OPTN/UNOS Histocompatibility Committee

Adding HLA DQA1 Unacceptable Antigen Equivalences Table

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Executive Summary

This proposal intends to bridge a gap between the science and practice of human leukocyte antigen (HLA) compatibility assessments and the applications of computer programming. Policy approved by the OPTN/UNOS Board of Directors in November 2014 requires HLA typing for HLA-DQA1 for deceased donors to be reported to the OPTN, and requires UNOS to change UNet^{SM} programming to allow transplant programs to report DQA1 as an unacceptable antigen. This proposal adds an HLA DQA1 equivalency table to policy that identifies the relationship between parent antigens and corresponding allelic subtypes. The addition of the table allows UNOS staff to program data entry for DQA1 unacceptable antigens/alleles, removing concerns about patient safety due to human error and incorrect data entry.

Adding HLA DQA1 Unacceptable Antigen Equivalences Table

Affected Policies: 4.10 Reference Tables of HLA Antigen Values and Split Equivalences

Sponsoring Committee: Histocompatibility Committee

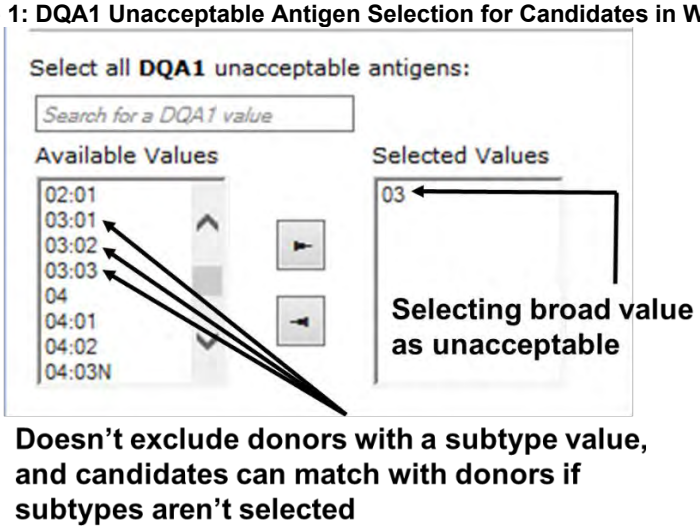
Public Comment Period: January, 25, 2016 – March, 25, 2016

What problem will this proposal solve?

In November 2014, the OPTN/UNOS Board of Directors approved a policy modification to expand OPTN HLA typing requirements to include DQA1 and DPB1 as part of the allocation process.[1] During the implementation phase of this project, the Histocompatibility Committee noticed an incongruity between the unacceptable antigen relationships within the DQA1 locus and how UNOS programmed DQA1 unacceptable antigen data entry. Because the policy approved by the Board in November 2014 did not include an equivalency table for DQA1, UNOS programmed a one-to-one exclusionary relationship for unacceptable antigens. In the one-to-one relationship, candidates are only excluded from donors when there is an exact match between donor type entered and the unacceptable antigen/allele entered for candidates.

However, within HLA there are broad categories of DQA1 types and specific subtypes that belong to each category. The broad category is a simple way to represent all the subtypes as unacceptable antigens without having to enter each one. Under the current system, a donor whose phenotype is recorded as DQA1*03:01 will not be excluded from a candidate when a center selects the broad DQA1*03 category as unacceptable for that candidate, as shown in Figure 1 below. The DQA1*03:01 donor type will only be excluded if a transplant center also selects DQA1*03:01 as unacceptable for the candidate.

Figure 1: DQA1 Unacceptable Antigen Selection for Candidates in WaitList[SM]



[1] Alcorn, James. Policy Notice: Expanding HLA Typing Requirements. December 12, 2014. Link to Policy Notice on the OPTN website (last visited January 6, 2016).

