

Prediction Quality of Hispanic Ancestry

Aug 01, 2012

Table 1: The sensitivity (SEN), specificity (SPE), positive predictive value (PPV) and negative predictive value (NPV) calculated from validation samples for each four-digit HLA allele without call threshold, when Study Data of Hispanic ancestry were divided to training and validation parts with equal sizes. The SNP markers in the intersect of Illumina platforms were used.

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
<i>HLA-A: Overall accuracy: 93.4%</i>												
1	01:01	22	0.0683	17	0.0620	100.0	100.0	100.0	100.0	100.0	100.0	–
2	01:02	1	0.0031	–	–	–	–	–	–	–	–	–
3	02:01	78	0.2422	75	0.2737	100.0	96.7	98.7	96.0	90.2	99.5	02:11 (100)
4	02:02	1	0.0031	–	–	–	–	–	–	–	–	–
5	02:05	2	0.0062	2	0.0073	100.0	99.6	50.0	100.0	100.0	99.6	–
6	02:06	4	0.0124	5	0.0182	100.0	99.6	80.0	100.0	100.0	99.6	02:01 (100)
7	02:07	1	0.0031	–	–	–	–	–	–	–	–	–
8	02:11	8	0.0248	4	0.0146	100.0	98.5	25.0	99.6	50.0	98.9	02:01 (100)
9	02:13	1	0.0031	–	–	–	–	–	–	–	–	–
10	02:22	4	0.0124	4	0.0146	100.0	98.5	0.0	100.0	–	98.5	02:01 (100)
11	02:64	2	0.0062	–	–	–	–	–	–	–	–	–
12	02:90	1	0.0031	–	–	–	–	–	–	–	–	–
13	03:01	21	0.0652	15	0.0547	100.0	100.0	100.0	100.0	100.0	100.0	–
14	11:01	14	0.0435	12	0.0438	100.0	100.0	100.0	100.0	100.0	100.0	–
15	23:01	13	0.0404	9	0.0328	100.0	100.0	100.0	100.0	100.0	100.0	–
16	24:02	33	0.1025	26	0.0949	100.0	99.6	100.0	99.6	96.3	100.0	–
17	24:03	2	0.0062	1	0.0036	100.0	100.0	100.0	100.0	100.0	100.0	–
18	24:25	1	0.0031	–	–	–	–	–	–	–	–	–
19	24:53	1	0.0031	–	–	–	–	–	–	–	–	–
20	25:01	2	0.0062	2	0.0073	100.0	99.3	0.0	100.0	–	99.3	26:01 (100)
21	26:01	13	0.0404	13	0.0474	100.0	99.3	100.0	99.2	86.7	100.0	–
22	26:08	1	0.0031	–	–	–	–	–	–	–	–	–
23	29:01	1	0.0031	1	0.0036	100.0	100.0	100.0	100.0	100.0	100.0	–
24	29:02	17	0.0528	14	0.0511	100.0	100.0	100.0	100.0	100.0	100.0	–
25	30:01	6	0.0186	4	0.0146	100.0	100.0	100.0	100.0	100.0	100.0	–
26	30:02	5	0.0155	5	0.0182	100.0	100.0	100.0	100.0	100.0	100.0	–
27	30:04	2	0.0062	2	0.0073	100.0	100.0	100.0	100.0	100.0	100.0	–

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
28	30:10	1	0.0031	–	–	–	–	–	–	–	–	–
29	31:01	20	0.0621	24	0.0876	100.0	100.0	100.0	100.0	100.0	100.0	–
30	32:01	6	0.0186	5	0.0182	100.0	100.0	100.0	100.0	100.0	100.0	–
31	33:01	4	0.0124	4	0.0146	100.0	100.0	100.0	100.0	100.0	100.0	–
32	33:03	1	0.0031	–	–	–	–	–	–	–	–	–
33	36:01	1	0.0031	–	–	–	–	–	–	–	–	–
34	68:01	18	0.0559	20	0.0730	100.0	98.2	90.0	98.8	85.7	99.2	24:02 (50)
35	68:02	4	0.0124	3	0.0109	100.0	100.0	100.0	100.0	100.0	100.0	–
36	68:03	2	0.0062	2	0.0073	100.0	99.3	0.0	100.0	–	99.3	68:01 (50)
37	68:05	1	0.0031	1	0.0036	100.0	99.6	0.0	100.0	–	99.6	68:01 (100)
38	68:17	4	0.0124	4	0.0146	100.0	98.9	75.0	99.3	60.0	99.6	68:01 (100)
39	68:23	1	0.0031	–	–	–	–	–	–	–	–	–
40	74:01	1	0.0031	–	–	–	–	–	–	–	–	–
41	92:36	1	0.0031	–	–	–	–	–	–	–	–	–
<i>HLA-B: Overall accuracy: 75.0%</i>												
1	07:02	14	0.0294	16	0.0417	100.0	99.7	93.8	100.0	100.0	99.7	07:05 (100)
2	07:05	3	0.0063	2	0.0052	100.0	99.7	100.0	99.7	66.7	100.0	–
3	08:01	17	0.0357	12	0.0312	100.0	100.0	100.0	100.0	100.0	100.0	–
4	13:02	5	0.0105	10	0.0260	100.0	99.7	90.0	100.0	100.0	99.7	57:01 (100)
5	14:01	4	0.0084	3	0.0078	100.0	100.0	100.0	100.0	100.0	100.0	–
6	14:02	7	0.0147	9	0.0234	100.0	99.7	88.9	100.0	100.0	99.7	27:05 (100)
7	15:01	14	0.0294	9	0.0234	100.0	97.9	88.9	98.1	52.2	99.7	35:43 (100)
8	15:03	3	0.0063	2	0.0052	100.0	99.5	50.0	99.7	66.7	99.7	15:01 (100)
9	15:04	12	0.0252	14	0.0365	100.0	99.7	92.9	100.0	100.0	99.7	15:01 (100)
10	15:05	2	0.0042	2	0.0052	100.0	99.5	0.0	100.0	–	99.5	15:01 (100)
11	15:07	1	0.0021	–	–	–	–	–	–	–	–	–
12	15:09	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	15:01 (50)
13	15:10	2	0.0042	1	0.0026	100.0	100.0	100.0	100.0	100.0	100.0	–
14	15:15	1	0.0021	–	–	–	–	–	–	–	–	–
15	15:16	2	0.0042	2	0.0052	100.0	99.7	50.0	100.0	100.0	99.7	15:01 (100)
16	15:17	2	0.0042	1	0.0026	100.0	100.0	100.0	100.0	100.0	100.0	–
17	15:20	1	0.0021	–	–	–	–	–	–	–	–	–
18	18:01	20	0.0420	15	0.0391	100.0	100.0	100.0	100.0	100.0	100.0	–
19	27:02	1	0.0021	–	–	–	–	–	–	–	–	–
20	27:03	1	0.0021	–	–	–	–	–	–	–	–	–
21	27:05	5	0.0105	3	0.0078	100.0	99.5	100.0	99.5	66.7	100.0	–
22	35:01	28	0.0588	21	0.0547	100.0	91.9	95.2	91.7	39.2	99.7	35:19 (50)
23	35:02	5	0.0105	4	0.0104	100.0	99.5	100.0	99.5	80.0	100.0	–
24	35:03	3	0.0063	5	0.0130	100.0	99.2	40.0	100.0	100.0	99.2	51:01 (67)
25	35:04	3	0.0063	3	0.0078	100.0	99.2	0.0	100.0	–	99.2	35:01 (67)
26	35:05	11	0.0231	11	0.0286	100.0	97.4	27.3	99.5	60.0	97.9	35:01 (100)
27	35:08	2	0.0042	2	0.0052	100.0	99.5	0.0	100.0	–	99.5	35:02 (50)
28	35:09	6	0.0126	8	0.0208	100.0	97.9	0.0	100.0	–	97.9	35:01 (100)
29	35:10	2	0.0042	1	0.0026	100.0	99.5	100.0	99.5	33.3	100.0	–
30	35:12	7	0.0147	5	0.0130	100.0	99.0	20.0	100.0	100.0	99.0	35:01 (100)
31	35:16	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	35:01 (100)

