At-a-Glance

- **Proposal to Require that Deceased Donor HLA Typing be Performed by DNA Methods and Identify Additional Antigens for Kidney, Kidney-pancreas, Pancreas, and Pancreas Islet Offers**

- **Affected/Proposed Policy:** UNOS Bylaws Appendix B Attachment IIA - Standards for Histocompatibility Testing D HLA Typing D1.000
  3.5.9.1 Essential Information for Kidney Offers
  3.8.2.2 Essential Information for Pancreas Offers

- **Histocompatibility Committee**

  This proposal would require that OPOs and their associated laboratories perform HLA typing of deceased donors by DNA methods and identify the HLA-A, -B, -Cw, -DR and -DQ antigens before making any kidney, kidney-pancreas, pancreas, or pancreas islet offers.

- **Affected Groups**
  Directors of Organ Procurement
  Lab Directors/Supervisors
  OPO Executive Directors
  OPO Medical Directors
  OPO Coordinators

- Should this proposal apply to Thoracic Allocation?

Proposal to Require that Deceased Donor HLA Typing be Performed by DNA Methods and Identify Additional Antigens for Kidney, Kidney-Pancreas, Pancreas, and Pancreas Islet Offers

Affected Policies:
UNOS Bylaws Appendix B Attachment IIA - Standards for Histocompatibility Testing
D HLA Typing D1.000
3.5.9.1 Essential Information for Kidney Offers
3.8.2.2 Essential Information for Pancreas Offers

Histocompatibility Committee

Summary and Goals of the Proposal:

This proposal would require that OPOs and their associated laboratories perform HLA typing of deceased donors by DNA methods and identify the HLA-A, -B, -Cw, -DR and -DQ antigens before making any kidney, kidney-pancreas, pancreas, or pancreas islet offers.

The purpose of this proposal is to extend the HLA typing requirements for deceased donors to include the identification of HLA-A, -B, -Cw, -DR and -DQ antigens. These additional requirements would align the deceased donor HLA types with the unacceptable antigens that can be listed for sensitized patients. The proposal further requires HLA testing of deceased donors to employ molecular methods. The molecular technologies are currently in use by 98 of the 103 UNOS member laboratories that reported deceased donor types during 2008-10/2009. Most deceased donors had HLA-Cw antigens (84%) and HLA-DQ antigens (98%) reported on donor histocompatibility forms during this period. These modifications will increase accuracy and precision of the HLA typing and should reduce the number of predictably crossmatch incompatible offers for sensitized candidates.

Background and Significance of the Proposal

The problem
The proposal addresses two problems: first, the high error rate associated with HLA typing by older, serological methods and second, the need for the typing of antigens encoded by additional HLA loci that will identify crossmatch incompatible donors. The availability of accurate donor HLA typing prior to the match run is necessary because these HLA antigens affect the allocation of deceased donor kidneys and pancreata, as well as other solid organs.

Alternatives considered:
The alternative is to retain the current requirement, which does not explicitly require reporting HLA-Cw or DQ antigens and does not specify a method for identifying these antigens. Many patients have antibodies directed against Cw and DQ antigens that are listed as unacceptable in a deceased donor. If a donor HLA type does not include these antigens, or includes a broad description that might include the unacceptable antigen, an inappropriate offer may be made for those patients. A few laboratories use serological methods to HLA type deceased donors, which are less precise and less accurate than the molecular testing currently in use at most laboratories. This proposal does not permit the sole use of serological testing to identify donor HLA antigens

Strengths and weaknesses:

The strength of this proposal is that it will align the HLA-typing requirements in policy with the current technologies for identifying HLA antibodies, offering better protection and access for sensitized patients and improving organ allocation.

A potential weakness of the proposal is that it may require a few laboratories to acquire equipment to perform molecular testing and may require training of technologists to perform this testing on deceased donors. We have determined that 95% (98/103) of affected laboratories already have the infrastructure to perform this testing. Others have suggested that they require UNOS policy to obtain infrastructure from their hospital or agency that controls their budgets.

Collaboration:
This proposal affects all sensitized kidney, kidney-pancreas, pancreas, and pancreas islet transplant candidates as well as sensitized candidates awaiting thoracic organs (hearts and lungs) and intestines. The Thoracic Committee approached the Histocompatibility Committee in support of a requirement for HLA typing of heart donors prior to allocation at the July 15, 2009 committee meeting.