It is critical that when the broad category is entered as unacceptable, no organ from a donor with one of the subtypes is ever offered to the candidate. Hence, the current system, with its one-to-one exclusionary relationship, creates a potential problem since it does not exclude the subtypes of the broad category automatically, and relies on members to enter the broad antigen (ex. DQA1*03) along with all of the corresponding subtypes (ex. DQA1*03:01, 03:02, and 03:03) in order to exclude donors with that broad antigen from the match run.

Members of the Histocompatibility Committee find that the current system creates a potential patient safety issues. Ideally, if a member wants to exclude all donors with any subtype of a broad category, the member should be able to do so by simply selecting the broad category. Under the current input method, it is possible for candidates who cannot accept broad categories of antigens to match with donors who have a subtype of the parent if the transplant program has not manually selected each individual subtype as an unacceptable antigen.

Adding a DQA1 equivalency table allows UNOS staff to program UNet to recognize the relationships between parent antigens and their corresponding subtypes, and automatically exclude inappropriate matches if a broad antigen is entered.

Additionally, the proposal makes some stylistic changes to *Policy 4.10 Reference Tables of HLA Antigen Values and Split Equivalences* that are non-substantive and intended to clarify and be consistent across policy. First, headings in the table columns changed from “patient” to “candidate” to maintain consistent references across policy. Secondly, there are two examples of how to interpret the tables, one each for the matching and unacceptable antigen equivalency tables. These examples used to appear after the tables, but were moved to appear before the tables to help members interpret the information in the matching and unacceptable antigen equivalency tables.

Why should you support this proposal?

Adding a DQA1 equivalency table will reduce risks to patient safety, and decrease the likelihood of inappropriate organ allocation. Changing UNet to including subtypes as unacceptable antigens automatically when parent antigens are selected as unacceptable antigens reduces the risk of an organ being offered to a candidate that may lead to graft rejection due to the presence of incompatible DQA1 subtype antigens. This proposal also has the potential to reduce cold ischemia time and organ discard caused by scenarios where a transplant program accepts an organ offer under the assumption that a donor’s and candidate’s HLA is compatible, only to find that the physical crossmatch is positive and the organ cannot be transplanted into the intended candidate.

Additionally, adding the equivalency table allows UNOS to program DQA1 unacceptable antigen entry in the same manner as other HLA loci. Uniformity across HLA data entry screens within UNet will help eliminate human errors due to members having to follow special rules for DQA1 entry. This in turn, slightly reduces the burden of data entry on OPTN members.

How was this proposal developed?

The Committee developed this proposal in response to the implementation of previously approved policies. The Committee noticed that selection of broad DQA1 antigens did not exclude candidates from matching with donors that had a subtype of that antigen. UNOS staff developed a solution to avoid immediate patient safety issues and to implement the DQA1 typing requirements as planned by posting explanatory text in the DQA1 selection field. However, because the application of the equivalency tables impacts allocation and organ offers, the programming must follow the rules in policy; therefore programming cannot be changed to automatically associate DQA1 parent alleles with the corresponding subtypes until an equivalency table is created. Therefore, the Committee created a DQA1 equivalency

table based on the ImMunoGeneTics HLA database maintained by the European Bioinformatics Institute[2]. The table defines the relationship between the broad antigens and their corresponding subtypes. The Committee then voted to submit the table for public comment.

How well does this proposal address the problem statement?

By creating a DQA1 equivalency table, UNOS staff can program UNet to recognize the relationship between DQA1 parent alleles and corresponding subtypes, and directly solve the problem related to DQA1 unacceptable matching. Currently, data on how often incompatible matches occur between broad antigen and corresponding subtype were not collected for DQA1. The Committee recognized the patient safety issue prior to the UNet implementation date of DQA1 on January 21, 2016. Since that implementation, there has been no record of members entering parent antigens without the corresponding subtypes. This is due in large part to communications efforts and warnings programmed into UNet that alerted members to the safety issue. Nonetheless, the presence of the potential patient safety issue is real and one that the Committee wants to proactively address by fixing programming for DQA1.