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
32	35:17	2	0.0042	2	0.0052	100.0	99.5	0.0	100.0	–	99.5	35:01 (100)
33	35:19	4	0.0084	2	0.0052	100.0	99.7	100.0	99.7	66.7	100.0	–
34	35:20	3	0.0063	2	0.0052	100.0	99.5	0.0	100.0	–	99.5	35:01 (100)
35	35:22	2	0.0042	2	0.0052	100.0	99.5	0.0	100.0	–	99.5	35:05 (100)
36	35:43	8	0.0168	5	0.0130	100.0	99.0	60.0	99.5	60.0	99.5	35:01 (50)
37	37:01	2	0.0042	3	0.0078	100.0	100.0	100.0	100.0	100.0	100.0	–
38	38:01	9	0.0189	7	0.0182	100.0	99.5	85.7	99.7	85.7	99.7	57:01 (100)
39	39:01	5	0.0105	5	0.0130	100.0	98.4	0.0	99.7	0.0	98.7	39:09 (53)
40	39:02	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	39:09 (100)
41	39:03	3	0.0063	3	0.0078	100.0	99.7	66.7	100.0	100.0	99.7	39:05 (100)
42	39:05	9	0.0189	11	0.0286	100.0	97.7	45.5	99.2	62.5	98.4	39:09 (100)
43	39:06	7	0.0147	3	0.0078	100.0	99.5	33.3	100.0	100.0	99.5	39:01 (50)
44	39:07	1	0.0021	–	–	–	–	–	–	–	–	–
45	39:09	11	0.0231	6	0.0156	100.0	96.9	83.3	97.1	30.9	99.7	39:05 (100)
46	39:10	1	0.0021	–	–	–	–	–	–	–	–	–
47	39:12	1	0.0021	–	–	–	–	–	–	–	–	–
48	39:13	1	0.0021	–	–	–	–	–	–	–	–	–
49	39:14	1	0.0021	–	–	–	–	–	–	–	–	–
50	40:01	9	0.0189	5	0.0130	100.0	99.5	100.0	99.5	71.4	100.0	–
51	40:02	14	0.0294	19	0.0495	100.0	95.6	63.2	97.3	53.3	98.1	40:04 (86)
52	40:04	11	0.0231	10	0.0260	100.0	96.1	20.0	98.1	21.1	97.9	40:02 (88)
53	40:05	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	40:02 (100)
54	40:06	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	35:19 (50)
55	40:08	2	0.0042	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	40:04 (100)
56	40:64	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	40:02 (100)
57	41:01	3	0.0063	2	0.0052	100.0	99.7	50.0	100.0	100.0	99.7	42:01 (100)
58	41:02	4	0.0084	2	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–
59	42:01	2	0.0042	1	0.0026	100.0	99.5	100.0	99.5	33.3	100.0	–
60	42:02	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	42:01 (100)
61	44:02	10	0.0210	12	0.0312	100.0	99.5	83.3	100.0	100.0	99.5	40:01 (100)
62	44:03	36	0.0756	22	0.0573	100.0	99.5	95.5	99.7	95.5	99.7	15:03 (50)
63	44:04	1	0.0021	–	–	–	–	–	–	–	–	–
64	45:01	4	0.0084	2	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–
65	46:01	1	0.0021	–	–	–	–	–	–	–	–	–
66	47:01	1	0.0021	–	–	–	–	–	–	–	–	–
67	48:01	19	0.0399	16	0.0417	100.0	100.0	100.0	100.0	100.0	100.0	–
68	48:02	1	0.0021	–	–	–	–	–	–	–	–	–
69	49:01	11	0.0231	11	0.0286	100.0	99.7	90.9	100.0	100.0	99.7	44:03 (100)
70	50:01	5	0.0105	5	0.0130	100.0	100.0	100.0	100.0	100.0	100.0	–
71	50:02	1	0.0021	–	–	–	–	–	–	–	–	–
72	51:01	37	0.0777	27	0.0703	100.0	98.4	96.3	98.6	85.2	99.7	15:01 (50)
73	51:02	1	0.0021	–	–	–	–	–	–	–	–	–
74	51:08	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	35:01 (50)
75	51:13	1	0.0021	–	–	–	–	–	–	–	–	–
76	52:01	11	0.0231	11	0.0286	100.0	99.7	90.9	100.0	100.0	99.7	35:01 (50)
77	53:01	4	0.0084	2	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
78	55:01	4	0.0084	2	0.0052	100.0	99.7	50.0	100.0	100.0	99.7	51:01 (100)
79	56:01	2	0.0042	2	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–
80	57:01	8	0.0168	4	0.0104	100.0	99.2	100.0	99.2	57.1	100.0	–
81	57:02	1	0.0021	–	–	–	–	–	–	–	–	–
82	57:03	3	0.0063	1	0.0026	100.0	100.0	100.0	100.0	100.0	100.0	–
83	58:01	5	0.0105	6	0.0156	100.0	99.7	83.3	100.0	100.0	99.7	35:01 (50)
84	58:02	1	0.0021	1	0.0026	100.0	99.7	0.0	100.0	–	99.7	57:01 (100)
85	81:01	1	0.0021	–	–	–	–	–	–	–	–	–
<i>HLA-C: Overall accuracy: 96.2%</i>												
1	01:02	24	0.0764	25	0.0874	100.0	99.7	96.0	100.0	100.0	99.6	08:01 (100)
2	02:02	7	0.0223	6	0.0210	100.0	100.0	100.0	100.0	100.0	100.0	–
3	02:10	1	0.0032	1	0.0035	100.0	100.0	100.0	100.0	100.0	100.0	–
4	03:02	1	0.0032	–	–	–	–	–	–	–	–	–
5	03:03	10	0.0318	5	0.0175	100.0	99.3	100.0	99.3	71.4	100.0	–
6	03:04	25	0.0796	26	0.0909	100.0	97.9	92.3	98.5	85.7	99.2	03:03 (100)
7	03:05	3	0.0096	3	0.0105	100.0	99.0	0.0	100.0	–	99.0	03:04 (100)
8	03:06	1	0.0032	1	0.0035	100.0	99.7	0.0	100.0	–	99.7	03:04 (100)
9	03:07	1	0.0032	–	–	–	–	–	–	–	–	–
10	04:01	52	0.1656	49	0.1713	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:01	13	0.0414	12	0.0420	100.0	99.3	83.3	100.0	100.0	99.3	15:02 (100)
12	06:02	19	0.0605	17	0.0594	100.0	100.0	100.0	100.0	100.0	100.0	–
13	07:01	31	0.0987	29	0.1014	100.0	100.0	100.0	100.0	100.0	100.0	–
14	07:02	34	0.1083	30	0.1049	100.0	100.0	100.0	100.0	100.0	100.0	–
15	07:04	2	0.0064	1	0.0035	100.0	100.0	100.0	100.0	100.0	100.0	–
16	08:01	5	0.0159	5	0.0175	100.0	99.7	100.0	99.6	83.3	100.0	–
17	08:02	8	0.0255	8	0.0280	100.0	100.0	100.0	100.0	100.0	100.0	–
18	08:03	9	0.0287	7	0.0245	100.0	100.0	100.0	100.0	100.0	100.0	–
19	08:04	1	0.0032	–	–	–	–	–	–	–	–	–
20	08:10	1	0.0032	–	–	–	–	–	–	–	–	–
21	08:11	1	0.0032	–	–	–	–	–	–	–	–	–
22	12:02	5	0.0159	5	0.0175	100.0	100.0	100.0	100.0	100.0	100.0	–
23	12:03	16	0.0510	12	0.0420	100.0	100.0	100.0	100.0	100.0	100.0	–
24	14:02	6	0.0191	6	0.0210	100.0	100.0	100.0	100.0	100.0	100.0	–
25	15:02	14	0.0446	15	0.0524	100.0	98.6	93.3	98.9	82.4	99.6	18:01 (100)
26	15:05	1	0.0032	1	0.0035	100.0	99.7	0.0	100.0	–	99.7	15:02 (100)
27	16:01	14	0.0446	14	0.0490	100.0	100.0	100.0	100.0	100.0	100.0	–
28	16:02	4	0.0127	3	0.0105	100.0	100.0	100.0	100.0	100.0	100.0	–
29	16:04	1	0.0032	–	–	–	–	–	–	–	–	–
30	17:01	3	0.0096	4	0.0140	100.0	100.0	100.0	100.0	100.0	100.0	–
31	18:01	1	0.0032	1	0.0035	100.0	99.7	100.0	99.6	50.0	100.0	–
<i>HLA-DRB1: Overall accuracy: 82.0%</i>												
1	01:01	12	0.0269	12	0.0305	100.0	99.2	83.3	99.7	90.9	99.5	01:03 (100)
2	01:02	8	0.0179	9	0.0228	100.0	100.0	100.0	100.0	100.0	100.0	–
3	01:03	3	0.0067	3	0.0076	100.0	99.5	100.0	99.5	60.0	100.0	–
4	03:01	28	0.0628	27	0.0685	100.0	99.7	100.0	99.7	96.4	100.0	–
5	03:02	1	0.0022	1	0.0025	100.0	99.7	0.0	100.0	–	99.7	08:02 (100)

