Update to the Human Leukocyte Antigens (HLA) Equivalency Tables

Sponsoring Committee: **Histocompatibility**

Policy/Bylaws Affected: **Policy 2.11.A: Required Information for Deceased Kidney Donors, Policy 2.11.B: Required Information for Deceased Liver Donors, 2.11.C: Required Information for Deceased Heart Donors, 2.11.D: Required Information for Deceased Lung Donors, 2.11.E: Required Information for Deceased Pancreas Donors, 4.1: Requirements for Laboratory Review of Reports, 4.2: Requirements for Waiting list Data Verification, 4.3: Requirements for Performing and Reporting HLA Typing, 4.4: Resolving Discrepant Donor and Recipient HLA Results, 4.5: Antibody Screening and Reporting, 4.6: Crossmatching, 4.7: Blood Type Determination, 4.8: Preservation of Excess Specimens, 4.9: HLA Antigen Values and Split Equivalneces, Policy 4.10: Reference Tables of HLA Antigen Values and Split Equivalences, 13.5.A: HLA Typing Requirements for OPTN KPD Candidates, and 13.5.C: HLA Typing Requirements for OPTN KPD Donors**

Public Comment: **August 2015**

Effective Date: **All policies listed above except for 4.9 and 4.10 will be effective March 1, 2016. Policies 4.9 and 4.10 will be effective pending implementation and notice to OPTN members.**

Problem Statement

This proposal addresses four different issues:

1. Updates the Equivalency Tables as required by OPTN Policy
2. Adds new alleles to the HLA antigen dropdown in UNet^{SM}
3. Updates terminology to reflect modern terminology
4. Removes duplicative sections of HLA policy

Policy 4.7: HLA Antigen Values and Split Equivalences, states: “The Histocompatibility Committee must review and recommend any changes needed to the tables on or before June 1 of each year.” The Board of Directors last approved updates to the Equivalency Tables in November 2013. Since that time, additional updates to the equivalencies have been proposed and will be incorporated into these tables in policy.

This proposal also adds additional alleles (subtypes) to the HLA antigen dropdown options in UNet to increase access to transplant for sensitized candidates and improve identification of zero antigen mismatches. Current dropdowns are unnecessarily disadvantaging candidates who have antibodies against some but not all alleles in a single antigen group. For these patients, members currently can only list corresponding antigens (inclusive of all alleles in the group) as unacceptable antigens, excluding candidates from a broader donor pool than necessary. In addition, candidates with an allele specific

antibody that is in the same antigen group as their own allele cannot have the unacceptable allele or the antigen listed (for example, candidate type: B*44:02; unacceptable allele, B*44:03).

Additionally, current policy references HLA-DPB, HLA-DQA, and HLA-DQB. This terminology is not medically accurate as defined by accepted terminology from the World Health Organization and the genetics community. Therefore, the Committee also proposes updating references to these HLA loci in policy to HLA-DPB1, HLA-DQA1, and HLA-DQB1 to distinguish them from other closely related loci, and to reflect commonly accepted practices within the histocompatibility community.

Lastly, in November of 2014, the Board passed a proposal to expand the Deceased Donor HLA Types. This proposal added Policy 4.4: *Requirements for Performing and Reporting HLA Typing*, which was meant to replace current Policy 4.1: *HLA Typing*. However, section 4.1 was never stricken from policy. This proposal removes the current Policy 4.1, and adds references to pancreas and pancreas islet HLA requirements in Policy 4.4 so that they are aligned with Policy 3.4.D: *Candidate Human Leukocyte Antigen (HLA) Requirements*.

Summary of Changes

This proposal makes the following changes to policy:

- Changes all references of HLA- DPB, DQA, and DQB to DPB1, DQA1, and DQB1, respectively
- Adds alleles to the HLA- DR51, DR52, and DR53 dropdown menus in UNet
- Updates matching antigen equivalencies and unacceptable antigens in all tables
- Removes duplicative Policy 4.1: *HLA Typing*
- Adds pancreas and pancreas islet references to Policy 4.3: *Requirements for Performing and Reporting HLA Typing*.