Intended and unintended consequences:
The intended consequences of this policy change are to improve organ allocation by increasing the accuracy of HLA typing for deceased donors and to provide more complete typing that will avoid predictably crossmatch incompatible offers to sensitized patients. The long range consequences will include fewer errors in HLA types used for ranking candidates for deceased donor kidneys and pancreata and better access for sensitized patients to crossmatch compatible organs. Transplant coordinators, physicians and laboratory personnel will spend less time evaluating organ offers for histocompatibility. Costs may be reduced because repeated or supplemental donor HLA testing may be reduced. Broader geographic sharing of extrarenal organs will result from more accurate virtual crossmatching.

Unintended consequences of this policy might be an increase in reporting broad HLA antigens, since the molecular nomenclature differs slightly from the serological nomenclature and requires conversion. All laboratories should be capable of correctly converting molecular types. However, in cases when typing results are entered by non-laboratory personnel, some training may be required.

Supporting Evidence:

OPTN data indicate that between January 2008 and June 2009, 20% of class I and 16% of class II deceased donor HLA types were determined by serological tests alone. About 28% of discrepant HLA types involved donors who were HLA typed by serological methods. This is based on the committee's analysis of discrepant HLA types observed when comparing the donor HLA type reported on the match run with the HLA type reported on the donor histocompatibility form. (**Exhibit B**) The discrepancy rates will increase when typing for HLA-Cw and -DQ antigens is required. For example, there are no serological reagents that can distinguish Cw9 from Cw10. Laboratories using serology can only identify Cw3 (which includes both Cw9 and Cw10 antigens). There are no serological reagents that can identify Cw11-18 antigens and laboratories using serology will report these as blank or absent. Broad HLA antigens (antigens which can be further resolved into 2 or more distinct HLA types) were reported on 420 match runs for deceased kidney donors during the period June 2008-May 2009, representing about 6% of the match runs during this period. Broad HLA antigens were reported by 18 of 102 laboratories, 6 of which reported serological typing as the only method used for donor typing. Thus among the 18% of laboratories that reported imprecise HLA types, one-third were using serological methods alone. The

current error rate is 2% among kidney donors typed by molecular methods compared with 4% among those tested by serology alone.

UNOS policy 3.5.9.1 Essential Information for Kidney Offers currently requires donors to be typed for the HLA-A,-B.–DR, Bw4 and Bw6 locus antigens. Many patients have antibodies directed against HLA-Cw or -DQ locus antigens that are listed as unacceptable but do not preclude offers from donors that express these Cw or DQ antigens because the donor was not typed or because the results of typing these antigens were not reported prior to the match run. Moreover, among donors typed by serological tests, resolution of the Cw3, DQ1 and DQ3 parent antigens was poor (Cw3 was reported 29% of the time when a donor expressed Cw9 or 10, and DQ1 and DQ3 were reported 12% and 9% of the time, respectively, when the donor had DQ5 or 6 (DQ1)or DQ7,8,or 9 (DQ3). Unacceptable antigens defined by antibodies directed against the splits of these antigens (Cw9, Cw10, DQ5, DQ6, DQ7, DQ8, and DQ9) may or may not be expressed in donors typed only for the parent antigens and inappropriate offers to those sensitized patients would not be prevented.

Expected Impact on Program Goals, Strategic Plan, and Adherence to OPTN Final Rule:

The donor HLA type is used directly in kidney allocation (points for HLA-DR match) and indirectly through the entry of unacceptable HLA antigens to avoid offers of immunologically unacceptable organs for sensitized patients

Improved accuracy and definition of deceased donor HLA types will streamline allocation of organs, reduce wastage, and improve access for sensitized candidates. It affects patient safety by reducing offers of incompatible organs and operational effectiveness by reducing the need for repeat HLA typing of donors after allocation and prior to transplantation.

Plan for Evaluating the Proposal:

The aim of this proposal is to reduce the number of erroneous or incomplete HLA types reported in DonorNet and used for allocation. The Histocompatibility Committee reviews discrepant HLA types reported to UNOS for deceased kidney donors annually and will determine the level of reduction in discrepant donor HLA types expected to result from this policy change. These reviews compare deceased donor HLA types reported in DonorNet with those reported on the donor histocompatibility form and on the recipient histocompatibility form when the donor is retyped at the recipient center. The current error rate is 2% among kidney donors typed by molecular methods compared with 4% among those tested by serology alone.