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
6	04:01	8	0.0179	6	0.0152	100.0	99.0	66.7	99.5	66.7	99.5	04:07 (50)
7	04:02	5	0.0112	3	0.0076	100.0	99.7	100.0	99.7	75.0	100.0	–
8	04:03	9	0.0202	6	0.0152	100.0	98.5	0.0	100.0	–	98.5	04:07 (67)
9	04:04	24	0.0538	16	0.0406	100.0	97.2	43.8	99.5	77.8	97.7	04:07 (100)
10	04:05	4	0.0090	4	0.0102	100.0	99.5	50.0	100.0	100.0	99.5	04:07 (50)
11	04:06	2	0.0045	2	0.0051	100.0	100.0	100.0	100.0	100.0	100.0	–
12	04:07	41	0.0919	31	0.0787	100.0	94.4	93.5	94.5	58.6	99.4	08:02 (50)
13	04:10	4	0.0090	4	0.0102	100.0	99.7	75.0	100.0	100.0	99.7	04:04 (100)
14	04:11	4	0.0090	4	0.0102	100.0	99.0	0.0	100.0	–	99.0	04:07 (100)
15	07:01	46	0.1031	42	0.1066	100.0	99.2	100.0	99.1	94.4	100.0	–
16	08:01	5	0.0112	5	0.0127	100.0	99.5	60.0	100.0	100.0	99.5	08:02 (100)
17	08:02	37	0.0830	32	0.0812	100.0	98.0	100.0	97.8	81.0	100.0	–
18	08:04	4	0.0090	3	0.0076	100.0	99.2	33.3	99.7	50.0	99.5	11:04 (100)
19	08:06	1	0.0022	–	–	–	–	–	–	–	–	–
20	08:07	3	0.0067	3	0.0076	100.0	99.2	0.0	100.0	–	99.2	08:02 (100)
21	08:11	1	0.0022	–	–	–	–	–	–	–	–	–
22	08:13	1	0.0022	–	–	–	–	–	–	–	–	–
23	09:01	26	0.0583	24	0.0609	100.0	99.0	100.0	98.9	85.7	100.0	–
24	09:06	3	0.0067	3	0.0076	100.0	99.2	0.0	100.0	–	99.2	09:01 (100)
25	10:01	4	0.0090	3	0.0076	100.0	100.0	100.0	100.0	100.0	100.0	–
26	11:01	17	0.0381	15	0.0381	100.0	96.7	66.7	97.9	55.6	98.7	16:02 (60)
27	11:02	2	0.0045	1	0.0025	100.0	100.0	100.0	100.0	100.0	100.0	–
28	11:03	3	0.0067	2	0.0051	100.0	99.5	0.0	100.0	–	99.5	03:01 (50)
29	11:04	17	0.0381	17	0.0431	100.0	96.7	47.1	98.9	66.7	97.6	11:01 (78)
30	11:58	1	0.0022	–	–	–	–	–	–	–	–	–
31	12:01	6	0.0135	6	0.0152	100.0	99.7	83.3	100.0	100.0	99.7	14:02 (100)
32	13:01	14	0.0314	13	0.0330	100.0	99.5	92.3	99.7	92.3	99.7	15:01 (50)
33	13:02	16	0.0359	12	0.0305	100.0	99.7	91.7	100.0	100.0	99.7	01:01 (100)
34	13:03	6	0.0135	4	0.0102	100.0	99.5	50.0	100.0	100.0	99.5	07:01 (100)
35	13:04	1	0.0022	–	–	–	–	–	–	–	–	–
36	13:05	2	0.0045	1	0.0025	100.0	99.7	0.0	100.0	–	99.7	11:04 (100)
37	14:01	6	0.0135	5	0.0127	100.0	100.0	100.0	100.0	100.0	100.0	–
38	14:02	22	0.0493	20	0.0508	100.0	97.7	75.0	98.9	76.9	98.7	14:06 (80)
39	14:06	9	0.0202	11	0.0279	100.0	98.2	72.7	99.0	66.7	99.2	14:02 (100)
40	15:01	20	0.0448	22	0.0558	100.0	99.7	100.0	99.7	97.8	100.0	–
41	15:02	6	0.0135	8	0.0203	100.0	100.0	100.0	100.0	100.0	100.0	–
42	15:03	2	0.0045	1	0.0025	100.0	100.0	100.0	100.0	100.0	100.0	–
43	16:01	3	0.0067	4	0.0102	100.0	100.0	100.0	100.0	100.0	100.0	–
44	16:02	9	0.0202	9	0.0228	100.0	98.5	77.8	99.0	60.9	99.5	09:01 (50)
<i>HLA-DQA1: Overall accuracy: 93.8%</i>												
1	01:01	20	0.0719	20	0.0769	100.0	98.1	100.0	97.9	80.0	100.0	–
2	01:02	28	0.1007	30	0.1154	100.0	97.7	90.0	98.7	90.0	98.7	01:01 (100)
3	01:03	14	0.0504	13	0.0500	100.0	99.2	84.6	100.0	100.0	99.2	01:02 (100)
4	01:04	3	0.0108	3	0.0115	100.0	99.2	33.3	100.0	100.0	99.2	01:01 (50)
5	01:05	1	0.0036	1	0.0038	100.0	99.6	0.0	100.0	–	99.6	01:01 (100)
6	02:01	37	0.1331	31	0.1192	100.0	99.2	100.0	99.1	93.9	100.0	–

