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Lot No.	DQB12-0 DQA09-1


CTS Collaborative Transplant Study

WORKING INSTRUCTION

HLA-DQB1*/-DQA1* low resolution CTS-PCR-SSP TRAY KIT

LOCUS- AND LOT-SPECIFIC MANUAL

To be applied to the following product:

Product No.	Description
128	HLA-DQB1*/-DQA1* low resolution CTS-PCR-SSP Tray Kit 

1. Main differences

- Between Lot DQB12-0 (the current lot) and Lot DQB11-2:**
 The number of mixes has increased from 12 to 13.
 Mix 9 detects DQB1*03:05 (serology DQ8) in addition to DQB1*03:02 (serology DQ8).
 A completely new mix (amplifying DQB1*03:03 / DQ9) was inserted at position 11.
 Alleles which are not sequenced in the primer binding sites of mixes 9 and 11 (according to the IMGT/HLA Database of January 2018) have been excluded from the list of allele specificities of these mixes.
 The kit was updated to cover new alleles included in the IMGT/HLA Database of January 2018. Deleted and renamed alleles were taken into consideration.
- Between Lot DQA09-1 (the current lot) and Lot DQA09-0:**
 The kit was updated to cover new alleles included in the IMGT/HLA Database of January 2018. Deleted and renamed alleles were taken into consideration.

2. Introduction

- Intended use: This kit reveals a low/intermediate resolution typing of HLA-DQB1* and a low resolution typing of HLA-DQA1* by the PCR-SSP method.
- Allele coverage: IMGT/HLA Sequence Database Release 3.31.0, January 2018 for HLA-DQB1 and -DQA1, except:
HLA-DQB1*02:25/02:35/02:40/02:72, DQB1*03:05:02/03:17:02/03:61/03:72/03:100/03:181/03:226/03:262, DQB1*04:02:02/04:02:08/04:31, DQB1*05:01:14/05:03:10/05:21/05:60/05:72/05:73/05:82/05:98/05:105/05:116 and DQB1*06:02:08/06:03:19/06:09:04/06:15:01-06:15:02/06:22:01/06:22:03/06:37/06:48/06:51:02/06:69:02/06:118:03/06:153/06:167/06:231/06:247.
 These alleles are considered to be rare.
- This manual is only valid for **Lot No. DQB12-0 DQA09-1**
- 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: 23, of which:
 - 13 mixes for HLA-DQB1 typing (13 allele-specific mixes)
 - 11 mixes for HLA-DQA1 typing (10 allele-specific mixes + 1 negative control mix)
- Number of tests per tray: 4
- Number of trays per kit: 10
- The primer mixes are aliquoted and dried in thin-walled, yellow 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 (www.IHWG.org) for detailed result interpretation.

8. Interpretation Hints

- The quality and quantity of DNA as well as of the Taq polymerase are extremely crucial factors. If your bands are too weak, you might try to adjust these two factors until you obtain optimal results.
- Please also refer to Section 7 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-DQB1* locus:**
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.
- **HLA-DQA1* locus:**
HLA-DQA1*05:04 generates two PCR fragments with Mix 9.

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 me or my coworkers at:

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Hien Tran, M.D.

13. Appendix

Table 1: Sizes of the PCR products and allele specificities of each **HLA-DQB1*** CTS-PCR-SSP primer mix (**Lot-No DQB12-0**) based on IMGT/HLA Sequence Database Release 3.31.0, January 2018

