

## *Public Comment Proposal*

# Update Human Leukocyte Antigen (HLA) Equivalency Tables

*OPTN Histocompatibility Committee*

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# Update Human Leukocyte Antigen (HLA) Equivalency Tables

<i>Affected Policies:</i>	<p>2.11.A: Required Information for Deceased Kidney Donors</p> <p>2.11.B: Required Information for Deceased Liver Donors</p> <p>2.11.C: Required Information for Deceased Heart Donors</p> <p>2.11.D: Required Information for Deceased Lung Donors</p> <p>2.11.E: Required Information for Deceased Pancreas Donors</p> <p>4.3.A: Deceased Donor HLA Typing</p> <p>4.10: Reference Tables of HLA Antigen Values and Split Equivalences</p> <p>13.5.A: HLA Typing Requirements for OPTN KPD Candidates</p> <p>13.5.C: HLA Typing Requirements for OPTN KPD Donors</p>
<i>Sponsoring Committee:</i>	Histocompatibility
<i>Public Comment Period:</i>	August 3, 2021 – September 30, 2021

## Executive Summary

OPTN Policy 4.9: *HLA Antigen Values and Split Equivalences* requires the OPTN Histocompatibility Committee (Committee) to review HLA equivalency tables listed in OPTN Policy 4.10: *Reference Tables of HLA Antigen Values and Split Equivalences* on an annual basis and recommend any changes needed. The OPTN Board of Directors (Board) approved the most recent recommended table update in June 2020 with implementation following in June 2021.<sup>1</sup> During their 2021 annual review, the Committee identified changes that needed to be made to better ensure safety and accuracy in matching donors with transplant candidates and provide consistency among all UNet<sup>SM</sup> systems:

1. Addition of an equivalency table for HLA-DPA1
2. Require HLA-DPA1 typing for deceased kidney, pancreas, and kidney-pancreas donors, and other organs if requested.
3. Require HLA-DPA1 typing for OPTN kidney paired donation (KPD) living donors.
4. Require HLA-DPA1 unacceptable antigen reporting for OPTN KPD candidates, if present.
5. Update of HLA-DPB1 equivalences and reportable values.
6. Removal of broad antigens equivalent to allelic antibodies.
7. Alignment of HLA donor and transplant candidate data collection across UNet systems.

The OPTN is seeking the following feedback:

- Do organ procurement organizations anticipate any additional impacts on organ procurement caused by the requirement of HLA-DPA1 typing for kidney and pancreas donors, and all other organs as requested?

<sup>1</sup> OPTN Histocompatibility Committee, "Briefing to the OPTN Board of Directors on Human Leukocyte Antigen (HLA) Equivalency Tables Update 2020 (Including Expedited Pathway for Future Updates)", June 2020. <https://optn.transplant.hrsa.gov/governance/public-comment/hla-equivalency-tables-update-2020/>.

## Background

OPTN Policy 4.9: *HLA Antigen Values and Split Equivalences* requires the OPTN Histocompatibility Committee to review HLA equivalency tables listed in OPTN Policy 4.10: *Reference Tables of HLA Antigen Values and Split Equivalences* on an annual basis and recommend any changes needed. During the 2021 annual HLA equivalency tables review the committee identified changes to be made based on current nomenclature, clinical practice, and testing abilities. The OPTN Board of Directors approved the most recent recommended table update in June 2020.

## Purpose

The Committee conducted their required annual review of the HLA equivalency tables and identified the following areas of change:

1. Addition of an equivalency table for HLA-DPA1
2. Require HLA-DPA1 typing for deceased kidney, pancreas, and kidney-pancreas donors, and other organs if requested.
3. Require HLA-DPA1 typing for OPTN kidney paired donation (KPD) living donors.
4. Require HLA-DPA1 unacceptable antigen reporting for OPTN KPD candidates, if present.
5. Update of HLA-DPB1 equivalences and reportable values.
6. Removal of broad antigens equivalent to allelic antibodies.
7. Alignment of HLA donor and transplant candidate data collection across UNet systems.

## Proposal

### Addition of HLA-DPA1 Table and Typing Requirements

Organ procurement organizations are currently unable to report HLA-DPA1 typing within DonorNet®, but Histocompatibility laboratories are able to report this information after organ disposition within the Donor Histocompatibility Form (DHF) in Transplant Information Electronic Data Interchange (TIEDI®). While this is not a required field within TIEDI, over 80% of deceased donors had HLA-DPA1 typing reported in 2020.<sup>2</sup> Due to the increase in DPA1 reporting on the Donor Histocompatibility Form (DHF), the Committee felt there is no longer a significant barrier to requiring DPA1 typing for deceased donors.<sup>3</sup> Having this information available in discrete fields at the time of match run execution would allow for the unacceptable antigens a transplant program enters to screen automatically immunologically incompatible candidates. *Figure 1* shows the number and percent of living and deceased donors with HLA-DPA1 entered on the Donor Histocompatibility Form (DHF) in TIEDI in 2019 and 2020.

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<sup>2</sup> Based on OPTN data for donors recovered from January 1 to December 31, 2020.

<sup>3</sup> [https://optn.transplant.hrsa.gov/media/4720/20210608\\_histo\\_committee\\_meeting\\_summary.pdf](https://optn.transplant.hrsa.gov/media/4720/20210608_histo_committee_meeting_summary.pdf).

Figure 1: Donors with HLA-DPA1 typing

Donor Type	2019		2020	
	DPA1 Entered	Percent with DPA1	DPA1 Entered	Percent with DPA1
Deceased	9303	78.37%	10188	80.93%
Living	4525	61.24%	3639	63.52%

This proposal would require HLA-DPA1 typing for all deceased kidney, pancreas, and kidney-pancreas donors prior to organ offers. HLA-DPA1 typing would be required upon request for donors of all other organs. This is consistent with current requirements for HLA typing for deceased donors at all other loci.

This proposal would require HLA-DPA1 typing for OPTN kidney paired donation (KPD) prior to the paired candidate receiving organ offers. It would also require HLA-DPA1 unacceptable antigens be reported for OPTN KPD candidates if the candidate is sensitized at this locus. These requirements are consistent with current OPTN KPD HLA typing and reporting requirements for candidates and paired donors at other loci.<sup>4</sup>

The addition of DPA1 has also been called for by multiple members of the public during the last two equivalency tables updates.<sup>5</sup> This addition will allow for better characterization and prioritization of highly sensitized candidates, and also allow for more accurate HLA typing entry.<sup>6</sup>

## Removal of Broad Antigen Equivalents to Allelic Antibodies

The Committee identified a number of broad antigen values that were equivalent to allelic antibodies, as well as some values equivalent to less broad antigen groups.<sup>7</sup> Those equivalents may screen candidates off of a match run for a donor they may be able to accept, and as such the Committee proposes their removal. Programs that would prefer to continue screening broad antigen equivalents will still be able to do so, but programs that would prefer to screen only for specific allelic antibodies will be able to do so without screening off potentially compatible deceased donors who may only be typed at a broader serologic equivalent.<sup>8</sup> The broad antigens removed are available in *Figure 2*, below, and are still available as separate unacceptable antigens.

<sup>4</sup> See OPTN Policy 13.5.A: HLA Typing Requirements for OPTN KPD Candidates, OPTN Policy 13.5.B: Antibody Screening Requirements for OPTN KPD Candidates, and OPTN Policy 13.5.C: HLA Typing Requirements for OPTN KPD Donors.

<sup>5</sup> <https://optn.transplant.hrsa.gov/governance/public-comment/hla-equivalency-tables-update-2020/>, <https://optn.transplant.hrsa.gov/governance/public-comment/review-of-hla-tables/>.

<sup>6</sup> Tambur, Anat R., Patricia Campbell, Frans H. Claas, Sandy Feng, Howard M. Gebel, Annette M. Jackson, Roslyn B. Mannon, et al. "Sensitization in Transplantation: Assessment of Risk (STAR) 2017 Working Group Meeting Report." *American Journal of Transplantation* 18, no. 7 (2018): 1604–14. <https://doi.org/10.1111/ajt.14752>.

<sup>7</sup> [https://optn.transplant.hrsa.gov/media/4643/20210504\\_histo\\_hla-equiv-tables-review\\_subcommittee\\_meeting\\_summary.pdf](https://optn.transplant.hrsa.gov/media/4643/20210504_histo_hla-equiv-tables-review_subcommittee_meeting_summary.pdf).

<sup>8</sup> [https://optn.transplant.hrsa.gov/media/4643/20210504\\_histo\\_hla-equiv-tables-review\\_subcommittee\\_meeting\\_summary.pdf](https://optn.transplant.hrsa.gov/media/4643/20210504_histo_hla-equiv-tables-review_subcommittee_meeting_summary.pdf).

Figure 2: Broad antigen equivalences removed

Unacceptable antigen...	Broad antigen equivalence removed...
B*40:01	B*60
B*40:05	B*50
B*50:02	B*45
DR*03:01	DR*17
DR*03:02	DR*18
DR*03:03	DR*18
DQB1*03:01	DQB1*7
DQB1*03:02	DQB1*8
DQB1*03:03	DQB1*9
DQB1*03:19	DQB1*7
DQB1*7	DQB1*3
DQB1*8	DQB1*3
DQB1*9	DQB1*3

## Update of DPB1 Equivalences and Reportable Values

The Committee proposes updating HLA-DPB1 equivalences, epitopes, and reportable values in OPTN policy to be current with the Immuno Polymorphism Database-International ImMunoGeneTics (IPD-IMGT) HLA Database 3.44.0, with all non-null allele values included.<sup>9</sup> This will update the values within UNet, but not change requirements for HLA typing, candidate screening, candidate CPRA, or HLA matching for allocation. The proposed updates will keep HLA typing and unacceptable antigens aligned with current practice. It will also ensure that the unacceptable antigen screening for candidates will appropriately exclude incompatible donors based on current p-group equivalences and epitopes.

## Alignment of HLA Data Collection in UNet

The Committee proposes the alignment of HLA data collection within all UNet systems. Currently, HLA-DPA1 is only collected within the donor and recipient histocompatibility forms within the (TIEDI) part of UNet. Additionally, HLA-DQA1 and DPB1 are not collected within Waitlist<sup>SM</sup>. Alignment of data collection would allow for system validation of unacceptable antigens, cascade of information from Waitlist to Kidney Paired Donation (KPD<sup>SM</sup>), and allow for easier application programming interface (API) import of HLA typing data for candidates and donors. *Figure 3* shows the current and proposed requirements for candidate and recipient HLA typing and unacceptable antigens (UAs) by locus and UNet system. *Figure 4* shows the current and proposed requirements for living and deceased donor HLA typing by locus and UNet system.

<sup>9</sup> <https://www.ebi.ac.uk/ipd/imgt/hla/docs/release.html>.