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Table 1 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
7	03:01	57	0.2050	47	0.1808	100.0	97.7	100.0	97.2	88.7	100.0	–
8	03:02	15	0.0540	15	0.0577	100.0	98.8	80.0	100.0	100.0	98.8	03:01 (100)
9	03:03	11	0.0396	11	0.0423	100.0	98.5	63.6	100.0	100.0	98.4	03:01 (75)
10	04:01	33	0.1187	26	0.1000	100.0	100.0	100.0	100.0	100.0	100.0	–
11	04:02	1	0.0036	–	–	–	–	–	–	–	–	–
12	05:01	21	0.0755	19	0.0731	100.0	100.0	100.0	100.0	100.0	100.0	–
13	05:03	11	0.0396	10	0.0385	100.0	100.0	100.0	100.0	100.0	100.0	–
14	05:05	26	0.0935	34	0.1308	100.0	99.6	97.1	100.0	100.0	99.6	02:01 (100)
<i>HLA-DQB1 Overall accuracy: 95.7%</i>												
1	02:01	23	0.0710	23	0.0767	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:02	36	0.1111	29	0.0967	100.0	99.7	96.6	100.0	100.0	99.6	03:01 (100)
3	02:03	1	0.0031	–	–	–	–	–	–	–	–	–
4	03:01	62	0.1914	64	0.2133	100.0	97.3	98.4	97.0	90.0	99.6	03:03 (100)
5	03:02	62	0.1914	58	0.1933	100.0	99.3	98.3	99.6	98.3	99.6	03:01 (100)
6	03:03	20	0.0617	21	0.0700	100.0	98.7	90.5	99.3	90.5	99.3	03:01 (50)
7	03:04	1	0.0031	–	–	–	–	–	–	–	–	–
8	03:19	2	0.0062	2	0.0067	100.0	99.3	0.0	100.0	–	99.3	03:01 (100)
9	04:02	39	0.1204	30	0.1000	100.0	99.7	96.7	100.0	100.0	99.6	03:01 (100)
10	05:01	27	0.0833	27	0.0900	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:02	2	0.0062	2	0.0067	100.0	99.3	0.0	100.0	–	99.3	03:01 (50)
12	05:03	4	0.0123	5	0.0167	100.0	99.7	80.0	100.0	100.0	99.7	06:03 (100)
13	06:01	5	0.0154	4	0.0133	100.0	100.0	100.0	100.0	100.0	100.0	–
14	06:02	19	0.0586	17	0.0567	100.0	99.7	94.1	100.0	100.0	99.6	06:09 (100)
15	06:03	11	0.0340	9	0.0300	100.0	99.7	100.0	99.7	90.0	100.0	–
16	06:04	7	0.0216	6	0.0200	100.0	99.7	100.0	99.7	85.7	100.0	–
17	06:09	3	0.0093	3	0.0100	100.0	99.3	66.7	99.7	66.7	99.7	06:04 (100)
<i>HLA-DPB1: Overall accuracy: 93.1%</i>												
1	01:01	10	0.0360	10	0.0403	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:01	31	0.1115	30	0.1210	100.0	96.8	83.3	98.6	89.3	97.7	04:02 (60)
3	02:02	3	0.0108	3	0.0121	100.0	99.6	66.7	100.0	100.0	99.6	02:01 (100)
4	03:01	7	0.0252	8	0.0323	100.0	98.0	50.0	99.6	80.0	98.4	06:01 (50)
5	04:01	70	0.2518	71	0.2863	100.0	98.0	98.6	97.7	94.6	99.4	04:02 (100)
6	04:02	75	0.2698	64	0.2581	100.0	98.4	100.0	97.8	94.1	100.0	–
7	05:01	10	0.0360	9	0.0363	100.0	100.0	100.0	100.0	100.0	100.0	–
8	06:01	3	0.0108	2	0.0081	100.0	98.8	50.0	99.2	33.3	99.6	03:01 (100)
9	06:02	4	0.0144	3	0.0121	100.0	98.8	0.0	100.0	–	98.8	02:01 (67)
10	09:01	4	0.0144	2	0.0081	100.0	100.0	100.0	100.0	100.0	100.0	–
11	10:01	3	0.0108	1	0.0040	100.0	99.6	0.0	100.0	–	99.6	14:01 (100)
12	11:01	8	0.0288	8	0.0323	100.0	100.0	100.0	100.0	100.0	100.0	–
13	13:01	13	0.0468	9	0.0363	100.0	99.6	100.0	99.6	90.0	100.0	–
14	14:01	18	0.0647	17	0.0685	100.0	99.6	100.0	99.6	94.4	100.0	–
15	15:01	1	0.0036	–	–	–	–	–	–	–	–	–
16	16:01	1	0.0036	1	0.0040	100.0	100.0	100.0	100.0	100.0	100.0	–
17	17:01	5	0.0180	5	0.0202	100.0	100.0	100.0	100.0	100.0	100.0	–
18	18:01	1	0.0036	–	–	–	–	–	–	–	–	–
19	19:01	1	0.0036	–	–	–	–	–	–	–	–	–

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Table 1 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
20	20:01	1	0.0036	–	–	–	–	–	–	–	–	–
21	23:01	1	0.0036	–	–	–	–	–	–	–	–	–
22	24:01	1	0.0036	–	–	–	–	–	–	–	–	–
23	27:01	1	0.0036	1	0.0040	100.0	99.6	0.0	100.0	–	99.6	13:01 (100)
24	30:01	1	0.0036	–	–	–	–	–	–	–	–	–
25	89:01	1	0.0036	–	–	–	–	–	–	–	–	–
26	104:01	4	0.0144	4	0.0161	100.0	99.6	100.0	99.6	80.0	100.0	–

¹: CR – call rate; ACC – allele accuracy.

