

Prediction Quality of Asian 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 Asian 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: 92.1%</i>												
1	01:01	21	0.0331	21	0.0363	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:01	81	0.1278	65	0.1125	100.0	96.2	90.8	96.9	78.7	98.8	02:07 (50)
3	02:03	11	0.0174	12	0.0208	100.0	98.1	8.3	100.0	100.0	98.1	02:01 (91)
4	02:05	2	0.0032	2	0.0035	100.0	100.0	100.0	100.0	100.0	100.0	–
5	02:06	39	0.0615	27	0.0467	100.0	99.3	92.6	99.6	92.6	99.6	24:02 (50)
6	02:07	31	0.0489	32	0.0554	100.0	98.4	81.2	99.5	89.7	98.9	02:01 (100)
7	02:10	2	0.0032	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	02:06 (100)
8	02:11	9	0.0142	8	0.0138	100.0	100.0	100.0	100.0	100.0	100.0	–
9	02:16	1	0.0016	–	–	–	–	–	–	–	–	–
10	02:20	1	0.0016	–	–	–	–	–	–	–	–	–
11	02:53	1	0.0016	–	–	–	–	–	–	–	–	–
12	03:01	16	0.0252	13	0.0225	100.0	100.0	100.0	100.0	100.0	100.0	–
13	03:02	3	0.0047	2	0.0035	100.0	100.0	100.0	100.0	100.0	100.0	–
14	03:12	1	0.0016	–	–	–	–	–	–	–	–	–
15	11:01	112	0.1767	120	0.2076	100.0	99.3	98.3	99.6	98.3	99.6	11:02 (50)
16	11:02	10	0.0158	7	0.0121	100.0	99.8	100.0	99.8	87.5	100.0	–
17	11:03	1	0.0016	–	–	–	–	–	–	–	–	–
18	11:27	1	0.0016	–	–	–	–	–	–	–	–	–
19	23:01	1	0.0016	1	0.0017	100.0	100.0	100.0	100.0	100.0	100.0	–
20	24:02	102	0.1609	103	0.1782	100.0	97.8	100.0	97.3	88.8	100.0	–
21	24:03	4	0.0063	4	0.0069	100.0	99.5	25.0	100.0	100.0	99.5	24:02 (100)
22	24:04	1	0.0016	–	–	–	–	–	–	–	–	–
23	24:07	8	0.0126	8	0.0138	100.0	98.6	0.0	100.0	–	98.6	24:02 (100)
24	24:17	2	0.0032	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	24:02 (100)
25	24:20	1	0.0016	–	–	–	–	–	–	–	–	–
26	26:01	23	0.0363	17	0.0294	100.0	99.3	100.0	99.3	81.0	100.0	–
27	26:02	2	0.0032	2	0.0035	100.0	99.7	0.0	100.0	–	99.7	26:01 (100)

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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 (%)
28	26:03	3	0.0047	2	0.0035	100.0	99.7	0.0	100.0	–	99.7	26:01 (100)
29	29:01	2	0.0032	1	0.0017	100.0	100.0	100.0	100.0	100.0	100.0	–
30	30:01	22	0.0347	20	0.0346	100.0	100.0	100.0	100.0	100.0	100.0	–
31	30:02	1	0.0016	1	0.0017	100.0	100.0	100.0	100.0	100.0	100.0	–
32	30:04	4	0.0063	3	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–
33	31:01	24	0.0379	21	0.0363	100.0	99.5	100.0	99.5	87.5	100.0	–
34	31:16	1	0.0016	–	–	–	–	–	–	–	–	–
35	32:01	8	0.0126	9	0.0156	100.0	100.0	100.0	100.0	100.0	100.0	–
36	32:08	1	0.0016	–	–	–	–	–	–	–	–	–
37	33:01	1	0.0016	1	0.0017	100.0	100.0	100.0	100.0	100.0	100.0	–
38	33:03	58	0.0915	59	0.1021	100.0	99.8	98.3	100.0	100.0	99.8	11:01 (100)
39	34:01	9	0.0142	7	0.0121	100.0	99.8	100.0	99.8	87.5	100.0	–
40	34:05	1	0.0016	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	34:01 (100)
41	68:01	10	0.0158	7	0.0121	100.0	100.0	100.0	100.0	100.0	100.0	–
42	69:01	1	0.0016	–	–	–	–	–	–	–	–	–
43	74:01	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-B: Overall accuracy: 87.5%</i>												
1	07:02	22	0.0291	16	0.0239	100.0	100.0	100.0	100.0	100.0	100.0	–
2	07:05	12	0.0159	9	0.0134	100.0	100.0	100.0	100.0	100.0	100.0	–
3	08:01	11	0.0146	11	0.0164	100.0	100.0	100.0	100.0	100.0	100.0	–
4	13:01	27	0.0357	22	0.0328	100.0	100.0	100.0	100.0	100.0	100.0	–
5	13:02	27	0.0357	26	0.0388	100.0	100.0	100.0	100.0	100.0	100.0	–
6	14:01	4	0.0053	3	0.0045	100.0	100.0	100.0	100.0	100.0	100.0	–
7	14:02	2	0.0026	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
8	15:01	24	0.0317	28	0.0418	100.0	97.2	71.4	98.3	64.5	98.7	46:01 (50)
9	15:02	22	0.0291	19	0.0284	100.0	99.7	94.7	99.8	94.7	99.8	15:35 (100)
10	15:05	3	0.0040	2	0.0030	100.0	99.3	0.0	99.6	0.0	99.7	15:01 (100)
11	15:06	1	0.0013	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	15:01 (100)
12	15:07	5	0.0066	4	0.0060	100.0	99.4	0.0	100.0	–	99.4	15:01 (75)
13	15:08	1	0.0013	–	–	–	–	–	–	–	–	–
14	15:11	6	0.0079	5	0.0075	100.0	99.6	40.0	100.0	100.0	99.6	15:01 (100)
15	15:12	1	0.0013	–	–	–	–	–	–	–	–	–
16	15:13	1	0.0013	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
17	15:17	3	0.0040	4	0.0060	100.0	100.0	100.0	100.0	100.0	100.0	–
18	15:18	10	0.0132	9	0.0134	100.0	100.0	100.0	100.0	100.0	100.0	–
19	15:21	2	0.0026	2	0.0030	100.0	100.0	100.0	100.0	100.0	100.0	–
20	15:25	3	0.0040	3	0.0045	100.0	99.9	66.7	100.0	100.0	99.9	15:35 (100)