Position		Mix	Allele	Serology	Size
H1	H4	Mix 1	DQB1*04:10w, DQB1*05:01:01-05:01:13/05:01:15/05:01:16w/05:01:17-05:01:18/05:01:19w/05:01:20-05:03:09/05:03:11-05:20/05:22-05:25/05:26w/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/05:131-05:158, DQB1*06:23/06:156/06:162/06:169	-, DQ5(1), Null	see below
	H7				
G1	G4	Mix 2	DQB1*04:10w, DQB1*05:03:02/05:43:02, DQB1*06:23/06:156/06:162/06:169	-, DQ5(1)	135 bp
	G7				
G1	G4	Mix 2	DQB1*05:01:13/05:01:15/05:01:16w/05:01:17-05:01:18/05:01:19w/05:01:20-05:03:09/05:03:11-05:20/05:22-05:25/05:26w/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/05:131-05:158	DQ5(1), -, Null	225 bp
	G7				
G1	G4	Mix 2	DQB1*03:194, DQB1*06:01:01-06:01:15/06:02:07/06:03:01:01-06:03:06/06:03:08-06:03:18/06:03:20-06:03:27/06:08:01-06:08:03/06:11:02-06:12/06:14:01/06:14:03/06:17/06:21/06:26N/06:28/06:30-06:31/06:35/06:40-06:45/06:53:01-06:57/06:59-06:65/06:67/06:82/06:87/06:90-06:92/06:98-06:105/06:108/06:110/06:120/06:128/06:132-06:134/06:140-06:145/06:148/06:149w/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	-, DQ6(1), DQ1, Null	see below
	G7				
G1	G4	Mix 2	DQB1*06:01:01-06:01:15/06:35/06:43/06:45/06:53:01-06:57/06:98-06:105/06:108/06:120/06:132/06:140/06:142/06:157/06:168/06:177/06:181/06:194/06:205/06:209/06:214/06:229/06:239/06:243/06:245-06:246	DQ6(1), -, Null	160 bp
	G7				
G1	G4	Mix 2	DQB1*03:194, DQB1*06:02:07/06:03:01:01-06:03:06/06:03:08-06:03:18/06:03:20-06:03:27/06:08:01-06:08:03/06:11:02-06:12/06:14:01/06:14:03/06:17/06:21/06:26N/06:28/06:30-06:31/06:40-06:42/06:44/06:59-06:65/06:67/06:82/06:87/06:90-06:92/06:110/06:128/06:133-06:134/06:141/06:143-06:145/06:148/06:149w/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	-, DQ6(1), DQ1, Null	170 bp
	G7				

Position		Mix	Allele	Serology	Size
F1	F4 F7 F10	Mix 3	DQB1*03:08/03:137/03:228, DQB1*06:02:01:01-06:02:07/06:02:09-06:03:03/06:03:05w/06:03:06-06:03:07/06:03:11-06:03:13/06:03:15/06:03:17-06:03:18/06:03:20-06:03:25/06:03:27/06:08:01/06:10-06:11:03/06:13:01-06:14:02/06:16/06:19:01-06:20/06:23-06:24/06:26N/06:28-06:31/06:33/06:40-06:41/06:44/06:46-06:47/06:49-06:50/06:60-06:63/06:65w/06:67-06:68/06:70-06:84/06:87/06:90/06:92/06:95-06:97/06:106-06:107/06:109-06:117/06:119/06:122-06:128/06:130-06:131/06:133-06:134/06:136-06:138/06:141/06:143-06:144N/06:146:01-06:148/06:150-06:152/06:154/06:156/06:159/06:161-06:163/06:165-06:166/06:169-06:170/06:173-06:176/06:178-06:179N/06:182-06:183/06:185/06:187-06:188/06:191-06:192/06:195/06:197-06:200/06:201w/06:203/06:206:01-06:206:02/06:208/06:210-06:211/06:213/06:215-06:216N/06:219/06:221-06:228/06:230/06:232-06:238/06:240/06:242/06:244/06:248-06:249	- , DQ6(1), DQ1, Null	see below
F1	F4 F7	Mix 3	DQB1*03:08/03:137/03:228, DQB1*06:02:01:01-06:02:06/06:02:09-06:02:28/06:03:07/06:10-06:11:01/06:13:01-06:13:02/06:14:02/06:16/06:19:01-06:20/06:24/06:29/06:33/06:46-06:47/06:49-06:50/06:68/06:70-06:81/06:83-06:84/06:95-06:97/06:106-06:107/06:109/06:111-06:117/06:119/06:122-06:127/06:130-06:131/06:136-06:138/06:146:01-06:147/06:150-06:152/06:159/06:161/06:163/06:166/06:173-06:176/06:178-06:179N/06:182-06:183/06:188/06:192/06:197-06:198/06:200/06:201w/06:206:01-06:206:02/06:208/06:211/06:213/06:215-06:216N/06:219/06:224-06:228/06:232-06:233/06:235-06:237/06:240/06:242/06:249	- , DQ6(1), DQ1, Null	165 bp
E1	E4 E7 E10	Mix 4	DQB1*06:02:01:01-06:02:04/06:02:06-06:02:07/06:02:09-06:02:15/06:02:17-06:02:18/06:02:20-06:03:03/06:03:05w/06:03:06-06:03:07/06:03:11-06:03:13/06:03:15/06:03:17-06:03:18/06:03:20-06:03:25/06:03:27/06:08:01/06:10-06:11:03/06:13:01/06:14:01-06:14:02/06:16/06:19:02-06:20/06:23-06:24/06:26N/06:28-06:31/06:33/06:40-06:41/06:44/06:46-06:47/06:49-06:50/06:60-06:63/06:65w/06:67-06:68/06:70-06:79:01/06:80-06:84/06:87/06:90/06:92/06:95-06:97/06:106-06:107/06:109-06:113/06:115-06:117/06:122/06:124-06:128/06:130-06:131/06:133-06:134/06:136-06:137/06:141/06:143-06:144N/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/06:182-06:185/06:187-06:188/06:191-06:192/06:195/06:197-06:200/06:201w/06:203/06:206:01/06:208/06:210-06:211/06:213/06:216N/06:218-06:219/06:221-06:228/06:230/06:232-06:238/06:240/06:242/06:244/06:248-06:249	DQ6(1), - , DQ1, Null	105 bp
D1	D4 D7 D10	Mix 5	DQB1*06:04:01-06:07:02/06:09:01:01-06:09:03/06:09:05/06:09:06w/06:09:07/06:18:01-06:18:02/06:22:02/06:25/06:27:01-06:27:02/06:32:01-06:32:02/06:34/06:36/06:38-06:39/06:52/06:58/06:66/06:69:01/06:85-06:86/06:88-06:89/06:93-06:94/06:118:01-06:118:02/06:121w/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	DQ6(1), - , Null	170 bp
			DQB1*02:01:01-02:01:23/02:01:24w/02:02:01:01-02:24/02:26-02:34/02:36/02:37w/02:38-02:39/02:41-02:45/02:46w-02:47w/02:48-02:71/02:73-02:89/02:90w/02:91-02:104	DQ2, - , Null	200 bp