What Members Need to Do

All OPTN members and vendors will need to familiarize themselves with these changes.
Transplant programs may need to request updated HLA typing using molecular methods for existing candidates who may be disadvantaged by the changes to the HLA Matching Equivalences tables, especially for any candidate who has a ‘broad’ antigen listed in their reported HLA type.

Histocompatiblity labs will be required to assign antigens less broadly to candidates than in the past. Members may also need to review and modify unacceptable antigens reported for candidates with antibodies against alleles that are being added.

Affected Policy/Bylaw Language

New language is <u>underlined</u> and language that will be deleted is ~~struck through~~.

2.11 Required Deceased Donor Information

2.11.A Required Information for Deceased Kidney Donors

The host OPO must provide *all* the following additional information for all deceased donor kidney offers:

1. Date of admission for the current hospitalization
2. Donor name
3. Donor ID
4. Ethnicity
5. Relevant past medical or social history
6. Current history of abdominal injuries and operations
7. Current history of average blood pressure, hypotensive episodes, average urine output, and oliguria

8. Current medication and transfusion history
9. Anatomical description, including number of blood vessels, ureters, and approximate length of each
10. Human leukocyte antigen (HLA) information as follows: A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens prior to organ offers.
11. Indications of sepsis
12. Injuries to or abnormalities of the blood
13. Assurance that final blood and urine cultures are pending
14. Final urinalysis
15. Final blood urea nitrogen (BUN) and creatinine
16. Recovery blood pressure and urine output information
17. Recovery medications
18. Type of recovery procedure, flush solution and method, and flush storage solution
19. Warm ischemia time and organ flush characteristics

2.11.B Required Information for Deceased Liver Donors

The host OPO must provide *all* the following additional information for all deceased donor liver offers:

1. Donor name
2. Donor ID
3. Ethnicity
4. Height
5. Weight
6. Vital signs, including blood pressure, heart rate and temperature
7. Social history, including drug use
8. History of treatment in hospital including current medications, vasopressors, and hydration
9. Current history of hypotensive episodes, urine output, and oliguria
10. Indications of sepsis
11. Aspartate aminotransferase (AST)
12. Bilirubin (direct)
13. Other laboratory tests within the past 12 hours including:
    a. Alanine aminotransferase (ALT)
    b. Alkaline phosphatase
    c. Total bilirubin
    d. Creatinine
    e. Hemoglobin (hgb) and hemocrit (hct)
    f. International normalized ration (INR) or Prothrombin (PT) if INR is not available, and partial thromboplastin time (PTT)
    g. White blood cell count (WBC)
14. Human leukocyte antigen (HLA) typing if requested by the transplant hospital, including A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens in the timeframe specified by the transplant program

If a transplant program requests HLA typing for a deceased liver donor, it must communicate this request to the OPO and the OPO must provide the HLA information listed above. The transplant program must document requests for donor HLA typing, including the turnaround time specified for reporting the donor HLA typing results. The OPO must document HLA typing provided to the requesting transplant program.

2.11.C Required Information for Deceased Heart Donors

The host OPO must provide *all* the following additional information for all deceased donor heart offers:

1. Height

2. Weight
3. Vital signs, including blood pressure, heart rate, and temperature
4. History of treatment in hospital including vasopressors and hydration
5. Cardiopulmonary, social, and drug activity histories
6. Details of any documented cardiac arrest or hypotensive episodes
7. 12-lead interpreted electrocardiogram
8. Arterial blood gas results and ventilator settings
9. Cardiology consult or echocardiogram, if the hospital has the facilities
10. Human leukocyte antigen (HLA) typing if requested by the transplant hospital, including A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens prior to the final organ acceptance
11. Toxoplasma antibody (Ab) test result or an appropriate donor sample sent with the heart for testing at the transplant hospital

For heart deceased donors, if a transplant program requires donor HLA typing prior to submitting a final organ acceptance, it must communicate this request to the OPO and document the request. The OPO must provide the HLA information required in the list above and document that the information was provided to the transplant program.