21	15:27	2	0.0026	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	15:01 (100)
22	15:35	6	0.0079	3	0.0045	100.0	99.6	100.0	99.6	50.0	100.0	–
23	15:38	1	0.0013	–	–	–	–	–	–	–	–	–
24	15:58	1	0.0013	–	–	–	–	–	–	–	–	–
25	18:01	8	0.0106	7	0.0104	100.0	100.0	100.0	100.0	100.0	100.0	–
26	27:02	1	0.0013	–	–	–	–	–	–	–	–	–
27	27:04	8	0.0106	4	0.0060	100.0	99.7	100.0	99.7	66.7	100.0	–
28	27:05	9	0.0119	9	0.0134	100.0	99.9	88.9	100.0	100.0	99.8	40:06 (100)
29	27:06	2	0.0026	1	0.0015	100.0	100.0	100.0	100.0	100.0	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 (%)
30	27:07	2	0.0026	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	40:06 (100)
31	35:01	27	0.0357	24	0.0358	100.0	99.0	100.0	98.9	76.2	100.0	–
32	35:02	2	0.0026	1	0.0015	100.0	99.9	100.0	99.9	66.7	100.0	–
33	35:03	17	0.0225	11	0.0164	100.0	99.3	54.5	100.0	100.0	99.2	35:01 (100)
34	35:05	6	0.0079	6	0.0090	100.0	100.0	100.0	100.0	100.0	100.0	–
35	35:08	1	0.0013	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	35:01 (50)
36	37:01	13	0.0172	10	0.0149	100.0	100.0	100.0	100.0	100.0	100.0	–
37	38:01	4	0.0053	3	0.0045	100.0	100.0	100.0	100.0	100.0	100.0	–
38	38:02	23	0.0304	17	0.0254	100.0	99.0	94.1	99.1	74.1	99.8	40:06 (100)
39	39:01	11	0.0146	13	0.0194	100.0	99.0	53.8	99.8	87.5	99.1	38:02 (60)
40	39:05	1	0.0013	–	–	–	–	–	–	–	–	–
41	39:09	1	0.0013	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	39:01 (100)
42	40:01	61	0.0807	48	0.0716	100.0	99.9	100.0	99.8	98.0	100.0	–
43	40:02	22	0.0291	23	0.0343	100.0	98.5	87.0	98.9	74.1	99.5	40:06 (100)
44	40:03	2	0.0026	2	0.0030	100.0	99.7	0.0	100.0	–	99.7	40:02 (100)
45	40:06	37	0.0489	34	0.0507	100.0	98.5	91.2	98.9	82.7	99.5	27:04 (67)
46	40:10	1	0.0013	–	–	–	–	–	–	–	–	–
47	41:01	1	0.0013	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
48	44:02	7	0.0093	6	0.0090	100.0	99.9	83.3	100.0	100.0	99.8	40:02 (100)
49	44:03	29	0.0384	29	0.0433	100.0	99.7	96.6	99.8	96.6	99.8	40:01 (50)
50	45:01	1	0.0013	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	44:03 (100)
51	46:01	46	0.0608	39	0.0582	100.0	98.8	94.9	99.0	83.3	99.7	15:01 (50)
52	47:01	2	0.0026	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
53	48:01	13	0.0172	14	0.0209	100.0	99.4	78.6	99.8	91.7	99.5	40:02 (67)
54	48:03	1	0.0013	1	0.0015	100.0	99.9	0.0	100.0	–	99.9	48:01 (100)
55	49:01	2	0.0026	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
56	50:01	4	0.0053	5	0.0075	100.0	100.0	100.0	100.0	100.0	100.0	–
57	51:01	50	0.0661	56	0.0836	100.0	99.0	96.4	99.2	91.5	99.7	51:02 (100)
58	51:02	4	0.0053	4	0.0060	100.0	99.6	75.0	99.7	60.0	99.8	51:01 (100)
59	51:06	3	0.0040	4	0.0060	100.0	100.0	100.0	100.0	100.0	100.0	–
60	51:34	1	0.0013	–	–	–	–	–	–	–	–	–
61	52:01	31	0.0410	22	0.0328	100.0	99.3	77.3	100.0	100.0	99.2	51:01 (80)
62	54:01	27	0.0357	22	0.0328	100.0	98.4	77.3	99.1	73.9	99.2	55:02 (40)
63	55:01	3	0.0040	3	0.0045	100.0	99.6	0.0	100.0	–	99.6	55:02 (67)
64	55:02	11	0.0146	12	0.0179	100.0	97.9	58.3	98.6	42.4	99.2	54:01 (80)
65	56:01	7	0.0093	3	0.0045	100.0	99.4	66.7	99.6	40.0	99.8	55:02 (100)
66	56:03	1	0.0013	–	–	–	–	–	–	–	–	–
67	56:04	2	0.0026	2	0.0030	100.0	99.9	50.0	100.0	100.0	99.9	55:02 (100)
68	57:01	10	0.0132	9	0.0134	100.0	100.0	100.0	100.0	100.0	100.0	–
69	58:01	35	0.0463	41	0.0612	100.0	99.7	97.6	99.8	100.0	99.8	35:01 (100)
70	59:01	4	0.0053	4	0.0060	100.0	99.4	0.0	100.0	–	99.4	55:02 (75)
71	67:01	4	0.0053	3	0.0045	100.0	99.7	33.3	100.0	100.0	99.7	38:02 (100)
72	81:01	1	0.0013	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
<i>HLA-C: Overall accuracy: 96.6%</i>												
1	01:02	83	0.1305	73	0.1246	100.0	99.0	98.6	99.0	93.5	99.8	04:01 (50)
2	01:03	5	0.0079	4	0.0068	100.0	99.3	0.0	100.0	–	99.3	01:02 (100)

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
3	02:02	5	0.0079	4	0.0068	100.0	100.0	100.0	100.0	100.0	100.0	–
4	03:02	33	0.0519	29	0.0495	100.0	100.0	100.0	100.0	100.0	100.0	–
5	03:03	50	0.0786	38	0.0648	100.0	99.5	97.4	99.6	94.9	99.8	03:04 (100)
6	03:04	50	0.0786	53	0.0904	100.0	99.3	96.2	99.6	96.2	99.6	03:03 (100)
7	03:49	1	0.0016	–	–	–	–	–	–	–	–	–
8	04:01	37	0.0582	32	0.0546	100.0	99.7	100.0	99.6	94.1	100.0	–
9	04:03	6	0.0094	5	0.0085	100.0	99.7	80.0	99.8	80.0	99.8	–
10	04:06	1	0.0016	–	–	–	–	–	–	–	–	–