²: the most likely miscalled allele and the proportion of the most likely miscalled allele in all miscalled alleles.

Table 2: The sensitivity (SEN), specificity (SPE), positive predictive value (PPV) and negative predictive value (NPV) calculated from validation samples for each four-digit HLA allele with call threshold 0.5, when Study Data of Hispanic ancestry were divided to training and validation parts with equal sizes. The SNP markers in the intersect of Illumina platforms were used.

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
<i>HLA-A: Overall accuracy: 96.0%, Call rate: 82.5%</i>												
1	01:01	22	0.0683	17	0.0620	100.0	100.0	100.0	100.0	100.0	100.0	-
2	01:02	1	0.0031	-	-	-	-	-	-	-	-	-
3	02:01	78	0.2422	75	0.2737	84.0	98.2	100.0	97.5	94.0	100.0	-
4	02:02	1	0.0031	-	-	-	-	-	-	-	-	-
5	02:05	2	0.0062	2	0.0073	50.0	100.0	100.0	100.0	100.0	100.0	-
6	02:06	4	0.0124	5	0.0182	40.0	100.0	100.0	100.0	100.0	100.0	-
7	02:07	1	0.0031	-	-	-	-	-	-	-	-	-
8	02:11	8	0.0248	4	0.0146	50.0	99.1	0.0	100.0	-	99.3	02:01 (100)
9	02:13	1	0.0031	-	-	-	-	-	-	-	-	-
10	02:22	4	0.0124	4	0.0146	50.0	99.1	0.0	100.0	-	99.3	02:01 (100)
11	02:64	2	0.0062	-	-	-	-	-	-	-	-	-
12	02:90	1	0.0031	-	-	-	-	-	-	-	-	-
13	03:01	21	0.0652	15	0.0547	100.0	100.0	100.0	100.0	100.0	100.0	-
14	11:01	14	0.0435	12	0.0438	83.3	100.0	100.0	100.0	100.0	100.0	-
15	23:01	13	0.0404	9	0.0328	88.9	100.0	100.0	100.0	100.0	100.0	-
16	24:02	33	0.1025	26	0.0949	80.8	100.0	100.0	100.0	100.0	100.0	-
17	24:03	2	0.0062	1	0.0036	0.0	-	-	-	-	-	-
18	24:25	1	0.0031	-	-	-	-	-	-	-	-	-
19	24:53	1	0.0031	-	-	-	-	-	-	-	-	-
20	25:01	2	0.0062	2	0.0073	100.0	99.1	0.0	100.0	-	99.3	26:01 (100)
21	26:01	13	0.0404	13	0.0474	84.6	99.1	100.0	99.1	84.6	100.0	-
22	26:08	1	0.0031	-	-	-	-	-	-	-	-	-
23	29:01	1	0.0031	1	0.0036	100.0	100.0	100.0	100.0	100.0	100.0	-
24	29:02	17	0.0528	14	0.0511	100.0	100.0	100.0	100.0	100.0	100.0	-
25	30:01	6	0.0186	4	0.0146	75.0	100.0	100.0	100.0	100.0	100.0	-
26	30:02	5	0.0155	5	0.0182	60.0	100.0	100.0	100.0	100.0	100.0	-
27	30:04	2	0.0062	2	0.0073	100.0	100.0	100.0	100.0	100.0	100.0	-
28	30:10	1	0.0031	-	-	-	-	-	-	-	-	-
29	31:01	20	0.0621	24	0.0876	91.7	100.0	100.0	100.0	100.0	100.0	-
30	32:01	6	0.0186	5	0.0182	80.0	100.0	100.0	100.0	100.0	100.0	-
31	33:01	4	0.0124	4	0.0146	75.0	100.0	100.0	100.0	100.0	100.0	-
32	33:03	1	0.0031	-	-	-	-	-	-	-	-	-
33	36:01	1	0.0031	-	-	-	-	-	-	-	-	-
34	68:01	18	0.0559	20	0.0730	70.0	98.7	92.9	99.1	86.7	99.6	68:17 (100)
35	68:02	4	0.0124	3	0.0109	100.0	100.0	100.0	100.0	100.0	100.0	-
36	68:03	2	0.0062	2	0.0073	50.0	99.6	0.0	100.0	-	99.6	68:01 (100)
37	68:05	1	0.0031	1	0.0036	100.0	99.6	0.0	100.0	-	99.6	68:01 (100)
38	68:17	4	0.0124	4	0.0146	25.0	99.6	100.0	99.6	50.0	100.0	-
39	68:23	1	0.0031	-	-	-	-	-	-	-	-	-
40	74:01	1	0.0031	-	-	-	-	-	-	-	-	-