Figure 3: Candidate and Recipient HLA Reporting in UNet<sup>10</sup>

Waitlist Unacceptable Antigens	Waitlist HLA Typing	KPD HLA Typing	KPD Unacceptable and Other Antigen Specificities	TIEDI HLA typing (RHF)
A	A <sup>R</sup>	A <sup>R</sup>	A	A <sup>R</sup>
B/Bw4/Bw6	B/Bw4/Bw6 <sup>R</sup>	B/Bw4/Bw6 <sup>R</sup>	B/Bw4/Bw6	B/Bw4/Bw6 <sup>R</sup>
C	C	C	C	C <sup>V</sup>
DR	DR <sup>R</sup>	DR <sup>R</sup>	DR	DR <sup>R</sup>
DR51/52/53	DR51/52/53	DR51/52/53	DR51/52/53	DR51/52/53 <sup>V</sup>
DQA1	<b>DQA1<sup>P</sup></b>	DQA1	DQA1	DQA1 <sup>V</sup>
DQB1	DQB1	DQB1	DQB1	DQB1 <sup>V</sup>
<b>DPA1<sup>P</sup></b>	<b>DPA1<sup>P</sup></b>	<b>DPA1<sup>P</sup></b>	<b>DPA1<sup>P</sup></b>	DPA1 <sup>V</sup>
DPB1	<b>DPB1<sup>P</sup></b>	DPB1	DPB1	DPB1 <sup>V</sup>

Figure 4: Kidney, Pancreas, and Kidney/Pancreas Donor HLA Reporting in UNet<sup>11</sup>

DonorNet Deceased Donor HLA Typing	KPD Living Donor HLA Typing	TIEDI Deceased Donor DHF	TIEDI Living Donor DHF
A <sup>R</sup>	A <sup>R</sup>	A <sup>R</sup>	A <sup>V</sup>
B/Bw4/Bw6 <sup>R</sup>	B/Bw4/Bw6 <sup>R</sup>	B/Bw4/Bw6 <sup>R</sup>	B/Bw4/Bw6 <sup>V</sup>
C <sup>R</sup>	C <sup>R</sup>	C <sup>R</sup>	C <sup>V</sup>
DR <sup>R</sup>	DR <sup>R</sup>	DR <sup>R</sup>	DR <sup>V</sup>
DR51/52/53 <sup>R</sup>	DR51/52/53 <sup>R</sup>	DR51/52/53 <sup>R</sup>	DR51/52/53 <sup>V</sup>
DQA1 <sup>R</sup>	DQA1 <sup>R</sup>	DQA1 <sup>R</sup>	DQA1 <sup>V</sup>
DQB1 <sup>R</sup>	DQB1 <sup>R</sup>	DQB1 <sup>R</sup>	DQB1 <sup>V</sup>
<b>DPA1<sup>P</sup></b>	<b>DPA1<sup>P</sup></b>	DPA1 <sup>V</sup>	DPA1 <sup>V</sup>
DPB1 <sup>R</sup>	DPB1 <sup>R</sup>	DPB1 <sup>R</sup>	DPB1 <sup>V</sup>

## NOTA and Final Rule Analysis

The Committee submits the following proposal for the Board consideration under the authority of the National Organ Transplantation Act, which states, “The Organ Procurement and Transplantation Network shall... (A) establish... (ii) a national system... to match organs and individuals included in the list, especially individuals whose immune system makes it difficult for them to receive organs...”<sup>12</sup> An increase in the number of available loci and alleles should allow for better assessment of a candidate's

<sup>10</sup> Proposed additions are bolded and noted with a P. Required HLA typing is noted with an R and required data entry for field validation is noted with a V. Required data fields need a response to validate but include “not done” as an acceptable option by OPTN policy. Of note, HLA-A, B, and DR are only required for kidney, pancreas, and kidney-pancreas candidates within Waitlist. Candidates for other organs or organ combinations do not require HLA typing at these loci.

<sup>11</sup> Proposed additions are bolded and noted with a P. Required HLA typing is noted with an R and required data entry for field validation is noted with a V. Required data fields need a response to validate but include “not done” as an acceptable option by OPTN policy. Donors of all other organs are required to enter data for HLA typing required for kidney, pancreas, and kidney-pancreas donors, but “not done” is an acceptable option.

<sup>12</sup> 42 USC §274(b)(2)(A)(ii).

immunologic compatibility with a potential donor. Additional HLA reporting should most greatly benefit sensitized candidates.

The Committee submits the following proposal for Board consideration under the authority of the OPTN Final Rule, which states, “An organ procurement organization or transplant hospital shall, as specified from time to time by the Secretary, submit to the OPTN...information regarding transplant candidates, transplant recipients, [and] donors of organs....”<sup>13</sup> The OPTN shall “maintain records of all transplant candidates, all organ donors and all transplant recipients”<sup>14</sup> and shall “...receive...such records and information electronically...”<sup>15</sup> This proposal will allow the OPTN to collect more complete HLA data on living and deceased donors and donor organs, and maintain such data in the OPTN dataset.

The Committee also submits the following proposal for the Board consideration under the authority of the OPTN Final Rule, which states “The OPTN Board of Directors shall be responsible for developing...policies for the equitable allocation for cadaveric organs.”<sup>16</sup> This proposal may affect allocation, as candidate and donor HLA typings are used for matching purposes in kidney and pancreas allocation.<sup>17</sup> In addition, donor HLA typings are used to screen incompatible candidates from a match for all organ types.

The Final Rule requires that when developing policies for the equitable allocation of cadaveric organs, such policies must be developed “in accordance with §121.8,” which requires that allocation policies “(1) Shall be based on sound medical judgment; (2) Shall seek to achieve the best use of donated organs; (3) Shall preserve the ability of a transplant program to decline an offer of an organ or not to use the organ for the potential recipient in accordance with §121.7(b)(4)(d) and (e); (4) Shall be specific for each organ type or combination of organ types to be transplanted into a transplant candidate; (5) Shall be designed to avoid wasting organs, to avoid futile transplants, to promote patient access to transplantation, and to promote the efficient management of organ placement;...(8) Shall not be based on the candidate's place of residence or place of listing, except to the extent required by paragraphs (a)(1)-(5) of this section.”<sup>18</sup> This proposal:

- **Is based on sound medical judgment**<sup>19</sup> because it is an evidenced-based change relying on analysis of OPTN data, as well as peer-review literature and the Committee’s collective clinical experience. Additionally, the proposed changes were made to align the tables with the Immuno Polymorphism Database-International ImMunoGeneTics (IPD-IMGT) HLA Database project. The IPD-IMGT/HLA database is a repository for sequences of the human major histocompatibility complex (MHC). This database is updated several times each year. HLA value changes in this proposal use version 3.44.0 released in April 2021.
- **Is designed to avoid futile transplants**<sup>20</sup>: This proposal allows for better assessment of transplant immunologic risk, benefitting post-transplant outcomes.

<sup>13</sup> 42 CFR §121.11(b)(2)

<sup>14</sup> 42 CFR §121.11(a)(1)(ii)

<sup>15</sup> 42 CFR §121.11(a)(1)(iii)

<sup>16</sup> 42 CFR §121.4(a)(1).

<sup>17</sup> OPTN Policy 8.3: *Kidney Allocation Score*; OPTN Policy 11.5: *Pancreas, Kidney-Pancreas, and Islet Allocation Classifications and Rankings*.

<sup>18</sup> 42 CFR §121.8(a)

<sup>19</sup> 42 CFR §121.8(a)(1).

<sup>20</sup> 42 CFR §121.8(a)(5).

- Proposed changes help to increase accuracy of HLA matching, allowing centers to better assess immunologic incompatibility of a donor organ with the potential candidate, which helps to avoid the risk of worse post-transplant outcomes.
- **Is designed to...promote patient access to transplantation<sup>21</sup>** by giving similarly situated candidates equitable opportunities to receive an organ offer.
  - Proposed changes help to characterize sensitized patients as accurately as possible, helping allow proper and equitable access to donated organs based on candidates' relative sensitization.
- **Is designed to avoid wasting organs<sup>22</sup>** by decreasing the number of organs recovered but not transplanted
  - Increasing the number of reportable loci and alleles within UNet would allow for further compatibility screening, potentially lowering the number of unexpected positive crossmatches, and thus lowering the risk of not being able to transplant an accepted organ.
- **Promotes the efficient management of organ placement<sup>23</sup>** by avoiding unexpected positive crossmatches.
  - Proposed changes help to increase accuracy of HLA matching, allowing centers to better assess immunologic incompatibility of a donor organ with the potential candidate upon receipt of HLA typing. This allows for an earlier assessment than after a crossmatch is performed, helping avoid unexpected positive crossmatches.
- **Is not based on a candidate's place of residence or place of listing except to the extent required by other regulatory requirements.<sup>24</sup>**
  - Increasing and updating the reportable HLA, as well as aligning the HLA data collection across UNet systems, is not dependent on a candidate's place of residence or place of listing.

This proposal also preserves the ability of a transplant program to decline and offer or not use the organ for a potential recipient,<sup>25</sup> and it is specific to each organ type for which HLA reporting for donors and candidates is applicable.<sup>26</sup>

Although the proposal outlined in this briefing paper addresses certain aspects of the Final Rule listed above, the Committee does not expect impact on the requirement of the Final Rule to **seek to achieve the best use of donated organs<sup>27</sup>**

The OPTN Final Rule also requires the OPTN to consider **“whether to adopt transition procedures that would treat people on the waiting list and awaiting transplantation prior to the adoption or effective date of the revised policies no less favorably than they would have been treated under the previous policies.”<sup>28</sup>** Upon consideration of whether there would be any populations treated less favorably, it was determined that the proposed changes will not affect any patient population more or less favorably

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<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> 42 CFR §121.8(a)(5).

<sup>24</sup> 42 CFR §121.8(a)(8).

<sup>25</sup> 42 CFR §121.8(a)(3).

<sup>26</sup> 42 CFR §121.8(a)(4).

<sup>27</sup> 42 CFR §121.8(a)(2).

<sup>28</sup> 42 CFR §121.8(d).



when receiving organ offers. There were no changes to HLA matching equivalences. While candidate unacceptable antigen screening will be updated, it is in line with current practice and current known immunocompatibility. Candidates who would now be screened off of a match run due the equivalency tables updates would not have been able to accept the offer due to immunologic incompatibility before this update. Therefore, the Committee does not recommend that the Board adopt any transition procedures for this proposal.<sup>29</sup>

## Alignment with OPTN Strategic Plan<sup>30</sup>

*Improve waitlisted patient, living donor, and transplant recipient outcomes:*

The increased specificity with the addition of these HLA values will improve outcomes by providing members with additional HLA equivalences, which will improve organ survival, especially for sensitized candidates.

*Promote efficiency in donation and transplant:*

Aligning the data collection between UNet systems will increase efficiency, by allowing for HLA data to validate and cascade between systems. Additional validation and additional system interconnectedness will promote efficiency. This will also allow for the development of an API to upload donor and candidate HLA.

## Implementation Considerations

### Member and OPTN Operations

#### *Operations affecting Histocompatibility Laboratories*

Histocompatibility laboratories may need to type deceased donors for HLA-DPA1 and screen candidates for DPA1 antibodies, if they are not already. Laboratories will need to update their laboratory informatics systems (LIS) to reflect the changes in this proposal.

#### *Operations affecting Organ Procurement Organizations*

OPOs may need to evaluate their agreements with histocompatibility laboratories to accommodate any needed transactional changes related to the proposal changes.