Position	Mix	Allele	Serology	Size
C1	C4	DQB1*03:01:01-03:01:01:12/03:01:01:14-03:01:39/03:04:01-03:04:03/03:09-03:10:02:02/03:13-03:13:03:14:02/03:16/03:19-01-03:19:02/03:21-03:24/03:27-03:29/03:35/03:36w/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/03:172-03:173/03:180/03:182-03:183/03:186-03:188/03:191-03:198/03:201-03:202/03:206-03:208/03:216-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271, DQB1*04:10, DQB1*05:03:02?, DQB1*06:35/06:53:01-06:53:02	DQ7(3), -, DQ3, Null, DQ5(1)	see below
	C7	DQB1*03:01:01-03:01:01:12/03:01:01:14-03:01:39/03:04:01-03:04:03/03:09/03:13/03:16/03:19:01-03:19:02/03:21-03:22/03:24/03:27-03:29/03:35/03:36w/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75-03:80/03:82-03:84N/03:92-03:94/03:101-03:103/03:108-03:109/03:114-03:116/03:118N-03:121/03:122w/03:127/03:129-03:131/03:133-03:135/03:139-03:140/03:142-03:144/03:147/03:150/03:151w/03:152/03:154/03:157-03:160/03:162-03:167/03:169-03:170/03:171w/03:172-03:173/03:182/03:186-03:188/03:191-03:194/03:196-03:198/03:201-03:202/03:206-03:208/03:216/03:218-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271, DQB1*06:35/06:53:01-06:53:02	DQ7(3), -, Null	100 bp
	C10	Mix 6	DQB1*03:01:01-03:01:01:12/03:01:01:14-03:01:39/03:04:01-03:04:03/03:09-03:10:02:02/03:13-03:13:03:14:02/03:16/03:19-01-03:19:02/03:21-03:22/03:24/03:27-03:29/03:35/03:36w/03:42/03:44/03:46-03:60/03:69/03:71/03:73/03:75-03:80/03:82-03:84N/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/03:172-03:173/03:180/03:182-03:183/03:186-03:188/03:191-03:194/03:196-03:198/03:201-03:202/03:206-03:208/03:216/03:218-03:219/03:231-03:232/03:235-03:236/03:241-03:243/03:246/03:252-03:257/03:260/03:264/03:266-03:268/03:271, DQB1*04:10, DQB1*05:03:02?, DQB1*06:35/06:53:01-06:53:02	
B1	B4	DQB1*03:23:01-03:23:02/03:217, DQB1*04:10, DQB1*05:03:02?	-, DQ5(1)	120 bp
	B7	DQB1*03:04:01-03:04:03/03:14:01-03:14:02/03:70/03:80/03:179w, DQB1*06:246w	DQ7(3), -	175 bp
A1	A4	DQB1*03:02:01-03:02:09/03:02:11-03:02:15/03:02:16w/03:02:17-03:02:26/03:07-03:08/03:11/03:32/03:37/03:45/03:62-03:64/03:66N-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/03:240/03:245/03:247/03:251/03:261/03:263/03:265/03:269N/03:273-03:274, DQB1*06:29/06:123/06:139/06:246	DQ8(3), -, Null	130 bp
	A7			
H2	H5	DQB1*03:02:01-03:02:01:06/03:02:09/03:02:12/03:02:21-03:02:24/03:05:01/03:211/03:245/03:247/03:250-03:251/03:263	DQ8(3), -	190 bp
G2	G5	DQB1*02:03/02:77, DQB1*03:03:02:01-03:03:05/03:03:06w/03:03:07-03:03:15/03:06w/03:12/03:15/03:20/03:25:01w-03:25:02w/03:26/03:30-03:31/03:33-03:34/03:38-03:41/03:43/03:65/03:74/03:79/03:86-03:91Q/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, DQB1*04:03:01w-04:03:03w, DQB1*06:03:10/06:51:01/06:66/06:96/06:168/06:172	DQ2, -, DQ9(3), DQ3, Null	135 bp
	G8			
F2	F5	DQB1*03:02:01-03:03:02:05/03:195/03:239/03:248-03:249	DQ9(3), -	177 bp
	F8			
	F11			