11	04:26	1	0.0016	–	–	–	–	–	–	–	–	–
12	05:01	6	0.0094	6	0.0102	100.0	100.0	100.0	100.0	100.0	100.0	–
13	06:02	46	0.0723	45	0.0768	100.0	100.0	100.0	100.0	100.0	100.0	–
14	07:01	17	0.0267	14	0.0239	100.0	100.0	100.0	100.0	100.0	100.0	–
15	07:02	97	0.1525	104	0.1775	100.0	99.7	99.0	99.8	99.0	99.8	04:01 (50)
16	07:04	7	0.0110	6	0.0102	100.0	99.8	83.3	100.0	100.0	99.8	15:02 (100)
17	07:06	1	0.0016	–	–	–	–	–	–	–	–	–
18	08:01	53	0.0833	50	0.0853	100.0	99.3	98.0	99.4	94.2	99.8	12:02 (100)
19	08:02	5	0.0079	5	0.0085	100.0	100.0	100.0	100.0	100.0	100.0	–
20	08:03	4	0.0063	3	0.0051	100.0	99.5	0.0	100.0	–	99.5	08:01 (100)
21	12:02	26	0.0409	25	0.0427	100.0	99.7	96.0	99.8	96.0	99.8	01:02 (50)
22	12:03	14	0.0220	11	0.0188	100.0	100.0	100.0	100.0	100.0	100.0	–
23	12:04	3	0.0047	3	0.0051	100.0	100.0	100.0	100.0	100.0	100.0	–
24	12:05	1	0.0016	–	–	–	–	–	–	–	–	–
25	12:09	1	0.0016	–	–	–	–	–	–	–	–	–
26	14:02	35	0.0550	32	0.0546	100.0	99.8	96.9	100.0	100.0	99.8	04:01 (100)
27	14:03	12	0.0189	13	0.0222	100.0	99.8	92.3	100.0	100.0	99.8	01:02 (50)
28	15:02	30	0.0472	30	0.0512	100.0	99.5	96.7	99.6	93.5	99.8	03:04 (100)
29	15:05	1	0.0016	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	15:02 (100)
30	15:13	1	0.0016	–	–	–	–	–	–	–	–	–
31	16:01	1	0.0016	–	–	–	–	–	–	–	–	–
32	16:02	1	0.0016	–	–	–	–	–	–	–	–	–
33	16:04	1	0.0016	–	–	–	–	–	–	–	–	–
34	17:01	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-DRB1: Overall accuracy: 88.7%</i>												
1	01:01	12	0.0165	14	0.0210	100.0	100.0	100.0	100.0	100.0	100.0	–
2	01:02	1	0.0014	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
3	03:01	40	0.0551	34	0.0511	100.0	99.8	100.0	99.8	97.1	100.0	–
4	04:01	7	0.0096	7	0.0105	100.0	99.7	71.4	100.0	100.0	99.7	04:03 (100)
5	04:02	2	0.0028	2	0.0030	100.0	99.7	0.0	100.0	–	99.7	04:03 (100)
6	04:03	21	0.0289	20	0.0300	100.0	97.1	65.0	98.1	52.0	98.9	04:06 (100)
7	04:04	7	0.0096	6	0.0090	100.0	99.1	16.7	99.8	50.0	99.2	04:03 (60)
8	04:05	42	0.0579	34	0.0511	100.0	98.9	85.3	99.7	95.1	99.2	04:03 (20)
9	04:06	17	0.0234	13	0.0195	100.0	98.5	84.6	98.8	57.9	99.7	04:03 (100)
10	04:07	1	0.0014	2	0.0030	100.0	99.7	0.0	100.0	–	99.7	04:03 (100)
11	04:08	1	0.0014	–	–	–	–	–	–	–	–	–
12	04:10	5	0.0069	4	0.0060	100.0	99.7	75.0	99.8	75.0	99.8	04:05 (50)
13	04:18	1	0.0014	–	–	–	–	–	–	–	–	–

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	Allele	Num. Train	Freq. Train	Num. Valid.	Freq. Valid.	CR ¹ (%)	ACC ¹ (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)	Miscall ² (%)
14	07:01	65	0.0895	61	0.0916	100.0	100.0	100.0	100.0	100.0	100.0	–
15	07:03	1	0.0014	–	–	–	–	–	–	–	–	–
16	08:01	3	0.0041	2	0.0030	100.0	99.7	0.0	100.0	–	99.7	08:02 (50)
17	08:02	10	0.0138	7	0.0105	100.0	99.7	100.0	99.7	77.8	100.0	–
18	08:03	36	0.0496	36	0.0541	100.0	99.1	86.1	99.8	96.9	99.2	12:02 (40)
19	08:04	1	0.0014	–	–	–	–	–	–	–	–	–
20	08:09	1	0.0014	–	–	–	–	–	–	–	–	–
21	08:12	1	0.0014	–	–	–	–	–	–	–	–	–
22	09:01	86	0.1185	65	0.0976	100.0	99.2	100.0	99.2	92.9	100.0	–
23	10:01	16	0.0220	18	0.0270	100.0	100.0	100.0	100.0	100.0	100.0	–
24	11:01	35	0.0482	27	0.0405	100.0	97.9	92.6	98.1	67.6	99.7	03:01 (50)
25	11:04	7	0.0096	7	0.0105	100.0	98.9	14.3	99.8	50.0	99.1	11:01 (83)
26	11:06	1	0.0014	–	–	–	–	–	–	–	–	–
27	11:11	1	0.0014	–	–	–	–	–	–	–	–	–
28	12:01	22	0.0303	26	0.0390	100.0	98.6	73.1	99.7	90.5	98.9	11:01 (57)
29	12:02	40	0.0551	53	0.0796	100.0	99.5	100.0	99.5	94.6	100.0	–
30	13:01	16	0.0220	13	0.0195	100.0	99.8	100.0	99.8	92.9	100.0	–
31	13:02	31	0.0427	28	0.0420	100.0	99.5	89.3	100.0	100.0	99.5	09:01 (33)
32	13:03	1	0.0014	–	–	–	–	–	–	–	–	–
33	13:05	1	0.0014	–	–	–	–	–	–	–	–	–
34	13:07	1	0.0014	–	–	–	–	–	–	–	–	–
35	13:12	3	0.0041	2	0.0030	100.0	100.0	100.0	100.0	100.0	100.0	–
36	14:01	12	0.0165	15	0.0225	100.0	98.3	60.0	99.2	64.3	99.1	14:04 (83)
37	14:03	6	0.0083	5	0.0075	100.0	99.8	80.0	100.0	100.0	99.8	11:01 (100)
38	14:04	15	0.0207	14	0.0210	100.0	98.3	100.0	98.3	54.9	100.0	–
39	14:05	15	0.0207	15	0.0225	100.0	99.2	73.3	99.8	91.7	99.4	14:04 (100)
40	14:06	1	0.0014	–	–	–	–	–	–	–	–	–
41	14:07	2	0.0028	2	0.0030	100.0	99.7	0.0	100.0	–	99.7	14:01 (50)
42	14:12	1	0.0014	–	–	–	–	–	–	–	–	–
43	14:18	1	0.0014	–	–	–	–	–	–	–	–	–
44	14:54	5	0.0069	4	0.0060	100.0	99.4	0.0	100.0	–	99.4	14:01 (100)
