

Manual No.	22
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Product No.	122
Lot No.	DR43-4 DQB14-1

CTS Collaborative Transplant Study

WORKING INSTRUCTION

HLA- DRB1* /-DQB1* CTS-PCR-SSP TRAY KIT

LOCUS- AND LOT-SPECIFIC MANUAL

To be applied to the following product:

Product No.	Description
122	HLA-DRB1* /-DQB1* CTS-PCR-SSP TRAY KIT 

1. Main differences

HLA-DRB1:

Between lot DR43-4 (the current lot) and the previous lot DR43-3:

The kit was updated to cover new alleles included in the IMGT/HLA Sequence Database of January 2024. Deleted and renamed alleles were taken into consideration.

HLA-DQB1:

Between lot DQB14-1 (the current lot) and the previous lot DQB14-0:

The kit was updated to cover new alleles included in the IMGT/HLA Sequence Database of January 2024. Deleted and renamed alleles were taken into consideration.

2. Introduction

- Intended use: This kit reveals a low/intermediate resolution typing of HLA-DRB1* (besides HLA-DRB3*/4*/5* low resolution) and -DQB1* by the PCR-SSP method.
- Allele coverage: IMGT/HLA Sequence Database Release 3.55.0, January 2024 for HLA-DRB1* and HLA-DQB1*, except:
 - **HLA-DRB1***01:01:31/01:02:12/01:18:01-01:18:02/01:22/01:33N/01:44:01-01:44:02/01:60/01:76/01:134, DRB1*04:11:04/04:156/04:373, DRB1*08:01:06/08:57/08:80, DRB1*09:09/09:23, DRB1*10:12, DRB1*11:02:03/11:04:13/11:86/11:94/11:110/11:123/11:156/11:167/11:172/11:185/11:187/11:192/11:208/11:294N, DRB1*12:31N/12:42/12:57/12:83, DRB1*13:195, DRB1*14:231N/14:247, DRB1*15:01:22/15:34, DRB1*16:50, DRB3*01:68/01:95/01:104/01:109, DRB3*02:26-02:27/02:47/02:58/02:66/02:91/02:111/02:131/02:143/02:160, DRB4*01:14N/01:62/01:88, DRB4*03:01N, DRB5*01:01:10/01:51/01:73/01:79Q/01:87/01:97/01:110/01:131N
 - **HLA-DQB1*** 02:25/02:35/02:40/02:72/02:147, DQB1*04:02:02/04:02:08/04:02:22/04:02:23/04:31/04:48, DQB1*05:01:01:31-34/05:01:14/05:01:49/05:02:28/05:03:01:10/05:03:10/05:03:31/05:21/05:60/05:72-05:73/05:82/05:98/05:105/05:116/05:175/05:207/05:218/05:258/05:300/05:319-325, DQB1*06:09:04/06:22:01/06:22:03/06:69:02/06:153:01-06:153:02/06:167/06:231/06:247/06:260/06:301/06:318/06:332/06:342/06:415/06:417/06:441

These alleles are considered to be rare.

- This manual is only valid for **Lot No. DR43-4 DQB14-1**.
- This manual should be used together with the Main Manual (General Information) which is the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A).

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4. Kit Composition

- Number of PCR primer mixes per test: 38:
 - 23 HLA-specific mixes and 1 negative control mix for HLA-DRB1 typing
 - 13 HLA-specific mixes and 1 negative control mix for HLA-DQB1 typing
 - Please note: Wells (positions on tray) B5 - A5, H6 - A6, B11 - A11 and H12 - A12 are empty.
- Number of tests per tray: 2
- Number of trays per kit: 10
- The primer mixes are aliquoted and dried in PCR-Trays.
- PCR buffer: 3.0 ml of Mastermix SSP (without Taq polymerase).

For storage condition, please refer to Section 1 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A) supplied along with this product.

5. Materials, Reagents and Equipment not supplied

Please refer to Section 2 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A) supplied along with this product.

6. Sample Requirements, PCR and Gel Electrophoresis

Please refer to Section 3 to 6 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A) supplied along with this product.

7. Result Evaluation

- Check the approximate size of the PCR product against the Primer Mix Specificity Tables (Appendix / Table 1 and 2) to confirm the correct product size.
- Use the Amplification Pattern Tables (Appendix / Table 3 and 4) to make the allele assignments or use the SCORE Software for detailed result interpretation.

8. Interpretation Hints

- Weak or false positive reactions can occur if you use a different Taq polymerase. In addition, the quality and quantity of DNA is a crucial factor and can affect the mix reactivities. Under suboptimal test conditions, some mixes could give rise to false positive reactions (if there are any potentially false positive reactions when using this specific lot, they are indicated in Section 9).
- Alleles that are known to amplify weakly are listed with "w" (= weak) in the tables (Appendix).
- Please also refer to Sections 7 and 8 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A) supplied along with this product.

9. Special notes

- **HLA-DRB1* locus:**
 - Mix 5 and mix 6 detect (among other alleles) the most common HLA-DRB1*03 alleles which correspond either to serological split HLA-DR17 or HLA-DR18, respectively.
 - The following mix could give a false positive reaction: Mix 7.
- **HLA-DQB1* locus:**
 - Differentiation of HLA-DQB1*03 serological equivalents: Mix 6 and 7 mainly detect HLA-DQB1*03 alleles which belong to the serological group of HLA-DQ7(3). Mix 8 and 9 react positively with HLA-DQB1*03 alleles of the HLA-DQ8(3) serological group, whereas mix 10 and 11 amplify HLA-DQB1*03 alleles which can serologically be defined as HLA-DQ9(3). Some other less common alleles are amplified by these mixes in addition.
 - Mix 12: The majority of HLA-DQB1 alleles amplified by mix 12 result in two PCR fragments (110/160 bp), except HLA-DQB1*03:05 and some rare alleles that generate only one PCR fragment (110 bp).
 - Some mixes contain specific primers which may give rise to PCR fragments of **two** different sizes simultaneously (see Table 2).
 - Potentially false positive reactions: Mixes 9 and 11.

10. Troubleshooting

Please refer to Section 8 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No. 100A) supplied along with this product.

11. Precaution

Please refer to Material Safety Data Sheet for the CTS-PCR-SSP TRAY and MINITRAY KITS (Manual No. 100B) supplied along with this product.

12. Contact

If you have any particular questions concerning this kit, which are not answered in this or the Main Manual, please do not hesitate to contact us at:

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13. Appendix

Table 1: Allele specificities and sizes of the PCR products of each **HLA-DRB1*** CTS-PCR-SSP primer mix (**Lot No. DR43-4**) based on IMGT/HLA Sequence Database Release 3.55.0, January 2024

Position		Mix	Allele	Serology	Size
H1	H7	Mix 1	DRB1*01:01:01:01-01:01:30/01:01:32-01:01:44/01:01:45?/01:01:46-01:02:11/01:02:13-01:17/01:19-01:21/01:23-01:32/01:34-01:38/01:39Nw-01:40Nw/01:41-01:43/01:45-01:48/01:49w/01:50-01:59/01:61-01:64/01:65:01w-01:65:02w/01:66-01:75/01:77-01:133/01:135-01:149	DR1, -, DR103, Null	140 bp
G1	G7	Mix 2	DRB1*15:01:01:01-15:01:21/15:01:23-15:33/15:35-15:112/15:113Nw/15:114-15:224, DRB1*16:09:01-16:10:02/16:33/16:36-16:37/16:58/16:66	DR15(2), -, DR2, Null, DR16(2)	140 bp/ 215 bp
F1	F7	Mix 3	DRB1*15:21, DRB1*16:01:01:01-16:01:08/16:01:09w/16:01:10-16:05:02/16:07-16:49/16:51-16:76	-, DR16(2), DR2, Null	210 bp
E1	E7	Mix 4	DRB1*03:01:01:01-03:01:01:27/03:01:02:01w-03:01:02:02w/03:01:03/03:01:05-03:01:13/03:01:14w/03:01:15-03:02:01:02/03:02:02w/03:02:03-03:05:02/03:05:03w/03:06-03:11:01/03:11:03-03:13:01/03:13:02w/03:14-03:15:01:02/03:15:02w/03:16-03:41:02/03:43-03:75/03:77-03:83/03:85-03:86/03:88-03:91/03:93-03:96/03:98-03:110/03:112-03:124/03:127w/03:128-03:129/03:130w/03:131-03:134/03:135w/03:136-03:144/03:145w/03:146-03:156N/03:158-03:161/03:163-03:173/03:175-03:176/03:178-03:189N/03:190w/03:191?/03:192-03:211, DRB1*11:07:01/11:07:02w/11:53/11:103:01-11:103:02/11:105/11:107/11:125/11:136/11:173, DRB1*14:104w/14:111w/14:171, DRB3*01:14w	DR17(3), -, DR18(3), DR3, Null, DR11(5)	225 bp
D1	D7	Mix 5	DRB1*03:01:01:01-03:01:41/03:04:01-03:04:02/03:06/03:08/03:10-03:11:01/03:11:03/03:12?/03:13:01-03:13:02/03:15:01:01-03:16/03:18-03:20/03:22-03:23/03:25:01-03:26/03:28/03:30-03:34/03:36-03:37/03:39/03:42-03:48/03:50-03:52:02/03:54w/03:55-03:56/03:58-03:62/03:64-03:73/03:75-03:80/03:82-03:87/03:89/03:91-03:96/03:98-03:99/03:100:01w-03:100:02w/03:104/03:106-03:112/03:114/03:116-03:118/03:121/03:123-03:129/03:132-03:153/03:156N-03:166/03:168-03:170/03:172-03:175/03:177/03:180-03:184/03:186-03:187/03:189N-03:204N/03:205w/03:207-03:210, DRB1*09:06, DRB1*11:59/11:83/11:135/11:182, DRB1*13:27:01-13:27:02/13:71/13:129/13:144/13:176/13:326, DRB1*14:82/14:95/14:132, DRB3*01:34, DRB3*03:33	DR17(3), -, DR3, Null, DR13(6)	220 bp
C1	C7	Mix 6	DRB1*03:02:01:01-03:02:06/03:05:01-03:05:03/03:09/03:14/03:27/03:29/03:38/03:53/03:74/03:81/03:88/03:90/03:102-03:103/03:115/03:122/03:130-03:131/03:154/03:167/03:176/03:178-03:179/03:188/03:206?/03:211, DRB1*11:09:01:01-11:09:01:02/11:20/11:28:02/11:87:01-11:87:02/11:122, DRB1*13:02:01:01-13:02:03/13:02:05-13:02:22/13:05:01:01-13:05:03/13:26:01-13:26:02/13:29:01:01-13:29:01:02/13:31/13:34/13:36/13:39/13:41/13:50:02-13:50:03/13:56/13:63/13:65/13:67/13:73-13:74/13:85/13:96:01-13:96:02/13:99/13:103-13:104/13:109/13:119-13:120/13:123-13:124/13:126/13:128/13:136/13:139-13:140/13:142N-13:143/13:145/13:147/13:155/13:157-13:159/13:165/13:168/13:170-13:171:02/13:179/13:189/13:196/13:198-13:199/13:202-13:203/13:207-13:212/13:220/13:225/13:235-13:237/13:239-13:241/13:243-13:244/13:255N/13:257/13:264-13:265/13:268N-13:269/13:275/13:277/13:280/13:282/13:285/13:288-13:289N/13:292-13:293/13:296-13:298N/13:301-13:302/13:306/13:310N/13:312/13:318/13:320/13:325/13:331-13:332/13:334/13:341/13:344/13:348-13:349, DRB1*14:02:01:01-14:02:07/14:02:09-14:03:02/14:09/14:13/14:19/14:24/14:27:01-14:27:02/14:30/14:46-14:48/14:51/14:63/14:67/14:85/14:89/14:98/14:109/14:115/14:134-14:135/14:144/14:174/14:179/14:194/14:198/14:200/14:209/14:218/14:222N-14:223/14:226/14:239/14:242:01-14:242:02/14:252, DRB1*16:08, DRB3*01:08/01:46/01:52/01:71, DRB3*02:06?/02:20	DR18(3), -, DR3, DR11(5), DR13(6), Null, DR14(6), DR1403	190 bp