Position		Mix	Allele	Serology	Size
E2	E5 E8 E11	Mix 12	DQB1*03:01:01:01:01:12/03:01:01:14-03:01:01:19/03:01:03:03:01:05/03:01:05/03:01:06w/03:01:07-03:02:02/03:02:04w/03:02:05-03:02:12/03:02:13w/03:02:14-03:02:22/03:02:24-03:03:02:05/03:03:04-03:04:03/03:05:03-03:05:04/03:07-03:17:01/03:18-03:19:02/03:21-03:22/03:23:02-03:24/03:25:02-03:36/03:38-03:53/03:54w/03:55-03:60/03:62-03:71/03:74/03:76-03:99Q/03:101-03:111/03:113-03:117/03:119-03:128/03:130-03:131/03:133-03:135/03:137-03:155/03:157-03:161/03:163-03:174/03:176-03:180/03:182/03:184-03:203/03:204w/03:205-03:222/03:224-03:225/03:227-03:236/03:239-03:249/03:251/03:253-03:261/03:263-03:268/03:269Nw/03:270-03:274, DQB1*05:11:01, DQB1*06:02:02/06:03:02/06:04:08/06:09:07	DQ7(3), -, DQ8(3), DQ9(3), Null, DQ6(1)	160 bp
D2	D5 D8 D11	Mix 13	DQB1*03:132, DQB1*04:01:01-04:02:01:01/04:02:01:04-04:02:01:07/04:02:03-04:02:07/04:02:09-04:03:01/04:04-04:30/04:32-04:42	-, DQ4, Null	210 bp

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

w = weak

? = nucleotide sequence information not available for the primer matching sequence

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! Alleles which are not sequenced in the primer binding sites of mixes 9 and 11 (according to the IMGT/HLA Database of January 2018) have been excluded from the list of allele specificities of these mixes.