Additional Data Collection:

HLA-Cw and HLA-DQ types will be required rather than optional data elements in UNet^{SM}. No additional data collection will be required. Approximately 84% of deceased donors already have HLA-Cw and DQ types reported on the donor histocompatibility form. This proposal would require them to be reported in DonorNet prior to the match run and the typing performed by molecular methods.

Expected Implementation Plan:

Laboratories that serve OPOs will need to implement molecular HLA typing methods for their deceased donor typing on a real-time basis, preferably using methods that permit accurate typing of pre-

procurement samples with minimum delay. They will need to convert the typing results to serologic equivalents and report these in a timely fashion prior to the match run. While some laboratories may require additional equipment and training, it is expected that this can be accomplished within 6 months.

Communication and Education Plan:

Laboratories will need to be notified of this change in advance of implementation to provide time for infrastructure changes and training where needed. Training in this case will be done by the laboratories or their vendors using the specific tests they have chosen. Appendix 3A is currently under revision and will provide the list of antigens and their equivalences that will be acceptable. (**Exhibit A**) The agencies that inspect laboratories for UNOS (ASHI and CAP) will need to be informed of this policy change and to adapt their inspection guidelines accordingly to demonstrate and to monitor compliance with this policy change.

Monitoring and Evaluation:

The Histocompatibility Committee will continue to monitor accuracy and reproducibility of donor types as described above. The ASHI and CAP inspectors monitor laboratory compliance with UNOS policies and will need to adjust their guidelines to incorporate this change.

Policy or Bylaw Proposal:

3.5.9 Minimum Information/Tissue for Kidney Offer.

3.5.9.1 Essential Information for Kidney Offers. The Host OPO must provide the following information to the potential recipient center with each kidney offer:
(i) Donor name and Donor I.D. number, age, sex, and race;
(ii) Date of admission for the current hospitalization;
(iii) Diagnosis;
(iv) Blood type;
(v) ~~HLAA, B, Bw4, Bw6, and DR antigens~~ Identified splits of HLA-A,-B,Bw4, Bw6,-Cw,-DR and -DQ antigens as listed in exhibit A)
(vi)…

Bylaws Appendix B Attachment IIA - Standards for Histocompatibility Testing

D HLA Typing D1.000 ~~The laboratory must be able to define HLA-A, B, Bw4,Bw6, C, DR and DQ antigens at a level that is appropriate for solid organ transplantation~~ The laboratory must be able to define HLA-A,-B, -Bw4,Bw6, -Cw, -DR and -DQ antigens at a level that is appropriate for solid organ transplantation. Laboratories that perform deceased donor typing to be used in kidney, kidney-pancreas, pancreas, or pancreas islet allocation must report molecular typing results (at the level of serological splits) for all required antigens prior to organ offers.

3.8.2.2 Essential Information for Pancreas Offers. The Host OPO or donor center must provide the following donor information, with the exception of pending serologies, to the recipient center with each pancreas offer:…..

15. Familial history of diabetes; and
16. ~~HLAA, B, Bw4, Bw6, and DR antigens.~~ Identified splits of HLA-A,-B,Bw6,,-Cw,-DR and _DQ antigens (as listed in appendix 3A)

HLA A, B, Cw, DR, and DQ Acceptable "split" HLA Antigens					
A LOCUS ANTIGEN	**B LOCUS ANTIGEN**	**Cw LOCUS ANTIGEN**	**DR LOCUS ANTIGEN**	**DQ LOCUS ANTIGEN**	
1		1	1	2	
2	7	2	4	4	
3	8	4	7	5	
11	13	5	8	6	
23	14	6	9	7	
24	18	7	10	8	
25	27	8	11	9	
26	35	9	12		
28	37	10	13		
29	38	12	14		
30	39	13	15		
31	41	14	16		
32	42	15	17		
33	44	16	18		
34	45	17	103		
36	46	18	1403		
43	47		1404		
66	48		51		
68	49		52		
69	50		53		
74	51				
80	52				
203	53				
210	54				
2403	55				
6601	56				
6602	57				
	58				
	59				
	60				
	61				
	62				
	63				
	64				
	65				
	67				
	70				
	71				
	72				
	73				
	75				
	76				
	77				
	78				
	81				
	82				
	703				
	0804				
	1304				
	2708				
	3901				
	3902				
	3905				
	4005				
	5102				
	5103				
	8201				
	Bw4				
	Bw6				

