghandi et al. (2001)
49	381 bp	442 bp	484 bp	2	1	3	1	14	1	0	0	16	1	16	1	1	2	1	Klein *et al.* (2003)

Poster available for download from STRBase: http://www.cstl.nist.gov/biotech/strbase/pub_pres/Promega2010poster.pdf