The heart recovery team must have the opportunity to speak directly with the responsible ICU personnel or the onsite donor coordinator in order to obtain current information about the deceased donor's physiology.

2.11.D Required Information for Deceased Lung Donors

The host OPO must provide *all* the following additional information for all deceased lung donor offers:

1. Height
2. Weight
3. Vital signs, including blood pressure, heart rate, and temperature
4. History of medical treatment in hospital including vasopressors and hydration
5. Smoking history
6. Cardiopulmonary, social, and drug activity histories
7. Arterial blood gases and ventilator settings on 5 cm/H_20/PEEP including PO_2/FiO_2 ratio and preferably 100% FiO_2, within 2 hours prior to the offer
8. Bronchoscopy results
9. Chest x-ray interpreted by a radiologist or qualified physician within 3 hours prior to the offer
10. Details of any documented cardiac arrest or hypotensive episodes
11. Sputum gram stain, with description of sputum
12. Electrocardiogram
13. Echocardiogram, if the OPO has the facilities
14. HLA typing if requested by the transplant hospital, including A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens prior to final organ acceptance

If the host OPO cannot perform a bronchoscopy, it must document that it is unable to provide bronchoscopy results and the receiving transplant hospital may perform it. The lung recovery team may perform a confirmatory bronchoscopy provided unreasonable delays are avoided and deceased donor stability and the time limitations in *Policy 5.6.B: Time Limit for Acceptance* are maintained.

For lung deceased donors, if a transplant hospital requires donor HLA typing prior to submitting a final organ acceptance, it must communicate this request to the OPO and document the request. The OPO must provide the HLA information required in the list above and document that the information was provided to the transplant program.

The lung recovery team must have the opportunity to speak directly with the responsible ICU

personnel or the onsite OPO donor coordinator in order to obtain current information about the deceased donor's physiology.

2.11.E Required Information for Deceased Pancreas Donors

The host OPO must provide *all* the following additional information for all deceased donor pancreas offers:

1. Donor name
2. Donor ID
3. Ethnicity
4. Weight
5. Date of admission for the current hospitalization
6. Alcohol use (if known)
7. Current history of abdominal injuries and operations including pancreatic trauma
8. Current history of average blood pressure, hypotensive episodes, cardiac arrest, average urine output, and oliguria
9. Current medication and transfusion history
10. Pertinent past medical or social history including pancreatitis
11. Familial history of diabetes
12. Insulin protocol
13. Indications of sepsis
14. Serum amylase
15. Serum lipase
16. HLA information as follows: A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens prior to organ offers.

~~4.1 HLA Typing~~

~~4.1.A Requirements for Performing and Reporting HLA Typing~~

~~Laboratories must do *all* of the following:~~

1. ~~Perform HLA typing on all potential transplant recipients and donors when requested by a physician or other authorized individuals.~~
2. ~~Ensure that all HLA typing is accurately determined and report HLA typing results to the OPO or Transplant Program according to the turnaround time specified in the written agreement between the laboratory and any affiliated OPO or transplant program.~~
3. ~~Report serological split level and molecular typing results to the OPO for all required HLA types according to Table 4.1 *HLA Typing Requirements for Deceased Donors* Policy 2.11: *Required Deceased Donor Information*, whenever the lab performs HLA typing on deceased kidney, kidney-pancreas, and pancreas donors.~~
4. ~~Report HLA typing results to the Transplant Program for all required HLA types, according to Table 4.21 *HLA Typing Requirements for Candidates,* whenever the laboratory performs HLA typing on candidates.~~