45	15:01	70	0.0964	66	0.0991	100.0	98.9	95.5	99.3	94.0	99.5	14:04 (33)
46	15:02	48	0.0661	50	0.0751	100.0	99.7	98.0	99.8	98.0	99.8	15:01 (100)
47	15:06	1	0.0014	–	–	–	–	–	–	–	–	–
48	16:01	1	0.0014	–	–	–	–	–	–	–	–	–
49	16:02	12	0.0165	13	0.0195	100.0	99.4	76.9	99.8	90.9	99.5	11:01 (67)
<i>HLA-DQA1: Overall accuracy: 86.8%</i>												
1	01:01	34	0.0570	31	0.0542	100.0	98.1	67.7	99.8	95.5	98.2	01:04 (80)
2	01:02	109	0.1829	106	0.1853	100.0	97.9	93.4	98.9	95.2	98.5	01:03 (57)
3	01:03	73	0.1225	77	0.1346	100.0	99.0	97.4	99.2	94.9	99.6	01:02 (100)
4	01:04	28	0.0470	24	0.0420	100.0	98.4	95.8	98.5	74.2	99.8	01:01 (100)
5	01:05	8	0.0134	8	0.0140	100.0	99.8	87.5	100.0	100.0	99.8	01:02 (100)
6	02:01	54	0.0906	55	0.0962	100.0	99.8	100.0	99.8	98.2	100.0	–
7	03:01	83	0.1393	68	0.1189	100.0	93.5	55.9	98.6	82.6	94.3	03:02 (54)
8	03:02	50	0.0839	55	0.0962	100.0	95.8	87.3	96.7	74.7	98.6	03:03 (57)
9	03:03	28	0.0470	27	0.0472	100.0	95.8	77.8	96.7	54.2	98.9	03:01 (100)

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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 (%)
10	04:01	9	0.0151	7	0.0122	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:01	34	0.0570	27	0.0472	100.0	98.8	74.1	100.0	100.0	98.7	05:05 (86)
12	05:03	6	0.0101	5	0.0087	100.0	99.0	20.0	99.6	33.3	99.3	05:05 (100)
13	05:05	29	0.0487	28	0.0490	100.0	97.2	96.4	97.2	64.3	99.8	02:01 (100)
14	05:06	2	0.0034	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	05:05 (100)
15	05:08	7	0.0117	6	0.0105	100.0	99.7	66.7	100.0	100.0	99.6	05:05 (100)
16	05:09	3	0.0050	2	0.0035	100.0	99.7	0.0	100.0	–	99.7	05:05 (100)
17	06:01	39	0.0654	45	0.0787	100.0	99.5	100.0	99.4	93.8	100.0	–
<i>HLA-DQB1 Overall accuracy: 96.0%</i>												
1	02:01	25	0.0399	27	0.0452	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:02	44	0.0703	38	0.0635	100.0	99.8	97.4	100.0	100.0	99.8	03:03 (100)
3	03:01	111	0.1773	104	0.1739	100.0	98.0	98.1	98.0	91.9	99.6	03:03 (100)
4	03:02	45	0.0719	50	0.0836	100.0	99.7	96.0	100.0	100.0	99.6	03:03 (100)
5	03:03	83	0.1326	86	0.1438	100.0	98.2	95.3	98.6	90.6	99.2	03:01 (100)
6	03:04	1	0.0016	–	–	–	–	–	–	–	–	–
7	03:13	1	0.0016	–	–	–	–	–	–	–	–	–
8	04:01	32	0.0511	26	0.0435	100.0	99.7	96.2	99.8	96.2	99.8	04:02 (100)
9	04:02	13	0.0208	12	0.0201	100.0	99.7	91.7	99.8	91.7	99.8	04:01 (100)
10	05:01	36	0.0575	34	0.0569	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:02	44	0.0703	38	0.0635	100.0	99.5	92.1	100.0	100.0	99.5	03:01 (100)
12	05:03	31	0.0495	35	0.0585	100.0	99.7	100.0	99.6	95.9	100.0	–
13	06:01	74	0.1182	78	0.1304	100.0	99.3	97.4	99.6	97.4	99.6	03:01 (50)
14	06:02	43	0.0687	34	0.0569	100.0	99.7	97.1	99.8	97.1	99.8	06:01 (100)
15	06:03	12	0.0192	12	0.0201	100.0	99.2	58.3	100.0	100.0	99.2	03:03 (30)
16	06:04	18	0.0288	13	0.0217	100.0	99.7	84.6	100.0	100.0	99.7	03:01 (50)
17	06:05	1	0.0016	–	–	–	–	–	–	–	–	–
18	06:09	11	0.0176	11	0.0184	100.0	100.0	100.0	100.0	100.0	100.0	–
19	06:10	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-DPB1: Overall accuracy: 89.8%</i>												
1	01:01	18	0.0332	15	0.0293	100.0	99.8	93.3	100.0	100.0	99.8	26:01 (100)
2	01:02	1	0.0018	–	–	–	–	–	–	–	–	–
3	02:01	109	0.2011	113	0.2207	100.0	96.9	95.6	97.2	91.1	98.7	04:01 (60)
4	02:02	21	0.0387	24	0.0469	100.0	98.0	66.7	99.6	88.9	98.4	02:01 (75)
5	03:01	16	0.0295	13	0.0254	100.0	97.7	76.9	98.2	54.1	99.4	104:01 (33)
6	04:01	78	0.1439	66	0.1289	100.0	98.6	93.9	99.3	94.7	99.1	02:01 (75)
7	04:02	25	0.0461	29	0.0566	100.0	99.2	100.0	99.2	87.9	100.0	–
8	05:01	165	0.3044	154	0.3008	100.0	97.3	95.5	98.0	95.1	98.0	14:01 (43)
9	06:01	1	0.0018	–	–	–	–	–	–	–	–	–
10	06:02	3	0.0055	3	0.0059	100.0	99.4	0.0	100.0	–	99.4	04:02 (100)
11	08:02	1	0.0018	–	–	–	–	–	–	–	–	–
12	09:01	10	0.0185	12	0.0234	100.0	100.0	100.0	100.0	100.0	100.0	–
13	09:02	10	0.0185	8	0.0156	100.0	98.4	62.5	99.0	50.0	99.4	13:01 (67)
14	10:01	2	0.0037	1	0.0020	100.0	100.0	100.0	100.0	100.0	100.0	–
15	13:01	21	0.0387	20	0.0391	100.0	98.6	80.0	99.4	84.2	99.2	09:02 (100)
16	14:01	16	0.0295	18	0.0352	100.0	99.0	94.4	99.2	81.0	99.8	05:01 (100)
17	16:01	1	0.0018	1	0.0020	100.0	99.8	0.0	100.0	–	99.8	03:01 (50)

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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 (%)
18	17:01	15	0.0277	14	0.0273	100.0	100.0	100.0	100.0	100.0	100.0	–