Position		Mix	Allele	Serology	Size
B1	B7	Mix 7	DRB1*03:49, DRB1*04:01:01:01-04:05:11/04:05:13-04:11:03/04:11:05-04:155/04:157N-04:372/04:374-04:375, DRB1*08:38, DRB1*11:22/11:102:01-11:102:02/11:175/11:275/11:278, DRB1*14:10:01:01-14:10:01:02/14:57/14:143/14:161/14:182	-, DR4, Null, DR14(6)	85 bp/ 145 bp/ 200 bp/ 260 bp
A1	A7	Mix 8	DRB1*01:21w, DRB1*07:01:01:01-07:01:01:02/07:01:01:04-07:01:34/07:03-07:139/07:140?/07:141-07:155	-, DR7, Null	115 bp/ 190 bp
H2	H8	Mix 9	DRB1*08:01:01:01-08:01:02/08:01:04-08:01:05/08:01:07-08:02:04/08:02:05?/08:02:06-08:04:01:05/08:04:03-08:19/08:21-08:30:03/08:32-08:56/08:58-08:66/08:68:01-08:79/08:81-08:124/08:125?/08:126-08:127, DRB1*11:67/11:193:01-11:193:02, DRB1*12:16:01-12:16:03/12:22/12:39:01-12:39:02/12:46/12:96, DRB1*14:04:01:01-14:04:09/14:15/14:28/14:31/14:50:01-14:50:02/14:68:01-14:68:02/14:71/14:73/14:76/14:79/14:93/14:107/14:120/14:138/14:145/14:148/14:152N/14:180/14:196/14:201/14:205:01/14:206/14:210Q/14:220/14:224/14:229/14:233/14:241/14:249-14:250/14:254N	DR8, -, Null, DR1404, DR14(6)	165 bp/ 215 bp/ 250 bp
G2	G8	Mix 10	DRB1*09:01:02:01-09:05/09:07-09:08/09:10-09:22/09:24-09:57	DR9, -, Null	220 bp
F2	F8	Mix 11	DRB1*01:34w, DRB1*10:01:01:01/10:01:01:03-10:11/10:13-10:30/10:31w/10:32-10:46	-, DR10	205 bp
E2	E8	Mix 12	DRB1*01:75, DRB1*03:08/03:65/03:140, DRB1*04:15/04:61/04:138/04:145/04:154/04:170/04:265/04:291/04:323/04:339, DRB1*08:31/08:41/08:63/08:75, DRB1*10:23, DRB1*11:01:01:01/11:01:01:03-11:02:02/11:02:04-11:04:12/11:04:14-11:11:01/11:11:03-11:21/11:22?/11:23:01-11:25/11:26?/11:27:01-11:39/11:40?/11:41-11:70/11:72-11:85/11:87:01-11:93/11:95-11:109/11:111-11:122/11:124:01-11:155/11:157-11:166/11:168-11:171/11:173-11:184/11:186/11:188-11:191/11:193:01-11:202/11:203w/11:204-11:207/11:209-11:210/11:211w/11:212-11:253/11:254w/11:255-11:263/11:265-11:292/11:295-11:316/11:317?/11:318-11:329N, DRB1*12:04/12:49, DRB1*14:11:01:01-14:11:01:02, DRB1*15:99/15:109, DRB1*16:16/16:27, DRB3*01:42, DRB3*02:18, DRB5*01:13/01:41	-, DR4, DR11(5), Null, DR11(5)/DR13(6), DR14(6)	125 bp
D2	D8	Mix 13	DRB1*08:25/08:32/08:47/08:53/08:87, DRB1*12:01:01:01-12:01:04/12:01:05w/12:01:06-12:19:02/12:20w/12:21-12:30/12:32-12:41/12:43-12:56/12:58-12:82/12:84-12:88/12:89?/12:90-12:109	-, DR12(5), Null	105 bp/ 210 bp
C2	C8	Mix 14	DRB1*03:125, DRB1*11:09:01:01-11:09:01:02/11:16:01:01-11:16:01:02/11:20/11:28:02/11:40w/11:58:01/11:59w/11:83/11:87:01-11:87:02/11:113/11:115/11:122w/11:182, DRB1*13:01:01:01-13:02:22/13:05:01:01-13:06/13:10/13:15-13:16:01:02/13:18/13:26:01-13:28:02/13:31-13:32/13:34-13:36/13:39-13:42:02/13:50:02-13:51/13:53/13:59/13:61:01-13:61:02/13:63w/13:65/13:67/13:69/13:73-13:74/13:79-13:80/13:85/13:87/13:91-13:93/13:96:01-13:96:02/13:98-13:99/13:102-13:105/13:109-13:110/13:111w/13:112-13:113N/13:117:01:01-13:117:01:02/13:120-13:121/13:123-13:128/13:130-13:131/13:136-13:148/13:153/13:155-13:160/13:165-13:166/13:168/13:170-13:171:02/13:173/13:176-13:177/13:179/13:183-13:187/13:189-13:191/13:198-13:203/13:205/13:207-13:215/13:217-13:218/13:220-13:222/13:223w/13:225-13:226/13:233/13:234w/13:236-13:245/13:248-13:249N/13:251-13:252N/13:254-13:275/13:277/13:279-13:283/13:285/13:287-13:294/13:296w/13:297-13:306/13:308-13:311/13:313/13:315/13:318/13:320/13:322N-13:325/13:327-13:328/13:331-13:332/13:334/13:336/13:339/13:341/13:343-13:345/13:348-13:350, DRB1*14:27:01-14:27:02/14:63/14:67/14:78, DRB1*16:08	-, DR11(5), DR11(5)/DR13(6), DR13(6), Null, DR14(6)	130 bp

Position	Mix	Allele	Serology	Size	
B2	B8	Mix 15	DRB1*03:12/03:155/03:158, DRB1*11:03:01-11:03:04/11:11:01/11:11:03/11:36/11:40-11:41/11:55/11:59/11:63:01-11:63:02/11:68/11:76/11:85/11:122/11:138-11:139/11:151/11:161/11:168/11:176/11:213/11:231/11:233/11:237/11:241/11:260/11:301N, DRB1*13:03:01:01-13:04/13:12:01-13:13/13:20:01:01-13:21:02/13:24:01:01-13:24:01:03/13:29:01:01-13:30/13:32-13:33:03/13:38/13:43/13:48-13:49:02/13:54-13:55/13:58/13:63/13:65-13:66:02/13:71/13:75/13:78/13:81/13:88-13:90/13:93-13:95/13:101/13:108/13:111/13:115/13:118/13:120/13:122/13:133-13:134/13:139/13:149/13:151-13:152/13:154/13:161/13:164/13:167/13:169/13:174/13:188/13:194/13:216/13:219/13:227-13:228/13:230/13:247/13:253/13:276/13:295N/13:307/13:317/13:319N/13:321/13:329N/13:333/13:338/13:340/13:342/13:346-13:347, DRB1*14:13/14:63/14:65/14:78/14:85/14:169-14:170	DR3, -, DR11(5), Null, DR13(6), DR14(6)	170 bp/ 200 bp
A2	A8	Mix 16	DRB1*11:09:01:01-11:09:01:02/11:28:02/11:40w/11:58:01/11:59w/11:83/11:87:01-11:87:02/11:113/11:115/11:122w/11:182, DRB1*13:05:01:01-13:05:03/13:18/13:26:01-13:26:02/13:42:01-13:42:02/13:50:02-13:50:03/13:63w/13:111w/13:136/13:144/13:158:01-13:158:02/13:189/13:199/13:203/13:277/13:302/13:349, DRB1*14:27:01-14:27:02, DRB1*16:08	DR11(5), -, DR13(6), DR14(6)	130 bp
H3	H9	Mix 17	DRB1*03:01:01:01-03:01:06/03:01:07w/03:01:08-03:01:13/03:01:14w/03:01:15-03:07:02/03:09-03:11:01/03:11:03-03:37/03:38w/03:39-03:41:02/03:43-03:45/03:46w/03:47-03:58/03:59w/03:60-03:64/03:66-03:78/03:79w/03:80-03:86/03:88-03:110/03:112-03:126/03:127w/03:128-03:129/03:130w/03:131-03:134/03:135w/03:136-03:139/03:141-03:155/03:157-03:161/03:163-03:189N/03:190w/03:191-03:211, DRB1*08:01:01:01-08:01:02/08:01:04-08:01:05/08:01:07-08:02:04/08:02:05?/08:02:06-08:04:01:05/08:04:03-08:24:02/08:25w/08:26-08:30:03/08:32-08:33/08:34w/08:35-08:40/08:42-08:46/08:47w/08:48-08:51/08:52w/08:53-08:56/08:58-08:62/08:64-08:68:02/08:70-08:74/08:76-08:79/08:81-08:108/08:109w/08:110-08:111/08:112w-08:113w/08:114-08:124/08:125?/08:126-08:127, DRB1*11:264/11:293, DRB1*12:01:01:01w-12:01:07w/12:01:09w-12:01:11w/12:01:12?/12:02:01:01w-12:02:05w/12:02:07w-12:03:03w/12:05w-12:08w/12:09/12:10w-12:17w/12:19:01w-12:23w/12:24N-12:25/12:26w-12:30w/12:32w/12:34w-12:41w/12:43w-12:45w/12:46/12:48/12:50w-12:53w/12:54/12:55w-12:56w/12:58w-12:61w/12:62/12:63w-12:66w/12:67/12:68w-12:75w/12:76/12:77w-12:82w/12:84w-12:88w/12:89?/12:90w-12:95w/12:96/12:97w-12:109w, DRB1*13:01:01:01-13:01:40/13:01:41w/13:02:01:01-13:02:11/13:02:12w/13:02:13-13:53/13:54w/13:55-13:66:02/13:68-13:76/13:77w/13:78-13:99/13:100w/13:101-13:102/13:103w/13:104-13:159/13:160w/13:161/13:162w/13:163-13:164/13:165w/13:166-13:182/13:184-13:194/13:196-13:198/13:199w/13:201-13:217/13:218w/13:219-13:227/13:229-13:247/13:250-13:298N/13:300-13:350, DRB1*14:01:01:01-14:09/14:12:01-14:38:02/14:40-14:45/14:47/14:48w/14:49-14:54:01:17/14:54:03-14:54:07/14:54:08w/14:54:09-14:56/14:58-14:60/14:62-14:65/14:67-14:124/14:125w/14:126:01-14:140/14:142/14:144-14:147/14:149-14:176/14:177w/14:178-14:181/14:183-14:194/14:195Nw/14:196-14:198/14:200-14:221/14:223-14:230/14:232-14:246/14:248?/14:249-14:251/14:252?/14:253-14:256/14:258-14:260, DRB3*01:14w	DR17(3), -, DR18(3), DR3, Null, DR8, DR12(5), DR13(6), DR14(6), DR1403, DR1404, DR6	165 bp/ 170 bp/ 175 bp
G3	G9	Mix 18	DRB1*03:10/03:97/03:126/03:191, DRB1*08:08/08:29, DRB1*11:17/11:52-11:54:02/11:89/11:150/11:159/11:202/11:267/11:283/11:293, DRB1*12:66/12:96, DRB1*13:43/13:45/13:76/13:159/13:171:01/13:179/13:188/13:191/13:197/13:206/13:217/13:302, DRB1*14:01:01:01-14:01:05/14:04:01:01-14:05:05/14:07:01-14:08/14:11:01:01-14:11:01:02/14:14/14:16/14:18/14:22-14:23:04/14:25:01-14:26/14:28/14:31-14:33/14:35-14:36/14:38:01-14:39/14:42-14:45/14:49-14:51/14:53-14:56/14:58-14:62/14:64/14:68:01-14:76/14:79/14:82/14:86-14:88/14:90-14:93/14:95-14:97/14:99/14:101/14:103-14:107/14:110-14:114/14:117-14:120/14:122/14:124/14:125w/14:126:01-14:126:02/14:128-14:134/14:137N-14:140/14:142/14:145-14:155/14:157-14:158/14:160-14:164/14:166N-14:169/14:171-14:173/14:175/14:178/14:180/14:184-14:193/14:196-14:197N/14:199-14:208/14:210Q-14:211/14:213-14:217/14:219-14:221/14:224-14:225/14:227-14:230/14:232-14:238/14:240-14:241/14:243-14:246/14:248?/14:249?/14:250-14:251/14:253-14:256/14:258-14:260	DR17(3), -, DR11(5), DR14(6), DR1404, DR6, DR13(6), Null	175 bp/ 225 bp