Table 2: Sizes of the PCR products and allele specificities of each **HLA-DQA1*** CTS-PCR-SSP primer mix (**Lot-No DQA09-1**) based on IMGT/HLA Sequence Database Release 3.31.0, January 2018

Position		Mix	Allele	Serology	Size
C2	C8	Mix 1	DQA1*01:01:01:01-01:01:03:01:04:01:01:01:05:02/01:07Q/01:12	-	145 bp
B2	B8	Mix 2	DQA1*01:02:01:01-01:03:01:06/01:08-01:11/01:13-01:15N	- , Null	145 bp
A2	A8	Mix 3	DQA1*01:01:01:01-01:02:04/01:04:01:01-01:09/01:11-01:13	-	170 bp
H3	H9	Mix 4	DQA1*01:03:01:01-01:03:01:06/01:10/01:14-01:15N	- , Null	170 bp
G3	G9	Mix 5	DQA1*01:04:01:01-01:05:02/01:06?/01:07Q/01:08?/01:12?-01:13?/01:15N?, DQA1*03:01:03?, DQA1*04:03N?-04:04?, DQA1*05:02?/05:04?/05:10?, DQA1*06:01:02?-06:02?	- , Null	200 bp
F3	F9	Mix 6	DQA1*02:01:01:01-02:01:01:02	-	105 bp
E3	E9	Mix 7	DQA1*03:01:01/03:01:03-03:03:02	-	130 bp
D3	D9	Mix 8	DQA1*04:01:01-04:04	- , Null	215 bp
C3	C9	Mix 9	DQA1*05:01:01-01-05:09/05:10w/05:11 DQA1*05:04	-	see below 205 bp
B3	B9	Mix 10	DQA1*05:01:01:01-05:09/05:10w/05:11	-	190 bp
A3	A9	Mix 11	DQA1*06:01:01-06:02 Negative Control	-	105 bp none (440 bp)

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

w = weak

? = nucleotide sequence information not available for the primer matching sequence

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)

Table 3: Amplification patterns of **HLA-DQB1*** alleles detected by the HLA-DQB1* CTS-PCR-SSP primer mixes (Lot No. **DQB12-0**) based on IMGT/HLA Sequence Database Release 3.31.0, January 2018