Was this proposal changed in response to public comment?

Comments on this proposal from the public were minimal. Comments were limited to the results of the non-discussion votes at regional meetings and one comment from the OPTN/UNOS Kidney Transplantation Committee. The regions overwhelmingly passed this proposal on the non-discussion agenda, with zero votes against and only one abstention. In addition, formal comments from AST, ASTS, and ASHI approved of the proposal. After the public comment period ended, the committee reviewed the proposal and updated the policy language to reflect the most recently adopted version of OPTN policy language, but did not change the content of the proposed table.

Which populations are impacted by this proposal?

Sensitized candidates will be positively impacted by this proposal, especially those who have antibodies against subtype antigens of DQA1. As of March 31, 2016, 2,350 registrations on the waiting list had DQA1 reported as unacceptable antigen. Adding the DQA1 equivalency table will reduce the likelihood that candidates will receive an incompatible donor offer based on failure to select all subtype antigens associated with a broad DQA1 allele, relieving potential safety issues associated with DQA1 unacceptable antigen entry. This proposal also relieves the burden on member labs and transplant programs by reducing data entry requirements in UNet where human error can affect patient safety, allocation, and cold ischemia time. The proposal also alleviates any confusion among members by creating a uniform method of entering unacceptable antigens in UNet among all HLA loci.

How does this proposal support the OPTN Strategic Plan?

1. *Increase the number of transplants:* There is no impact to this goal.
2. *Improve equity in access to transplants:* There is no impact to this goal.
3. *Improve waitlisted patient, living donor, and transplant recipient outcomes:* This proposal will improve recipient outcomes by automatically preventing recipients that are sensitized to a broad antigen from receiving a donor organ with a subtype of that antigen. Updates to the histocompatibility equivalency tables are generally considered to support this strategic goal.
4. *Promote living donor and transplant recipient safety:* This proposal promotes transplant recipient safety by avoiding matches between donors and candidates that could result in acute rejection,

[2] Link to the ImMunoGeneTics HLA database maintained by the European Bioinformatics Institute

prolonged cold ischemia time, or discard of the donor organ. This is the primary goal of this proposal.

5. *Promote the efficient management of the OPTN:* This proposal promotes efficient management of the OPTN by aligning the entry for DQA1 with other HLA loci already in policy. Users will be relieved of following special rules for data entry regarding one locus.

How will the sponsoring Committee evaluate whether this proposal was successful post implementation?

This policy will be evaluated approximately 1 and 2 years post-implementation to determine whether the number of organ offers refused due to a positive crossmatch has decreased.

How will the OPTN implement this proposal?

This proposal will require a small programming effort in UNet^{SM}. UNOS will add this project to it's roadmap of IT projects upon adoption by the board and schedule it for implementation. Additionally, UNOS will notify members in advance of any changes to the system. To communicate these changes, UNOS will use standard communication vehicles such as system notices, member e-newsletters, Transplant Pro articles and Tech News articles.

Corresponding instructional programming will depend on the development and implementation plan for the proposal.

How will members implement this proposal?

Members will need to be aware when the changes to the system occur and change how they enter unacceptable antigens for DQA1. Members will also need to work with third party vendors on implementing the changes to DQA1 for their individual labs and in-house systems.

Will this proposal require members to submit additional data?

No, members will not need to submit additional data.

How will members be evaluated for compliance with this proposal?

The proposed language does not change any member compliance requirements, so there will be no need to evaluate member compliance with the proposal.

Policy or Bylaw Language

Proposed new language is underlined (example) and language that is proposed for removal is struck through (~~example~~).

RESOLVED, that changes to Policy 4.10 (Reference Tables of HLA Antigen Values and Split Equivalences), as set forth below, are hereby approved, effective pending programming and notice to OPTN members.

4.10 Reference Tables of HLA Antigen Values and Split Equivalences

Tables 4-2, 4-3, and *4-4* show candidate-donor antigen ~~combinations~~ equivalencies and whether they are mismatches. For each candidate antigen, the donor antigens that are not mismatched are listed below. All other combinations are considered mismatches.