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Table 2 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
41	92:36	1	0.0031	–	–	–	–	–	–	–	–	–
<i>HLA-B: Overall accuracy: 93.8%, Call rate: 37.5%</i>												
1	07:02	14	0.0294	16	0.0417	68.8	100.0	100.0	100.0	100.0	100.0	–
2	07:05	3	0.0063	2	0.0052	0.0	–	–	–	–	–	–
3	08:01	17	0.0357	12	0.0312	91.7	100.0	100.0	100.0	100.0	100.0	–
4	13:02	5	0.0105	10	0.0260	40.0	100.0	100.0	100.0	100.0	100.0	–
5	14:01	4	0.0084	3	0.0078	66.7	100.0	100.0	100.0	100.0	100.0	–
6	14:02	7	0.0147	9	0.0234	44.4	100.0	100.0	100.0	100.0	100.0	–
7	15:01	14	0.0294	9	0.0234	33.3	98.6	66.7	99.3	66.7	99.7	35:43 (100)
8	15:03	3	0.0063	2	0.0052	0.0	–	–	–	–	–	–
9	15:04	12	0.0252	14	0.0365	35.7	100.0	100.0	100.0	100.0	100.0	–
10	15:05	2	0.0042	2	0.0052	50.0	99.3	0.0	100.0	–	99.7	15:01 (100)
11	15:07	1	0.0021	–	–	–	–	–	–	–	–	–
12	15:09	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
13	15:10	2	0.0042	1	0.0026	0.0	–	–	–	–	–	–
14	15:15	1	0.0021	–	–	–	–	–	–	–	–	–
15	15:16	2	0.0042	2	0.0052	0.0	–	–	–	–	–	–
16	15:17	2	0.0042	1	0.0026	0.0	–	–	–	–	–	–
17	15:20	1	0.0021	–	–	–	–	–	–	–	–	–
18	18:01	20	0.0420	15	0.0391	46.7	100.0	100.0	100.0	100.0	100.0	–
19	27:02	1	0.0021	–	–	–	–	–	–	–	–	–
20	27:03	1	0.0021	–	–	–	–	–	–	–	–	–
21	27:05	5	0.0105	3	0.0078	66.7	100.0	100.0	100.0	100.0	100.0	–
22	35:01	28	0.0588	21	0.0547	0.0	–	–	–	–	–	–
23	35:02	5	0.0105	4	0.0104	75.0	100.0	100.0	100.0	100.0	100.0	–
24	35:03	3	0.0063	5	0.0130	0.0	–	–	–	–	–	–
25	35:04	3	0.0063	3	0.0078	33.3	99.3	0.0	100.0	–	99.7	35:43 (100)
26	35:05	11	0.0231	11	0.0286	18.2	100.0	100.0	100.0	100.0	100.0	–
27	35:08	2	0.0042	2	0.0052	50.0	99.3	0.0	100.0	–	99.7	35:01 (50)
28	35:09	6	0.0126	8	0.0208	0.0	–	–	–	–	–	–
29	35:10	2	0.0042	1	0.0026	0.0	–	–	–	–	–	–
30	35:12	7	0.0147	5	0.0130	0.0	–	–	–	–	–	–
31	35:16	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
32	35:17	2	0.0042	2	0.0052	0.0	–	–	–	–	–	–
33	35:19	4	0.0084	2	0.0052	50.0	100.0	100.0	100.0	100.0	100.0	–
34	35:20	3	0.0063	2	0.0052	0.0	–	–	–	–	–	–
35	35:22	2	0.0042	2	0.0052	0.0	–	–	–	–	–	–
36	35:43	8	0.0168	5	0.0130	40.0	98.6	100.0	98.6	50.0	100.0	–
37	37:01	2	0.0042	3	0.0078	33.3	100.0	100.0	100.0	100.0	100.0	–
38	38:01	9	0.0189	7	0.0182	57.1	100.0	100.0	100.0	100.0	100.0	–
39	39:01	5	0.0105	5	0.0130	0.0	–	–	–	–	–	–
40	39:02	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
41	39:03	3	0.0063	3	0.0078	0.0	–	–	–	–	–	–
42	39:05	9	0.0189	11	0.0286	0.0	–	–	–	–	–	–
43	39:06	7	0.0147	3	0.0078	33.3	100.0	100.0	100.0	100.0	100.0	–
44	39:07	1	0.0021	–	–	–	–	–	–	–	–	–

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Table 2 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
45	39:09	11	0.0231	6	0.0156	50.0	100.0	100.0	100.0	100.0	100.0	–
46	39:10	1	0.0021	–	–	–	–	–	–	–	–	–
47	39:12	1	0.0021	–	–	–	–	–	–	–	–	–
48	39:13	1	0.0021	–	–	–	–	–	–	–	–	–
49	39:14	1	0.0021	–	–	–	–	–	–	–	–	–
50	40:01	9	0.0189	5	0.0130	20.0	99.3	100.0	99.3	50.0	100.0	–
51	40:02	14	0.0294	19	0.0495	10.5	97.9	0.0	99.3	0.0	99.5	40:04 (100)
52	40:04	11	0.0231	10	0.0260	10.0	97.9	0.0	98.6	0.0	99.7	40:02 (100)
53	40:05	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
54	40:06	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
55	40:08	2	0.0042	1	0.0026	0.0	–	–	–	–	–	–
56	40:64	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
57	41:01	3	0.0063	2	0.0052	50.0	100.0	100.0	100.0	100.0	100.0	–
58	41:02	4	0.0084	2	0.0052	0.0	–	–	–	–	–	–
59	42:01	2	0.0042	1	0.0026	100.0	100.0	100.0	100.0	100.0	100.0	–
60	42:02	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
61	44:02	10	0.0210	12	0.0312	50.0	99.3	83.3	100.0	100.0	99.7	40:01 (100)
62	44:03	36	0.0756	22	0.0573	77.3	100.0	100.0	100.0	100.0	100.0	–
63	44:04	1	0.0021	–	–	–	–	–	–	–	–	–
64	45:01	4	0.0084	2	0.0052	0.0	–	–	–	–	–	–
65	46:01	1	0.0021	–	–	–	–	–	–	–	–	–
66	47:01	1	0.0021	–	–	–	–	–	–	–	–	–
67	48:01	19	0.0399	16	0.0417	50.0	100.0	100.0	100.0	100.0	100.0	–
68	48:02	1	0.0021	–	–	–	–	–	–	–	–	–
69	49:01	11	0.0231	11	0.0286	54.5	100.0	100.0	100.0	100.0	100.0	–
70	50:01	5	0.0105	5	0.0130	60.0	100.0	100.0	100.0	100.0	100.0	–
71	50:02	1	0.0021	–	–	–	–	–	–	–	–	–
72	51:01	37	0.0777	27	0.0703	48.1	99.3	100.0	99.2	92.9	100.0	–
73	51:02	1	0.0021	–	–	–	–	–	–	–	–	–
74	51:08	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
75	51:13	1	0.0021	–	–	–	–	–	–	–	–	–
76	52:01	11	0.0231	11	0.0286	72.7	99.3	87.5	100.0	100.0	99.7	35:01 (50)
77	53:01	4	0.0084	2	0.0052	50.0	100.0	100.0	100.0	100.0	100.0	–
78	55:01	4	0.0084	2	0.0052	0.0	–	–	–	–	–	–
79	56:01	2	0.0042	2	0.0052	0.0	–	–	–	–	–	–
80	57:01	8	0.0168	4	0.0104	100.0	100.0	100.0	100.0	100.0	100.0	–
81	57:02	1	0.0021	–	–	–	–	–	–	–	–	–
82	57:03	3	0.0063	1	0.0026	0.0	–	–	–	–	–	–
83	58:01	5	0.0105	6	0.0156	50.0	100.0	100.0	100.0	100.0	100.0	–
84	58:02	1	0.0021	1	0.0026	0.0	–	–	–	–	–	–
85	81:01	1	0.0021	–	–	–	–	–	–	–	–	–
<i>HLA-C: Overall accuracy: 98.4%, Call rate: 87.4%</i>												
1	01:02	24	0.0764	25	0.0874	80.0	99.6	95.0	100.0	100.0	99.6	08:01 (100)
2	02:02	7	0.0223	6	0.0210	50.0	100.0	100.0	100.0	100.0	100.0	–
3	02:10	1	0.0032	1	0.0035	0.0	–	–	–	–	–	–
4	03:02	1	0.0032	–	–	–	–	–	–	–	–	–