Data Request

- Typing methods (serology vs. DNA) reported on donor histocompatibility forms for all donors recovered from January 1, 2008 through June 30, 2009 by blinded laboratory. For each laboratory provide percentage of donors typed only by serology method as well as percentages of donors with reported Cw and DQ antigens.
- Number of discrepant typings in Donor Discrepant HLA Typings Report in UNet^{SM} by typing method and blinded donor laboratory. For donor laboratories with any number of discrepant donor typings provide percentage of donors with serology only typing reported on donor histocompatibility forms out of all donors. Limit the analysis to deceased kidney donors recovered from January 1, 2006 through June 30, 2009.
- Number of discrepancies in donor HLA data between what was given at the time of the match and what was reported on the donor histocompatibility form by typing method and blinded donor laboratory. For donor laboratories with any number of discrepant donor typings provide percentage of donors with serology only typing reported on donor histocompatibility forms out of all donors. Limit the analysis to deceased kidney donors recovered from January 1, 2006 through June 30, 2009.

Data and Methods

Typing methods by laboratory are based on validated donor histocompatibility forms. Forms without donor HLA were excluded.

Donor Discrepant HLA Typings Report in UNET^{SM} compares deceased donor HLA typings reported on the donor histocompatibility forms against donor HLA typings reported on all recipient histocompatibility forms. A donor has discrepant HLA typings if HLA information entered is not identical or equivalent. Typing methods reported on donor histocompatibility forms by donor laboratories with any number of discrepant donor typings were tabulated. Analysis was limited to deceased kidney donors recovered from January 1, 2006 through June 30, 2009.

Donor HLA typings on the match runs were compared to donor HLA typings reported on donor histocompatibility forms for all deceased kidney donors recovered from January 1, 2006 through June 30, 2009. Matches run without donor HLA were excluded (e.g., test matches, matches for extended criteria kidneys). The analysis was limited to HLA A, B, and DR, as these are the only loci used in the match algorithm. A donor HLA typings was counted as discrepant if HLA information entered was not identical or equivalent.

Information provided in this report is based on OPTN data as of November 27, 2009.

Results

Table 1 shows HLA typing methods reported on donor histocompatibility forms by donor type and year. In 2006 38% of deceased donors where typed by serology only at class I and 28% at class II. In 2008-6/2009 this percentage decreased to 20% at class I and 16% at class II.

Table 2 shows HLA typing methods reported on donor histocompatibility forms by laboratory.

- Only 11 out 150 laboratories reported serology only typing at both class I and class II for all donors. Six of these 12 laboratories had living donors only.
- Most laboratories reported DNA typing or combination of DNA and serology typing for at least some of their donors. More than half of laboratories (86 out 150) didn't report serology only typing for any of their donors.

Table 3 provides typing methods reported on donor histocompatibility forms by laboratories with discrepancies in Donor Discrepant HLA Typings Report in UNET^{SM} for deceased kidney donors recovered from January 1, 2006 through June 30, 2009. There were 94 donor laboratories involved in 752 discrepancies. Five laboratories with highest numbers of discrepancies reported serology only or serology in combination with DNA typing for all of their donors with discrepant HLA typings.

Table 4 shows typing methods reported on donor histocompatibility forms by laboratories with discrepancies in donor HLA provided at the time of the match vs. reported on the donor histocompatibility forms. For deceased kidney donors recovered from January 1, 2006 through June 30, 2009 there were 84 donor laboratories involved in 362 discrepancies. Four laboratories with highest numbers of discrepancies reported serology only or serology in combination with DNA typing for most of their donors with discrepant HLA typings.

Table 1. HLA Typing Methods Reported on Donor Histocompatibility (DH) Forms
by Donor Type and Year
Donors Recovered January 1, 2006 – June 30, 2009
Validated DH Forms with Donor HLA Reported

Donor Type	Year	Class I								Class II							
		Serology		DNA		Both		All		Serology		DNA		Both		All	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Deceased	**2006**	2,922	38	3,002	39	1,750	23	7,674	100	2,149	28	4,057	53	1,468	19	7,674	100
	2007	2,298	29	3,222	41	2,282	29	7,802	100	1,721	22	4,205	54	1,876	24	7,802	100
	2008-6/09	2,367	20	6,040	52	3,245	28	11,652	100	1,841	16	7,324	63	2,487	21	11,652	100
Living	**2006**	2,831	43	3,099	48	582	9	6,512	100	1,292	20	4,813	74	407	6	6,512	100
	2007	1,961	32	3,490	57	643	11	6,094	100	960	16	4,773	78	361	6	6,094	100
	2008-6/09	2,247	25	5,972	66	897	10	9,116	100	1,230	13	7,305	80	581	6	9,116	100