Examples of how "Matching Antigen Equivalences" works:

- If the candidate types as B70: only donors that type as B70 are considered matched. Donors typed as B71 or B72 are considered mismatched.
- If the candidate types as B71: only donors that type as B71 or B1510 are considered matched. Donors typed as B70 are considered mismatched.

Table 4-2: HLA A Matching Antigen Equivalences

~~Patient~~ Candidate A-Locus Antigen	Equivalent Donor Antigens
1	1
2	2, 0201, 0202, 0203, 0205, 0206
0201	0201, 2
0202	0202, 2
0203	0203, 2
0205	0205, 2
0206	0206, 2
3	3
9	9
10	10
11	11, 1101, 1102
1101	1101, 11
1102	1102, 11
19	19
23	23
24	24, 2402, 2403
2402	2402, 24
2403	2403, 24
25	25
26	26
28	28
29	29, 2901, 2902
2901	2901, 29
2902	2902, 29
30	30, 3001, 3002
3001	3001, 30
3002	3002, 30
31	31
32	32
33	33, 3301, 3303
3301	3301, 33
3303	3303, 33
34	34
3401	3401, 34
3402	3402, 34
36	36
43	43
66	66, 6601, 6602
6601	6601, 66
6602	6602, 66
68	68, 6801, 6802
6801	6801, 68
6802	6802, 68
69	69
74	74
80	80

Table 4-3: HLA B Matching Antigen Equivalences

~~Patient~~ Candidate B-Locus Antigen	Equivalent Donor Antigens
5	5
7	7, 0702
0702	0702, 7
8	8
0802	0802
0803	0803
0804	0804
12	12
13	13, 1301, 1302
1301	1301, 13
1302	1302, 13
14	14
1401	1401, 64
1402	1402, 65
15	15
1501	1501, 62
1502	1502, 75
1503	1503, 72
1510	1510, 71
1511	1511, 75
1512	1512, 76
1513	1513, 77
1516	1516, 63
1517	1517, 63
16	16
17	17
18	18
21	21
22	22
27	27, 2705
2705	2705, 27

~~Patient~~ Candidate B-Locus Antigen	Equivalent Donor Antigens
2708	2708
35	35
37	37
38	38
39	39, 3901, 3902, 3905, 3913
3901	3901, 39
3902	3902, 39
3905	3905, 39
3913	3913, 39
40	40
4001	4001, 60
4002	4002, 61
4005	4005, 50
4006	4006, 61
41	41
42	42
44	44, 4402, 4403
4402	4402, 44
4403	4403, 44
4415	4415, 45
45	45, 4415
46	46
47	47
48	48
49	49
50	50, 4005
51	51, 5101, 5102
5101	5101, 51

~~Patient~~ Candidate B-Locus Antigen	Equivalent Donor Antigens
5102	5102, 51
52	52
53	53
54	54
55	55
56	56
57	57, 5701, 5703
5701	5701, 57
5703	5703, 57
58	58
59	59
60	60, 4001
61	61, 4002, 4006
62	62, 1501
63	63, 1516, 1517
64	64, 1401
65	65, 1402
67	67
70	70
71	71, 1510
72	72, 1503
73	73
75	75, 1502, 1511
76	76, 1512
77	77, 1513
78	78
81	81
82	82

Table 4-4: HLA DR Matching Antigen Equivalence

~~Patient~~ Candidate DR-Locus Antigen	Equivalent Donor Antigens
1	1, 0101, 0102
0101	0101, 1
0102	0102, 1
103	103
2	2
3	3
0301	0301, 17
0302	0302, 18
4	4
0401	0401, 4
0402	0402, 4
0403	0403, 4
0404	0404, 4
0405	0405, 4
0407	0407, 4
5	5
6	6
7	7