19	19:01	1	0.0018	1	0.0020	100.0	100.0	100.0	100.0	100.0	100.0	–
20	21:01	3	0.0055	2	0.0039	100.0	99.6	0.0	100.0	–	99.6	03:01 (100)
21	26:01	7	0.0129	6	0.0117	100.0	99.8	100.0	99.8	85.7	100.0	–
22	29:01	1	0.0018	–	–	–	–	–	–	–	–	–
23	31:01	1	0.0018	–	–	–	–	–	–	–	–	–
24	38:01	1	0.0018	1	0.0020	100.0	99.8	0.0	100.0	–	99.8	05:01 (100)
25	41:01	1	0.0018	1	0.0020	100.0	99.8	0.0	100.0	–	99.8	02:01 (50)
26	45:01	1	0.0018	–	–	–	–	–	–	–	–	–
27	48:01	1	0.0018	1	0.0020	100.0	99.8	0.0	100.0	–	99.8	02:01 (100)
28	86:01	1	0.0018	–	–	–	–	–	–	–	–	–
29	104:01	11	0.0203	9	0.0176	100.0	98.4	22.2	99.8	66.7	98.6	03:01 (57)

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 Asian 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: 93.8%, Call rate: 91.7%</i>												
1	01:01	21	0.0331	21	0.0363	95.2	100.0	100.0	100.0	100.0	100.0	–
2	02:01	81	0.1278	65	0.1125	84.6	97.4	94.5	97.7	82.5	99.4	02:07 (67)
3	02:03	11	0.0174	12	0.0208	83.3	98.1	0.0	100.0	–	98.3	02:01 (90)
4	02:05	2	0.0032	2	0.0035	100.0	100.0	100.0	100.0	100.0	100.0	–
5	02:06	39	0.0615	27	0.0467	92.6	99.6	100.0	99.6	92.6	100.0	–
6	02:07	31	0.0489	32	0.0554	81.2	99.2	92.3	99.6	92.3	99.6	02:01 (100)
7	02:10	2	0.0032	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	02:06 (100)
8	02:11	9	0.0142	8	0.0138	87.5	100.0	100.0	100.0	100.0	100.0	–
9	02:16	1	0.0016	–	–	–	–	–	–	–	–	–
10	02:20	1	0.0016	–	–	–	–	–	–	–	–	–
11	02:53	1	0.0016	–	–	–	–	–	–	–	–	–
12	03:01	16	0.0252	13	0.0225	100.0	100.0	100.0	100.0	100.0	100.0	–
13	03:02	3	0.0047	2	0.0035	50.0	100.0	100.0	100.0	100.0	100.0	–
14	03:12	1	0.0016	–	–	–	–	–	–	–	–	–
15	11:01	112	0.1767	120	0.2076	92.5	99.6	99.1	99.8	99.1	99.8	11:02 (100)
16	11:02	10	0.0158	7	0.0121	85.7	99.8	100.0	99.8	85.7	100.0	–
17	11:03	1	0.0016	–	–	–	–	–	–	–	–	–
18	11:27	1	0.0016	–	–	–	–	–	–	–	–	–
19	23:01	1	0.0016	1	0.0017	0.0	–	–	–	–	–	–
20	24:02	102	0.1609	103	0.1782	94.2	97.9	100.0	97.5	89.8	100.0	–
21	24:03	4	0.0063	4	0.0069	50.0	99.6	0.0	100.0	–	99.7	24:02 (100)
22	24:04	1	0.0016	–	–	–	–	–	–	–	–	–
23	24:07	8	0.0126	8	0.0138	100.0	98.5	0.0	100.0	–	98.6	24:02 (100)
24	24:17	2	0.0032	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	24:02 (100)
25	24:20	1	0.0016	–	–	–	–	–	–	–	–	–
26	26:01	23	0.0363	17	0.0294	100.0	99.2	100.0	99.2	81.0	100.0	–
27	26:02	2	0.0032	2	0.0035	100.0	99.6	0.0	100.0	–	99.7	26:01 (100)
28	26:03	3	0.0047	2	0.0035	100.0	99.6	0.0	100.0	–	99.7	26:01 (100)
29	29:01	2	0.0032	1	0.0017	100.0	100.0	100.0	100.0	100.0	100.0	–
30	30:01	22	0.0347	20	0.0346	100.0	100.0	100.0	100.0	100.0	100.0	–
31	30:02	1	0.0016	1	0.0017	0.0	–	–	–	–	–	–
32	30:04	4	0.0063	3	0.0052	100.0	100.0	100.0	100.0	100.0	100.0	–
33	31:01	24	0.0379	21	0.0363	100.0	100.0	100.0	100.0	100.0	100.0	–
34	31:16	1	0.0016	–	–	–	–	–	–	–	–	–
35	32:01	8	0.0126	9	0.0156	88.9	100.0	100.0	100.0	100.0	100.0	–
36	32:08	1	0.0016	–	–	–	–	–	–	–	–	–
37	33:01	1	0.0016	1	0.0017	0.0	–	–	–	–	–	–
38	33:03	58	0.0915	59	0.1021	98.3	100.0	100.0	100.0	100.0	100.0	–
39	34:01	9	0.0142	7	0.0121	85.7	99.8	100.0	99.8	85.7	100.0	–
40	34:05	1	0.0016	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	34:01 (100)

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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	68:01	10	0.0158	7	0.0121	85.7	100.0	100.0	100.0	100.0	100.0	–
42	69:01	1	0.0016	–	–	–	–	–	–	–	–	–
43	74:01	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-B: Overall accuracy: 94.7%, Call rate: 71.0%</i>												
1	07:02	22	0.0291	16	0.0239	93.8	100.0	100.0	100.0	100.0	100.0	–
2	07:05	12	0.0159	9	0.0134	88.9	100.0	100.0	100.0	100.0	100.0	–
3	08:01	11	0.0146	11	0.0164	90.9	100.0	100.0	100.0	100.0	100.0	–
4	13:01	27	0.0357	22	0.0328	77.3	100.0	100.0	100.0	100.0	100.0	–
5	13:02	27	0.0357	26	0.0388	84.6	100.0	100.0	100.0	100.0	100.0	–
6	14:01	4	0.0053	3	0.0045	66.7	100.0	100.0	100.0	100.0	100.0	–
7	14:02	2	0.0026	1	0.0015	0.0	–	–	–	–	–	–
8	15:01	24	0.0317	28	0.0418	46.4	99.0	92.3	99.2	75.0	99.8	46:01 (100)
9	15:02	22	0.0291	19	0.0284	84.2	99.8	93.8	100.0	100.0	99.8	15:35 (100)
10	15:05	3	0.0040	2	0.0030	50.0	99.8	0.0	100.0	–	99.9	15:01 (100)
11	15:06	1	0.0013	1	0.0015	0.0	–	–	–	–	–	–
12	15:07	5	0.0066	4	0.0060	25.0	99.8	0.0	100.0	–	99.9	15:01 (100)
13	15:08	1	0.0013	–	–	–	–	–	–	–	–	–