For OPOs that use third party vendors to input HLA information into UNet, their vendors will have to update their programs to reflect the changes in this proposal.

#### *Operations affecting Transplant Hospitals*

Transplant hospitals may need to evaluate their agreements with histocompatibility laboratories to accommodate any needed transactional changes related to the proposal changes.

For transplant hospitals that use third party vendors to input HLA information into UNet, their vendors will have to update their programs to reflect the changes in this proposal.

<sup>29</sup> [https://optn.transplant.hrsa.gov/media/4720/20210608\\_histo\\_committee\\_meeting\\_summary.pdf](https://optn.transplant.hrsa.gov/media/4720/20210608_histo_committee_meeting_summary.pdf).

<sup>30</sup> For more information on the goals of the OPTN Strategic Plan, visit <https://optn.transplant.hrsa.gov/governance/strategic-plan/>.

## *Operations affecting the OPTN*

This proposal will require IT implementation in DonorNet, KPD, TIEDI, and Waitlist. This is anticipated to be a large effort, with an estimated 1,200 hours required for implementation. Professional education will create an offering to educate members on proposed changes, and Communications will inform members of the proposed changes.

Research estimates 40 hours of ongoing annual effort to monitor the effects of this proposal.

## Projected Fiscal Impact

### *Projected Impact on Histocompatibility Laboratories*

There is minimal or no expected impact to histocompatibility laboratories. A large majority of histocompatibility laboratories already have DPA1 typing capabilities and are reporting this information even though it is not currently required. Histocompatibility laboratories may incur minimal costs associated with annual upgrades to existing computer systems. It is expected that collecting and reporting DPA1 typing will improve allocation efficiency and virtual crossmatching by providing the capability of listing DPA1 as an unacceptable antigen.

### *Projected Impact on Organ Procurement Organizations*

There is minimal or no expected impact to organ procurement organizations. There may be a minimal cost related to ordering DPA1 typing.

### *Projected Impact on Transplant Hospitals*

There is minimal or no expected impact to transplant hospitals. There may be a minimal cost related to ordering DPA1 typing.

### *Projected Impact on the OPTN*

Implementation will include a large IT effort, with effects on Waitlist, KPD, DonorNet, and TIEDI. There will also be communications on the proposed changes.

## Post-implementation Monitoring

### Member Compliance

The Final Rule requires that allocation policies “include appropriate procedures to promote and review compliance including, to the extent appropriate, prospective and retrospective reviews of each transplant program's application of the policies to patients listed or proposed to be listed at the program.”<sup>31</sup>

The proposed language will not change the current routine monitoring of OPTN members. Any data entered in UNet may be reviewed by the OPTN, and members are required to provide documentation as requested.

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<sup>31</sup> 42 CFR §121.8(a)(7).

## Policy Evaluation

The Final Rule requires that allocation policies “be reviewed periodically and revised as appropriate.”<sup>32</sup> The Committee will evaluate changes in CPRA values due to revisions of UA equivalences immediately after the implementation compared to values immediately prior to the implementation.

The Committee’s hypothesis is that more accurate typing and the ability to better report these results in UNet along with the revised UA equivalency tables will result in improved allocation due to more efficient virtual crossmatching. The following questions, and any others subsequently requested by the Committee, will guide the evaluation of the proposal after implementation:

1. Has the number of organ offers refused due to a positive cross match changed after implementation?
2. Are members reporting the new donor HLA and unacceptable antigen values added during the table revision?
3. Was there a change in CPRA values among kidney, kidney-pancreas, and pancreas registrations on the waiting list?

The following metrics, and any others subsequently requested by the Committee, will be evaluated as data become available to compare performance before and after the implementation of this policy:

1. Deceased donor HLA typing frequencies
2. Changes in HLA and unacceptable antigen frequencies of kidney, kidney-pancreas and pancreas registrations on the waiting list
3. The number and percentage of offers refused due to a positive crossmatch

These metrics will be evaluated at approximately one and two years’ post-implementation.

## Conclusion

The Committee conducted their required annual review of the HLA equivalency tables and is proposing the following major areas of change:

1. Addition of an equivalency table for HLA-DPA1
2. Require HLA-DPA1 typing for deceased kidney, pancreas, and kidney-pancreas donors, and other organs if requested.
3. Require HLA-DPA1 typing for OPTN kidney paired donation (KPD) living donors.
4. Require HLA-DPA1 unacceptable antigen reporting for OPTN KPD candidates, if present.
5. Update of HLA-DPB1 equivalences and reportable values.
6. Removal of broad antigens equivalent to allelic antibodies.
7. Alignment of HLA donor and transplant candidate data collection across UNet systems.

The OPTN is seeking the following feedback:

- Do organ procurement organizations anticipate any additional impacts on organ procurement caused by the requirement of HLA-DPA1 typing for kidney and pancreas donors, and all other organs as requested?

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<sup>32</sup> 42 CFR §121.8(a)(6).

## Policy Language

Proposed new language is underlined (example) and language that is proposed for removal is struck through (~~example~~). Heading numbers, table and figure captions, and cross-references affected by the numbering of these policies will be updated as necessary.

### 1           **2.11.A      Required Information for Deceased Kidney Donors**

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

- 4
- 5           1. Anatomical description, including number of blood vessels, ureters, and approximate length  
6           of each
- 7           2. Biopsy results, if performed
- 8           3. Human leukocyte antigen (HLA) information as follows: A, B, Bw4, Bw6, C, DR, DR51, DR52,  
9           DR53, DQA1, DQB1, DPA1, and DPB1 antigens prior to organ offers
- 10          4. Injuries to or abnormalities of blood vessels, ureters, or kidney
- 11          5. Kidney perfusion information, if performed
- 12          6. Kidney laterality

### 13           **2.11.B      Required Information for Deceased Liver Donors**

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

- 16
- 17          1. Human leukocyte antigen (HLA) typing if requested by the transplant hospital, including A,  
18          B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, DPA1, and DPB1 antigens in the  
19          timeframe specified by the transplant program
- 20          2. Other laboratory tests within 12 hours of the offer:
  - 21           a. Alanine aminotransferase/aspartate aminotransferase (ALT/AST)
  - 22           b. Alkaline phosphatase
  - 23           c. Total and direct bilirubin
  - 24           d. International normalized ration (INR) or Prothrombin (PT) if INR is not available
  - 25           e. Partial thromboplastin time (PTT)
- 26          3. Pre-procurement biopsy results, if performed
- 27          4. Pre-procurement CT imaging results, if performed
- 28

### 29           **2.11.C      Required Information for Deceased Heart Donors**

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

- 32
- 33          1. 12-lead electrocardiogram interpretation, if available
- 34          2. Arterial blood gas results and ventilator settings

- 35 3. Cardiology consult, if performed
- 36 4. Echocardiogram
- 37 5. Human leukocyte antigen (HLA) typing if requested by the transplant hospital, including A,
- 38 B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, DPA1, and DPB1 antigens prior to the
- 39 final organ acceptance

40

41 **2.11.D Required Information for Deceased Lung Donors**

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

43 offers:

- 44
- 45 1. Arterial blood gases and ventilator settings on 5 cm/H<sub>2</sub>O/PEEP including PO<sub>2</sub>/FiO<sub>2</sub> ratio and
- 46 preferably 100% FiO<sub>2</sub>, within 2 hours prior to the offer
- 47 2. Bronchoscopy results, if performed
- 48 3. Chest x-ray interpreted by a radiologist or qualified physician within 3 hours prior to the
- 49 offer
- 50 4. HLA typing if requested by the transplant hospital, including A, B, Bw4, Bw6, C, DR, DR51,
- 51 DR52, DR53, DQA1, DQB1, DPA1, and DPB1 antigens prior to final organ acceptance
- 52 5. Sputum gram stain, with description of sputum
- 53 6. Lung laterality

54

55 If the host OPO cannot perform a bronchoscopy, it must document that it is unable to provide

56 bronchoscopy results and the receiving transplant hospital may perform it. The lung recovery

57 team may perform a confirmatory bronchoscopy provided unreasonable delays are avoided and

58 deceased donor stability and the time limitations in *Policy 5.6.B: Time Limit for Review and*

59 *Acceptance of Organ Offers* are maintained.

60

61 **2.11.E Required Information for Deceased Pancreas Donors**

62 The host OPO must provide *all* the following additional information for all deceased donor

63 pancreas offers:

- 64
- 65 1. Family history of diabetes (including Type 1 and Type 2)
- 66 2. Hemoglobin A1C, if performed
- 67 3. HLA information as follows: A, B, Bw4, Bw6, C, DR, DR51, DR52, DR53, DQA1, DQB1, DPA1,
- 68 and DPB1 antigens prior to organ offers
- 69 4. Insulin protocol
- 70 5. Serum amylase
- 71 6. Serum lipase

72

73 **4.3.A Deceased Donor HLA Typing**

74 If the laboratory performs HLA typing on a deceased donor, the laboratory must perform  
 75 molecular typing and report results at the level of serological splits to the OPO for all required  
 76 HLA types on deceased donors according to *Table 4-1: Deceased Donor HLA Typing*  
 77 *Requirements*.

78  
 79 *Table 4-1* below provides the requirements of HLA typing of HLA A, B, Bw4, Bw6, C, DR, DR51,  
 80 DR52, DR53, DQA1, DQB1, DPA1, and DPB1 antigens.

81  
 82 **Table 4-1: 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

83  
 84 **4.10 Reference Tables of HLA Antigen Values and Split Equivalences**

85 **4.10.A: HLA Matching Equivalences**

86  
 87 *Tables 4-2, 4-3, and 4-4* show candidate-donor antigen equivalences and whether they are mismatches.  
 88 For each candidate antigen listed below, all of the donor antigens that are not mismatched considered  
 89 equivalent for the purposes of HLA matching are listed below beside the candidate antigen in each row.  
 90 All other combinations are considered mismatches: for the purposes of HLA matching.

91 Examples of how “Matching Antigen Equivalences” works:

- 92 ● ~~If the candidate types as B70: only donors that type as B70 are considered matched. Donors typed~~  
 93 ~~as B71 or B72 are considered mismatched.~~
- 94 ● ~~If the candidate types as B71: only donors that type as B71, B15:10, or B15:18 are considered~~  
 95 ~~matched. Donors typed as B70 are considered mismatched.~~
- 96
- 97 ● ~~Tables 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-13, and 4-14 show candidate-donor~~  
 98 ~~unacceptable antigen combinations. For each candidate antigen, the donor antigens that are~~  
 99 ~~unacceptable are listed below.~~
- 100 ● ~~Table 4-15 shows a candidate unacceptable epitopes for DPB1 and their corresponding donor~~  
 101 ~~HLA types~~
- 102 ● ~~Table 4-16 shows the values that can be reported as valid DPB1 HLA typing.~~
- 103 ● ~~Table 4-17 shows additional unacceptable antigen equivalences to be used in the Calculated~~  
 104 ~~Panel Reactive Antibody (CPRA) only.~~

105

106 Examples of how “Unacceptable Antigen Equivalences” works:  
 107 If a candidate has B70 listed as an “unacceptable antigen”, donors typed as B70, B71, B72, 15:03, 15:10,  
 108 or 15:18 are considered unacceptable.