~~Patient~~ Candidate DR-Locus Antigen	Equivalent Donor Antigens
8	8
9	9
0901	0901, 9
0902	0902, 9
10	10
11	11
1101	1101, 11
1104	1104, 11
12	12
1201	1201, 12
1202	1202, 12
13	13, 1301, 1303
1301	1301, 13
1303	1303, 13
14	14, 1401, 1402, 1403, 1404, 1454

~~Patient~~ Candidate DR-Locus Antigen	Equivalent Donor Antigens
1401	1401, 14, 1454
1402	1402, 14
1403	1403, 14
1404	1404, 14
1454	1454, 14, 1401
15	15
1501	1501, 15
1502	1502, 15
1503	1503, 15
16	16
1601	1601, 16
1602	1602, 16
17	17, 0301
18	18, 0302

~~Examples of how "Matching Antigen Equivalences" works:~~

- ~~If the candidate types as B70: only donors that type as B70 are considered matched.~~
- ~~If the candidate types as B71: only donors that type as B71 or B1510 are considered matched.~~

Tables 4-5, 4-6, *4-7, 4-8, 4-9, 4-10, 4-11, 4-12,* and *4-1~~2~~3*, show candidate-donor unacceptable antigen combinations. For each candidate antigen, the donor antigens that are unacceptable are listed below. Table 4-14 shows additional unacceptable antigen equivalences to be used in the Calculated Panel Reactive Antibody (CPRA) only.

Examples of how "Unacceptable Antigen Equivalences" works:

If a candidate has B70 listed as an "unacceptable antigen", donors typed as B70, B71, B72, 1503, or 1510 are considered unacceptable.

Table 4-5: HLA A Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable A-Locus Antigen	Donor Equivalent Antigens
1	1
2	2, 0201, 0202, 0203, 0205, 0206
0201	0201
0202	0202
0203	0203
0205	0205
0206	0206
3	3
9	9, 23, 24, 2402, 2403
10	10, 25, 26, 34, 3401, 3402, 66, 6601, 6602, 43
11	11, 1101, 1102
1101	1101
1102	1102

~~Patient~~ Candidate Unacceptable A-Locus Antigen	Donor Equivalent Antigens
19	19, 29, 2901, 2902, 30, 3001, 3002, 31, 32, 33, 3301, 3303, 74
23	23
24	24, 2402, 2403
2402	2402
2403	2403
25	25
26	26
28	28, 68, 69, 6801, 6802
29	29, 2901, 2902
2901	2901
2902	2902
30	30, 3001, 3002
3001	3001
3002	3002
31	31

~~Patient~~ Candidate Unacceptable A-Locus Antigen	Donor Equivalent Antigens
32	32
33	33, 3301, 3303
3301	3301
3303	3303
34	34, 3401, 3402
3401	3401
3402	3402
36	36
43	43
66	66, 6601, 6602
6601	6601
6602	6602
68	68, 6801, 6802
6801	6801
6802	6802
69	69
74	74
80	80

Table 4-6 HLA B Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
5	5, 51, 5101, 5102
7	7, 0702
0702	0702
8	8
0802	0802
0803	0803

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
0804	0804
12	12, 44, 4402, 4403, 4415, 45
13	13, 1301, 1302
1301	1301

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
1302	1302
14	14, 64, 65, 1401, 1402
1401	1401
1402	1402

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
15	15, 62, 63, 75, 76, 77, 1501, 1502, 1503, 1510, 1511, 1512, 1513, 1516, 1517
1501	1501
1502	1502
1503	1503
1510	1510
1511	1511
1512	1512
1513	1513
1516	1516
1517	1517
16	16, 38, 39, 3901, 3902 3905, 3913
17	17, 57, 5701, 5703, 58
18	18
21	21, 49, 50, 4005
22	22, 54, 55, 56
27	27, 2705, 2708
2705	2705
2708	2708
35	35
37	37
38	38
39	39, 3901, 3902, 3905, 3913
3901	3901
3902	3902
3905	3905
3913	3913