~~Table 4.1 shows HLA types required to be reported for deceased donors.~~

Table 4.1: HLA Typing Requirements for Deceased Donors

Organ	A	B	Bw4	Bw6	C	DR	DR51	DR52	DR53	DPB	DQB
Kidney	●	●	●	●	●	●	●	●	●	●	●
Pancreas	●	●	●	●	●	●	●	●	●	●	●
Kidney-Pancreas	●	●	●	●	●	●	●	●	●	●	●
Heart*	●	●	●	●	●	●	●	●	●	●	●
Lung*	●	●	●	●	●	●	●	●	●	●	●

* For deceased heart and lung donors, if a transplant hospital requires donor HLA typing prior to submitting a final organ acceptance, it must communicate this request to the OPO and document this request. The OPO must provide the HLA information required in the table above and document that the information was provided to the transplant program. The transplant hospital may request HLA-DPB typing, but the OPO need only provide it if its affiliated laboratory performs related testing.

Table 4.21 shows HLA types required to be reported for candidates.

Table 4.21: HLA Typing Requirements for Candidates

Organ	A	B	Bw4	Bw6	DR
Kidney alone	●	●	●	●	●
Pancreas alone	●	●	●	●	●
Kidney-Pancreas	●	●	●	●	●

4.21 Requirements for Laboratory Review of Reports

[*Subsequent headings affected by the re-numbering of this policy will also be changed as necessary.*]

4.4.3.A Deceased Donor HLA Typing

If the laboratory performs HLA typing on a deceased donor, the laboratory must perform molecular typing and report results at the level of serological splits to the OPO for all required HLA types on deceased donors according to Table 4-31 Deceased Donor HLA Typing Requirements.

Table 4-31 below provides the requirements of HLA typing of HLA A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, and DPB1 antigens.

Table 4-~~3~~1: Deceased Donor HLA Typing Requirements

If a Laboratory Performs HLA Typing on a:	Then the Laboratory Must Report Results to the OPO at the Following Times:
Deceased Kidney, Kidney-Pancreas, Pancreas, or Pancreas Islet Donor	Prior to organ offers
Deceased Heart, Heart-Lung, or Lung Donors	Prior to final acceptance, if required by the transplant program
Deceased Liver Donors	Within the period specified by the transplant program

4.~~4~~.3.B HLA Typing for Candidates

Laboratories must perform HLA typing on a kidney, kidney-pancreas, pancreas, or pancreas islet candidate and report results for HLA A, B, Bw4, Bw6, and DR to the transplant program prior to registration on the waiting list.

4.~~5~~.4 Resolving Discrepant Donor and Recipient HLA Typing Results

[*Subsequent headings affected by the re-numbering of this policy will also be changed as necessary.*]

4.~~10~~.9 HLA Antigen Values and Split Equivalences

HLA matching of A, B, and DR locus antigens is based on the antigens which are listed in *Policy 4.1~~1~~0: Reference Tables of HLA Antigen Values and Split Equivalences*. The Histocompatibility Committee must review and recommend any changes needed to the tables on or before June 1 of each year. For matching purposes, split antigens not on this list will be indicated on the waiting list as the parent antigens and will match only with the corresponding parent antigens.

4.~~11~~10 Reference Tables of HLA Antigen Values and Split Equivalences

Tables 4-~~3~~2, 4-~~4~~3, and *4-~~5~~4*, show ~~patient~~ candidate-donor antigen combinations 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. ~~Antigens with an * indicate an allele that may not have a World Health Organization (WHO) approved serologic specificity. Antigens given **99 means the patient locus was not tested.~~

Table 4-~~3~~2 HLA A Matching Antigen Equivalences

Patient 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

Patient A Locus Antigen	Equivalent Donor Antigens
9	9
10	10
11	11, 1101, 1102
1101	1101, 11
1102	1102, 11
19	19
23	23
24	24, 2402, 2403

Patient A Locus Antigen	Equivalent Donor Antigens
2402	2402, 24
2403	2403, 24
25	25
26	26
28	28
29	29, 2901, 2902
2901	2901, 29
2902	2902, 29

Patient A Locus Antigen	Equivalent Donor Antigens
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