109  
 110 **4.10.B: HLA Unacceptable Antigen Equivalences**

111  
 112 At the time of the match run, if an antigen or epitope is entered as unacceptable for a candidate, then  
 113 the candidate will not appear on the match run for donors reported with any of the equivalent antigens  
 114 described in Tables 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-13, 4-14, 4-15, and 4-16 below.

115  
 116 HLA values listed below as equivalent for the purposes of unacceptable antigen screening are also  
 117 equivalent for the purposes of reporting HLA typing, with the exception of epitope-based unacceptable  
 118 antigen assignments in Table 4-15.

119  
 120 **Table 4-5: HLA A Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable A-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
1	1, 01:01, 01:02
01:01	01:01
01:02	01:02
2	2, 02:01, 02:02, 02:03, 02:05, 02:06, 02:07, 02:10, 02:18
02:01	02:01
02:02	02:02
02:03	02:03
02:05	02:05
02:06	02:06
02:07	02:07
02:10	02:10
02:18	02:18
3	3, 03:01, 03:02, 32:04
03:01	03:01
03:02	03:02
9	9, 23, 24, 24:02, 24:03
10	10, 25, 26, 26:01, 26:02, 26:03, 34, 34:01, 34:02, 66, 66:01, 66:02, 43
11	11, 11:01, 11:02
11:01	11:01
11:02	11:02
19	19, 29, 29:01, 29:02, 30, 30:01, 30:02, 31, 32, 33, 33:01, 33:03, 74
23	23
24	24, 24:02, 24:03

If this Candidate Unacceptable A-Locus Unacceptable Antigen is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:
24:02	24:02
24:03	24:03
25	25
26	26, 26:01, 26:02, 26:03
26:01	26:01
26:02	26:02
26:03	26:03
28	28, 68, 69, 68:01, 68:02
29	29, 29:01, 29:02
29:01	29:01
29:02	29:02
30	30, 30:01, 30:02
30:01	30:01
30:02	30:02
31	31
32	32
32:04	32:04
33	33, 33:01, 33:03
33:01	33:01
33:03	33:03
34	34, 34:01, 34:02
34:01	34:01
34:02	34:02
36	36
43	43
66	66, 66:01, 66:02
66:01	66:01
66:02	66:02
68	68, 68:01, 68:02
68:01	68:01
68:02	68:02
69	69
74	74
80	80



Table 4-6 HLA B Unacceptable Antigen Equivalences

If this Candidate Unacceptable B-Locus Unacceptable Antigen is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:
5	5, 51, 51:01, 51:02, 52
7	7, 07:02, 07:03, 07:14
07:02	07:02
07:03	07:03
07:14	07:14
8	8, 08:01, 08:02, 08:03, 08:04
08:01	08:01
08:02	08:02
08:03	08:03
08:04	08:04
12	12, 44, 44:02, 44:03, 45, 50:02
13	13, 13:01, 13:02
13:01	13:01
13:02	13:02
14	14, 64, 65, 14:01, 14:02
14:01	14:01, 64
14:02	14:02, 65
15	15, 62, 63, 70, 71, 72, 75, 76, 77, 15:01, 15:02, 15:03, 15:04, 15:06, 15:07, 15:10, 15:11, 15:12, 15:13, 15:16, 15:17, 15:18, 15:20, 15:21, 15:24, 15:27
15:01	15:01
15:02	15:02
15:03	15:03
15:04	15:04
15:06	15:06
15:07	15:07
15:10	15:10
15:11	15:11
15:12	15:12
15:13	15:13
15:16	15:16
15:17	15:17
15:18	15:18
15:20	15:20
15:21	15:21
15:24	15:24

If this Candidate <del>Unacceptable</del> B-Locus <del>Unacceptable</del> Antigen is reported:	<del>Donor Equivalent Antigen</del> The following HLA values are considered equivalent to the reported unacceptable antigen:
15:27	15:27
16	16, 38, 38:01, 38:02, 39, 39:01, 39:02, 39:04, 39:05, 39:06, 39:13
17	17, 57, 57:01, 57:03, 58
18	18
21	21, 49, 50, 40:05, 50:01
22	22, 54, 55, 55:01, 55:02, 55:04, 56, 56:01, 56:03
27	27, 27:03, 27:04, 27:05, 27:06
27:03	27:03
27:04	27:04
27:05	27:05
27:06	27:06
27:08	27:08
35	35, 35:01, 35:02, 35:03, 35:08, 35:12
35:01	35:01
35:02	35:02
35:03	35:03
35:08	35:08
35:12	35:12
37	37
38	38, 38:01, 38:02
38:01	38:01
38:02	38:02
39	39, 39:01, 39:02, 39:04, 39:05, 39:06, 39:13
39:01	39:01
39:02	39:02
39:04	39:04
39:05	39:05
39:06	39:06
39:13	39:13
40	40, 60, 61, 40:01, 40:02, 40:03, 40:04, 40:06
40:01	40:01, 60
40:02	40:02
40:03	40:03
40:04	40:04
40:05	40:05, 50
40:06	40:06

<u>If this Candidate Unacceptable B-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
41	41, 41:01, 41:02
41:01	41:01
41:02	41:02
42	42, 42:01, 42:02
42:01	42:01
42:02	42:02
44	44, 44:02, 44:03
44:02	44:02
44:03	44:03
45	45, 50:02
46	46
47	47
48	48, 48:01, 48:02
48:01	48:01
48:02	48:02
49	49
50	50, 40:05, 50:01
50:01	50:01
50:02	50:02, 45
51	51, 51:01, 51:02
51:01	51:01
51:02	51:02
52	52
53	53
54	54
55	55, 55:01, 55:02, 55:04
55:01	55:01
55:02	55:02
55:04	55:04
56	56, 56:01, 56:03
56:01	56:01
56:03	56:03
57	57, 57:01, 57:03
57:01	57:01
57:03	57:03
58	58

<u>If this Candidate Unacceptable B-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
59	59
60	60, 40:01
61	61, 40:02, 40:03, 40:04, 40:06
62	62, 15:01, 15:04, 15:06, 15:07, 15:20, 15:27
63	63, 15:16, 15:17
64	64, 14:01
65	65, 14:02
67	67
70	70, 71, 72, 15:03, 15:10, 15:18
71	71, 15:10, 15:18
72	72, 15:03
73	73
75	75, 15:02, 15:11, 15:21
76	76, 15:12
77	77, 15:13
78	78
81	81
82	82
83:01	83:01
Bw4	Bw4, 08:02, 08:03, 5, 13, 13:01, 13:02, 15:13, 15:16, 15:17, 15:24,17, 27, 27:03, 27:04, 27:05, 27:06, 37, 38, 38:01, 38:02, 44, 44:02, 44:03, 47, 49, 51, 51:01, 51:02, 52, 53, 57, 57:01, 57:03, 58, 59, 63, 77
Bw6	Bw6, 7, 07:02, 07:03, 07:14, 8, 08:01, 08:04, 14, 14:01, 14:02,15:01, 15:02, 15:03, 15:04, 15:06, 15:07, 15:10, 15:11,15:12, 15:18, 15:20, 15:21, 15:27, 18, 22, 27:08, 35, 35:01, 35:02, 35:03, 35:08, 35:12, 39, 39:01, 39:02, 39:04, 39:05, 39:06, 39:13, 40, 40:01, 40:02, 40:03, 40:04, 40:05, 40:06, 41, 41:01, 41:02, 42, 42:01, 42:02, 45, 48, 48:01 48:02, 50, 50:01, 50:02, 54, 55, 55:01, 55:02, 55:04, 56, 56:01, 56:03, 60, 61, 62, 64, 65, 67, 70, 71, 72, 75, 76, 78, 81, 82

**Table 4-7: HLA C Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable C-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
01	01, 01:02, 01:03
01:02	01:02
01:03	01:03

123  
124

<u>If this Candidate Unacceptable C-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen</u> The following HLA values are considered equivalent to the reported unacceptable antigen:
02	02, 02:02, 02:10
02:02	02:02
02:10	02:10
03	03, 03:02, 03:03, 03:04, 03:05, 03:06, 09, 10
03:02	03:02
03:03	03:03
03:04	03:04
03:05	03:05
03:06	03:06
04	04, 04:01, 04:03, 04:04, 04:07
04:01	04:01
04:03	04:03
04:04	04:04
04:07	04:07
05	05, 05:01
05:01	05:01
06	06, 06:02
06:02	06:02
07	07, 07:01, 07:02, 07:04; 07:06, 07:18
07:01	07:01
07:02	07:02
07:04	07:04
07:06	07:06
07:18	07:18
08	08, 08:01, 08:02, 08:03, 08:04
08:01	08:01
08:02	08:02
08:03	08:03
08:04	08:04
09	09, 03:03
10	10, 03:02, 03:04, 03:06
12	12, 12:02, 12:03, 12:04
12:02	12:02
12:03	12:03
12:04	12:04
14	14, 14:02, 14:03

<u>If this Candidate Unacceptable C-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen</u> The following HLA values are considered equivalent to the reported unacceptable antigen:
14:02	14:02
14:03	14:03
15	15, 15:02, 15:04, 15:05, 15:06, 15:09
15:02	15:02
15:04	15:04
15:05	15:05
15:06	15:06
15:09	15:09
16	16, 16:01, 16:02, 16:04
16:01	16:01
16:02	16:02
16:04	16:04
17	17, 17:01, 17:03
17:01	17:01
17:03	17:03
18	18, 18:01, 18:02
18:01	18:01
18:02	18:02

125

126

**Table 4-8: HLA DR Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DR_Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen</u> The following HLA values are considered equivalent to the reported unacceptable antigen:
1	1, 01:01, 01:02
01:01	01:01
01:02	01:02
01:03	01:03, 103
2	2, 15, 15:01, 15:02, 15:03, 16, 16:01, 16:02
3	3, 17, 18, 03:01, 03:02, 03:03
03:01	03:01, 17
03:02	03:02, 18
03:03	03:03, 18
4	4, 04:01, 04:02, 04:03, 04:04, 04:05, 04:06, 04:07, 04:10, 04:11
04:01	04:01
04:02	04:02

<u>If this Candidate Unacceptable DR-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen</u> The following HLA values are considered equivalent to the reported unacceptable antigen:
04:03	04:03
04:04	04:04
04:05	04:05
04:06	04:06
04:07	04:07
04:10	04:10
04:11	04:11
5	5, 11, 11:01, 11:04, 12, 12:01, 12:02
6	6, 13, 13:01, 13:02, 13:03, 13:05, 14, 14:01, 14:02, 14:03, 14:04, 14:05, 14:06, 14:54
7	7
8	8, 08:01, 08:02, 08:03, 08:07
08:01	08:01
08:02	08:02
08:03	08:03
08:07	08:07
9	9, 09:01, 09:02
09:01	09:01
09:02	09:02
10	10
11	11, 11:01, 11:03, 11:04
11:01	11:01
11:03	11:03
11:04	11:04
12	12, 12:01, 12:02
12:01	12:01
12:02	12:02
13	13, 13:01, 13:02,13:03, 13:05
13:01	13:01
13:02	13:02
13:03	13:03
13:05	13:05
14	14, 14:01, 14:02, 14:03, 14:04, 14:05, 14:06, 14:54
14:01	14:01, 14:54
14:02	14:02
14:03	14:03