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
40	40, 60, 61, 4001, 4002
4001	4001, 60
4002	4002
4005	4005, 50
4006	4006
41	41
42	42
44	44, 4402, 4403
4402	4402
4403	4403
4415	4415, 45
45	45, 4415
46	46
47	47
48	48
49	49
50	50, 4005
51	51, 5101, 5102
5101	5101
5102	5102
52	52
53	53
54	54
55	55
56	56
57	57, 5701, 5703
5701	5701
5703	5703
58	58
59	59
60	60
61	61, 4002, 4006
62	62, 1501
63	63, 1516
64	64, 1401
65	65, 1402

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
67	67
70	70, 71, 72, 1503, 1510
71	71, 1510
72	72, 1503
73	73
75	75, 1502, 1511
76	76, 1512
77	77, 1513
78	78
81	81
82	82
Bw4	Bw4, 0802, 0803, 0804, 5, 13, 1301, 1302, 1513, 1516, 1517, 17, 27, 37, 38, 44, 4402, 4403, 4415, 47, 49, 51, 5101, 5102, 52, 53, 57, 5701, 5703, 58, 59, 63, 77

~~Patient~~ Candidate Unacceptable B-Locus Antigen	Donor Equivalent Antigens
Bw6	Bw6, 7, 0702, 8, 0801, 14, 1401, 1402,1501, 1502, 1503, 1510, 1511, 1512,18, 22, 2708, 35, 39, 3901, 3902 3905, 3913 40, 4001, 4002, 4006, 41, 42, 45, 48, 50, 4005, 54, 55, 56, 60, 61, 62, 64, 65, 67, 70, 71, 72, 75, 76, 78, 81, 82

Table 4-7: HLA C Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable C-Locus Antigen	Donor Equivalent Antigens
01	01
02	02
03	03, 09, 10
04	04
05	05
06	06

~~Patient~~ Candidate Unacceptable C-Locus Antigen	Donor Equivalent Antigens
07	07, 0701, 0702
0701	0701
0702	0702
08	08
09	09
10	10

~~Patient~~ Candidate Unacceptable C-Locus Antigen	Donor Equivalent Antigens
12	12
14	14
15	15
16	16
17	17
18	18

Table 4-8: HLA DR Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable DR-Locus Antigen	Donor Equivalent Antigens
1	1, 0101, 0102
0101	0101
0102	0102
103	103
2	2, 15, 1501, 1502, 1503, 16, 1601, 1602
3	3, 17, 18, 0301, 0302
0301	0301, 17
0302	0302, 18
4	4, 0401, 0402, 0403, 0404, 0405, 0407
0401	0401
0402	0402
0403	0403
0404	0404
0405	0405
0407	0407

~~Patient~~ Candidate Unacceptable DR-Locus Antigen	Donor Equivalent Antigens
5	5, 11, 1101, 1104, 12, 1201, 1202
6	6, 13, 1301, 1303, 14, 1401, 1402, 1403, 1404, 1454
7	7
8	8
9	9, 0901, 0902
0901	0901
0902	0902
10	10
11	11, 1101, 1104
1101	1101
1104	1104
12	12, 1201, 1202
1201	1201
1202	1202

~~Patient~~ Candidate Unacceptable DR-Locus Antigen	Donor Equivalent Antigens
13	13, 1301, 1303
1301	1301
1303	1303
14	14, 1401, 1402, 1403, 1404, 1454
1401	1401
1402	1402
1403	1403
1404	1404
1454	1454
15	15, 1501, 1502, 1503
1501	1501
1502	1502
1503	1503
16	16, 1601, 1602
1601	1601
1602	1602
17	17, 0301
18	18, 0302

Table 4-9: HLA DR51 Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable DR51-Locus Antigen	Donor Equivalent Antigens
5*01:01	5*01:01
5*02:02	5*02:02
51	51, 5*01:01, 5*02:02