Position	Mix	Allele	Serology	Size	
F3	F9	Mix 19	DRB1*03:126/03:157w/03:177, DRB1*04:211, DRB1*11:09:01:01-11:09:01:02/11:28:02w/11:58:01w/11:83/11:87:01-11:87:02/11:113/11:115w/11:182/11:280, DRB1*12:58, DRB1*13:05:01:01-13:06/13:18/13:26:01-13:26:02/13:42:01-13:42:02/13:50:02w-13:50:03w/13:56/13:77/13:119/13:136/13:144/13:146/13:156-13:158:02/13:163/13:181/13:189w/13:193/13:199/13:203/13:235/13:277/13:302/13:331/13:349, DRB1*14:02:01:01-14:03:02/14:06:01-14:06:06/14:09/14:12:01-14:13/14:17-14:18/14:27:01-14:27:02/14:29-14:30/14:33/14:46-14:48/14:51-14:52/14:59/14:63-14:64/14:67/14:78/14:80-14:81/14:83/14:85/14:89/14:95/14:98w/14:106/14:108/14:115/14:121/14:132-14:135/14:144/14:154/14:165/14:170/14:174/14:176-14:177/14:179/14:194-14:195N/14:198/14:200/14:209/14:212/14:218/14:222N-14:223/14:239/14:242:01-14:242:02/14:246/14:252, DRB1*16:08w	-, DR11(5), DR13(6), DR14(6), DR1403, DR6, Null	145 bp/ 150 bp
E3	E9	Mix 20	DRB1*09:07, DRB5*01:01:01:01-01:01:09/01:01:11-01:02:01/01:02:02w/01:02:03-01:25/01:26w/01:27N-01:47/01:48Nw/01:49N-01:50/01:52N-01:72/01:74w/01:75-01:78/01:80-01:86/01:88-01:96/01:98-01:109/01:111-01:112/01:113w/01:114-01:130/01:132-01:137, DRB5*02:02:01-02:38	-, DR51, Null	175 bp/ 210 bp
D3	D9	Mix 21	DRB1*03:42/03:87, DRB1*14:141/14:257, DRB3*01:01:02:01-01:13/01:15-01:67/01:69-01:94/01:96-01:103/01:105N-01:106/01:107?/01:108/01:110-01:123, DRB3*02:01-02:25/02:28-02:46/02:48-02:57/02:59-02:65/02:67N-02:77/02:78w/02:79-02:90/02:92-02:108/02:109Nw/02:110/02:112-02:116/02:117w/02:118-02:123/02:124w/02:125N-02:130/02:132-02:142/02:144-02:159/02:161/02:162w/02:163-02:189/02:190?/02:191-02:201, DRB3*03:01:01:01-03:01:12/03:01:13w/03:01:14-03:21/03:23-03:45/03:46w/03:47-03:67/03:68?	-, DR52, Null	215 bp
C3	C9	Mix 22†	DRB4*01:01:01:01/01:01:01:03-01:01:01:04/01:01:12-01:03:01:01/01:03:01:03-01:03:01:12/01:03:01:14-01:03:02:02/01:152, DRB4*02:01N	DR53, -, Null	150 bp
B3	B9	Mix 23	DRB4*01:03:01:02N/01:03:01:13N	Null	275 bp
A3	A9	Mix 24	Negative Control		None (440 bp)

Amplification control (internal positive control): 440 base pairs (bp)

w = weak

? = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities

Mix 6: HLA-DRB1*03:81 serology unclear

HLA-DRB1*08:04:02 is not listed since the primer matching sequences are unknown

† = Alleles which are not sequenced in the primer binding sites of mixes 22 (according to the IMGT/HLA Database of January 2024) have been excluded from the list of allele specificities of this mix: HLA-DRB4*01:01:02-01:01:11/01:03:03-01:13/01:15-01:61:02N/01:63-01:87/01:89-01:151/01:153-01:178.

Table 2: Allele specificities and sizes of the PCR products of each **HLA-DQB1*** CTS-PCR-SSP primer mix (**Lot No. DQB14-1**) based on IMGT/HLA Sequence Database Release 3.55.0, January 2024

Position	Mix	Allele	Serology	Size	
H4	H10	Mix 1	DQB1*04:10w, DQB1*05:01:01:01-05:01:01:30/05:01:02-05:01:13/05:01:15/05:01:16w/05:01:17-05:01:18/05:01:19w/05:01:20-05:01:48/05:02:01:01-05:02:27/05:03:01:01-05:03:01:09/05:03:02-05:03:09/05:03:11-05:03:24/05:03:25w/05:03:26-05:03:30/05:04-05:20:02/05:22-05:25/05:26w/05:27-05:33/05:34w/05:35-05:43:02/05:44w/05:45-05:59/05:61-05:71/05:74-05:81/05:83-05:97/05:99-05:104/05:106-05:112/05:113w/05:114-05:115/05:117-05:127/05:128Nw/05:129/05:130w/05:131-05:170/05:171w/05:172-05:174/05:176-05:206N/05:208N-05:217/05:219-05:227/05:228w/05:229-05:257/05:259-05:299/05:301/05:302w/05:303-05:318, DQB1*06:23/06:156/06:162/06:169/06:325	-, DQ5(1), Null	see below
			DQB1*04:10w, DQB1*05:03:02/05:43:02/05:301, DQB1*06:23/06:156/06:162/06:169	-, DQ5(1)	135 bp
			DQB1*05:01:01:01-05:01:01:30/05:01:02-05:01:13/05:01:15/05:01:16w/05:01:17-05:01:18/05:01:19w/05:01:20-05:01:48/05:02:01:01-05:02:27/05:03:01:01-05:03:01:09/05:03:02-05:03:09/05:03:11-05:03:24/05:03:25w/05:03:26-05:03:30/05:04-05:20:02/05:22-05:25/05:26w/05:27-05:33/05:34w/05:35-05:43:02/05:44w/05:45-05:59/05:61-05:71/05:74-05:81/05:83-05:97/05:99-05:104/05:106-05:112/05:113w/05:114-05:115/05:117-05:127/05:128Nw/05:129/05:130w/05:131-05:170/05:171w/05:172-05:174/05:176-05:206N/05:208N-05:217/05:219-05:227/05:228w/05:229-05:257/05:259-05:299/05:301/05:302w/05:303-05:318, DQB1*06:325	DQ5(1), -, Null	225 bp
G4	G10	Mix 2	DQB1*03:194/03:408, DQB1*06:01:01:01-06:01:29/06:01:30?/06:01:31-06:01:34/06:02:07/06:03:01:01-06:03:06/06:03:08-06:03:18/06:03:20-06:03:49/06:08:01:01-06:08:03/06:11:02-06:12/06:14:01/06:14:03/06:17/06:21/06:26N/06:28/06:30-06:31/06:35/06:40-06:45/06:53:01-06:57:02/06:59-06:65/06:67/06:82/06:87/06:90-06:92:02/06:98-06:105/06:108/06:110/06:120/06:128/06:132-06:134/06:140-06:145:02/06:148/06:149w/06:154/06:157/06:165/06:168/06:170/06:177/06:181/06:184-06:185/06:187/06:190:01-06:191/06:194-06:196/06:199/06:203/06:205/06:209-06:210/06:214/06:218/06:221-06:223/06:229-06:230/06:233-06:234/06:238-06:239/06:243-06:246/06:248/06:250-06:251/06:253/06:257w/06:258-06:259/06:263/06:268-06:269/06:272/06:274-06:275/06:276w/06:277-06:279/06:285/06:302/06:305/06:307/06:309-06:310/06:312/06:316/06:319:01/06:321/06:323/06:327-06:331/06:334/06:336/06:340/06:345N-06:346/06:350/06:352/06:359-06:360/06:362/06:365/06:367/06:371/06:373/06:378/06:382/06:385/06:391-06:392/06:394N/06:396/06:399?/06:400/06:403/06:410/06:418-06:419/06:421/06:423N-06:425/06:427-06:428/06:433/06:435/06:440/06:443/06:450/06:453-06:455/06:459-06:460/06:462-06:463/06:464?/06:466/06:469-06:472/06:474-06:475/06:478/06:480	-, DQ6(1), DQ1, Null	see below
			DQB1*03:408, DQB1*06:01:01:01-06:01:29/06:01:30?/06:01:31-06:01:34/06:35/06:43/06:45/06:53:01-06:57:02/06:98-06:105/06:108/06:120/06:132/06:140/06:142/06:157/06:168/06:177/06:181/06:194/06:205/06:209/06:214/06:229/06:239/06:243/06:245-06:246/06:251/06:257w/06:258/06:263/06:268/06:274/06:277/06:285/06:305/06:307/06:309-06:310/06:312/06:321/06:323/06:330N/06:359/06:382/06:418-06:419/06:421/06:427/06:435/06:462-06:463/06:464?/06:466/06:469/06:471-06:472/06:475	-, DQ6(1), Null	160 bp
			DQB1*03:194/06:02:07/06:03:01:01-06:03:06/06:03:08-06:03:18/06:03:20-06:03:49/06:08:01:01-06:08:03/06:11:02-06:12/06:14:01/06:14:03/06:17/06:21/06:26N/06:28/06:30-06:31/06:40-06:42/06:44/06:59-06:65/06:67/06:82/06:87/06:90-06:92:02/06:110/06:128/06:133-06:134/06:141/06:143-06:145:02/06:148/06:149w/06:154/06:165/06:170/06:184-06:185/06:187/06:190:01-06:191/06:195-06:196/06:199/06:203/06:210/06:218/06:221-06:223/06:230/06:233/06:234/06:238/06:244/06:248/06:250/06:253/06:259/06:269/06:272/06:275/06:276w/06:278-06:279/06:302/06:316/06:319:01/06:327-06:329/06:331/06:334/06:336/06:340/06:345N-06:346/06:350/06:352/06:360/06:362/06:365/06:367/06:371/06:373/06:378/06:385/06:391-06:392/06:394N/06:396/06:399?/06:400/06:403/06:410/06:418-06:419/06:421/06:423N-06:425/06:427-06:428/06:433/06:440/06:443/06:450/06:453-06:455/06:459-06:460/06:470/06:474/06:478/06:480	-, DQ6(1), DQ1, Null	170 bp

Position	Mix	Allele	Serology	Size
F4	F10	Mix 3		
			- , DQ6(1), DQ1, Null	see below
			- , DQ6(1), DQ1, Null	130 bp
			- , DQ6(1), DQ1, Null	165 bp