<u>If this Candidate Unacceptable DR-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
14:04	14:04
14:05	14:05
14:06	14:06
14:54	14:54, 14:01
15	15, 15:01, 15:02, 15:03
15:01	15:01
15:02	15:02
15:03	15:03
16	16, 16:01, 16:02
16:01	16:01
16:02	16:02
17	17, 03:01
18	18, 03:02, 03:03
103	103, 01:03

127

128

**Table 4-9: HLA DR51 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DR51-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
5*01	5*01, 5*01:01, 5*01:02
5*01:01	5*01:01
5*01:02	5*01:02
5*02	5*02, 5*02:02
5*02:02	5*02:02
51	51, 5*01:01, 5*01:02, 5*02:02, 5*01, 5*02

129



130

**Table 4-10: HLA DR52 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DR52-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
3*01	3*01, 3*01:01
3*01:01	3*01:01
3*02	3*02, 3*02:01, 3*02:02
3*02:01	3*02:01
3*02:02	3*02:02
3*03	3*03, 3*03:01
3*03:01	3*03:01
52	52, 3*01:01, 3*02:01, 3*02:02, 3*03:01, 3*01, 3*02, 3*03

131

132

**Table 4-11: HLA DR53 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DR-53 Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
4*01	4*01, 4*01:01, 4*01:03
4*01:01	4*01:01
4*01:03	4*01:03
53	53, 4*01:01, 4*01:03, 4*01

133

134

**Table 4-12: HLA DQA1 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DQA1-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
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

If this Candidate Unacceptable DQA1_ Locus Unacceptable Antigen is reported:	<del>Donor Equivalent Antigens</del> The following HLA values are considered equivalent to the reported unacceptable antigen:
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
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

136

**Table 4-13: HLA DQB1 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DQB1-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
2	2, 02:01, 02:02
02:01	02:01
02:02	02:02
3	3, 7, 8, 9, 03:01, 03:02, 03:03, 03:19
03:01	03:01, <del>7</del>
03:02	03:02, <del>8</del>
03:03	03:03, <del>9</del>
03:19	03:19, <del>7</del>
4	4, 04:01, 04:02
04:01	04:01
04:02	04:02
5	5, 05:01, 05:02, 05:03
05:01	05:01
05:02	05:02
05:03	05:03
6	6, 06:01, 06:02, 06:03, 06:04, 06:09
06:01	06:01
06:02	06:02
06:03	06:03
06:04	06:04
06:09	06:09
7	7, <del>3</del> ,03:01, 03:19
8	8, <del>3</del> ,03:02
9	9, <del>3</del> ,03:03

137

138

**Table 4-14: HLA DPA1 Unacceptable Antigen Equivalences**

<u>If this DPA1-Locus Unacceptable Antigen is reported:</u>	<u>The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
<u>01</u>	<u>01, 01:03, 01:04, 01:05, 01:06, 01:07, 01:08, 01:09, 01:10, 01:11, 01:12</u>
<u>01:03</u>	<u>01:03</u>
<u>01:04</u>	<u>01:04</u>
<u>01:05</u>	<u>01:05</u>
<u>01:06</u>	<u>01:06</u>
<u>01:07</u>	<u>01:07</u>

<u>If this DPA1-Locus Unacceptable Antigen is reported:</u>	<u>The following HLA values are considered equivalent to the reported unacceptable antigen:</u>
<u>01:08</u>	<u>01:08</u>
<u>01:09</u>	<u>01:09</u>
<u>01:10</u>	<u>01:10</u>
<u>01:11</u>	<u>01:11</u>
<u>01:12</u>	<u>01:12</u>
<u>02</u>	<u>02, 02:01, 02:02, 02:03, 02:04, 02:07</u>
<u>02:01</u>	<u>02:01</u>
<u>02:02</u>	<u>02:02</u>
<u>02:03</u>	<u>02:03</u>
<u>02:04</u>	<u>02:04</u>
<u>02:07</u>	<u>02:07</u>
<u>03</u>	<u>03, 03:01, 03:02, 03:03</u>
<u>03:01</u>	<u>03:01</u>
<u>03:02</u>	<u>03:02</u>
<u>03:03</u>	<u>03:03</u>
<u>04</u>	<u>04, 04:01</u>
<u>04:01</u>	<u>04:01</u>

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**Table 4-145: HLA DPB1 Unacceptable Antigen Equivalences**

<u>If this Candidate Unacceptable DPB1-Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen. All of the following HLA values are considered equivalent to the unacceptable antigen reported and to all values within the row:</u>
<u>01:01</u>	<u>01:01, 162:01, 417:01, 462:01, 616:01, 733:01, 807:01, 810:01, 853:01, 931:01, 953:01, 979:01, 998:01, 999:01, 1024:01, 1038:01, 1050:01, 1068:01, 1076:01, 1151:01, 1162:01, 1183:01</u>
<u>02:01</u>	<u>02:01, 141:01, 352:01, 414:01, 416:01, 461:01, 617:01, 640:01, 678:01, 723:01, 783:01, 799:01, 819:01, 845:01, 857:01, 861:01, 955:01, 967:01, 975:01, 1036:01, 1051:01, 1055:01, 1077:01, 1082:01, 1094:01, 1102:01, 1115:01, 1160:01, 1175:01</u>
<u>02:02</u>	<u>02:02, 547:01, 721:01, 766:01, 1188:01</u>
<u>03:01</u>	<u>03:01, 104:01, 124:01, 351:01, 669:01, 675:01, 676:01, 704:01, 706:01, 728:01, 829:01, 855:01, 938:01, 946:01, 948:01, 952:01, 1000:01, 1014:01, 1021:01, 1049:01, 1114:01, 1134:01, 1157:01</u>
<u>04:01</u>	<u>04:01, 126:01, 350:01, 415:01, 459:01, 464:01, 534:01, 615:01, 618:01, 670:01, 677:01, 699:01, 702:01, 755:01, 757:01, 765:01, 767:01, 784:01, 804:01, 806:01, 813:01, 820:01, 824:01, 826:01, 849:01, 850:01, 859:01, 880:01, 882:01, 926:01, 932:01, 939:01, 978:01, 988:01, 989:01, 992:01, 997:01, 1001:01, 1002:01, 1003:01, 1004:01, 1010:01, 1011:01, 1023:01, 1033:01, 1074:01,</u>

If this Candidate Unacceptable DPB1_Locus Unacceptable Antigen is reported:	<del>Donor Equivalent Antigen</del> All of the following HLA values are considered equivalent to the unacceptable antigen reported and to all values within the row:
	<u>1086:01, 1091:01, 1100:01, 1129:01, 1132:01, 1144:01, 1146:01, 1148:01, 1152:01, 1155:01, 1161:01, 1164:01, 1173:01, 1181:01, 1184:01</u>
04:02	04:02, 105:01, 463:01, 571:01, 647:01, 665:01, <u>674:01</u> , 701:01, 725:01, 726:01, 730:01, 731:01, 734:01, 735:01, 763:01, 809:01, 818:01, 823:01, 858:01, 881:01, 927:01, 933:01, 954:01, 958:01, 981:01, 1005:01, 1013:01, 1020:01, 1025:01, 1031:01, 1035:01, <u>1037:01, 1072:01, 1075:01, 1083:01, 1085:01, 1124:01, 1153:01, 1171:01, 1194:01</u>
05:01	05:01, 135:01, 668:01, 729:01, 744:01, 764:01, 790:01, 847:01, 848:01, 851:01, 860:01, 923:01, 951:01, 1015:01, 1018:01, <u>1117:01, 1118:01, 1119:01, 1120:01, 1143:01, 1172:01</u>
06:01	06:01, 737:01, 906:01, 914:01, 1022:01, <u>1087:01, 1111:01</u>
08:01	08:01
09:01	09:01, 797:01, 899:01, <u>1149:01</u>
10:01	10:01, 650:01, 673:01, 902:01, <u>1126:01</u>
11:01	11:01, 649:01, 654:01, 672:01, 707:01, 907:01, 937:01, <u>1063:01</u>
13:01	13:01, 107:01, 133:01, 518:01, 519:01, 888:01, 924:01, 947:01, 996:01, <u>1065:01, 1069:01, 1105:01, 1123:01, 1131:01, 1185:01</u>
14:01	14:01, 498:01, 572:01, 651:01, 671:01, 705:01, 834:01, 854:01, 949:01, <u>1187:01</u>
15:01	15:01, 585:01, 896:01, 910:01, <u>1054:01, 1192:01</u>
16:01	16:01, 652:01, 653:01, 864:01, 886:01, 940:01, 968:01
17:01	17:01, 131:01, 168:01, 460:01, 846:01, 956:01, 1032:01, <u>1052:01</u>
18:01	18:01, 897:01, 942:01, <u>1165:01</u>
19:01	19:01, 106:01, 533:01, 535:01, 785:01, 965:01, <u>1101:01</u>
20:01	20:01, 905:01
21:01	21:01, 1019:01, <u>1186:01, 1190:01</u>
22:01	22:01, 1026:01
23:01	23:01, 138:01
24:01	24:01
25:01	25:01
26:01	26:01, <u>1088:01</u>
27:01	27:01
28:01	28:01, 296:01
29:01	29:01, 909:01
30:01	30:01

<u>If this Candidate Unacceptable DPB1_Locus Unacceptable Antigen is reported:</u>	<u>Donor Equivalent Antigen All of the following HLA values are considered equivalent to the unacceptable antigen reported and to all values within the row:</u>
31:01	31:01, 945:01
34:01	34:01, 835:01, 913:01
35:01	35:01
<u>38:01</u>	<u>38:01, 1099:01</u>
39:01	39:01, 584:01
40:01	40:01, 745:01
45:01	45:01, 832:01
51:01	51:01, 736:01
57:01	57:01, 648:01
59:01	59:01, 782:01
80:01	80:01, 762:01
85:01	85:01, 713:01, 901:01, 1034:01
90:01	90:01, 1012:01
104:01	104:01
105:01	105:01
106:01	106:01
107:01	107:01
124:01	124:01
126:01	126:01
131:01	131:01
132:01	132:01, 1027:01
135:01	135:01
137:01	137:01, 791:01
<u>152:01</u>	<u>152:01, 944:01</u>
<u>398:01</u>	<u>398:01, 922:01</u>
<u>1096:01</u>	<u>1096:01, 1133:01</u>

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**Table 4-156: Epitope based Unacceptable Antigen Assignment for DPB1**