Patient A Locus Antigen	Equivalent Donor Antigens
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

Patient A Locus Antigen	Equivalent Donor Antigens
6802	6802, 68
69	69
74	74
80	80
~~203~~	~~203, 2~~
~~210~~	~~210, 2~~
~~2403~~	~~2403, 24~~
~~*6601~~	~~*6601, 66~~
~~*6602~~	~~*6602, 66~~
~~** 99~~	~~(No equivalent)~~

Table 4-43: HLA B Matching Antigen Equivalences

Patient B Locus Antigen	Equivalent Donor Antigens
5	5
7	7~~, 703~~, 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~~, 64, 65~~
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

Patient B Locus Antigen	Equivalent Donor Antigens
17	17
18	18
21	21
22	22
27	27, 2705
2705	2705, 27
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~~, 61~~
4001	4001, 60
4002	4002, 61
4005	4005, 50
4006	4006, 61
41	41
42	42
44	44, 4402, 4403

Patient B Locus Antigen	Equivalent Donor Antigens
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~~, 5103~~
5101	5101, 51
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

Patient B Locus Antigen	Equivalent Donor Antigens
61	61, 4002, 4006
62	62, 1501
63	63, 1516, 1517
64	64, 1401
65	65, 1402
67	67
70	70, 71, 72
71	71, 70, 1510
72	72, 70, 1503
73	73

Patient B Locus Antigen	Equivalent Donor Antigens
75	75, 1502, 1511 15
76	76, 15, 1512
77	77, 15, 1513
78	78
81	81
82	82, *8201
703	703,7
*0804	*0804, 8
*1304	*1304, 15, 21, 49, 50
2708	2708, 27

Patient B Locus Antigen	Equivalent Donor Antigens
3901	3901, 39
3902	3902, 39
*3905	*3905, 39
4005	4005, 50
5101	5101, 51
5102	5102, 51, 53
5103	5103, 51
7801	7801
*8201	*8201, 82
** 99	(No equivalent)

Table 4-~~54~~: HLA DR Matching Antigen Equivalence

Patient DR Locus Antigen	Equivalent Donor Antigens
1	1,~~ 103~~ 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
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
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
~~103~~	~~103, 1~~
~~1403~~	~~1403, 14, 6~~
~~1404~~	~~1404, 14, 6~~
~~** 99~~	~~(No equivalent)~~

~~*** Indicates an allele; may not have a WHO-approved serologic specificity**~~
~~**** Code 99 means not tested**~~

Examples of how "Matching Antigen Equivalences" works:

- If the ~~patient~~candidate types as ~~has~~ B70: only d~~D~~onors that type as~~with~~ B70~~, B71, and B72~~ are considered ~~not mis~~matched.
- If the~~ patient~~candidate types as~~has~~ B71: only d~~D~~onors that type as~~with~~ B71 or B1510 ~~and B720~~ are considered ~~not mis~~matched. ~~Donors with B72 are considered mismatched.~~

Tables 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11 and *4-12*, show candidate-donor unacceptable antigen combinations. For each candidate antigen, the donor antigens that are unacceptable are listed below.

Table 4-~~6~~5: HLA A Unacceptable Antigen Equivalences

Patient Unacceptable A Locus Antigen	Donor Equivalent Antigens
1	1
2	2, 0201, 0202, 0203, 0205, 0206 ~~210~~
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
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
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
~~203~~	~~203~~
~~210~~	~~210~~
~~2403~~	~~2403~~
~~*6601~~	~~*6601~~
~~*6602~~	~~*6602~~

Table 4-~~7~~6 HLA B Unacceptable Antigen Equivalences

Patient Unacceptable B Locus Antigen	Donor Equivalent Antigens
5	5, 51, 5101, 5102, ~~5103,~~ 52~~, 78~~
7	7~~, 703~~, 0702
0702	0702
8	8
0802	0802
0803	0803
0804	0804
12	12, 44, 4402, 4403, 4415, 45
13	13, 1301, 1302
1301	1301
1302	1302
14	14, 64, 65, 1401, 1402
1401	1401
1402	1402
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
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~~5103~~
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
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~~, *8201~~
~~703~~	~~703~~
~~*0804~~	~~*0804~~