Position	Mix	Allele	Serology	Size	
		DQB1*03:23:01, DQB1*05:43:02, DQB1*06:02:01:01-06:02:02/06:02:04/06:02:06-06:02:09/06:02:12-06:02:13/06:02:15/06:02:17-06:02:18/06:02:20-06:02:42/06:02:44-06:02:57/06:02:59-06:03:03/06:03:05w/06:03:06-06:03:07/06:03:11-06:03:12/06:03:15/06:03:17-06:03:25/06:03:27-06:03:29/06:03:31-06:03:32/06:03:35-06:03:38/06:03:40-06:03:49/06:07:01/06:11:01:01-06:11:03/06:14:01-06:14:02/06:15:01-06:16/06:19:02-06:20/06:23-06:24/06:26N/06:28/06:30-06:32:01/06:33/06:37/06:40-06:41:01:03/06:44/06:46-06:50/06:51:02/06:60-06:62/06:65w/06:67-06:68/06:70-06:74/06:76-06:79:01/06:80-06:84:01:02/06:87/06:90/06:92:02/06:95/06:96:02/06:107/06:109-06:113/06:115-06:118:01/06:118:03/06:122/06:124/06:126-06:128/06:131/06:133-06:134/06:137/06:141/06:143-06:144N/06:146:01-06:148/06:151/06:154/06:156/06:159/06:161-06:163/06:165/06:169/06:173-06:176/06:178-06:179N/06:183-06:185/06:187-06:188/06:191-06:192/06:195/06:197-06:201/06:203/06:210-06:211/06:213/06:216N/06:218-06:219/06:221/06:223-06:228/06:230/06:232-06:238/06:240/06:244/06:248-06:250/06:253/06:255-06:256/06:262/06:269-06:273/06:276/06:278-06:279/06:284/06:286/06:289-06:290/06:293-06:298/06:300/06:304N/06:306N/06:308N/06:311/06:314-06:317N/06:322:03/06:324/06:326-06:329/06:333-06:336/06:338/06:340-06:341N/06:344-06:347/06:350/06:352/06:354-06:357/06:360/06:362-06:367/06:370/06:372-06:373/06:376/06:378-06:380/06:383N-06:386/06:388/06:390-06:397N/06:399-06:406/06:409-06:413/06:416:01:01Q-06:416:01:02Q/06:422N-06:425/06:428/06:430-06:431/06:433/06:436-06:438/06:440/06:442-06:443/06:445-06:446/06:448/06:450-06:451/06:453-06:454N/06:456N-06:457/06:459-06:461/06:468/06:470/06:474/06:476/06:478/06:480	-, DQ6(1), DQ1, Null	65 bp	
		DQB1*06:02:01:01-06:02:02/06:02:04/06:02:06-06:02:07/06:02:09/06:02:11-06:02:13/06:02:15/06:02:17-06:02:18/06:02:20-06:02:57/06:02:59-06:03:03/06:03:05w/06:03:06-06:03:07/06:03:11-06:03:13/06:03:15/06:03:17-06:03:25/06:03:27-06:03:29/06:03:31-06:03:33/06:03:35-06:03:49/06:08:01:01-06:08:01:02/06:10-06:11:03/06:13:01/06:14:01-06:14:02/06:16/06:19:02-06:20/06:23-06:24/06:26N/06:28-06:31/06:33/06:40-06:41:01:03/06:44/06:46-06:47/06:49-06:50/06:60-06:63/06:65w/06:67-06:68/06:70-06:79:01/06:80-06:84:01:02/06:87/06:90/06:92:02/06:95-06:96:02/06:106-06:107/06:109-06:113/06:115-06:117/06:122/06:124-06:128/06:130-06:131/06:133-06:134/06:136-06:137/06:141/06:143-06:144N/06:146:01-06:148/06:151/06:154/06:156/06:159/06:161-06:163/06:165-06:166/06:169-06:170/06:173-06:176/06:178-06:179N/06:182-06:185/06:187-06:188/06:191-06:192/06:195/06:197-06:201/06:203/06:206:01/06:210-06:211/06:213/06:216N/06:218-06:219/06:221-06:228/06:230/06:232-06:238/06:240/06:244/06:248-06:250/06:253/06:255-06:256/06:262/06:264/06:269-06:273/06:276/06:278-06:279/06:284/06:286/06:289-06:290/06:293-06:298/06:300/06:304N/06:306N/06:308N/06:311/06:314-06:317N/06:322:01/06:322:03/06:324/06:326-06:329/06:333-06:336/06:338/06:340-06:341N/06:344-06:347/06:350/06:352/06:354-06:357/06:360/06:362-06:367/06:370/06:372-06:374/06:376/06:378-06:380/06:383N-06:386/06:388-06:397N/06:399-06:401/06:403-06:406/06:408-06:413/06:416:01:01Q-06:416:01:02Q/06:422N-06:425/06:428/06:430-06:431/06:433/06:436-06:438/06:440/06:442-06:443/06:445-06:446/06:448/06:450-06:451/06:453-06:456N/06:459-06:461/06:468/06:470/06:474/06:476-06:478/06:480	DQ6(1), -, DQ1, Null	105 bp	
E4	E10	Mix 4	DQB1*06:04:01:01-06:07:02/06:09:01:01-06:09:03/06:09:05/06:09:06w/06:09:07-06:09:12/06:18:01-06:18:02/06:22:02/06:25/06:27:01-06:27:02/06:32:01-06:32:02/06:34/06:36/06:38-06:39/06:52/06:58/06:66/06:69:01/06:85-06:86/06:88:01:01-06:89/06:93-06:94/06:118:01-06:118:02/06:118:04/06:121w/06:129/06:135/06:142/06:155/06:158N/06:160/06:164/06:168/06:171-06:172/06:180/06:186/06:189/06:193N/06:202/06:204/06:207/06:212w/06:217/06:241/06:252N/06:254/06:261/06:265-06:267/06:280-06:283/06:287-06:288/06:291-06:292/06:299/06:303N/06:313/06:320/06:339/06:343/06:348-06:349/06:351/06:353/06:358/06:361/06:368-06:369/06:375/06:381/06:387/06:398/06:407/06:414N/06:420/06:426/06:429/06:432/06:434/06:439Q/06:444/06:449/06:452N/06:458N/06:465/06:467/06:473/06:479	DQ6(1), -, Null	170 bp
D4	D10	Mix 5	DQB1*02:01:01:01-02:01:09/02:01:11-02:01:13/02:01:15-02:01:23/02:01:24w/02:01:25-02:24/02:26-02:34/02:36/02:37w/02:38-02:39/02:41-02:45/02:46w-02:47w/02:48-02:71/02:73-02:89/02:90w/02:91-02:146/02:148-02:215	DQ2, -, Null	200 bp

Position	Mix	Allele	Serology	Size	
C4	C10	Mix 6	DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:59/03:04:01:01-03:04:04/03:09-03:10:03/03:13-03:14:02/03:16/03:19:01:01-03:19:06/03:21-03:23:02/03:24/03:27-03:29/03:35/03:36w/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75-03:77/03:80/03:82-03:84N/03:92-03:94/03:101-03:103/03:108-03:109/03:114-03:116/03:118N-03:121/03:122w/03:127-03:131/03:133-03:135/03:138-03:140/03:142-03:144/03:147/03:150/03:151w/03:152/03:154/03:157-03:160/03:162-03:167/03:169-03:170/03:171w/03:172-03:173/03:180/03:182-03:183/03:186-03:188/03:191-03:198:02/03:201-03:202/03:206-03:208/03:216-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271/03:275-03:276N/03:281/03:284-03:286/03:288/03:290-03:294/03:297/03:302-03:303N/03:305-03:307/03:309:01-03:309:02/03:311-03:312/03:317:01-03:318/03:326-03:331/03:335/03:338N/03:340N-03:342/03:347/03:350/03:353-03:355/03:358N/03:360-03:361/03:366/03:370/03:372-03:373/03:376N-03:378/03:380-03:381/03:385N/03:387/03:389-03:391/03:394/03:396/03:399N-03:401/03:404/03:407N-03:408/03:417-03:421/03:423-03:428/03:430-03:432/03:434-03:436/03:438-03:439/03:443/03:448-03:449/03:451/03:454-03:455/03:458/03:460/03:465/03:467-03:470/03:472-03:476/03:480Q/03:482-03:483/03:485-03:486/03:488N/03:491-03:492/03:496-03:497/03:499N/03:503/03:506/03:508/03:513-03:514, DQB1*04:10, DQB1*05:03:02?, DQB1*06:35/06:53:01-06:53:02/06:475	DQ7(3), -, Null, DQ5(1)	see below
			DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:37/03:01:39-03:01:59/03:04:01:01-03:04:01:02/03:04:03-03:04:04/03:09/03:13/03:16/03:19:01:01-03:19:06/03:21-03:22:02/03:24/03:27-03:29/03:35/03:36w/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75/03:77/03:82-03:84N/03:92-03:94/03:101-03:103/03:108-03:109/03:114-03:116/03:118N-03:120/03:122w/03:127/03:129-03:130/03:133-03:135/03:140/03:142-03:144/03:147/03:150/03:151w/03:152/03:154/03:157-03:160/03:162-03:165/03:167/03:169-03:170/03:171w/03:172-03:173/03:182/03:186-03:188/03:191-03:194/03:196-03:198:02/03:201-03:202/03:206-03:208/03:216/03:218-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:254/03:256/03:260/03:264/03:266-03:268/03:271/03:275-03:276N/03:281/03:284-03:286/03:288/03:290-03:294/03:297/03:302-03:303N/03:305-03:307/03:309:01-03:309:02/03:311-03:312/03:317:01-03:318/03:326/03:328-03:331/03:335/03:338N/03:340N-03:342/03:347/03:350/03:354N-03:355/03:358N/03:360-03:361/03:370/03:372-03:373/03:376N-03:378/03:380-03:381/03:385N/03:387/03:389-03:391/03:394/03:396/03:399N-03:401/03:404/03:407N-03:408/03:417-03:421/03:423-03:428/03:430-03:432/03:434-03:436/03:439/03:443/03:448-03:449/03:451/03:454-03:455/03:458/03:460/03:465/03:467-03:470/03:472-03:473N/03:476/03:480Q/03:482-03:483/03:485-03:486/03:488N/03:491-03:492/03:496-03:497/03:499N/03:503/03:506/03:508/03:513-03:514, DQB1*06:35/06:53:01-06:53:02/06:475	DQ7(3), -, Null	100 bp
			DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:59/03:04:01:01-03:04:04/03:09-03:10:03/03:13-03:14:02/03:16/03:19:01:01-03:19:06/03:21-03:22:02/03:24/03:27-03:29/03:35/03:36w/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75-03:77/03:80/03:82-03:84N/03:92-03:94/03:101-03:103/03:108-03:109/03:114-03:116/03:118N-03:121/03:122w/03:127-03:131/03:133-03:135/03:138-03:140/03:142-03:144/03:147/03:150/03:151w/03:152/03:154/03:157-03:160/03:162-03:167/03:169-03:170/03:171w/03:172-03:173/03:180/03:182-03:183/03:186-03:188/03:191-03:198:02/03:201-03:202/03:206-03:207/03:216/03:218-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271/03:275-03:276N/03:281/03:284-03:286/03:288/03:290-03:294/03:297/03:302-03:303N/03:305-03:307/03:309:01-03:309:02/03:311-03:312/03:317:01-03:318/03:326-03:331/03:335/03:338N/03:340N-03:342/03:347/03:350/03:353-03:355/03:358N/03:360-03:361/03:366/03:370/03:372-03:373/03:376N-03:378/03:380-03:381/03:385N/03:387/03:389-03:391/03:394/03:396/03:400N-03:401/03:404/03:407N-03:408/03:417-03:421/03:423-03:428/03:430-03:432/03:434/03:436/03:438-03:439/03:448-03:449/03:451/03:454-03:455/03:458/03:460/03:465/03:467-03:470/03:472-03:476/03:480Q/03:482-03:483/03:485-03:486/03:488N/03:491-03:492/03:496-03:497/03:499N/03:503/03:506/03:508/03:513-03:514	DQ7(3), -, Null, DQ8(3)	215 bp
			DQB1*03:23:01-03:23:02/03:217/03:355, DQB1*04:10, DQB1*05:03:02?	-, DQ5(1)	120 bp
B4	B10	Mix 7	DQB1*03:04:01:01-03:04:04/03:14:01-03:14:02/03:70/03:80/03:179w/03:318/03:327/03:443/03:474w, DQB1*06:246w	DQ7(3), -	175 bp