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*02:01:01:02:01:23:02:02:01:01:02:02:05:02:04:02:24:02:26:02:34:02:36:02:38:02:39:02:41:02:45:02:48:02:71:02:73:02:76:02:78:02:89:02:91:02:104	DQ2, -, Null					5								
DQB1*02:01:24:02:37:02:46:02:47:02:90	-					w								
DQB1*02:03:02:77	DQ2, -					5					10			
DQB1*03:01:01:03:01:01:12:03:01:01:14:03:01:01:19:03:01:03:03:01:05:03:01:07:03:01:39:03:09:03:10:02:02:03:13:03:16:03:19:01:03:19:02:03:21:03:22:03:23:02:03:24:03:27:03:29:03:35:03:42:03:44:03:46:03:53:03:55:03:60:03:69:03:71:03:76:03:77:03:82:03:84N:03:92:03:94:03:101:03:103:03:108:03:109:03:114:03:116:03:119:03:121:03:127:03:128:03:130:03:131:03:133:03:135:03:138:03:140:03:142:03:144:03:147:03:150:03:152:03:154:03:157:03:160:03:163:03:167:03:169:03:170:03:172:03:173:03:180:03:182:03:186:03:188:03:191:03:193:03:196:03:198:03:201:03:202:03:206:03:208:03:216:03:219:03:231:03:232:03:235:03:236:03:241:03:243:03:246:03:253:03:257:03:260:03:264:03:266:03:268:03:271	DQ7(3), -, Null						6							
DQB1*03:01:02:03:23:01:03:73:03:75:03:118N:03:129:03:162:03:183:03:252	-						6						w	
DQB1*03:02:01:01:03:02:01:06:03:02:09:03:02:12:03:02:21:03:02:22:03:02:24:03:211:03:245:03:247:03:251:03:263	DQ8(3), -								8	9			12	
DQB1*03:02:03:02:05:03:02:08:03:02:11:03:02:14:03:02:15:03:02:17:03:02:20:03:02:25:03:02:26:03:07:03:11:03:32:03:45:03:62:03:64:03:66N:03:68:03:81:03:85:03:106:03:107:03:125:03:146:03:153:03:161:03:174:03:178:03:184:03:185:03:189:03:190:03:199:03:203:03:205:03:210:03:213N:03:215:03:220:03:221:03:224:03:229:03:233:03:240:03:261:03:265:03:273:03:274	DQ8(3), -, Null								8					
DQB1*03:02:03:03:37:03:175:03:223:03:237N, DQB1*06:139	DQ8(3), -, Null								8					
DQB1*03:02:04:03:02:13:03:204:03:269N	DQ8(3), -, Null								8				w	
DQB1*03:02:10:03:05:03:03:05:04:03:17:01:03:18:03:78:03:110:03:148:03:149:03:244:03:259:03:272	-, DQ8(3)												12	
DQB1*03:02:16:03:225	-								w				12	
DQB1*03:02:23	-								8	9				
DQB1*03:03:02:01:03:03:02:05:03:239:03:248:03:249	DQ9(3), -										10	11	12	
DQB1*03:03:03:03:20:03:112:03:136:03:156:03:238, DQB1*06:51:01	DQ9(3), -										10			
DQB1*03:03:04:03:03:05:03:07:03:03:15:03:12:03:15:03:26:03:30:03:31:03:33:03:34:03:38:03:41:03:43:03:65:03:74:03:79:03:86:03:91Q:03:95N:03:99Q:03:104:03:105:03:111:03:113:03:117:03:123:03:124:03:141:03:155:03:168:03:176:03:177:03:200:03:209:03:212:03:222:03:227:03:230:03:234:03:258:03:270	-, Null										10		12	
DQB1*03:03:06:03:25:02:03:126:03:145	-										w		12	
DQB1*03:04:01:03:04:03:03:14:01:03:14:02:03:80	DQ7(3), -						6	7					12	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*03:05:01/03:250	DQ8(3), -									9				
DQB1*03:06/03:25:01, DQB1*04:03:02-04:03:03	DQ3, -										w			
DQB1*03:08/03:228	-			3					8				12	
DQB1*03:36/03:122/03:151/03:171	-						w						12	
DQB1*03:70	-							7	8				12	
DQB1*03:132, DQB1*04:01:01-04:02:01:01/04:02:01-04:04:02:01:07/04:02:03-04:02:07/04:02:09-04:02:14/04:04-04:09/04:11-04:30/04:32-04:42	- , DQ4, Null													13
DQB1*03:137	-			3							10		12	
DQB1*03:179	-							w	8				12	
DQB1*03:194	-		2				6						12	
DQB1*03:195	-						6					11	12	
DQB1*04:03:01	-										w			13
DQB1*04:10	-	w					6							13
DQB1*05:01:01-05:01:13/05:01:15/05:01:17-05:01:18/05:01:20-05:03:01:03/05:03:03-05:03:09/05:03:11-05:10/05:11:02-05:20/05:22-05:25/05:27-05:33/05:35-05:43:02/05:45-05:59/05:61-05:71/05:74-05:81/05:83-05:97/05:99-05:104/05:106-05:112/05:114-05:115/05:117-05:127/05:129/05:131-05:158	DQ5(1), -, Null	1												
DQB1*05:01:16/05:01:19/05:26/05:34/05:44/05:113/05:128N/05:130	-, Null	w												
DQB1*05:03:02	DQ5(1)	1					?							
DQB1*05:11:01	-	1											12	
DQB1*06:01:01-06:01:15/06:03:04/06:03:08-06:03:09/06:03:14/06:03:16/06:03:26/06:08:02-06:08:03/06:12/06:14:03/06:17/06:21/06:42-06:43/06:45/06:54N-06:57/06:59/06:64/06:91/06:98-06:105/06:108/06:120/06:132/06:140/06:145/06:157/06:177/06:181/06:190:01-06:190:02/06:194/06:196/06:205/06:209/06:214/06:229/06:239/06:243/06:245	DQ6(1), -, DQ1, Null		2											
DQB1*06:02:01:01-06:02:01:04/06:02:03-06:02:06/06:02:09-06:02:28/06:03:07/06:10-06:11:01/06:13:01-06:13:02/06:14:02/06:16/06:19:01-06:20/06:24/06:33/06:46-06:47/06:49-06:50/06:68/06:70-06:81/06:83-06:84/06:95/06:97/06:106-06:107/06:109/06:111-06:117/06:119/06:122/06:124-06:127/06:130-06:131/06:136-06:138/06:146:01-06:147/06:150-06:152/06:159/06:161/06:163/06:166/06:173-06:176/06:178-06:179N/06:182-06:183/06:188/06:192/06:197-06:198/06:200/06:206:01-06:206:02/06:208/06:211/06:213/06:215-06:216N/06:219/06:224-06:228/06:232/06:235-06:237/06:240/06:242/06:249	DQ6(1), -, DQ1, Null			3										
DQB1*06:02:02	DQ6(1)			3									12	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13
DQB1*06:02:07/06:03:01:01-06:03:01:02/06:03:03/06:03:06/06:03:11-06:03:13/06:03:15/06:03:17-06:03:18/06:03:20-06:03:25/06:03:27/06:08:01/06:11:02-06:11:03/06:14:01/06:26N/06:28/06:30-06:31/06:40-06:41/06:44/06:60-06:63/06:67/06:82/06:87/06:90/06:92/06:110/06:128/06:133-06:134/06:141/06:143-06:144N/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	- , DQ6(1), DQ1, Null		2	3										
DQB1*06:03:02	DQ6(1)		2	3									12	
DQB1*06:03:05/06:65	-		2	w										
DQB1*06:03:10	-		2							10				
DQB1*06:04:01-06:04:07/06:04:09-06:07:02/06:09:01:01-06:09:03/06:09:05/06:18:01-06:18:02/06:22:02/06:25/06:27:01-06:27:02/06:32:01-06:32:02/06:34/06:36/06:38-06:39/06:52/06:58/06:69:01/06:85-06:86/06:88-06:89/06:93-06:94/06:118:01-06:118:02/06:129/06:135/06:155/06:158N/06:160/06:164/06:171/06:180/06:186/06:189/06:193N/06:202/06:204/06:207/06:217/06:241	DQ6(1), -, Null				4									
DQB1*06:04:08/06:09:07	-				4								12	
DQB1*06:09:06/06:121/06:212	-				w									
DQB1*06:23/06:156/06:162/06:169	-	1		3										
DQB1*06:29/06:123	-			3				8						
DQB1*06:35/06:53:01-06:53:02	-		2				6							
DQB1*06:66/06:172	-				4						10			
DQB1*06:96	-			3							10			
DQB1*06:142	-		2		4									
DQB1*06:149	-		w											
DQB1*06:168	-		2		4						10			
DQB1*06:201	-			w										
DQB1*06:246	-		2					w	8					