Exhibit B

Table 2. HLA Typing Methods Reported on Donor Histocompatibility (DH) Forms

by Donor Laboratory (N = 150 Laboratories)

Donors Recovered January 1, 2008 – October 31, 2009

Validated DH Forms with Donor HLA Reported

Laboratory	Typing Method (Class I and II combined)							% of Donors with Reported		Donor type	
	Serology		DNA		DNA and Serology		All Methods				
	N	%	N	%	N	%	N	Cw	DQ	% Living Donors	% Deceased Donors
All	3,471	13.7	14,891	58.6	7,063	27.8	25,425	77.4	94.0	44.0	56.0
21887D	171	100.0	0	0.0	0	0.0	171	99.4	100.0	45.6	54.4
04945D	89	100.0	0	0.0	0	0.0	89	100.0	100.0	40.4	59.6
30573D	87	100.0	0	0.0	0	0.0	87	97.7	100.0	60.9	39.1
31089D	57	100.0	0	0.0	0	0.0	57	98.2	100.0	100.0	0.0
29541D	52	100.0	0	0.0	0	0.0	52	0.0	100.0	42.3	57.7
16684D	50	100.0	0	0.0	0	0.0	50	88.0	100.0	98.0	2.0
27434D	16	100.0	0	0.0	0	0.0	16	12.5	100.0	100.0	0.0
28681D	10	100.0	0	0.0	0	0.0	10	100.0	100.0	100.0	0.0
16297D	9	100.0	0	0.0	0	0.0	9	100.0	100.0	100.0	0.0
17802D	6	100.0	0	0.0	0	0.0	6	0.0	0.0	100.0	0.0
08299D	1	100.0	0	0.0	0	0.0	1	0.0	100.0	100.0	0.0
29412D	348	99.4	0	0.0	2	0.6	350	94.6	100.0	32.6	67.4
24682D	138	97.9	3	2.1	0	0.0	141	17.7	100.0	46.1	53.9
24768D	107	95.5	0	0.0	5	4.5	112	74.1	100.0	29.5	70.5
27176D	41	95.3	1	2.3	1	2.3	43	62.8	100.0	97.7	2.3
25155D	32	94.1	0	0.0	2	5.9	34	100.0	100.0	100.0	0.0
17501D	524	92.9	3	0.5	37	6.6	564	93.1	100.0	34.9	65.1
30444D	61	92.4	1	1.5	4	6.1	66	98.5	100.0	100.0	0.0
01290D	6	85.7	0	0.0	1	14.3	7	100.0	100.0	85.7	14.3
08901D	434	81.1	7	1.3	94	17.6	535	96.1	97.8	8.4	91.6
19221D	153	76.5	4	2.0	43	21.5	200	95.5	99.5	15.5	84.5
00043D	58	75.3	16	20.8	3	3.9	77	98.7	100.0	20.8	79.2
30960D	17	73.9	0	0.0	6	26.1	23	0.0	100.0	100.0	0.0
23564D	44	73.3	14	23.3	2	3.3	60	45.0	100.0	40.0	60.0
09202D	87	71.3	0	0.0	35	28.7	122	0.0	0.0	61.5	38.5
26789D	18	69.2	3	11.5	5	19.2	26	100.0	100.0	100.0	0.0
20210D	47	69.1	16	23.5	5	7.4	68	94.1	98.5	20.6	79.4