Position		Mix	Allele	Serology	Size
A4	A10	Mix 8	DQB1*03:02:01:01-03:02:09/03:02:11-03:02:15/03:02:16w/03:02:17-03:02:39/03:07-03:08/03:11/03:32/03:37/03:45-01-03:45:02/03:62-03:64/03:66N-03:68/03:70/03:81/03:85/03:106-03:107/03:125/03:146/03:153/03:161/03:174-03:175/03:178-03:179/03:184-03:185/03:189-03:190/03:199/03:203-03:205/03:210-03:211/03:213N-03:215/03:220-03:221/03:223-03:224/03:225w/03:228-03:229/03:233/03:237N/03:240/03:245/03:247/03:251/03:261/03:263:01:01-03:263:01:02/03:265/03:269N/03:273-03:274/03:277-03:279/03:287/03:289/03:295-03:296/03:298-03:301/03:308/03:310N/03:315/03:320-03:324/03:333-03:334N/03:339N/03:343-03:345/03:348-03:349/03:352/03:362/03:364/03:367-03:369/03:371/03:379/03:383/03:386/03:388/03:392/03:403N/03:409-03:410/03:412-03:413/03:415-03:416/03:422N/03:429/03:433/03:437w/03:440N-03:442/03:444/03:446-03:447/03:450/03:452/03:456-03:457/03:459/03:462-03:464/03:466/03:471/03:479/03:481/03:484/03:490/03:493/03:495/03:498/03:500-03:502/03:504/03:511-03:512/03:515/03:517, DQB1*06:29/06:123/06:139/06:246/06:337	DQ8(3), -, Null	130 bp
H5	H11	Mix 9 †	DQB1*03:02:01:01-03:02:01:10/03:02:01:12-03:02:03/03:02:09/03:02:12/03:02:21-03:02:24/03:02:32-03:02:33/03:02:36-03:02:37/03:02:39/03:05:01/03:05:03-03:05:04/03:08/03:11/03:37/03:68/03:211/03:229/03:245/03:247/03:250-03:251/03:263:01:01-03:263:01:02/03:289/03:415-03:416/03:422N/03:429/03:442/03:464/03:481/03:484/03:493/03:498/03:500-03:502/03:504	DQ8(3), -, Null	190 bp
G5	G11	Mix 10	DQB1*02:77/02:180, DQB1*03:03:02:01-03:03:05/03:03:06w/03:03:07-03:03:16/03:03:17w/03:03:18-03:03:25/03:03:27-03:03:29/03:03:30?/03:06w/03:12/03:15/03:20/03:23:03/03:25:01w-03:25:02w/03:26/03:30-03:31/03:33-03:34/03:38:01-03:41/03:43/03:65/03:74/03:79/03:86-03:91Q/03:95N-03:99Q/03:104-03:105/03:111-03:113/03:117/03:123-03:124/03:126w/03:136-03:137/03:141/03:145w/03:155-03:156/03:168/03:176-03:177/03:200/03:209/03:212/03:222/03:227/03:230/03:234/03:238-03:239/03:248-03:249/03:258/03:270/03:280/03:282N-03:283/03:304/03:313/03:316/03:319/03:332/03:336-03:337/03:351/03:356N-03:357N/03:359/03:363/03:365/03:374-03:375N/03:382:01-03:382:02/03:384/03:393/03:395/03:397-03:398/03:402/03:405-03:406/03:411N/03:414/03:445/03:453/03:461/03:477-03:478/03:487/03:489/03:494/03:505/03:507/03:509N-03:510/03:516/03:518, DQB1*04:03:01w-04:03:03w, DQB1*06:02:43/06:03:10/06:03:33/06:51:01/06:66/06:96:01/06:118:04/06:168/06:172/06:322:01-06:322:02/06:377	-, DQ9(3), DQ3, Null	135 bp
F5	F11	Mix 11 †	DQB1*03:02:01:11/03:03:02:01-03:03:04/03:03:11/03:03:30/03:25:01/03:30-03:31/03:40/03:105/03:126/03:195/03:239/03:248-03:249/03:414/03:445/03:453/03:505/03:507	-, DQ9(3)	175 bp
E5	E11	Mix 12	DQB1*02:57?/02:77?/02:141?, DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:05/03:01:06w/03:01:07-03:01:52/03:01:54-03:02:22/03:02:24-03:05:05/03:07-03:22:02/03:23:02-03:24/03:25:02-03:128/03:130-03:131/03:133-03:324/03:326-03:487/03:488N?/03:489-03:512/03:513?/03:514-03:518, DQB1*05:11:01/05:131?/05:240, DQB1*06:02:02/06:03:02/06:03:34/06:04:08/06:09:07/06:29?/06:63/06:66/06:87/06:96:01?-06:96:02?/06:139/06:145:02/06:172/06:208:02/06:209?/06:320?/06:322:01-06:322:03/06:337/06:475	-, DQ7(3), Null, DQ8(3), DQ9(3), DQ6(1)	see below
			DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:01:60/03:01:03-03:01:05/03:01:06w/03:01:07-03:01:29/03:01:31-03:01:52/03:01:54-03:02:02:02/03:02:05-03:02:12/03:02:14-03:02:22/03:02:24-03:03:02:16/03:03:04-03:04:04/03:05:03-03:05:04/03:07-03:17:01/03:18-03:19:06/03:21-03:22:02/03:23:02-03:24/03:25:02-03:36/03:38:01/03:39-03:43/03:45:01-03:53/03:55-03:60/03:62-03:71/03:74/03:76-03:98/03:101-03:111/03:113-03:117/03:119-03:128/03:130-03:131/03:133-03:135/03:137-03:155/03:157-03:161/03:163-03:174/03:176-03:180/03:182/03:184-03:203/03:205-03:222/03:224-03:225/03:227-03:232/03:234-03:236/03:239-03:249/03:251/03:253-03:261/03:263:01:01-03:268/03:270-03:290/03:292-03:324/03:326-03:335/03:337-03:345/03:347-03:350/03:353/03:355-03:370/03:372-03:373/03:375N-03:390/03:392-03:440N/03:442-03:487/03:488N?/03:489-03:512/03:513?/03:514-03:515/03:517-03:518, DQB1*05:11:01/05:240, DQB1*06:02:02/06:03:02/06:03:34/06:04:08/06:09:07/06:145:02/06:208:02	DQ7(3), -, Null, DQ8(3), DQ9(3), DQ6(1)	160 bp

Position		Mix	Allele	Serology	Size
			DQB1*02:57?/02:77?/02:141?, DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:05/03:01:06w/03:01:07-03:01:36/03:01:38-03:01:52/03:01:54-03:02:22/03:02:24-03:05:05/03:07-03:15/03:17:01-03:22:02/03:24/03:26-03:128/03:130-03:131/03:133-03:171/03:173-03:213N/03:215-03:216/03:218-03:233/03:235-03:258/03:260/03:262-03:281/03:283-03:324/03:326-03:354N/03:356N-03:449/03:451-03:487/03:488N?/03:489-03:512/03:513?/03:514-03:518, DQB1*05:131?, DQB1*06:29?/06:63/06:66/06:87/06:96:01?/06:96:02?/06:139/06:172/06:209?/06:320?/06:322:01-06:322:03/06:337/06:475	-, DQ7(3), Null, DQ8(3), DQ9(3)	110 bp
D5	D11	Mix 13	DQB1*03:132, DQB1*04:01:01:01-04:01:05/04:01:06?/04:02:01:01/04:02:01:04-04:02:01:21/04:02:03-04:02:07/04:02:09-04:02:21/04:02:23?/04:02:24-04:03:01/04:04-04:30/04:32-04:47/04:49-04:66/04:67w/04:68N-04:90/04:91?/04:92-04:97	-, DQ4, Null	210 bp
C5	C11	Mix 14	Negative Control		440 bp

Amplification control (internal positive control): 440 base pairs (bp)

Positions: B5 + A5, H6 - A6, B11 + A11 and H12 - A12 are empty wells.

w = weak

? = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities

Bold: mixes which result in PCR fragments of different sizes (the specificities are first indicated all in one row, then split into several groups in the subsequent rows depending on the fragment size)

Mix 6, HLA-DQB1*03:10: a rare allele according to Mack SJ et al., Tissue Antigens 2013, serological equivalent is controversially discussed (DQ3, DQ7 or DQ8).

† **ATTENTION!** HLA-DQB1 alleles which are not sequenced in the primer binding sites of mixes 9 and 11 (according to the IMGT/HLA Database of January 2024) have been excluded from the list of allele specificities of these mixes.

Table 3: Amplification patterns of **HLA-DRB1*** and other HLA-DRB* alleles detected by the HLA-DRB1* CTS-PCR-SSP primer mixes (**Lot No. DR43-4**) based on IMGT/HLA Sequence Database Release 3.55.0, January 2024

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*01:01:01:01:01:01:30/01:01:32-01:01:44/01:01:46-01:02:11/01:02:13-01:17/01:19-01:20:02/01:23-01:32/01:35-01:38/01:41-01:43/01:45-01:48/01:50-01:59/01:61-01:64/01:66-01:74/01:77-01:133/01:135-01:149	DR1, -, DR103, Null	1																						
DRB1*01:01:45	-	?																						
DRB1*01:21	-	1							w															
DRB1*01:34	-	1										w												
DRB1*01:39N-01:40N/01:49/01:65:01-01:65:02	Null, -	w																						
DRB1*01:75	-	1											12											
DRB1*03:01:01:01:01:03:01:01:27/03:01:03/03:01:05-03:01:06/03:01:08-03:01:13/03:01:15-03:01:41/03:04:01-03:04:02/03:06/03:11:01/03:11:03/03:13:01/03:15:01:01-03:15:01:02/03:16/03:18-03:20/03:22-03:23/03:25:01-03:26/03:28/03:30-03:34/03:36-03:37/03:39/03:43-03:45/03:47-03:48/03:50-03:52:02/03:55-03:56/03:58/03:60-03:62/03:64/03:66-03:73/03:75/03:77-03:78/03:80/03:82-03:83/03:85-03:86/03:89/03:91/03:93-03:96/03:98-03:99/03:104/03:106-03:110/03:112/03:114/03:116-03:118/03:121/03:123-03:124/03:128-03:129/03:132-03:134/03:136-03:139/03:141-03:144/03:146-03:153/03:159-03:161/03:163-03:166/03:168-03:170/03:172-03:173/03:175/03:180-03:184/03:186-03:187/03:189N/03:192-03:204N/03:207-03:210	DR17(3), -, DR3, Null				4	5												17						
DRB1*03:01:02:01-03:01:02:02/03:13:02/03:15:02/03:145	DR17(3), -				w	5												17						
DRB1*03:01:04/03:76/03:84/03:92/03:174N, DRB1*13:129/13:326	DR17(3), -, Null					5												17						
DRB1*03:01:07/03:46/03:59/03:79	DR17(3), -				4	5												w						
DRB1*03:01:14/03:127/03:135/03:190	-				w	5												w						
DRB1*03:02:01:01-03:02:01:02/03:02:03-03:02:06/03:05:01-03:05:02/03:09/03:14/03:27/03:29/03:53/03:74/03:81/03:88/03:90/03:102-03:103/03:115/03:122/03:131/03:154/03:167/03:176/03:178-03:179/03:188/03:211	DR18(3), -, DR3				4		6											17						
DRB1*03:02:02/03:05:03	DR18(3), DR3				w		6											17						
DRB1*03:03/03:07:01:01-03:07:02/03:17/03:21/03:24/03:35/03:40-03:41:02/03:57/03:63/03:101/03:105/03:113/03:119-03:120/03:171/03:185	DR18(3), DR3, -				4													17						
DRB1*03:08/03:65/03:140	-				4	5							12											
DRB1*03:10	DR17(3)				4	5												17	18					
DRB1*03:12	DR3				4	?										15		17						