If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable epitope:								
55AAE	01:01	04:01	11:01	13:01	15:01	23:01	26:01	27:01	31:01
	33:01	34:01	39:01	40:01	52:01	55:01	56:01	58:01	62:01
	63:01	65:01	66:01	67:01	71:01	72:01	74:01	85:01	87:01
	89:01	90:01	95:01	96:01	99:01	102:01	103:01	107:01	110:01
	112:01	117:01	118:01	121:01	125:01	126:01	127:01	128:01	133:01
	134:01	138:01	142:01	147:01	149:01	150:01	158:01	160:01	162:01
	169:01	173:01	174:01	175:01	176:01	177:01	178:01	179:01	180:01
	181:01	192:01	193:01	194:01	195:01	199:01	201:01	202:01	206:01
	207:01	209:01	212:01	213:01	220:01	224:01	225:01	227:01	228:01
	230:01	231:01	232:01	240:01	244:01	246:01	247:01	250:01	253:01
	255:01	262:01	264:01	267:01	268:01	272:01	275:01	276:01	278:01
	279:01	280:01	281:01	282:01	283:01	290:01	294:01	295:01	298:01
	299:01	303:01	304:01	305:01	306:01	314:01	318:01	319:01	320:01
	322:01	323:01	325:01	326:01	327:01	333:01	334:01	335:01	336:01
	340:01	341:01	345:01	346:01	348:01	350:01	353:01	354:01	356:01
	360:01	362:01	370:01	371:01	372:01	375:01	376:01	377:01	378:01
	387:01	388:01	389:01	392:01	393:01	396:01	397:01	398:01	399:01
	411:01	412:01	415:01	417:01	418:01	425:01	426:01	428:01	434:01
	435:01	436:01	437:01	438:01	440:01	449:01	451:01	453:01	454:01
	456:01	458:01	459:01	462:01	464:01	465:01	468:01	471:01	474:01
	475:01	476:01	479:01	480:01	481:01	482:01	483:01	485:01	486:01
	487:01	490:01	493:01	497:01	500:01	503:01	512:01	516:01	517:01
	518:01	519:01	520:01	521:01	522:01	523:01	524:01	529:01	531:01
	534:01	538:01	542:01	543:01	544:01	553:01	554:01	556:01	559:01
	561:01	562:01	563:01	564:01	565:01	569:01	575:01	576:01	578:01
	580:01	583:01	584:01	585:01	591:01	592:01	593:01	597:01	599:01
	600:01	607:01	609:01	612:01	614:01	615:01	616:01	618:01	623:01
	625:01	626:01	631:01	632:01	634:01	635:01	636:01	643:01	644:01
	649:01	654:01	658:01	666:01	667:01	670:01	672:01	677:01	679:01
	682:01	683:01	686:01	687:01	694:01	695:01	699:01	702:01	703:01
	707:01	708:01	709:01	713:01	716:01	722:01	733:01	739:01	742:01
	745:01	747:01	749:01	750:01	753:01	755:01	757:01	758:01	761:01
	765:01	767:01	768:01	769:01	772:01	773:01	784:01	787:01	788:01
	789:01	795:01	803:01	804:01	806:01	807:01	808:01	810:01	811:01
	812:01	813:01	814:01	820:01	822:01	824:01	826:01	828:01	830:01
	835:01	837:01	840:01	842:01	849:01	850:01	852:01	853:01	856:01
	859:01	879:01	880:01	882:01	888:01	893:01	895:01	896:01	901:01
55AAE	904:01	907:01	908:01	910:01	912:01	913:01	915:01	916:01	921:01

If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable epitope:								
	922:01	924:01	926:01	930:01	931:01	932:01	934:01	937:01	945:01
	947:01	953:01	957:01	966:01	969:01	972:01	976:01	978:01	979:01
	988:01	989:01	991:01	992:01	993:01	996:01	997:01	998:01	999:01
	1001:01	1002:01	1003:01	1004:01	1010:01	1011:01	1012:01	1016:01	1023:01
	1024:01	1033:01	1034:01	<u>1038:01</u>	<u>1040:01</u>	<u>1042:01</u>	<u>1046:01</u>	<u>1048:01</u>	<u>1050:01</u>
	<u>1054:01</u>	<u>1057:01</u>	<u>1060:01</u>	<u>1062:01</u>	<u>1063:01</u>	<u>1064:01</u>	<u>1065:01</u>	<u>1066:01</u>	<u>1068:01</u>
	<u>1069:01</u>	<u>1073:01</u>	<u>1074:01</u>	<u>1076:01</u>	<u>1078:01</u>	<u>1080:01</u>	<u>1081:01</u>	<u>1086:01</u>	<u>1088:01</u>
	<u>1091:01</u>	<u>1097:01</u>	<u>1100:01</u>	<u>1105:01</u>	<u>1108:01</u>	<u>1109:01</u>	<u>1113:01</u>	<u>1122:01</u>	<u>1123:01</u>
	<u>1129:01</u>	<u>1131:01</u>	<u>1132:01</u>	<u>1137:01</u>	<u>1138:01</u>	<u>1139:01</u>	<u>1141:01</u>	<u>1144:01</u>	<u>1145:01</u>
	<u>1146:01</u>	<u>1147:01</u>	<u>1148:01</u>	<u>1151:01</u>	<u>1152:01</u>	<u>1155:01</u>	<u>1161:01</u>	<u>1162:01</u>	<u>1164:01</u>
	<u>1166:01</u>	<u>1167:01</u>	<u>1170:01</u>	<u>1173:01</u>	<u>1177:01</u>	<u>1181:01</u>	<u>1183:01</u>	<u>1184:01</u>	<u>1185:01</u>
	<u>1192:01</u>	<u>1195:01</u>							
55DED	03:01	06:01	09:01	14:01	17:01	20:01	29:01	35:01	44:01
	46:01	50:01	57:01	69:01	70:01	76:01	78:01	80:01	86:01
	88:01	91:01	92:01	98:01	104:01	108:01	111:01	119:01	124:01
	130:01	131:01	132:01	152:01	156:01	157:01	164:01	166:01	168:01
	182:01	197:01	203:01	205:01	208:01	214:01	221:01	222:01	234:01
	235:01	241:01	242:01	243:01	245:01	248:01	249:01	251:01	259:01
	266:01	270:01	287:01	288:01	289:01	292:01	293:01	329:01	332:01
	343:01	351:01	355:01	361:01	363:01	379:01	383:01	384:01	385:01
	386:01	391:01	394:01	404:01	405:01	407:01	409:01	413:01	439:01
	442:01	445:01	446:01	447:01	460:01	472:01	484:01	491:01	492:01
	498:01	504:01	505:01	506:01	508:01	509:01	530:01	536:01	540:01
	541:01	545:01	546:01	548:01	555:01	566:01	567:01	568:01	572:01
	581:01	601:01	610:01	613:01	620:01	621:01	629:01	630:01	645:01
	648:01	651:01	662:01	664:01	669:01	671:01	675:01	676:01	684:01
	688:01	689:01	698:01	704:01	705:01	706:01	714:01	719:01	727:01
	728:01	737:01	760:01	762:01	797:01	801:01	815:01	829:01	833:01
	834:01	839:01	846:01	854:01	855:01	883:01	899:01	905:01	906:01
	909:01	914:01	920:01	935:01	938:01	944:01	946:01	948:01	949:01
	952:01	956:01	970:01	977:01	983:01	987:01	990:01	994:01	1000:01
	1009:01	1014:01	1017:01	1021:01	1022:01	1027:01	1030:01	1032:01	<u>1043:01</u>
	<u>1047:01</u>	<u>1049:01</u>	<u>1052:01</u>	<u>1067:01</u>	<u>1071:01</u>	<u>1087:01</u>	<u>1090:01</u>	<u>1093:01</u>	<u>1103:01</u>
	<u>1104:01</u>	<u>1111:01</u>	<u>1114:01</u>	<u>1116:01</u>	<u>1125:01</u>	<u>1127:01</u>	<u>1128:01</u>	<u>1130:01</u>	<u>1134:01</u>
	<u>1149:01</u>	<u>1157:01</u>	<u>1158:01</u>	<u>1174:01</u>	<u>1178:01</u>	<u>1182:01</u>	<u>1187:01</u>		
	02:01	04:02	08:01	10:01	16:01	18:01	25:01	28:01	37:01
	41:01	45:01	48:01	49:01	51:01	53:01	59:01	60:01	68:01
	73:01	75:01	77:01	79:01	81:01	82:01	83:01	93:01	94:01
	105:01	109:01	113:01	115:01	116:01	122:01	123:01	129:01	136:01



If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable epitope:								
55DEE	137:01	141:01	143:01	144:01	145:01	146:01	151:01	153:01	155:01
	163:01	165:01	167:01	172:01	183:01	184:01	185:01	186:01	187:01
	188:01	189:01	191:01	196:01	198:01	200:01	204:01	210:01	211:01
	217:01	219:01	229:01	236:01	237:01	238:01	239:01	252:01	256:01
	257:01	258:01	260:01	261:01	263:01	265:01	269:01	271:01	273:01
	274:01	277:01	285:01	286:01	296:01	297:01	307:01	308:01	309:01
	310:01	311:01	312:01	313:01	316:01	321:01	324:01	338:01	339:01
	342:01	344:01	347:01	349:01	352:01	359:01	364:01	365:01	366:01
	367:01	368:01	369:01	373:01	374:01	380:01	381:01	402:01	410:01
	414:01	416:01	419:01	420:01	421:01	422:01	423:01	424:01	429:01
	430:01	431:01	432:01	433:01	441:01	443:01	444:01	448:01	452:01
	457:01	461:01	463:01	466:01	467:01	469:01	470:01	477:01	488:01
	489:01	494:01	499:01	501:01	502:01	510:01	511:01	513:01	514:01
	515:01	525:01	526:01	528:01	532:01	537:01	539:01	549:01	552:01
	557:01	571:01	574:01	577:01	579:01	582:01	586:01	594:01	595:01
	596:01	602:01	603:01	604:01	606:01	608:01	617:01	622:01	624:01
	627:01	628:01	633:01	637:01	639:01	640:01	641:01	646:01	647:01
	650:01	652:01	653:01	655:01	656:01	659:01	660:01	663:01	665:01
	673:01	674:01	678:01	680:01	681:01	685:01	690:01	692:01	701:01
	711:01	723:01	725:01	726:01	730:01	731:01	734:01	735:01	736:01
	740:01	741:01	751:01	752:01	759:01	763:01	770:01	771:01	774:01
	775:01	776:01	780:01	781:01	782:01	783:01	791:01	799:01	805:01
	809:01	816:01	817:01	818:01	819:01	823:01	827:01	832:01	836:01
	841:01	843:01	845:01	857:01	858:01	861:01	863:01	864:01	881:01
	884:01	885:01	886:01	887:01	889:01	890:01	891:01	892:01	897:01
	898:01	900:01	902:01	903:01	918:01	927:01	933:01	936:01	940:01
	942:01	943:01	954:01	955:01	958:01	963:01	964:01	967:01	968:01
	973:01	975:01	981:01	1005:01	1006:01	1007:01	1013:01	1020:01	1025:01
	1028:01	1031:01	1035:01	1036:01	<u>1037:01</u>	<u>1039:01</u>	<u>1051:01</u>	<u>1053:01</u>	<u>1055:01</u>
	<u>1056:01</u>	<u>1059:01</u>	<u>1072:01</u>	<u>1075:01</u>	<u>1077:01</u>	<u>1082:01</u>	<u>1083:01</u>	<u>1085:01</u>	<u>1089:01</u>
<u>1092:01</u>	<u>1094:01</u>	<u>1102:01</u>	<u>1106:01</u>	<u>1107:01</u>	<u>1110:01</u>	<u>1115:01</u>	<u>1124:01</u>	<u>1126:01</u>	
<u>1136:01</u>	<u>1140:01</u>	<u>1142:01</u>	<u>1150:01</u>	<u>1153:01</u>	<u>1159:01</u>	<u>1160:01</u>	<u>1163:01</u>	<u>1165:01</u>	
<u>1168:01</u>	<u>1171:01</u>	<u>1175:01</u>	<u>1176:01</u>	<u>1179:01</u>	<u>1194:01</u>				
55EAE	02:02	05:01	19:01	21:01	22:01	24:01	30:01	36:01	38:01
	47:01	54:01	97:01	100:01	101:01	106:01	114:01	135:01	139:01
	140:01	170:01	171:01	223:01	226:01	233:01	284:01	291:01	300:01
	301:01	302:01	317:01	330:01	331:01	337:01	358:01	390:01	395:01
	400:01	406:01	408:01	473:01	478:01	495:01	496:01	527:01	533:01
	535:01	547:01	550:01	558:01	560:01	573:01	587:01	588:01	589:01