14	15:11	6	0.0079	5	0.0075	20.0	99.8	0.0	100.0	–	99.9	15:01 (100)
15	15:12	1	0.0013	–	–	–	–	–	–	–	–	–
16	15:13	1	0.0013	1	0.0015	0.0	–	–	–	–	–	–
17	15:17	3	0.0040	4	0.0060	50.0	100.0	100.0	100.0	100.0	100.0	–
18	15:18	10	0.0132	9	0.0134	77.8	100.0	100.0	100.0	100.0	100.0	–
19	15:21	2	0.0026	2	0.0030	0.0	–	–	–	–	–	–
20	15:25	3	0.0040	3	0.0045	0.0	–	–	–	–	–	–
21	15:27	2	0.0026	1	0.0015	100.0	99.8	0.0	100.0	–	99.9	15:01 (100)
22	15:35	6	0.0079	3	0.0045	100.0	99.8	100.0	99.8	75.0	100.0	–
23	15:38	1	0.0013	–	–	–	–	–	–	–	–	–
24	15:58	1	0.0013	–	–	–	–	–	–	–	–	–
25	18:01	8	0.0106	7	0.0104	42.9	100.0	100.0	100.0	100.0	100.0	–
26	27:02	1	0.0013	–	–	–	–	–	–	–	–	–
27	27:04	8	0.0106	4	0.0060	100.0	99.6	100.0	99.6	66.7	100.0	–
28	27:05	9	0.0119	9	0.0134	66.7	100.0	100.0	100.0	100.0	100.0	–
29	27:06	2	0.0026	1	0.0015	0.0	–	–	–	–	–	–
30	27:07	2	0.0026	1	0.0015	100.0	99.8	0.0	100.0	–	99.9	40:06 (100)
31	35:01	27	0.0357	24	0.0358	70.8	99.4	100.0	99.4	85.0	100.0	–
32	35:02	2	0.0026	1	0.0015	0.0	–	–	–	–	–	–
33	35:03	17	0.0225	11	0.0164	54.5	99.4	50.0	100.0	100.0	99.6	35:01 (100)
34	35:05	6	0.0079	6	0.0090	50.0	100.0	100.0	100.0	100.0	100.0	–
35	35:08	1	0.0013	1	0.0015	0.0	–	–	–	–	–	–
36	37:01	13	0.0172	10	0.0149	80.0	100.0	100.0	100.0	100.0	100.0	–
37	38:01	4	0.0053	3	0.0045	66.7	100.0	100.0	100.0	100.0	100.0	–
38	38:02	23	0.0304	17	0.0254	82.4	99.2	100.0	99.1	77.8	100.0	–
39	39:01	11	0.0146	13	0.0194	53.8	99.4	57.1	100.0	100.0	99.5	38:02 (100)
40	39:05	1	0.0013	–	–	–	–	–	–	–	–	–
41	39:09	1	0.0013	1	0.0015	0.0	–	–	–	–	–	–
42	40:01	61	0.0807	48	0.0716	85.4	100.0	100.0	100.0	100.0	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 (%)
43	40:02	22	0.0291	23	0.0343	65.2	99.2	86.7	99.6	86.7	99.7	40:06 (100)
44	40:03	2	0.0026	2	0.0030	50.0	99.8	0.0	100.0	–	99.9	40:02 (100)
45	40:06	37	0.0489	34	0.0507	67.6	99.0	91.3	99.3	87.5	99.7	27:04 (100)
46	40:10	1	0.0013	–	–	–	–	–	–	–	–	–
47	41:01	1	0.0013	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
48	44:02	7	0.0093	6	0.0090	66.7	100.0	100.0	100.0	100.0	100.0	–
49	44:03	29	0.0384	29	0.0433	89.7	100.0	100.0	100.0	100.0	100.0	–
50	45:01	1	0.0013	1	0.0015	0.0	–	–	–	–	–	–
51	46:01	46	0.0608	39	0.0582	84.6	99.6	97.0	99.8	97.0	99.8	40:02 (100)
52	47:01	2	0.0026	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
53	48:01	13	0.0172	14	0.0209	64.3	99.8	100.0	99.8	90.0	100.0	–
54	48:03	1	0.0013	1	0.0015	100.0	99.8	0.0	100.0	–	99.9	48:01 (100)
55	49:01	2	0.0026	1	0.0015	0.0	–	–	–	–	–	–
56	50:01	4	0.0053	5	0.0075	80.0	100.0	100.0	100.0	100.0	100.0	–
57	51:01	50	0.0661	56	0.0836	83.9	99.2	95.7	99.5	95.7	99.7	51:02 (100)
58	51:02	4	0.0053	4	0.0060	75.0	99.4	66.7	99.6	50.0	99.8	51:01 (100)
59	51:06	3	0.0040	4	0.0060	75.0	100.0	100.0	100.0	100.0	100.0	–
60	51:34	1	0.0013	–	–	–	–	–	–	–	–	–
61	52:01	31	0.0410	22	0.0328	68.2	99.8	93.3	100.0	100.0	99.8	51:01 (100)
62	54:01	27	0.0357	22	0.0328	72.7	99.4	93.8	99.6	88.2	99.8	55:02 (100)
63	55:01	3	0.0040	3	0.0045	0.0	–	–	–	–	–	–
64	55:02	11	0.0146	12	0.0179	16.7	99.2	0.0	99.6	0.0	99.7	54:01 (100)
65	56:01	7	0.0093	3	0.0045	0.0	–	–	–	–	–	–
66	56:03	1	0.0013	–	–	–	–	–	–	–	–	–
67	56:04	2	0.0026	2	0.0030	0.0	–	–	–	–	–	–
68	57:01	10	0.0132	9	0.0134	88.9	100.0	100.0	100.0	100.0	100.0	–
69	58:01	35	0.0463	41	0.0612	90.2	100.0	100.0	100.0	100.0	100.0	–
70	59:01	4	0.0053	4	0.0060	25.0	99.8	0.0	100.0	–	99.9	55:02 (100)
71	67:01	4	0.0053	3	0.0045	66.7	99.8	50.0	100.0	100.0	99.9	38:02 (100)
72	81:01	1	0.0013	1	0.0015	100.0	100.0	100.0	100.0	100.0	100.0	–
<i>HLA-C: Overall accuracy: 97.8%, Call rate: 93.9%</i>												
1	01:02	83	0.1305	73	0.1246	95.9	99.1	98.6	99.2	94.5	99.8	04:01 (50)
2	01:03	5	0.0079	4	0.0068	100.0	99.3	0.0	100.0	–	99.3	01:02 (100)
3	02:02	5	0.0079	4	0.0068	100.0	100.0	100.0	100.0	100.0	100.0	–
4	03:02	33	0.0519	29	0.0495	96.6	100.0	100.0	100.0	100.0	100.0	–
5	03:03	50	0.0786	38	0.0648	97.4	99.5	97.3	99.6	94.7	99.8	03:04 (100)
6	03:04	50	0.0786	53	0.0904	98.1	99.5	96.2	99.8	98.0	99.6	03:03 (100)
7	03:49	1	0.0016	–	–	–	–	–	–	–	–	–
8	04:01	37	0.0582	32	0.0546	87.5	99.8	100.0	99.8	96.6	100.0	–
9	04:03	6	0.0094	5	0.0085	80.0	99.8	100.0	99.8	80.0	100.0	–
10	04:06	1	0.0016	–	–	–	–	–	–	–	–	–
11	04:26	1	0.0016	–	–	–	–	–	–	–	–	–
12	05:01	6	0.0094	6	0.0102	83.3	100.0	100.0	100.0	100.0	100.0	–