Table 4-10: HLA DR52 Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable DR52-Locus Antigen	Donor Equivalent Antigens
3*01:01	3*01:01
3*02:02	3*02:02
3*03:01	3*03:01
52	52, 3*01:01, 3*02:02, 3*03:01

Table 4-11: HLA DR53 Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable DR53-Locus Antigen	Donor Equivalent Antigens
4*01:01	4*01:01
4*01:03	4*01:03
53	53, 4*01:01, 4*01:03

Table 4-12: HLA DQA1 Unacceptable Antigen Equivalences

Candidate Unacceptable DQA1-Locus Antigen	*Donor Equivalent Antigens*
01	01, 01:01, 01:02, 01:03, 01:04, 01:05, 01:06, 01:07, 01:08, 01:09, 01:10, 01:11, 01:12
01:01	01:01
01:02	01:02
01:03	01:03
01:04	01:04
01:05	01:05
01:06	01:06
01:07	01:07
01:08	01:08
01:09	01:09
01:10	01:10
01:11	01:11
01:12	01:12
02	02, 02:01
02:01	02:01
03	03, 03:01, 03:02, 03:03
03:01	03:01
03:02	03:02
03:03	03:03
04	04, 04:01, 04:02, 04:04
04:01	04:01
04:02	04:02

Candidate Unacceptable DQA1-Locus Antigen	*Donor Equivalent Antigens*
04:03N	04:03N
04:04	04:04
05	05, 05:01, 05:02, 05:03, 05:04, 05:05, 05:06, 05:07, 05:08, 05:09, 05:10, 05:11
05:01	05:01
05:02	05:02
05:03	05:03
05:04	05:04
05:05	05:05
05:06	05:06
05:07	05:07
05:08	05:08
05:09	05:09
05:10	05:10
05:11	05:11
06	06, 06:01, 06:02
06:01	06:01
06:02	06:02

Table 4-123: HLA DQB1 Unacceptable Antigen Equivalences

~~Patient~~ Candidate Unacceptable DQB1-Locus Antigen	Donor Equivalent Antigens
1	1, 5, 6, 0501, 0502, 0601, 0602, 0603, 0604, 0609
2	2, 0201, 0202
3	3, 7, 8, 9, 0301, 0302, 0303, 0319
0301	0301, 7
0302	0302, 8
0303	0303, 9
0319	0319, 7
4	4, 0401, 0402
0401	0401
0402	0402
5	5, 0501, 0502
0501	0501
0502	0502
6	6, 0601, 0602, 0603, 0604, 0609
0601	0601
0602	0602
0603	0603
0604	0604
0609	0609
7	7, 3, 0301, 0319

~~Patient~~ Candidate Unacceptable DQB1-Locus Antigen	Donor Equivalent Antigens
8	8, 3, 0302
9	9, 3, 0303

~~Examples of how "Unacceptable Antigen Equivalences" works:~~

~~If a candidate has B70 listed as an "unacceptable antigen", donors typed as B70, B71, B72, 1503, or 1510 are considered unacceptable.~~

~~Table 4-14 shows additional unacceptable antigen equivalences to be used in the Calculated Panel Reactive Antibody (CPRA) only.~~

Table 4-13~~4~~: Additional Unacceptable Antigen Equivalences to be used in the Calculated Panel Reactive Antibody (CPRA) Only

Locus	Patient Unacceptable Antigen	Unacceptable DR antigen equivalences used for CPRA calculation
DR51	5*0101	2, 15, 16
	5*0202	2, 15, 16
	51	2, 15, 16
DR52	3*0101	3, 5, 6, 11, 12, 13, 14, 17, 18
	3*0202	3, 5, 6, 11, 12, 13, 14, 17, 18
	3*0301	3, 5, 6, 11, 12, 13, 14, 17, 18
	52	3, 5, 6, 11, 12, 13, 14, 17, 18
DR53	4*0101	4, 7, 9
	4*0103	4, 7, 9
	53	4, 7, 9

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