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*03:38	-				4		6											w						
DRB1*03:42/03:87, DRB3*01:34, DRB3*03:33	-					5																21		
DRB1*03:49	-				4			7										17						
DRB1*03:54/03:100:01-03:100:02/03:205	-				4	w												17						
DRB1*03:97, DRB1*11:293, DRB1*13:45/13:76/13:197/13:206, DRB1*14:01:01:01-14:01:05/14:05:01:01-14:05:05/14:07:01-14:08/14:14/ 14:16/14:22-14:23:04/14:25:01-14:26/14:32:01-14:32:03/14:35-14:36/ 14:38:01-14:38:02/14:42-14:45/14:49/14:53-14:54:01:17/14:54:03-14:54:07/ 14:54:09-14:56/14:58/14:60/14:62/14:69-14:70/14:72/14:74-14:75/14:86- 14:88/14:90-14:92N/14:96-14:97/14:99/14:101/14:103/14:105/14:110/ 14:112-14:114/14:117-14:119/14:122/14:124/14:126:01-14:126:02/14:128- 14:131/14:137N/14:139-14:140/14:142/14:146-14:147/14:149-14:151/14:153/ 14:155/14:157-14:158/14:160/14:162-14:164/14:166N-14:168/14:172-14:173/ 14:175/14:178/14:184-14:193/14:197N/14:202-14:204/14:205:02/14:207- 14:208/14:211/14:213-14:217/14:219/14:221/14:225/14:227-14:228/14:230/ 14:232/14:234-14:238/14:240/14:243-14:245/14:251/14:253/14:255-14:256/ 14:258-14:260	-, DR14(6), DR6, DR13(6), Null																	17	18					
DRB1*03:111/03:162, DRB1*09:06	-					5																		
DRB1*03:125, DRB1*13:27:01-13:27:02/13:176	-, DR13(6)					5									14			17						
DRB1*03:126, DRB1*14:95/14:132	-					5												17	18	19				
DRB1*03:130	-				w		6											w						
DRB1*03:155	-				4											15		17						
DRB1*03:156N	Null				4	5																		
DRB1*03:157	-					5												17		w				
DRB1*03:158	-				4	5										15		17						
DRB1*03:177	-					5												17		19				
DRB1*03:191	-				?	5												17	18					
DRB1*03:206	-				4		?											17						
DRB1*04:01:01:01-04:05:11/04:05:13-04:11:03/04:11:05-04:14/04:16-04:60/ 04:62-04:137/04:139-04:144/04:146-04:153/04:155/04:157N-04:169/04:171- 04:210/04:212N-04:264N/04:266N-04:290/04:292-04:322/04:324-04:338/ 04:340-04:372/04:374-04:375, DRB1*14:10:01:01-14:10:01:02/14:57/14:143/ 14:182	DR4, -, Null, DR14(6)							7																
DRB1*04:15/04:61/04:138/04:145/04:154/04:170/04:265/04:291/04:323/ 04:339, DRB1*11:102:01-11:102:02/11:175/11:275/11:278	DR4, -							7					12											

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*04:211	-							7												19				
DRB1*07:01:01:01-07:01:01:02/07:01:01:04-07:01:34/07:03-07:139/07:141-07:155	DR7, -, Null								8															
DRB1*07:140	-								?															
DRB1*08:01:01:01-08:01:02/08:01:04-08:01:05/08:01:07-08:02:04/08:02:06-08:04:01:05/08:04:03-08:07/08:09:01-08:19/08:21-08:24:02/08:26-08:28/08:30:01-08:30:03/08:33/08:35-08:37/08:39-08:40/08:42-08:46/08:48-08:51/08:54-08:56/08:58-08:62/08:64-08:66/08:68:01-08:68:02/08:70-08:74/08:76-08:79/08:81-08:86/08:88-08:108/08:110-08:111/08:114-08:124/08:126-08:127, DRB1*14:15	DR8, -, Null									9								17						
DRB1*08:02:05/08:125	-									?								?						
DRB1*08:08/08:29, DRB1*14:04:01:01-14:04:09/14:28/14:31/14:50:01-14:50:02/14:68:01-14:68:02/14:71/14:73/14:76/14:79/14:93/14:107/14:120/14:138/14:145/14:152N/14:180/14:196/14:201/14:205:01/14:206/14:210Q/14:220/14:224/14:229/14:233/14:241/14:250/14:254N	-, DR1404, DR14(6), Null									9								17	18					
DRB1*08:20/08:67, DRB1*11:264, DRB1*13:07:01-13:09/13:11:01-13:11:02/13:14:01-13:14:03/13:17/13:19/13:22:01:01-13:23:02/13:25/13:37/13:44/13:46-13:47/13:50:01/13:52/13:57/13:60/13:62/13:64/13:68/13:70/13:72/13:82-13:84/13:86/13:97:01-13:97:02/13:106-13:107/13:114/13:116/13:132/13:135/13:150/13:172/13:175/13:178/13:180/13:182/13:192/13:204/13:224/13:229/13:231-13:232/13:246/13:250/13:278Q/13:284/13:286/13:314/13:316/13:330/13:335/13:337, DRB1*14:20-14:21/14:34/14:37/14:40-14:41/14:77/14:84/14:94/14:100/14:102/14:116/14:123/14:127:01-14:127:02/14:136/14:156/14:159/14:181/14:183	-, DR13(6), DR14(6)																	17						
DRB1*08:25/08:47, DRB1*12:16:01-12:16:03/12:22/12:39:01-12:39:02	-									9				13				w						
DRB1*08:31, DRB1*11:01:01:01/11:01:01:03-11:02:02/11:02:04-11:02:07/11:04:01:01-11:04:12/11:04:14-11:06:03/11:08:01-11:08:03/11:10:01-11:10:02/11:12:01-11:15:02/11:18-11:19:03/11:21/11:23:01-11:25/11:27:01-11:28:01:02/11:28:03-11:35/11:37:01-11:39/11:42:01-11:51/11:56-11:57/11:58:02/11:60-11:62:02/11:64-11:66:02/11:69-11:70/11:72-11:75/11:77-11:82/11:84:01-11:84:03/11:88/11:90-11:93/11:95-11:101:03/11:104/11:106/11:108-11:109/11:111-11:112/11:114/11:116-11:121/11:124:01-11:124:02/11:126-11:134/11:137/11:140-11:149/11:152-11:155/11:157-11:158/11:160/11:162-11:166/11:169N-11:171/11:174/11:177-11:181/11:183-11:184/11:186/11:188-11:191/11:194:01-11:201/11:204-11:207/11:209-11:210/11:212/11:214-11:230/11:232/11:234-11:236/11:238-11:240/11:242-11:253/11:255-11:259/11:261-11:263/11:265-11:266/11:268-11:274/11:276-11:277/11:279/11:281-11:282/11:284-11:292/11:295-11:300/11:302-11:316/11:318-11:329N	DR11(5), -, Null												12											

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*08:32/08:53/08:87, DRB1*12:46	-									9				13				17						
DRB1*08:34/08:52/08:109/08:112-08:113	-									9								w						
DRB1*08:38	-							7		9								17						
DRB1*08:41/08:63/08:75, DRB1*11:67/11:193:01-11:193:02	-									9			12											
DRB1*08:69	-									9														
DRB1*09:01:02:01-09:05/09:08/09:10-09:22/09:24-09:57	DR9, -, Null										10													
DRB1*09:07	-										10										20			
DRB1*10:01:01:01/10:01:01:03-10:11/10:13-10:22/10:24-10:30/10:32-10:46	DR10, -											11												
DRB1*10:23	-											11	12											
DRB1*10:31	-											w												
DRB1*11:03:01-11:03:04/11:11:01/11:11:03/11:36/11:41/11:55/11:63:01-11:63:02/11:68/11:76/11:85/11:138-11:139/11:151/11:161/11:168/11:176/11:213/11:231/11:233/11:237/11:241/11:260/11:301N	DR11(5), -, Null												12			15								
DRB1*11:07:01/11:103:01-11:103:02/11:105/11:107/11:125/11:136/11:173	DR11(5), -				4								12											
DRB1*11:07:02	-				w								12											
DRB1*11:09:01:01-11:09:01:02/11:87:01-11:87:02	DR11(5), -					6							12	14		16			19					
DRB1*11:16:01:01-11:16:01:02	DR11(5)/ DR13 (6), -												12	14										
DRB1*11:17/11:52/11:54:01-11:54:02/11:89/11:150/11:159/11:202/11:267/11:283, DRB1*14:11:01:01-14:11:01:02	-, DR11(5), DR14(6)												12						18					
DRB1*11:20	DR11(5)					6							12	14										
DRB1*11:22	-							7					?											
DRB1*11:26/11:317	DR11(5), -												?											
DRB1*11:28:02	-					6							12	14		16			w					
DRB1*11:40	-												?	w	15	w								
DRB1*11:53	-				4								12						18					
DRB1*11:58:01/11:115	-												12	14		16			w					
DRB1*11:59	-					5							12	w	15	w								
DRB1*11:83/11:182	-					5							12	14		16			19					
DRB1*11:113	-												12	14		16			19					
DRB1*11:122	-					6							12	w	15	w								
DRB1*11:135	-					5							12											

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*11:203/11:211/11:254	-												w											
DRB1*11:280	-												12							19				
DRB1*12:01:01:01-12:01:04/12:01:06-12:01:07/12:01:09-12:01:11/ 12:02:01:01-12:02:05/12:02:07-12:03:03/12:05-12:08/12:10-12:15/12:17/ 12:19:01-12:19:02/12:21/12:23/12:26-12:30/12:32/12:34-12:38/12:40-12:41/ 12:43-12:45/12:50-12:53/12:55-12:56/12:59-12:61/12:63-12:65/12:68-12:75/ 12:77-12:82/12:84-12:88/12:90-12:95/12:97-12:109	DR12(5), -, Null													13			w							
DRB1*12:01:05/12:20	-													w			w							
DRB1*12:01:08/12:02:06/12:18/12:33/12:47	-													13										
DRB1*12:01:12	-													13			?							
DRB1*12:04/12:49	-												12	13										
DRB1*12:09/12:24N-12:25/12:48/12:54/12:62/12:67/12:76	-, Null													13			17							
DRB1*12:58	-													13			w		19					
DRB1*12:66	-													13			w	18						
DRB1*12:89	-													?			?							
DRB1*12:96	-									9				13			17	18						
DRB1*13:01:01:01-13:01:40/13:02:04/13:10/13:15-13:16:01:02/13:28:01- 13:28:02/13:35/13:40/13:51/13:53/13:59/13:61:01-13:61:02/13:69/13:79- 13:80/13:87/13:91-13:92/13:98/13:102/13:105/13:110/13:112-13:113N/ 13:117:01:01-13:117:01:02/13:121/13:125/13:127/13:130-13:131/13:137N- 13:138/13:141/13:148/13:153/13:166/13:173/13:177/13:184-13:187/13:190/ 13:201/13:205/13:213-13:215/13:221-13:222/13:226/13:233/13:238/ 13:242:01-13:242:02/13:245/13:251-13:252N/13:254/13:256/13:258-13:263/ 13:266-13:267/13:270-13:274/13:279/13:281/13:283/13:287/13:290-13:291/ 13:294/13:300/13:303-13:305/13:308-13:309/13:311/13:313/13:315/13:322N- 13:324N/13:327-13:328/13:336/13:339/13:343/13:345/13:350	DR13(6), -, Null														14		17							
DRB1*13:01:41/13:160/13:218	-														14		w							
DRB1*13:02:01:01-13:02:03/13:02:05-13:02:11/13:02:13-13:02:22/13:31/ 13:34/13:36/13:39/13:41/13:73-13:74/13:85/13:96:01-13:96:02/13:99/ 13:104/13:109/13:123-13:124/13:126/13:128/13:140/13:142N-13:143/ 13:145/13:147/13:155/13:168/13:170/13:171:02/13:198/13:202/13:207- 13:212/13:220/13:225/13:236-13:237/13:239-13:241/13:243-13:244/13:255N/ 13:257/13:264-13:265/13:268N-13:269/13:275/13:280/13:282/13:285/13:288- 13:289N/13:292-13:293/13:297-13:298N/13:301/13:306/13:310N/13:318/ 13:320/13:325/13:332/13:334/13:341/13:344/13:348	DR13(6), -, Null					6									14		17							
DRB1*13:02:12/13:103/13:165	-					6									14		w							