w = weak

? = nucleotide sequence information not available for the primer matching sequence

ATTENTION! Alleles which are not sequenced in the primer binding sites of mixes 9 and 11 (according to the IMGT/HLA Database of January 2018) have been excluded from the list of allele specificities of these mixes.

Table 4: Amplification patterns for all detectable HLA-DQA1* specificities (Lot-No DQA09-1) based on IMGT/HLA Sequence Database Release 3.31.0, January 2018

Allele	Serology	1	2	3	4	5	6	7	8	9	10
DQA1*01:01:01:01:01:01:03	-	1		3							
DQA1*01:02:01:01:01:02:04/01:11/01:16N	-, Null		2	3							
DQA1*01:03:01:01:01:03:01:08/01:10/01:14	-		2		4						
DQA1*01:04:01:01:01:05:02/01:07Q	-	1		3		5					
DQA1*01:06:01:08:01:09/01:13	-		2	3		?					
DQA1*01:12	-	1		3		?					
DQA1*01:15N	Null		2		4	?					
DQA1*02:01:01:01:02:01:01:02	-						6				
DQA1*02:01:02	-					?	6				
DQA1*03:01:01:03:02:01:01:03:04	-							7			
DQA1*03:01:03	-					?		7			
DQA1*04:01:01:01:04:02	-								8		
DQA1*04:03N-04:04	Null, -					?			8		
DQA1*05:01:01:01:05:01:02/05:03:01:01:05:03:01:02/05:05:01:01:05:09/05:11	-									9	
DQA1*05:02/05:04	-					?				9	
DQA1*05:10	-					?				w	
DQA1*06:01:01:01:06:01:01:02	-										10
DQA1*06:01:02-06:02	-					?					10

w = weak

? = nucleotide sequence information not available for the primer matching sequence