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Table 2 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
5	03:03	10	0.0318	5	0.0175	100.0	100.0	100.0	100.0	100.0	100.0	–
6	03:04	25	0.0796	26	0.0909	76.9	98.8	100.0	98.7	87.0	100.0	–
7	03:05	3	0.0096	3	0.0105	100.0	98.8	0.0	100.0	–	99.0	03:04 (100)
8	03:06	1	0.0032	1	0.0035	0.0	–	–	–	–	–	–
9	03:07	1	0.0032	–	–	–	–	–	–	–	–	–
10	04:01	52	0.1656	49	0.1713	95.9	100.0	100.0	100.0	100.0	100.0	–
11	05:01	13	0.0414	12	0.0420	66.7	100.0	100.0	100.0	100.0	100.0	–
12	06:02	19	0.0605	17	0.0594	94.1	100.0	100.0	100.0	100.0	100.0	–
13	07:01	31	0.0987	29	0.1014	100.0	100.0	100.0	100.0	100.0	100.0	–
14	07:02	34	0.1083	30	0.1049	96.7	100.0	100.0	100.0	100.0	100.0	–
15	07:04	2	0.0064	1	0.0035	0.0	–	–	–	–	–	–
16	08:01	5	0.0159	5	0.0175	80.0	99.6	100.0	99.6	80.0	100.0	–
17	08:02	8	0.0255	8	0.0280	100.0	100.0	100.0	100.0	100.0	100.0	–
18	08:03	9	0.0287	7	0.0245	85.7	100.0	100.0	100.0	100.0	100.0	–
19	08:04	1	0.0032	–	–	–	–	–	–	–	–	–
20	08:10	1	0.0032	–	–	–	–	–	–	–	–	–
21	08:11	1	0.0032	–	–	–	–	–	–	–	–	–
22	12:02	5	0.0159	5	0.0175	100.0	100.0	100.0	100.0	100.0	100.0	–
23	12:03	16	0.0510	12	0.0420	100.0	100.0	100.0	100.0	100.0	100.0	–
24	14:02	6	0.0191	6	0.0210	66.7	100.0	100.0	100.0	100.0	100.0	–
25	15:02	14	0.0446	15	0.0524	86.7	100.0	100.0	100.0	100.0	100.0	–
26	15:05	1	0.0032	1	0.0035	0.0	–	–	–	–	–	–
27	16:01	14	0.0446	14	0.0490	100.0	100.0	100.0	100.0	100.0	100.0	–
28	16:02	4	0.0127	3	0.0105	100.0	100.0	100.0	100.0	100.0	100.0	–
29	16:04	1	0.0032	–	–	–	–	–	–	–	–	–
30	17:01	3	0.0096	4	0.0140	25.0	100.0	100.0	100.0	100.0	100.0	–
31	18:01	1	0.0032	1	0.0035	0.0	–	–	–	–	–	–
<i>HLA-DRB1: Overall accuracy: 93.5%, Call rate: 50.8%</i>												
1	01:01	12	0.0269	12	0.0305	41.7	99.5	80.0	100.0	100.0	99.7	01:03 (100)
2	01:02	8	0.0179	9	0.0228	100.0	100.0	100.0	100.0	100.0	100.0	–
3	01:03	3	0.0067	3	0.0076	0.0	–	–	–	–	–	–
4	03:01	28	0.0628	27	0.0685	70.4	100.0	100.0	100.0	100.0	100.0	–
5	03:02	1	0.0022	1	0.0025	0.0	–	–	–	–	–	–
6	04:01	8	0.0179	6	0.0152	33.3	99.5	50.0	100.0	100.0	99.7	07:01 (50)
7	04:02	5	0.0112	3	0.0076	0.0	–	–	–	–	–	–
8	04:03	9	0.0202	6	0.0152	0.0	–	–	–	–	–	–
9	04:04	24	0.0538	16	0.0406	18.8	99.0	33.3	100.0	100.0	99.5	04:07 (100)
10	04:05	4	0.0090	4	0.0102	50.0	100.0	100.0	100.0	100.0	100.0	–
11	04:06	2	0.0045	2	0.0051	50.0	100.0	100.0	100.0	100.0	100.0	–
12	04:07	41	0.0919	31	0.0787	22.6	98.5	100.0	98.4	70.0	100.0	–
13	04:10	4	0.0090	4	0.0102	0.0	–	–	–	–	–	–
14	04:11	4	0.0090	4	0.0102	25.0	99.5	0.0	100.0	–	99.7	04:07 (100)
15	07:01	46	0.1031	42	0.1066	83.3	99.5	100.0	99.4	97.2	100.0	–
16	08:01	5	0.0112	5	0.0127	60.0	99.5	66.7	100.0	100.0	99.7	08:02 (100)
17	08:02	37	0.0830	32	0.0812	62.5	98.0	100.0	97.8	83.3	100.0	–
18	08:04	4	0.0090	3	0.0076	0.0	–	–	–	–	–	–