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*13:03:01:01-13:04/13:12:01-13:13/13:20:01:01-13:21:02/13:24:01:01-13:24:01:03/13:30/13:33:01-13:33:03/13:38/13:48-13:49:02/13:55/13:58/13:66:01-13:66:02/13:75/13:78/13:81/13:88-13:90/13:94:01-13:95/13:101/13:108/13:115/13:118/13:122/13:133-13:134/13:149/13:151-13:152/13:154/13:161/13:164/13:167/13:169/13:174/13:194/13:216/13:219/13:227/13:230/13:247/13:253/13:276/13:295N/13:307/13:317/13:319N/13:321/13:329N/13:333/13:338/13:340/13:342/13:346-13:347, DRB1*14:65	DR13(6), -, Null															15		17						
DRB1*13:05:01:01-13:05:03/13:26:01-13:26:02/13:136/13:158:01-13:158:02/13:203/13:277/13:349, DRB1*14:27:01-14:27:02	DR13(6), -, DR14(6)						6								14		16	17		19				
DRB1*13:06/13:146/13:156	DR13(6), -														14			17		19				
DRB1*13:18/13:42:01-13:42:02	DR13(6), -														14		16	17		19				
DRB1*13:29:01:01-13:29:01:02	DR13(6), -						6									15		17						
DRB1*13:32/13:93	-														14	15		17						
DRB1*13:43/13:188, DRB1*14:169	-															15		17	18					
DRB1*13:50:02-13:50:03/13:189	-						6								14		16	17		w				
DRB1*13:54	DR14(6)															15		w						
DRB1*13:56/13:119/13:235, DRB1*14:02:01:01-14:02:07/14:02:09-14:03:02/14:09/14:30/14:47/14:89/14:115/14:135/14:144/14:174/14:179/14:194/14:198/14:209/14:218/14:223/14:239/14:242:01-14:242:02	-, DR14(6), DR1403						6											17		19				
DRB1*13:63	-						6								w	15	w	17						
DRB1*13:65/13:120/13:139	-						6								14	15		17						
DRB1*13:67	-						6								14									
DRB1*13:71	-					5										15		17						
DRB1*13:77, DRB1*14:177/14:195N	-, Null																	w		19				
DRB1*13:100/13:162	-																	w						
DRB1*13:111	-														w	15	w	17						
DRB1*13:144	-					5									14		16	17		19				
DRB1*13:157/13:331, DRB1*14:67	-						6								14			17		19				
DRB1*13:159/13:171:01/13:179	-						6								14			17	18					
DRB1*13:163/13:181/13:193, DRB1*14:02:08/14:06:01-14:06:06/14:12:01-14:12:02/14:17/14:29/14:52/14:80-14:81/14:83/14:108/14:121/14:165/14:176/14:212	-, DR14(6), DR6																	17		19				
DRB1*13:183/13:200N/13:248-13:249N/13:299	-, Null														14									
DRB1*13:191/13:217	-														14			17	18					

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*13:196/13:312, DRB1*14:19/14:24/14:109/14:226	-, DR14(6)					6												17						
DRB1*13:199	-					6									14		16	w		19				
DRB1*13:223/13:234	-														w			17						
DRB1*13:228	-															15								
DRB1*13:296	-					6									w			17						
DRB1*13:302	-					6									14		16	17	18	19				
DRB1*14:13/14:85	DR14(6), -					6										15		17		19				
DRB1*14:18/14:33/14:59/14:64/14:106/14:133/14:154/14:246	DR6, -																	17	18	19				
DRB1*14:39/14:54:02/14:61/14:199	-																			18				
DRB1*14:46/14:222N	-, Null					6															19			
DRB1*14:48	-					6												w		19				
DRB1*14:51/14:134/14:200	-					6												17	18	19				
DRB1*14:54:08	-																	w		18				
DRB1*14:63	-					6									14	15		17		19				
DRB1*14:78	-														14	15		17		19				
DRB1*14:82	-					5												17	18					
DRB1*14:98	-					6												17		w				
DRB1*14:104/14:111	-				w													17	18					
DRB1*14:125	-																	w	w					
DRB1*14:141/14:257, DRB3*01:01:02:01-01:07/01:09-01:13/01:15-01:33/ 01:35-01:41/01:43-01:45/01:47-01:51/01:53-01:67/01:69-01:70/01:72-01:94/ 01:96-01:103/01:105N-01:106/01:108/01:110-01:123, DRB3*02:01-02:05:02/ 02:07-02:17/02:19/02:21-02:25/02:28-02:46/02:48-02:57/02:59-02:65/ 02:67N-02:77/02:79-02:90/02:92-02:108/02:110/02:112-02:116/02:118- 02:123/02:125N-02:130/02:132-02:142/02:144-02:159/02:161/02:163-02:189/ 02:191-02:201, DRB3*03:01:01:01-03:01:12/03:01:14-03:21/03:23-03:32/ 03:34-03:45/03:47-03:67	-, DR52, Null																					21		
DRB1*14:148	-									9										18				
DRB1*14:161	-							7										17	18					
DRB1*14:170	-															15		17		19				
DRB1*14:171	-				4													17	18					
DRB1*14:248	-																	?	?					
DRB1*14:249	-									9								17	?					

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DRB1*14:252	-						6											?		19				
DRB1*15:01:01:01-15:01:21/15:01:23-15:20/15:22-15:33/15:35-15:98/15:100-15:108/15:110-15:112/15:114-15:224	DR15(2), -, DR2, Null		2																					
DRB1*15:21, DRB1*16:09:01-16:10:02/16:33/16:36-16:37/16:58/16:66	-, DR16(2)		2	3																				
DRB1*15:99/15:109	-		2										12											
DRB1*15:113N	Null		w																					
DRB1*16:01:01:01-16:01:08/16:01:10-16:05:02/16:07/16:11-16:15/16:17-16:26/16:28-16:32/16:34-16:35/16:38:01-16:49/16:51-16:57/16:59Q-16:65/16:67-16:76	DR16(2), -, DR2, Null			3																				
DRB1*16:01:09	-			w																				
DRB1*16:08	-			3			6								14		16			w				
DRB1*16:16/16:27	-			3									12											
DRB3*01:08/01:46/01:52/01:71, DRB3*02:20	-						6															21		
DRB3*01:14	-				w													w						
DRB3*01:42, DRB3*02:18	-												12									21		
DRB3*01:107, DRB3*02:190, DRB3*03:68	-																					?		
DRB3*02:06	-						?															21		
DRB3*02:78/02:109N/02:117/02:124/02:162, DRB3*03:01:13/03:46	-, Null																					w		
DRB4*01:01:01:01/01:01:01:03-01:01:01:04/01:01:12-01:03:01:01/01:03:01:03-01:03:01:12/01:03:01:14-01:03:02:02/01:152, DRB4*02:01N	DR53, -, Null																						22	
DRB4*01:03:01:02N/01:03:01:13N	Null																							23
DRB5*01:01:01:01-01:01:09/01:01:11-01:02:01/01:02:03-01:12/01:14-01:25/01:27N-01:40/01:42-01:47/01:49N-01:50/01:52N-01:72/01:75-01:78/01:80-01:86/01:88-01:96/01:98-01:109/01:111-01:112/01:114-01:130/01:132-01:137, DRB5*02:02:01-02:38	DR51, -, Null																					20		
DRB5*01:02:02/01:26/01:48N/01:74/01:113	-, Null																					w		
DRB5*01:13/01:41	-												12									20		

w = weak

? = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities (HLA-DRB1*08:04:02 is not listed)

Table 4: Amplification patterns for all detectable **HLA-DQB1*** specificities (**Lot No. DQB14-1**) based on IMGT/HLA-Sequence Database Release 3.55.0, January 2024