Patient Unacceptable B Locus Antigen	Donor Equivalent Antigens
~~*1304~~	~~*1304~~
~~2708~~	~~2708~~
~~3901~~	~~3901~~
~~3902~~	~~3902~~
~~*3905~~	~~*3905~~
~~4005~~	~~4005, 50~~
~~5102~~	~~5102~~
~~5103~~	~~5103~~
~~7801~~	~~7801, 78~~
~~*8201~~	~~*8201, 82~~

Patient Unacceptable B Locus Antigen	Donor Equivalent Antigens
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 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-~~8~~7: HLA C Unacceptable Antigen Equivalences

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

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

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

Table 4-~~9~~8: HLA DR Unacceptable Antigen Equivalences

Patient 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
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
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
~~103~~	~~103~~
~~1403~~	~~1403~~
~~1404~~	~~1404~~
~~51*~~	~~51~~
~~52*~~	~~52~~
~~53*~~	~~53~~

Table 4-9: HLA DR51 Unacceptable Antigen Equivalences

Patient 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 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 Unacceptable DR 53 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 4-10~~2~~: HLA DQB1 Unacceptable Antigen Equivalences

Patient 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~~, 1~~
0501	0501
0502	0502
6	6, ~~1,~~ 0601, 0602, 0603, 0604, 0609
0601	0601
0602	0602
0603	0603
0604	0604

Patient Unacceptable DQB1 Locus Antigen	Donor Equivalent Antigens
0609	0609
7	7, 3, 0301, 0319
8	8, 3, 0302
9	9, 3, 0303

~~*** Indicates an allele; may not have a WHO-approved serologic specificity**~~

~~***** Please refer to the end of this section for information**~~

Examples of how "Unacceptable Antigen Equivalences" works:

If a ~~patient~~candidate has B70 listed as an "unacceptable antigen"~~:~~, donors typed as B70, B71, ~~and or~~ B72, 1503, or 1510 are considered unacceptable. ~~Donors typed as B73 and B75 are considered acceptable.~~

Table 4-13: 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

~~**Additional Unacceptable Antigen Equivalences to be used in the Calculated PRA Only:**~~

~~DR51 should also include DR2, DR15, DR16.~~
~~DR52 should also include DR3, DR5, DR6, DR11, DR12, DR13, DR14, DR17, DR18.~~
~~DR53 should also include DR4, DR7, DR9.~~

13.5 OPTN KPD Histocompatibility Testing

13.5.A HLA Typing Requirements for OPTN KPD Candidates

Before a candidate can appear on an OPTN KPD match run, the paired candidate's transplant hospital is responsible for reporting to the OPTN Contractor serological split level molecular typing results for *all* of the following:

- HLA-A

- HLA-B
- HLA-Bw4
- HLA-Bw6
- HLA-DR

If the candidate has unacceptable antigens listed for any of the following HLA types, then the paired candidate's transplant hospital is responsible for reporting to the OPTN Contractor serological split level molecular typing results for the corresponding HLA type before the candidate can appear on an OPTN KPD match run:

- HLA-C
- HLA-DR51
- HLA-DR52
- HLA-DR53
- HLA-DPB1
- HLA-DQA1
- HLA-DQB1

13.5.CHLA Typing Requirements for OPTN KPD Donors

Before a donor can appear on an OPTN KPD match run, the donor's transplant hospital is responsible for reporting to the OPTN Contractor serological split level molecular typing results for *all* of the following:

- HLA-A
- HLA-B
- HLA-Bw4
- HLA-Bw6
- HLA-C
- HLA-DR
- HLA-DR51
- HLA-DR52
- HLA-DR53
- HLA-DPB1
- HLA-DQA1
- HLA-DQB1

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