13	06:02	46	0.0723	45	0.0768	97.8	100.0	100.0	100.0	100.0	100.0	–
14	07:01	17	0.0267	14	0.0239	92.9	100.0	100.0	100.0	100.0	100.0	–
15	07:02	97	0.1525	104	0.1775	97.1	99.8	99.0	100.0	100.0	99.8	04:01 (50)

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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 (%)
16	07:04	7	0.0110	6	0.0102	66.7	100.0	100.0	100.0	100.0	100.0	–
17	07:06	1	0.0016	–	–	–	–	–	–	–	–	–
18	08:01	53	0.0833	50	0.0853	90.0	99.6	100.0	99.6	95.7	100.0	–
19	08:02	5	0.0079	5	0.0085	80.0	100.0	100.0	100.0	100.0	100.0	–
20	08:03	4	0.0063	3	0.0051	66.7	99.6	0.0	100.0	–	99.7	08:01 (100)
21	12:02	26	0.0409	25	0.0427	88.0	100.0	100.0	100.0	100.0	100.0	–
22	12:03	14	0.0220	11	0.0188	90.9	100.0	100.0	100.0	100.0	100.0	–
23	12:04	3	0.0047	3	0.0051	100.0	100.0	100.0	100.0	100.0	100.0	–
24	12:05	1	0.0016	–	–	–	–	–	–	–	–	–
25	12:09	1	0.0016	–	–	–	–	–	–	–	–	–
26	14:02	35	0.0550	32	0.0546	96.9	100.0	100.0	100.0	100.0	100.0	–
27	14:03	12	0.0189	13	0.0222	92.3	100.0	100.0	100.0	100.0	100.0	–
28	15:02	30	0.0472	30	0.0512	93.3	99.8	100.0	99.8	96.6	100.0	–
29	15:05	1	0.0016	1	0.0017	100.0	99.8	0.0	100.0	–	99.8	15:02 (100)
30	15:13	1	0.0016	–	–	–	–	–	–	–	–	–
31	16:01	1	0.0016	–	–	–	–	–	–	–	–	–
32	16:02	1	0.0016	–	–	–	–	–	–	–	–	–
33	16:04	1	0.0016	–	–	–	–	–	–	–	–	–
34	17:01	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-DRB1: Overall accuracy: 95.8%, Call rate: 71.5%</i>												
1	01:01	12	0.0165	14	0.0210	64.3	100.0	100.0	100.0	100.0	100.0	–
2	01:02	1	0.0014	1	0.0015	0.0	–	–	–	–	–	–
3	03:01	40	0.0551	34	0.0511	82.4	100.0	100.0	100.0	100.0	100.0	–
4	04:01	7	0.0096	7	0.0105	57.1	100.0	100.0	100.0	100.0	100.0	–
5	04:02	2	0.0028	2	0.0030	0.0	–	–	–	–	–	–
6	04:03	21	0.0289	20	0.0300	10.0	99.8	100.0	99.8	66.7	100.0	–
7	04:04	7	0.0096	6	0.0090	16.7	100.0	100.0	100.0	100.0	100.0	–
8	04:05	42	0.0579	34	0.0511	70.6	99.6	91.7	100.0	100.0	99.7	04:10 (50)
9	04:06	17	0.0234	13	0.0195	30.8	100.0	100.0	100.0	100.0	100.0	–
10	04:07	1	0.0014	2	0.0030	50.0	99.8	0.0	100.0	–	99.8	04:03 (100)
11	04:08	1	0.0014	–	–	–	–	–	–	–	–	–
12	04:10	5	0.0069	4	0.0060	25.0	99.8	100.0	99.8	50.0	100.0	–
13	04:18	1	0.0014	–	–	–	–	–	–	–	–	–
14	07:01	65	0.0895	61	0.0916	83.6	100.0	100.0	100.0	100.0	100.0	–
15	07:03	1	0.0014	–	–	–	–	–	–	–	–	–
16	08:01	3	0.0041	2	0.0030	100.0	99.6	0.0	100.0	–	99.7	08:02 (50)
17	08:02	10	0.0138	7	0.0105	85.7	99.6	100.0	99.6	75.0	100.0	–
18	08:03	36	0.0496	36	0.0541	69.4	99.8	100.0	99.8	96.2	100.0	–
19	08:04	1	0.0014	–	–	–	–	–	–	–	–	–
20	08:09	1	0.0014	–	–	–	–	–	–	–	–	–
21	08:12	1	0.0014	–	–	–	–	–	–	–	–	–
22	09:01	86	0.1185	65	0.0976	90.8	100.0	100.0	100.0	100.0	100.0	–
23	10:01	16	0.0220	18	0.0270	66.7	100.0	100.0	100.0	100.0	100.0	–
24	11:01	35	0.0482	27	0.0405	70.4	99.1	100.0	99.1	82.6	100.0	–
25	11:04	7	0.0096	7	0.0105	14.3	99.8	0.0	100.0	–	99.8	11:01 (100)
26	11:06	1	0.0014	–	–	–	–	–	–	–	–	–

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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 (%)
27	11:11	1	0.0014	–	–	–	–	–	–	–	–	–
28	12:01	22	0.0303	26	0.0390	57.7	99.4	80.0	100.0	100.0	99.5	11:01 (67)
29	12:02	40	0.0551	53	0.0796	88.7	99.8	100.0	99.8	97.9	100.0	–
30	13:01	16	0.0220	13	0.0195	69.2	100.0	100.0	100.0	100.0	100.0	–
31	13:02	31	0.0427	28	0.0420	78.6	100.0	100.0	100.0	100.0	100.0	–
32	13:03	1	0.0014	–	–	–	–	–	–	–	–	–
33	13:05	1	0.0014	–	–	–	–	–	–	–	–	–
34	13:07	1	0.0014	–	–	–	–	–	–	–	–	–
35	13:12	3	0.0041	2	0.0030	50.0	100.0	100.0	100.0	100.0	100.0	–
36	14:01	12	0.0165	15	0.0225	20.0	99.4	33.3	99.8	50.0	99.7	14:04 (100)
37	14:03	6	0.0083	5	0.0075	100.0	99.8	80.0	100.0	100.0	99.8	11:01 (100)
38	14:04	15	0.0207	14	0.0210	64.3	99.4	100.0	99.3	75.0	100.0	–
39	14:05	15	0.0207	15	0.0225	46.7	99.8	85.7	100.0	100.0	99.8	14:04 (100)
40	14:06	1	0.0014	–	–	–	–	–	–	–	–	–
41	14:07	2	0.0028	2	0.0030	0.0	–	–	–	–	–	–
42	14:12	1	0.0014	–	–	–	–	–	–	–	–	–
43	14:18	1	0.0014	–	–	–	–	–	–	–	–	–
44	14:54	5	0.0069	4	0.0060	25.0	99.8	0.0	100.0	–	99.8	14:01 (100)
45	15:01	70	0.0964	66	0.0991	77.3	99.8	98.0	100.0	100.0	99.8	16:02 (100)
46	15:02	48	0.0661	50	0.0751	82.0	100.0	100.0	100.0	100.0	100.0	–
47	15:06	1	0.0014	–	–	–	–	–	–	–	–	–
48	16:01	1	0.0014	–	–	–	–	–	–	–	–	–
49	16:02	12	0.0165	13	0.0195	46.2	99.8	100.0	99.8	85.7	100.0	–