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*02:01:01:01-02:01:09/02:01:11-02:01:13/02:01:15-02:01:23/02:01:25-02:24/02:26-02:34/02:36/02:38-02:39/02:41-02:45/02:48-02:56/02:58N-02:71/02:73-02:76/02:78-02:89/02/02:91-02:140/02:142:01:01-02:146/02:148-02:179/02:181-02:215	DQ2, -, Null					5								
DQB1*02:01:24/02:37/02:46-02:47/02:90	-					w								
DQB1*02:57/02:141	-					5							?	
DQB1*02:77	-					5					10		?	
DQB1*02:180	-					5					10			
DQB1*03:01:01:01-03:01:01:12/03:01:01:14-03:01:05/03:01:07-03:01:52/03:01:54-03:01:59/03:09-03:10/03/03:13/03:16/03:19:01:01-03:19:06/03:21-03:22:02/03:24/03:27-03:29/03:35/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75-03:77/03:82-03:84N/03:92-03:94/03:101-03:103/03:108-03:109/03:114-03:116/03:118N-03:121/03:127-03:128/03:130-03:131/03:133-03:135/03:138-03:140/03:142-03:144/03:147/03:150/03:152/03:154/03:157-03:160/03:162-03:167/03:169-03:170/03:172-03:173/03:180/03:182-03:183/03:186-03:188/03:191-03:193/03:196-03:198:02/03:201-03:202/03:206-03:208/03:216/03:218-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271/03:275-03:276N/03:281/03:284-03:286/03:288/03:290-03:294/03:297/03:302-03:303N/03:305-03:307/03:309:01-03:309:02/03:311-03:312/03:317:01-03:317:02/03:326/03:328-03:331/03:335/03:338N/03:340N-03:342/03:347/03:350/03:353-03:355/03:358N/03:360-03:361/03:366/03:370/03:372-03:373/03:376N-03:378/03:380-03:381/03:385N/03:387/03:389-03:391/03:394/03:396/03:399N-03:401/03:404/03:407N/03:417-03:421/03:423-03:428/03:430-03:432/03:434-03:436/03:438-03:439/03:448-03:449/03:451/03:454-03:455/03:458/03:460/03:465/03:467-03:470/03:472-03:473N/03:475-03:476/03:480Q/03:482-03:483/03:485-03:486/03:491-03:492/03:496-03:497/03:499N/03:503/03:506/03:508/03:514	DQ7(3), -, Null, DQ8(3)						6						12	
DQB1*03:01:06	-						6						w	
DQB1*03:01:53/03:129	-						6							
DQB1*03:02:01:01-03:02:01:10/03:02:01:12-03:02:03/03:02:09/03:02:12/03:02:21-03:02:22/03:02:24/03:02:32-03:02:33/03:02:36-03:02:37/03:02:39/03:11/03:37/03:68/03:211/03:229/03:245/03:247/03:251/03:263:01:01-03:263:01:02/03:289/03:415-03:416/03:422N/03:429/03:442/03:464/03:481/03:484/03:493/03:498/03:500-03:502/03:504	DQ8(3), -, Null								8	9			12	
DQB1*03:02:01:11	-								8			11	12	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*03:02:04-03:02:08/03:02:11/03:02:13-03:02:15/03:02:17-03:02:20/03:02:25-03:02:31/ 03:02:34-03:02:35/03:02:38/03:07/03:32/03:45:01-03:45:02/03:62-03:64/03:66N-03:67/03:81/03:85/ 03:106-03:107/03:125/03:146/03:153/03:161/03:174-03:175/03:178/03:184-03:185/03:189-03:190/ 03:199/03:203-03:205/03:210/03:213N-03:215/03:220-03:221/03:223-03:224/03:233/03:237N/ 03:240/03:261/03:265/03:269N/03:273-03:274/03:277-03:279/03:287/03:295-03:296/03:298-03:301/ 03:308/03:310N/03:315/03:320-03:324/03:333-03:334N/03:339N/03:343-03:345/03:348-03:349/ 03:352/03:362/03:364/03:367-03:369/03:371/03:379/03:383/03:386/03:388/03:392/03:403N/ 03:409-03:410/03:412-03:413/03:433/03:440N-03:441/03:444/03:446-03:447/03:450/03:452/03:456- 03:457/03:459/03:462-03:463/03:466/03:471/03:479/03:490/03:495/03:511-03:512/03:515/03:517, DQB1*06:139	DQ8(3), -, Null								8				12	
DQB1*03:02:10/03:03:26/03:05:02/03:05:05/03:17:01-03:18/03:61/03:72/03:78/03:100/03:110/ 03:148-03:149/03:181/03:226/03:244/03:259/03:262/03:272/03:314/03:346	-, DQ8(3)												12	
DQB1*03:02:16/03:225/03:437	-								w				12	
DQB1*03:02:23	-								8	9				
DQB1*03:03:02:01-03:03:04/03:03:11/03:30-03:31/03:40/03:105/03:239/03:248-03:249/03:414/ 03:445/03:453/03:505/03:507	DQ9(3), -										10	11	12	
DQB1*03:03:05/03:03:07-03:03:10/03:03:12-03:03:16/03:03:18-03:03:25/03:03:27-03:03:29/03:12/ 03:15/03:20/03:23:03/03:26/03:33-03:34/03:38:01-03:39/03:41/03:43/03:65/03:74/03:79/03:86- 03:91Q/03:95N-03:99Q/03:104/03:111-03:113/03:117/03:123-03:124/03:136/03:141/03:155-03:156/ 03:168/03:176-03:177/03:200/03:209/03:212/03:222/03:227/03:230/03:234/03:238/03:258/03:270/ 03:280/03:282N-03:283/03:304/03:313/03:316/03:319/03:332/03:336-03:337/03:351/03:356N- 03:357N/03:359/03:363/03:365/03:374-03:375N/03:382:01-03:382:02/03:384/03:393/03:395/ 03:397-03:398/03:402/03:405-03:406/03:411N/03:461/03:477-03:478/03:487/03:489/03:494/ 03:509N-03:510/03:516/03:518	-, Null										10		12	
DQB1*03:03:06/03:03:17/03:25:02/03:145	-										w		12	
DQB1*03:03:30	-										?	11	12	
DQB1*03:04:01:01-03:04:04/03:14:01-03:14:02/03:80/03:318/03:327/03:443	DQ7(3), -						6	7					12	
DQB1*03:05:01/03:05:03-03:05:04/03:250	DQ8(3), -									9			12	
DQB1*03:06, DQB1*04:03:02-04:03:03	DQ3, -										w			
DQB1*03:08	-			3					8	9			12	
DQB1*03:23:01	-			3			6							
DQB1*03:23:02/03:217	-			3			6						12	
DQB1*03:25:01	-										w	11		
DQB1*03:36/03:122/03:151/03:171	-						w						12	
DQB1*03:70	-							7	8				12	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*03:126	-										w	11	12	
DQB1*03:132, DQB1*04:01:01:01-04:01:05/04:02:01:01/04:02:01:04-04:02:01:21/04:02:03-04:02:07/04:02:09-04:02:21/04:02:24/04:04-04:09/04:11-04:30/04:32-04:47/04:49-04:66/04:68N-04:90/04:92-04:97	-, DQ4, Null													13
DQB1*03:137, DQB1*06:322:01-06:322:02	-			3							10		12	
DQB1*03:179	-							w	8				12	
DQB1*03:194/03:408, DQB1*06:475	-		2				6						12	
DQB1*03:195	-						6					11	12	
DQB1*03:228, DQB1*06:337	-			3					8				12	
DQB1*03:474	-						6	w					12	
DQB1*03:488N/03:513	Null, -						6						?	
DQB1*04:01:06/04:02:23/04:91	-													?
DQB1*04:03:01	-										w			13
DQB1*04:10	-	w					6							13
DQB1*04:67	-													w
DQB1*05:01:01:01-05:01:01:30/05:01:02-05:01:13/05:01:15/05:01:17-05:01:18/05:01:20-05:01:48/05:02:01:01-05:02:27/05:03:01:01-05:03:01:09/05:03:03-05:03:09/05:03:11-05:03:24/05:03:26-05:03:30/05:04-05:10/05:11:02-05:20/05:22-05:25/05:27-05:33/05:35-05:43:01/05:45-05:59/05:61-05:71/05:74-05:81/05:83-05:97/05:99-05:104/05:106-05:112/05:114-05:115/05:117-05:127/05:129/05:132Q-05:170/05:172-05:174/05:176-05:206N/05:208N-05:217/05:219-05:227/05:229-05:239/05:241-05:257/05:259-05:299/05:301/05:303-05:318, DQB1*06:325	DQ5(1), -, Null	1												
DQB1*05:01:16/05:01:19/05:03:25/05:26/05:34/05:44/05:113/05:128N/05:130/05:171/05:228/05:302	-, Null	w												
DQB1*05:03:02	DQ5(1)	1					?							
DQB1*05:11:01/05:240	-	1											12	
DQB1*05:43:02, DQB1*06:23/06:156/06:162/06:169	-	1		3										
DQB1*05:131	-	1											?	
DQB1*06:01:01:01-06:01:29/06:01:31-06:01:34/06:03:04/06:03:08-06:03:09/06:03:14/06:03:16/06:03:26/06:03:30/06:08:02-06:08:03/06:11:04-06:12/06:14:03/06:17/06:21/06:42-06:43/06:45/06:54N-06:57:02/06:59/06:64/06:91/06:98-06:105/06:108/06:120/06:132/06:140/06:145:01/06:157/06:177/06:181/06:190:01-06:190:02/06:194/06:196/06:205/06:214/06:229/06:239/06:243/06:245/06:251/06:258-06:259/06:263/06:268/06:274-06:275/06:277/06:285/06:302/06:305/06:307/06:309-06:310/06:312/06:319:01/06:321/06:323/06:330N-06:331/06:359/06:371/06:382/06:418-06:419/06:421/06:427/06:435/06:462-06:463/06:466/06:469/06:471-06:472	DQ6(1), -, DQ1, Null		2											

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*06:01:30/06:464	-		?											
DQB1*06:02:01:01-06:02:01:37/06:02:03-06:02:06/06:02:08-06:02:42/06:02:44-06:02:60/06:03:07/06:03:19/06:10-06:11:01:02/06:13:01-06:13:03/06:14:02/06:15:01-06:16/06:19:01-06:20/06:24/06:33/06:37/06:46-06:50/06:51:02/06:68/06:70-06:81/06:83-06:84:01:02/06:95/06:97/06:106-06:107/06:109/06:111-06:117/06:118:03/06:119/06:122/06:124-06:127/06:130-06:131/06:136-06:138/06:146:01-06:147/06:150-06:152/06:159/06:161/06:163/06:166/06:173-06:176/06:178-06:179N/06:182-06:183/06:188/06:192/06:197-06:198/06:200-06:201/06:206:01-06:206:02/06:208:01/06:211/06:213/06:215-06:216N/06:219/06:224-06:228/06:232/06:235-06:237/06:240/06:242/06:249/06:255-06:256/06:262/06:264/06:270:01-06:271/06:273/06:284/06:286/06:289-06:290/06:293-06:298/06:300/06:304N/06:306N/06:308N/06:311/06:314-06:315/06:317N/06:319:02/06:324/06:326/06:333/06:335/06:338/06:341N/06:344/06:347/06:354-06:357/06:363-06:364/06:366/06:370/06:372/06:374/06:376/06:379N-06:380/06:383N-06:384/06:386/06:388-06:390/06:393/06:395/06:397N/06:401-06:402/06:404-06:406/06:408-06:409/06:411-06:413/06:416:01:01Q-06:416:01:02Q/06:422N/06:430-06:431/06:436-06:438/06:442/06:445-06:448/06:451/06:456N-06:457/06:461/06:468/06:476-06:477N	DQ6(1), -, DQ1, Null			3										
DQB1*06:02:02/06:208:02/06:322:03	DQ6(1), -			3									12	
DQB1*06:02:07/06:03:01:01-06:03:01:21/06:03:03/06:03:06/06:03:11-06:03:13/06:03:15/06:03:17-06:03:18/06:03:20-06:03:25/06:03:27-06:03:29/06:03:31-06:03:32/06:03:35-06:03:49/06:08:01:01-06:08:01:02/06:11:02-06:11:03/06:14:01/06:26N/06:28/06:30-06:31/06:40-06:41:01:03/06:44/06:60-06:62/06:67/06:82/06:90/06:92:02/06:110/06:128/06:133-06:134/06:141/06:143-06:144N/06:148/06:154/06:165/06:170/06:184-06:185/06:187/06:191/06:195/06:199/06:203/06:210/06:218/06:221-06:223/06:230/06:233-06:234/06:238/06:244/06:248/06:250/06:253/06:269/06:272/06:278-06:279/06:316/06:327-06:329/06:334/06:336/06:340/06:345N-06:346/06:350/06:352/06:360/06:362/06:365/06:367/06:373/06:378/06:385/06:391-06:392/06:394N/06:396/06:400/06:403/06:410/06:423N-06:425/06:428/06:433/06:440/06:443/06:450/06:453-06:455/06:459-06:460/06:470/06:474/06:478/06:480	-, DQ6(1), DQ1, Null		2	3										
DQB1*06:02:43	-			3							10			
DQB1*06:03:02/06:63/06:87	DQ6(1), -		2	3									12	
DQB1*06:03:05/06:65	-		2	w										
DQB1*06:03:10	-		2								10			
DQB1*06:03:33	-		2	3							10			
DQB1*06:03:34/06:145:02	-		2										12	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*06:04:01:01-06:04:07/06:04:09-06:06/06:07:02/06:09:01:01-06:09:03/06:09:05/06:09:08-06:09:12/06:18:01-06:18:02/06:22:02/06:25/06:27:01-06:27:02/06:32:02/06:34/06:36/06:38-06:39/06:52/06:58/06:69:01/06:85-06:86/06:88:01:01-06:89/06:93-06:94/06:118:02/06:129/06:135/06:155/06:158N/06:160/06:164/06:171/06:180/06:186/06:189/06:193N/06:202/06:204/06:207/06:217/06:241/06:252N/06:254/06:261/06:265-06:267/06:280-06:283/06:287-06:288/06:291-06:292/06:299/06:303N/06:313/06:339/06:343/06:348-06:349/06:351/06:353/06:358/06:361/06:368-06:369/06:375/06:381/06:387/06:398/06:407/06:414N/06:420/06:426/06:429/06:432/06:434/06:439Q/06:444/06:449/06:452N/06:458N/06:465/06:467/06:473/06:479	DQ6(1), -, Null				4									
DQB1*06:04:08/06:09:07	-				4								12	
DQB1*06:07:01/06:32:01/06:118:01	-			3	4									
DQB1*06:09:06/06:121/06:212	-				w									
DQB1*06:29	-			3					8				?	
DQB1*06:35/06:53:01-06:53:02	-		2				6							
DQB1*06:51:01/06:377	-										10			
DQB1*06:66/06:172	-				4						10		12	
DQB1*06:96:01	-			3							10		?	
DQB1*06:96:02	-			3									?	
DQB1*06:118:04	-				4						10			
DQB1*06:123	-			3					8					
DQB1*06:142	-		2		4									
DQB1*06:149/06:257	-		w											
DQB1*06:168	-		2		4						10			
DQB1*06:209	-		2										?	
DQB1*06:246	-		2					w	8					
DQB1*06:276	-		w	3										
DQB1*06:320	-				4								?	
DQB1*06:399	-		?	3										

w = weak

? = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities

ATTENTION! HLA-DQB1 alleles which are not sequenced in the primer binding sites of mixes 9 and 11 (according to the IMGT/HLA Database of January 2024) have been excluded from the list of allele specificities of these mixes.

14. Certificates of Analysis



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CTS Collaborative Transplant Study

Certificate of Analysis

HLA-DRB1* CTS-PCR-SSP Tray Kit

Product number	104
Lot number	DR43-4
Number of HLA-specific primer mixes per test	23

Mix specifications

The specificity of each primer pair has been tested against a panel of well characterized DNAs.

Result

No false positive or false negative amplifications were obtained under our test conditions of the bulk reagents.

Date of approval 15.07.2024

Approved by H. Tran, M.D.
Quality Control, Supervisor



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CTS Collaborative Transplant Study

Certificate of Analysis

HLA-DQB1* CTS-PCR-SSP Tray Kit

Product number	119
Lot number	DQB14-1
Number of HLA-specific primer mixes per test	13

Mix specifications

The specificity of each primer pair has been tested against a panel of well characterized DNAs.

Result

No false positive or false negative amplifications were obtained under our test conditions of the bulk reagents.

Date of approval	12.06.2024
Approved by	H. Tran, M.D. Quality Control, Supervisor