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Table 2 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
19	08:06	1	0.0022	–	–	–	–	–	–	–	–	–
20	08:07	3	0.0067	3	0.0076	100.0	98.5	0.0	100.0	–	99.2	08:02 (100)
21	08:11	1	0.0022	–	–	–	–	–	–	–	–	–
22	08:13	1	0.0022	–	–	–	–	–	–	–	–	–
23	09:01	26	0.0583	24	0.0609	75.0	99.5	100.0	99.5	94.7	100.0	–
24	09:06	3	0.0067	3	0.0076	33.3	99.5	0.0	100.0	–	99.7	09:01 (100)
25	10:01	4	0.0090	3	0.0076	100.0	100.0	100.0	100.0	100.0	100.0	–
26	11:01	17	0.0381	15	0.0381	0.0	–	–	–	–	–	–
27	11:02	2	0.0045	1	0.0025	0.0	–	–	–	–	–	–
28	11:03	3	0.0067	2	0.0051	0.0	–	–	–	–	–	–
29	11:04	17	0.0381	17	0.0431	5.9	100.0	100.0	100.0	100.0	100.0	–
30	11:58	1	0.0022	–	–	–	–	–	–	–	–	–
31	12:01	6	0.0135	6	0.0152	50.0	100.0	100.0	100.0	100.0	100.0	–
32	13:01	14	0.0314	13	0.0330	69.2	100.0	100.0	100.0	100.0	100.0	–
33	13:02	16	0.0359	12	0.0305	50.0	100.0	100.0	100.0	100.0	100.0	–
34	13:03	6	0.0135	4	0.0102	0.0	–	–	–	–	–	–
35	13:04	1	0.0022	–	–	–	–	–	–	–	–	–
36	13:05	2	0.0045	1	0.0025	0.0	–	–	–	–	–	–
37	14:01	6	0.0135	5	0.0127	80.0	100.0	100.0	100.0	100.0	100.0	–
38	14:02	22	0.0493	20	0.0508	55.0	98.5	81.8	99.5	90.0	99.5	14:06 (100)
39	14:06	9	0.0202	11	0.0279	63.6	98.5	85.7	99.0	75.0	99.7	07:01 (50)
40	15:01	20	0.0448	22	0.0558	68.2	100.0	100.0	100.0	100.0	100.0	–
41	15:02	6	0.0135	8	0.0203	87.5	100.0	100.0	100.0	100.0	100.0	–
42	15:03	2	0.0045	1	0.0025	0.0	–	–	–	–	–	–
43	16:01	3	0.0067	4	0.0102	100.0	100.0	100.0	100.0	100.0	100.0	–
44	16:02	9	0.0202	9	0.0228	11.1	100.0	100.0	100.0	100.0	100.0	–
<i>HLA-DQA1: Overall accuracy: 95.8%, Call rate: 90.8%</i>												
1	01:01	20	0.0719	20	0.0769	100.0	98.3	100.0	98.1	83.3	100.0	–
2	01:02	28	0.1007	30	0.1154	83.3	98.7	92.0	99.5	95.8	99.2	01:01 (100)
3	01:03	14	0.0504	13	0.0500	92.3	99.6	91.7	100.0	100.0	99.6	01:02 (100)
4	01:04	3	0.0108	3	0.0115	66.7	99.6	50.0	100.0	100.0	99.6	01:01 (100)
5	01:05	1	0.0036	1	0.0038	100.0	99.6	0.0	100.0	–	99.6	01:01 (100)
6	02:01	37	0.1331	31	0.1192	100.0	100.0	100.0	100.0	100.0	100.0	–
7	03:01	57	0.2050	47	0.1808	89.4	97.9	100.0	97.4	89.4	100.0	–
8	03:02	15	0.0540	15	0.0577	86.7	99.2	84.6	100.0	100.0	99.2	03:01 (100)
9	03:03	11	0.0396	11	0.0423	72.7	98.7	62.5	100.0	100.0	98.8	03:01 (100)
10	04:01	33	0.1187	26	0.1000	100.0	100.0	100.0	100.0	100.0	100.0	–
11	04:02	1	0.0036	–	–	–	–	–	–	–	–	–
12	05:01	21	0.0755	19	0.0731	100.0	100.0	100.0	100.0	100.0	100.0	–
13	05:03	11	0.0396	10	0.0385	90.0	100.0	100.0	100.0	100.0	100.0	–
14	05:05	26	0.0935	34	0.1308	82.4	100.0	100.0	100.0	100.0	100.0	–
<i>HLA-DQB1 Overall accuracy: 98.9%, Call rate: 90.0%</i>												
1	02:01	23	0.0710	23	0.0767	91.3	100.0	100.0	100.0	100.0	100.0	–
2	02:02	36	0.1111	29	0.0967	96.6	99.6	96.4	100.0	100.0	99.6	03:01 (100)
3	02:03	1	0.0031	–	–	–	–	–	–	–	–	–
4	03:01	62	0.1914	64	0.2133	89.1	98.9	100.0	98.6	95.0	100.0	–

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Table 2 – continued from previous page

	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
5	03:02	62	0.1914	58	0.1933	96.6	100.0	100.0	100.0	100.0	100.0	–
6	03:03	20	0.0617	21	0.0700	76.2	100.0	100.0	100.0	100.0	100.0	–
7	03:04	1	0.0031	–	–	–	–	–	–	–	–	–
8	03:19	2	0.0062	2	0.0067	100.0	99.3	0.0	100.0	–	99.3	03:01 (100)
9	04:02	39	0.1204	30	0.1000	90.0	100.0	100.0	100.0	100.0	100.0	–
10	05:01	27	0.0833	27	0.0900	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:02	2	0.0062	2	0.0067	0.0	–	–	–	–	–	–
12	05:03	4	0.0123	5	0.0167	60.0	100.0	100.0	100.0	100.0	100.0	–
13	06:01	5	0.0154	4	0.0133	100.0	100.0	100.0	100.0	100.0	100.0	–
14	06:02	19	0.0586	17	0.0567	82.4	100.0	100.0	100.0	100.0	100.0	–
15	06:03	11	0.0340	9	0.0300	100.0	100.0	100.0	100.0	100.0	100.0	–
16	06:04	7	0.0216	6	0.0200	100.0	100.0	100.0	100.0	100.0	100.0	–
17	06:09	3	0.0093	3	0.0100	0.0	–	–	–	–	–	–
<i>HLA-DPB1: Overall accuracy: 97.5%, Call rate: 81.5%</i>												
1	01:01	10	0.0360	10	0.0403	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:01	31	0.1115	30	0.1210	70.0	99.0	95.2	99.4	95.2	99.6	04:01 (100)
3	02:02	3	0.0108	3	0.0121	66.7	100.0	100.0	100.0	100.0	100.0	–
4	03:01	7	0.0252	8	0.0323	12.5	99.5	0.0	100.0	–	99.6	06:01 (100)
5	04:01	70	0.2518	71	0.2863	87.3	99.5	100.0	99.3	98.4	100.0	–
6	04:02	75	0.2698	64	0.2581	96.9	100.0	100.0	100.0	100.0	100.0	–
7	05:01	10	0.0360	9	0.0363	88.9	100.0	100.0	100.0	100.0	100.0	–
8	06:01	3	0.0108	2	0.0081	0.0	–	–	–	–	–	–
9	06:02	4	0.0144	3	0.0121	33.3	99.5	0.0	100.0	–	99.6	02:01 (100)
10	09:01	4	0.0144	2	0.0081	0.0	–	–	–	–	–	–
11	10:01	3	0.0108	1	0.0040	100.0	99.5	0.0	100.0	–	99.6	14:01 (100)
12	11:01	8	0.0288	8	0.0323	75.0	100.0	100.0	100.0	100.0	100.0	–
13	13:01	13	0.0468	9	0.0363	77.8	99.5	100.0	99.5	87.5	100.0	–
14	14:01	18	0.0647	17	0.0685	88.2	99.5	100.0	99.5	93.8	100.0	–
15	15:01	1	0.0036	–	–	–	–	–	–	–	–	–
16	16:01	1	0.0036	1	0.0040	0.0	–	–	–	–	–	–
17	17:01	5	0.0180	5	0.0202	40.0	100.0	100.0	100.0	100.0	100.0	–
18	18:01	1	0.0036	–	–	–	–	–	–	–	–	–
19	19:01	1	0.0036	–	–	–	–	–	–	–	–	–
20	20:01	1	0.0036	–	–	–	–	–	–	–	–	–
21	23:01	1	0.0036	–	–	–	–	–	–	–	–	–
22	24:01	1	0.0036	–	–	–	–	–	–	–	–	–
23	27:01	1	0.0036	1	0.0040	100.0	99.5	0.0	100.0	–	99.6	13:01 (100)
24	30:01	1	0.0036	–	–	–	–	–	–	–	–	–
25	89:01	1	0.0036	–	–	–	–	–	–	–	–	–
26	104:01	4	0.0144	4	0.0161	75.0	100.0	100.0	100.0	100.0	100.0	–

¹: CR – call rate; ACC – allele accuracy.²: the most likely miscalled allele and the proportion of the most likely miscalled allele in all miscalled alleles.