If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable epitope:								
55EAE	590:01	611:01	619:01	638:01	668:01	697:01	715:01	717:01	718:01
	720:01	721:01	729:01	744:01	746:01	764:01	766:01	778:01	779:01
	785:01	790:01	798:01	802:01	847:01	848:01	851:01	860:01	923:01
	928:01	929:01	951:01	961:01	962:01	965:01	971:01	980:01	982:01
	1008:01	1015:01	1018:01	1019:01	1026:01	<u>1061:01</u>	<u>1095:01</u>	<u>1099:01</u>	<u>1101:01</u>
	<u>1117:01</u>	<u>1118:01</u>	<u>1119:01</u>	<u>1120:01</u>	<u>1143:01</u>	<u>1156:01</u>	<u>1172:01</u>	<u>1180:01</u>	<u>1186:01</u>
	<u>1188:01</u>	<u>1189:01</u>	<u>1190:01</u>						
84DEAV	01:01	03:01	05:01	06:01	08:01	09:01	10:01	11:01	13:01
	14:01	16:01	17:01	19:01	20:01	21:01	22:01	25:01	26:01
	27:01	29:01	30:01	31:01	35:01	36:01	37:01	38:01	44:01
	45:01	50:01	52:01	54:01	55:01	56:01	57:01	58:01	63:01
	65:01	67:01	68:01	69:01	70:01	76:01	78:01	79:01	84:01
	85:01	87:01	88:01	89:01	90:01	91:01	92:01	93:01	97:01
	98:01	102:01	103:01	104:01	106:01	107:01	110:01	111:01	114:01
	118:01	122:01	124:01	125:01	127:01	130:01	131:01	132:01	133:01
	135:01	136:01	137:01	140:01	142:01	147:01	150:01	152:01	156:01
	157:01	162:01	165:01	166:01	167:01	168:01	170:01	171:01	173:01
	182:01	184:01	197:01	201:01	202:01	203:01	204:01	205:01	206:01
	207:01	208:01	209:01	220:01	221:01	222:01	223:01	226:01	234:01
	241:01	243:01	244:01	245:01	246:01	247:01	248:01	249:01	250:01
	251:01	259:01	264:01	265:01	266:01	267:01	268:01	269:01	270:01
	277:01	284:01	285:01	287:01	288:01	289:01	291:01	293:01	295:01
	300:01	301:01	304:01	305:01	312:01	313:01	314:01	315:01	316:01
	317:01	324:01	325:01	326:01	327:01	329:01	331:01	337:01	340:01
	343:01	346:01	348:01	349:01	351:01	353:01	358:01	361:01	362:01
	363:01	370:01	371:01	379:01	383:01	384:01	385:01	386:01	388:01
	389:01	390:01	391:01	393:01	394:01	395:01	398:01	400:01	404:01
	405:01	407:01	408:01	409:01	410:01	411:01	412:01	413:01	417:01
	422:01	437:01	438:01	439:01	442:01	445:01	446:01	447:01	448:01
	449:01	458:01	460:01	462:01	466:01	470:01	472:01	473:01	481:01
	483:01	490:01	491:01	492:01	495:01	498:01	503:01	504:01	505:01
	506:01	509:01	514:01	515:01	516:01	517:01	518:01	519:01	527:01
	530:01	532:01	533:01	535:01	536:01	538:01	541:01	542:01	543:01
	545:01	548:01	550:01	552:01	558:01	560:01	562:01	563:01	564:01
	565:01	566:01	567:01	568:01	572:01	573:01	587:01	588:01	597:01
	599:01	600:01	608:01	609:01	610:01	611:01	612:01	613:01	616:01
	619:01	621:01	623:01	629:01	630:01	631:01	632:01	633:01	634:01
	635:01	636:01	638:01	645:01	648:01	649:01	650:01	651:01	652:01
	653:01	654:01	662:01	664:01	667:01	668:01	669:01	671:01	672:01

If this Candidate Unacceptable Epitope is reported:	<b>Donor Equivalent Antigens</b>								
	<u>The following HLA values are considered equivalent to the reported unacceptable epitope:</u>								
84DEAV	673:01	675:01	676:01	684:01	688:01	689:01	698:01	703:01	704:01
	705:01	706:01	707:01	708:01	709:01	710:01	711:01	713:01	714:01
	715:01	716:01	717:01	718:01	720:01	727:01	728:01	729:01	733:01
	737:01	744:01	746:01	749:01	760:01	764:01	778:01	785:01	789:01
	790:01	791:01	797:01	798:01	801:01	802:01	807:01	810:01	815:01
	822:01	825:01	829:01	832:01	833:01	834:01	839:01	846:01	847:01
	848:01	851:01	853:01	854:01	855:01	856:01	860:01	864:01	879:01
	883:01	886:01	888:01	891:01	892:01	893:01	898:01	899:01	901:01
	902:01	904:01	905:01	906:01	907:01	908:01	909:01	912:01	914:01
	920:01	922:01	923:01	924:01	929:01	930:01	931:01	935:01	937:01
	938:01	940:01	944:01	945:01	946:01	947:01	948:01	949:01	951:01
	952:01	953:01	956:01	965:01	968:01	969:01	970:01	971:01	976:01
	977:01	979:01	980:01	982:01	983:01	990:01	991:01	994:01	996:01
	998:01	999:01	1000:01	1006:01	1007:01	1008:01	1009:01	1012:01	1014:01
	1015:01	1017:01	1018:01	1019:01	1021:01	1022:01	1024:01	1026:01	1027:01
	1030:01	1032:01	1034:01	<u>1038:01</u>	<u>1043:01</u>	<u>1047:01</u>	<u>1049:01</u>	<u>1050:01</u>	<u>1052:01</u>
	<u>1057:01</u>	<u>1058:01</u>	<u>1061:01</u>	<u>1063:01</u>	<u>1065:01</u>	<u>1067:01</u>	<u>1068:01</u>	<u>1069:01</u>	<u>1071:01</u>
	<u>1073:01</u>	<u>1076:01</u>	<u>1087:01</u>	<u>1088:01</u>	<u>1090:01</u>	<u>1093:01</u>	<u>1095:01</u>	<u>1096:01</u>	<u>1099:01</u>
	<u>1101:01</u>	<u>1103:01</u>	<u>1105:01</u>	<u>1111:01</u>	<u>1114:01</u>	<u>1116:01</u>	<u>1117:01</u>	<u>1118:01</u>	<u>1119:01</u>
	<u>1120:01</u>	<u>1123:01</u>	<u>1125:01</u>	<u>1126:01</u>	<u>1127:01</u>	<u>1128:01</u>	<u>1130:01</u>	<u>1131:01</u>	<u>1133:01</u>
<u>1134:01</u>	<u>1137:01</u>	<u>1140:01</u>	<u>1141:01</u>	<u>1143:01</u>	<u>1145:01</u>	<u>1147:01</u>	<u>1149:01</u>	<u>1150:01</u>	
<u>1151:01</u>	<u>1156:01</u>	<u>1157:01</u>	<u>1158:01</u>	<u>1162:01</u>	<u>1166:01</u>	<u>1168:01</u>	<u>1170:01</u>	<u>1172:01</u>	
<u>1178:01</u>	<u>1180:01</u>	<u>1182:01</u>	<u>1183:01</u>	<u>1185:01</u>	<u>1186:01</u>	<u>1187:01</u>	<u>1189:01</u>	<u>1190:01</u>	
84GGPM	02:01	02:02	04:01	04:02	23:01	24:01	32:01	33:01	39:01
	41:01	46:01	47:01	48:01	49:01	51:01	59:01	60:01	66:01
	71:01	72:01	73:01	75:01	77:01	80:01	81:01	82:01	83:01
	86:01	94:01	95:01	96:01	99:01	100:01	101:01	105:01	108:01
	109:01	112:01	113:01	115:01	116:01	117:01	121:01	123:01	126:01
	128:01	129:01	134:01	138:01	141:01	143:01	144:01	145:01	146:01
	148:01	149:01	151:01	153:01	155:01	158:01	163:01	164:01	169:01
	172:01	174:01	175:01	176:01	179:01	180:01	181:01	183:01	185:01
	186:01	187:01	188:01	189:01	190:01	191:01	192:01	193:01	194:01
	195:01	196:01	199:01	200:01	210:01	211:01	212:01	213:01	214:01
	215:01	217:01	219:01	224:01	225:01	227:01	228:01	229:01	231:01
	232:01	233:01	235:01	236:01	237:01	238:01	239:01	240:01	252:01
	253:01	254:01	255:01	256:01	257:01	258:01	260:01	261:01	262:01
	263:01	271:01	272:01	273:01	274:01	275:01	276:01	278:01	281:01
	282:01	283:01	286:01	294:01	297:01	298:01	302:01	303:01	306:01
307:01	308:01	309:01	310:01	311:01	318:01	319:01	320:01	321:01	