<i>HLA-DQA1: Overall accuracy: 90.0%, Call rate: 80.8%</i>												
1	01:01	34	0.0570	31	0.0542	83.9	98.7	76.9	100.0	100.0	98.9	01:04 (83)
2	01:02	109	0.1829	106	0.1853	85.8	98.9	96.7	99.5	97.8	99.4	01:03 (67)
3	01:03	73	0.1225	77	0.1346	87.0	99.4	98.5	99.5	97.1	99.8	01:02 (100)
4	01:04	28	0.0470	24	0.0420	58.3	98.9	100.0	98.9	73.7	100.0	–
5	01:05	8	0.0134	8	0.0140	75.0	100.0	100.0	100.0	100.0	100.0	–
6	02:01	54	0.0906	55	0.0962	94.5	100.0	100.0	100.0	100.0	100.0	–
7	03:01	83	0.1393	68	0.1189	76.5	95.3	61.5	99.5	94.1	96.3	03:02 (56)
8	03:02	50	0.0839	55	0.0962	65.5	97.4	97.2	97.4	75.7	99.8	03:03 (100)
9	03:03	28	0.0470	27	0.0472	59.3	97.4	87.5	97.8	58.9	99.6	03:01 (100)
10	04:01	9	0.0151	7	0.0122	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:01	34	0.0570	27	0.0472	92.6	98.9	80.0	100.0	100.0	99.1	05:05 (80)
12	05:03	6	0.0101	5	0.0087	20.0	99.8	100.0	99.8	50.0	100.0	–
13	05:05	29	0.0487	28	0.0490	85.7	98.7	100.0	98.6	80.0	100.0	–
14	05:06	2	0.0034	1	0.0017	0.0	–	–	–	–	–	–
15	05:08	7	0.0117	6	0.0105	83.3	99.8	80.0	100.0	100.0	99.8	05:05 (100)
16	05:09	3	0.0050	2	0.0035	50.0	99.8	0.0	100.0	–	99.8	05:05 (100)
17	06:01	39	0.0654	45	0.0787	91.1	99.8	100.0	99.8	97.6	100.0	–
<i>HLA-DQB1 Overall accuracy: 98.1%, Call rate: 96.3%</i>												
1	02:01	25	0.0399	27	0.0452	100.0	100.0	100.0	100.0	100.0	100.0	–
2	02:02	44	0.0703	38	0.0635	100.0	99.8	97.4	100.0	100.0	99.8	03:03 (100)
3	03:01	111	0.1773	104	0.1739	99.0	98.6	98.1	98.7	94.4	99.6	03:03 (100)
4	03:02	45	0.0719	50	0.0836	92.0	100.0	100.0	100.0	100.0	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	03:03	83	0.1326	86	0.1438	96.5	99.0	96.4	99.4	96.4	99.4	03:01 (100)
6	03:04	1	0.0016	–	–	–	–	–	–	–	–	–
7	03:13	1	0.0016	–	–	–	–	–	–	–	–	–
8	04:01	32	0.0511	26	0.0435	96.2	99.7	96.0	99.8	96.0	99.8	04:02 (100)
9	04:02	13	0.0208	12	0.0201	100.0	99.7	91.7	99.8	91.7	99.8	04:01 (100)
10	05:01	36	0.0575	34	0.0569	100.0	100.0	100.0	100.0	100.0	100.0	–
11	05:02	44	0.0703	38	0.0635	100.0	99.5	92.1	100.0	100.0	99.5	03:01 (100)
12	05:03	31	0.0495	35	0.0585	100.0	100.0	100.0	100.0	100.0	100.0	–
13	06:01	74	0.1182	78	0.1304	94.9	100.0	100.0	100.0	100.0	100.0	–
14	06:02	43	0.0687	34	0.0569	97.1	100.0	100.0	100.0	100.0	100.0	–
15	06:03	12	0.0192	12	0.0201	58.3	100.0	100.0	100.0	100.0	100.0	–
16	06:04	18	0.0288	13	0.0217	84.6	100.0	100.0	100.0	100.0	100.0	–
17	06:05	1	0.0016	–	–	–	–	–	–	–	–	–
18	06:09	11	0.0176	11	0.0184	90.9	100.0	100.0	100.0	100.0	100.0	–
19	06:10	1	0.0016	–	–	–	–	–	–	–	–	–
<i>HLA-DPB1: Overall accuracy: 95.3%, Call rate: 82.8%</i>												
1	01:01	18	0.0332	15	0.0293	80.0	99.8	91.7	100.0	100.0	99.8	26:01 (100)
2	01:02	1	0.0018	–	–	–	–	–	–	–	–	–
3	02:01	109	0.2011	113	0.2207	85.0	97.6	96.9	97.9	93.0	99.3	04:01 (67)
4	02:02	21	0.0387	24	0.0469	66.7	98.3	62.5	99.8	90.9	98.8	02:01 (100)
5	03:01	16	0.0295	13	0.0254	30.8	99.5	100.0	99.5	66.7	100.0	–
6	04:01	78	0.1439	66	0.1289	93.9	99.1	96.8	99.4	96.8	99.6	02:01 (50)
7	04:02	25	0.0461	29	0.0566	93.1	99.3	100.0	99.2	90.0	100.0	–
8	05:01	165	0.3044	154	0.3008	88.3	99.3	99.3	99.3	98.5	99.7	14:01 (100)
9	06:01	1	0.0018	–	–	–	–	–	–	–	–	–
10	06:02	3	0.0055	3	0.0059	66.7	99.5	0.0	100.0	–	99.6	04:02 (100)
11	08:02	1	0.0018	–	–	–	–	–	–	–	–	–
12	09:01	10	0.0185	12	0.0234	91.7	100.0	100.0	100.0	100.0	100.0	–
13	09:02	10	0.0185	8	0.0156	62.5	99.3	60.0	99.8	75.0	99.6	05:01 (50)
14	10:01	2	0.0037	1	0.0020	0.0	–	–	–	–	–	–
15	13:01	21	0.0387	20	0.0391	80.0	99.5	93.8	99.8	93.8	99.8	09:02 (100)
16	14:01	16	0.0295	18	0.0352	77.8	99.8	100.0	99.8	93.3	100.0	–
17	16:01	1	0.0018	1	0.0020	0.0	–	–	–	–	–	–
18	17:01	15	0.0277	14	0.0273	92.9	100.0	100.0	100.0	100.0	100.0	–
19	19:01	1	0.0018	1	0.0020	0.0	–	–	–	–	–	–
20	21:01	3	0.0055	2	0.0039	0.0	–	–	–	–	–	–
21	26:01	7	0.0129	6	0.0117	50.0	99.8	100.0	99.8	75.0	100.0	–
22	29:01	1	0.0018	–	–	–	–	–	–	–	–	–
23	31:01	1	0.0018	–	–	–	–	–	–	–	–	–
24	38:01	1	0.0018	1	0.0020	100.0	99.8	0.0	100.0	–	99.8	05:01 (100)
25	41:01	1	0.0018	1	0.0020	0.0	–	–	–	–	–	–
26	45:01	1	0.0018	–	–	–	–	–	–	–	–	–
27	48:01	1	0.0018	1	0.0020	0.0	–	–	–	–	–	–
28	86:01	1	0.0018	–	–	–	–	–	–	–	–	–
29	104:01	11	0.0203	9	0.0176	44.4	99.5	50.0	100.0	100.0	99.6	03:01 (100)

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.