If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens The following HLA values are considered equivalent to the reported unacceptable epitope:								
	322:01	323:01	332:01	334:01	335:01	336:01	338:01	339:01	341:01
	342:01	344:01	350:01	352:01	354:01	355:01	356:01	359:01	360:01
	364:01	365:01	366:01	367:01	368:01	369:01	372:01	373:01	374:01
	375:01	376:01	377:01	378:01	380:01	381:01	392:01	396:01	397:01
	399:01	402:01	406:01	414:01	415:01	416:01	418:01	419:01	420:01
	421:01	423:01	424:01	425:01	426:01	427:01	428:01	429:01	430:01
	432:01	433:01	434:01	435:01	440:01	441:01	443:01	444:01	451:01
	452:01	453:01	456:01	457:01	459:01	461:01	463:01	464:01	465:01
	468:01	469:01	474:01	475:01	476:01	477:01	478:01	479:01	480:01
	485:01	486:01	487:01	488:01	494:01	496:01	497:01	500:01	501:01
	502:01	508:01	510:01	511:01	520:01	521:01	522:01	523:01	524:01
	525:01	528:01	529:01	531:01	534:01	537:01	539:01	540:01	547:01
	549:01	553:01	554:01	555:01	556:01	557:01	559:01	561:01	569:01
	571:01	574:01	575:01	576:01	577:01	578:01	579:01	581:01	582:01
	583:01	584:01	586:01	591:01	593:01	594:01	595:01	596:01	601:01
	602:01	603:01	604:01	605:01	606:01	607:01	614:01	615:01	617:01
	618:01	620:01	622:01	624:01	625:01	626:01	627:01	628:01	637:01
	639:01	640:01	641:01	642:01	643:01	646:01	647:01	655:01	656:01
84GGPM	658:01	659:01	660:01	663:01	665:01	666:01	670:01	674:01	677:01
	678:01	679:01	680:01	681:01	682:01	683:01	685:01	686:01	687:01
	690:01	692:01	694:01	699:01	701:01	702:01	721:01	722:01	723:01
	725:01	726:01	730:01	731:01	734:01	735:01	736:01	739:01	741:01
	742:01	747:01	750:01	751:01	753:01	755:01	757:01	758:01	759:01
	761:01	762:01	763:01	765:01	766:01	767:01	769:01	770:01	771:01
	772:01	773:01	774:01	775:01	776:01	779:01	780:01	781:01	782:01
	783:01	784:01	787:01	788:01	795:01	796:01	799:01	803:01	804:01
	805:01	806:01	808:01	809:01	811:01	812:01	813:01	814:01	816:01
	817:01	818:01	819:01	820:01	823:01	824:01	826:01	827:01	828:01
	830:01	836:01	837:01	840:01	841:01	842:01	843:01	845:01	849:01
	850:01	852:01	857:01	858:01	859:01	861:01	863:01	880:01	881:01
	882:01	884:01	885:01	887:01	889:01	890:01	895:01	915:01	916:01
	921:01	926:01	927:01	928:01	932:01	933:01	934:01	936:01	943:01
	954:01	955:01	957:01	958:01	961:01	962:01	963:01	964:01	966:01
	967:01	972:01	973:01	975:01	978:01	981:01	987:01	988:01	989:01
	992:01	993:01	997:01	1001:01	1002:01	1003:01	1004:01	1005:01	1010:01
	1011:01	1013:01	1016:01	1020:01	1023:01	1025:01	1028:01	1031:01	1033:01
	1035:01	1036:01	1037:01	1039:01	1040:01	1042:01	1046:01	1048:01	1051:01
84GGPM	<u>1053:01</u>	<u>1055:01</u>	<u>1056:01</u>	<u>1059:01</u>	<u>1060:01</u>	<u>1062:01</u>	<u>1064:01</u>	<u>1066:01</u>	<u>1072:01</u>
	<u>1074:01</u>	<u>1075:01</u>	<u>1077:01</u>	<u>1080:01</u>	<u>1081:01</u>	<u>1082:01</u>	<u>1083:01</u>	<u>1085:01</u>	<u>1086:01</u>
	<u>1089:01</u>	<u>1091:01</u>	<u>1094:01</u>	<u>1097:01</u>	<u>1100:01</u>	<u>1102:01</u>	<u>1104:01</u>	<u>1106:01</u>	<u>1108:01</u>

If this Candidate Unacceptable Epitope is reported:	Donor Equivalent Antigens								
	The following HLA values are considered equivalent to the reported unacceptable epitope:								
	<u>1110:01</u>	<u>1113:01</u>	<u>1115:01</u>	<u>1122:01</u>	<u>1124:01</u>	<u>1129:01</u>	<u>1132:01</u>	<u>1138:01</u>	<u>1139:01</u>
	<u>1144:01</u>	<u>1146:01</u>	<u>1148:01</u>	<u>1152:01</u>	<u>1153:01</u>	<u>1155:01</u>	<u>1159:01</u>	<u>1160:01</u>	<u>1161:01</u>
	<u>1163:01</u>	<u>1164:01</u>	<u>1167:01</u>	<u>1171:01</u>	<u>1173:01</u>	<u>1174:01</u>	<u>1175:01</u>	<u>1176:01</u>	<u>1177:01</u>
	<u>1179:01</u>	<u>1181:01</u>	<u>1184:01</u>	<u>1188:01</u>	<u>1194:01</u>	<u>1195:01</u>			
84VGPM	15:01	18:01	28:01	34:01	40:01	53:01	62:01	74:01	139:01
	198:01	290:01	292:01	296:01	299:01	333:01	345:01	347:01	387:01
	471:01	482:01	484:01	493:01	499:01	512:01	526:01	580:01	585:01
	644:01	695:01	745:01	752:01	768:01	835:01	896:01	897:01	900:01
	903:01	910:01	913:01	918:01	942:01	<u>1054:01</u>	<u>1109:01</u>	<u>1136:01</u>	<u>1142:01</u>
	<u>1165:01</u>	<u>1192:01</u>							

144

145 **4.10.C: HLA DPB1 Available Alleles**

146

147

**Table 4-167: Reportable Available OPTN DPB1 HLA Allele Values**

148 Table 4-16 contains all HLA-DPB1 alleles available for reporting to the OPTN for candidate, donor, or  
 149 recipient HLA typing.

150

01:01	02:01	02:02	03:01	04:01	04:02	05:01	06:01	08:01	09:01
10:01	11:01	13:01	14:01	15:01	16:01	17:01	18:01	19:01	20:01
21:01	22:01	23:01	24:01	25:01	26:01	27:01	28:01	29:01	30:01
31:01	32:01	33:01	34:01	35:01	36:01	37:01	38:01	39:01	40:01
41:01	44:01	45:01	46:01	47:01	48:01	49:01	50:01	51:01	52:01
53:01	54:01	55:01	56:01	57:01	58:01	59:01	60:01	62:01	63:01
65:01	66:01	67:01	68:01	69:01	70:01	71:01	72:01	73:01	74:01
75:01	76:01	77:01	78:01	79:01	80:01	81:01	82:01	83:01	84:01
85:01	86:01	87:01	88:01	89:01	90:01	91:01	92:01	93:01	94:01
95:01	96:01	97:01	98:01	99:01	100:01	101:01	102:01	103:01	104:01
105:01	106:01	107:01	108:01	109:01	110:01	111:01	112:01	113:01	114:01
115:01	116:01	117:01	118:01	119:01	121:01	122:01	123:01	124:01	125:01

126:01	127:01	128:01	129:01	130:01	131:01	132:01	133:01	134:01	135:01
136:01	137:01	138:01	139:01	140:01	141:01	142:01	143:01	144:01	145:01
146:01	147:01	148:01	149:01	150:01	151:01	152:01	153:01	155:01	156:01
157:01	158:01	160:01	162:01	163:01	164:01	165:01	166:01	167:01	168:01
169:01	170:01	171:01	172:01	173:01	174:01	175:01	176:01	177:01	178:01
179:01	180:01	181:01	182:01	183:01	184:01	185:01	186:01	187:01	188:01
189:01	190:01	191:01	192:01	193:01	194:01	195:01	196:01	197:01	198:01
199:01	200:01	201:01	202:01	203:01	204:01	205:01	206:01	207:01	208:01
209:01	210:01	211:01	212:01	213:01	214:01	215:01	217:01	219:01	220:01
221:01	222:01	223:01	224:01	225:01	226:01	227:01	228:01	229:01	230:01
231:01	232:01	233:01	234:01	235:01	236:01	237:01	238:01	239:01	240:01
241:01	242:01	243:01	244:01	245:01	246:01	247:01	248:01	249:01	250:01
251:01	252:01	253:01	254:01	255:01	256:01	257:01	258:01	259:01	260:01
261:01	262:01	263:01	264:01	265:01	266:01	267:01	268:01	269:01	270:01
271:01	272:01	273:01	274:01	275:01	276:01	277:01	278:01	279:01	280:01
281:01	282:01	283:01	284:01	285:01	286:01	287:01	288:01	289:01	290:01
291:01	292:01	293:01	294:01	295:01	296:01	297:01	298:01	299:01	300:01
301:01	302:01	303:01	304:01	305:01	306:01	307:01	308:01	309:01	310:01
311:01	312:01	313:01	314:01	315:01	316:01	317:01	318:01	319:01	320:01
321:01	322:01	323:01	324:01	325:01	326:01	327:01	329:01	330:01	331:01
332:01	333:01	334:01	335:01	336:01	337:01	338:01	339:01	340:01	341:01
342:01	343:01	344:01	345:01	346:01	347:01	348:01	349:01	350:01	351:01
352:01	353:01	354:01	355:01	356:01	358:01	359:01	360:01	361:01	362:01

363:01	364:01	365:01	366:01	367:01	368:01	369:01	370:01	371:01	372:01
373:01	374:01	375:01	376:01	377:01	378:01	379:01	380:01	381:01	383:01
384:01	385:01	386:01	387:01	388:01	389:01	390:01	391:01	392:01	393:01
394:01	395:01	396:01	397:01	398:01	399:01	400:01	402:01	404:01	405:01
406:01	407:01	408:01	409:01	410:01	411:01	412:01	413:01	414:01	415:01
416:01	417:01	418:01	419:01	420:01	421:01	422:01	423:01	424:01	425:01
426:01	427:01	428:01	429:01	430:01	431:01	432:01	433:01	434:01	435:01
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151

152 **13.5.A HLA Typing Requirements for OPTN KPD Candidates**

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

156

- 157 • HLA-A
- 158 • HLA-B
- 159 • HLA-Bw4
- 160 • HLA-Bw6
- 161 • HLA-DR

162

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

167

- 168 • HLA-C
- 169 • HLA-DR51
- 170 • HLA-DR52
- 171 • HLA-DR53
- 172 • [HLA-DPA1](#)
- 173 • HLA-DPB1
- 174 • HLA-DQA1
- 175 • HLA-DQB1

176

177 **13.5.C HLA Typing Requirements for OPTN KPD Donors**

178 Before a donor can appear on an OPTN KPD match run, the donor’s transplant hospital is responsible for

179 reporting to the OPTN serological split level molecular typing results for *all* of the following:

180

181

- HLA-A

182

- HLA-B

183

- HLA-Bw4

184

- HLA-Bw6

185

- HLA-C

186

- HLA-DR

187

- HLA-DR51

188

- HLA-DR52

189

- HLA-DR53

190

- HLA-DPA1

191

- HLA-DPB1

192

- HLA-DQA1

193

- HLA-DQB1

194

#

## **Appendix A: Changes to Histocompatibility Data Collection**

### **Waitlist additions**

*ADD:* Parent question field (Candidate Class II HLA data): DQA1

*ADD:* Parent question field (Candidate Class II HLA data): DPA1

*ADD:* Parent question field (Candidate Class II HLA data): DPB1

*ADD:* Parent question field (Candidate Class II HLA unacceptable antigens): DPA1

### **DonorNet additions**

*ADD:* Parent question field (Donor Class II HLA data): DPA1

### **KPD additions**

*ADD:* Parent question field (Donor Class II HLA data): DPA1

*ADD:* Parent question field (Candidate Class II HLA data): DPA1

*ADD:* Parent question field (Candidate Class II HLA unacceptable antigens): DPA1

*ADD:* Parent question field (Candidate Class II HLA other antibody specificities): DPA1