Exhibit B

Laboratory	Typing Method (Class I and II combined)							% of Donors with Reported		Donor type	
	Serology		DNA		DNA and Serology		All Methods				
	N	%	N	%	N	%	N	Cw	DQ	% Living Donors	% Deceased Donors
30530D	85	68.0	14	11.2	26	20.8	125	13.6	100.0	25.6	74.4
28337D	27	58.7	0	0.0	19	41.3	46	95.7	100.0	100.0	0.0
33583D	50	56.2	27	30.3	12	13.5	89	10.1	92.1	100.0	0.0
26445D	5	50.0	5	50.0	0	0.0	10	100.0	100.0	100.0	0.0
12814D	160	40.5	172	43.5	63	15.9	395	99.0	100.0	44.8	55.2
33239D	60	39.5	88	57.9	4	2.6	152	75.7	100.0	27.6	72.4
16770D	21	38.2	6	10.9	28	50.9	55	100.0	100.0	100.0	0.0
19006D	8	38.1	5	23.8	8	38.1	21	90.5	100.0	100.0	0.0
27219D	60	37.5	0	0.0	100	62.5	160	1.9	100.0	55.0	45.0
15437D	116	37.3	68	21.9	127	40.8	311	98.7	81.4	46.9	53.1
33110D	15	28.3	37	69.8	1	1.9	53	79.2	100.0	73.6	26.4
13416D	5	17.2	19	65.5	5	17.2	29	100.0	100.0	37.9	62.1
31175D	11	17.2	0	0.0	53	82.8	64	93.8	100.0	18.8	81.3
09073D	71	16.9	344	82.1	4	1.0	419	99.0	100.0	16.5	83.5
05031D	18	14.4	44	35.2	63	50.4	125	96.0	97.6	100.0	0.0
10578D	12	9.3	39	30.2	78	60.5	129	85.3	100.0	7.0	93.0
09546D	2	6.9	24	82.8	3	10.3	29	0.0	100.0	100.0	0.0
07439D	13	5.8	1	0.4	210	93.8	224	91.1	100.0	12.9	87.1
33153D	7	5.4	119	92.2	3	2.3	129	100.0	100.0	32.6	67.4
19479D	3	4.2	69	95.8	0	0.0	72	93.1	100.0	100.0	0.0
17759D	2	3.8	50	96.2	0	0.0	52	3.8	100.0	100.0	0.0
04859D	16	3.6	430	95.6	4	0.9	450	98.9	100.0	48.7	51.3
19823D	3	3.3	88	96.7	0	0.0	91	46.2	98.9	46.2	53.8
34185D	1	2.7	34	91.9	2	5.4	37	97.3	97.3	100.0	0.0
07912D	5	2.2	3	1.3	222	96.5	230	93.0	100.0	54.8	45.2
21801D	6	2.0	114	38.1	179	59.9	299	100.0	100.0	27.8	72.2
08944D	11	1.9	577	98.0	1	0.2	589	99.8	100.0	55.7	44.3
11180D	1	1.2	38	46.3	43	52.4	82	98.8	98.8	46.3	53.7
08686D	2	1.2	153	92.7	10	6.1	165	99.4	100.0	83.0	17.0
30014D	1	0.9	0	0.0	111	99.1	112	3.6	63.4	34.8	65.2
22016D	1	0.8	128	99.2	0	0.0	129	79.8	80.6	34.1	65.9
27735D	1	0.7	1	0.7	134	98.5	136	5.9	11.8	100.0	0.0
18920D	2	0.7	10	3.6	263	95.6	275	96.0	100.0	30.9	69.1
14663D	2	0.6	296	86.3	45	13.1	343	98.3	95.6	40.8	59.2

Exhibit B

Laboratory	Typing Method (Class I and II combined)							% of Donors with Reported		Donor type	
	Serology		DNA		DNA and Serology		All Methods				
	N	%	N	%	N	%	N	Cw	DQ	% Living Donors	% Deceased Donors
23091D	2	0.5	6	1.5	401	98.0	409	99.0	100.0	25.4	74.6
03655D	2	0.4	454	99.3	1	0.2	457	98.0	98.5	15.3	84.7
32078D	1	0.2	610	99.3	3	0.5	614	100.0	100.0	48.2	51.8
00086D	0	0.0	117	100.0	0	0.0	117	71.8	76.1	29.1	70.9
00516D	0	0.0	314	100.0	0	0.0	314	100.0	100.0	45.2	54.8
00645D	0	0.0	179	100.0	0	0.0	179	10.6	100.0	70.9	29.1
00946D	0	0.0	178	96.7	6	3.3	184	94.0	94.0	29.9	70.1
01247D	0	0.0	169	99.4	1	0.6	170	100.0	100.0	55.3	44.7
01677D	0	0.0	25	100.0	0	0.0	25	36.0	92.0	100.0	0.0
01935D	0	0.0	66	98.5	1	1.5	67	100.0	100.0	100.0	0.0
01978D	0	0.0	90	100.0	0	0.0	90	6.7	64.4	23.3	76.7
02064D	0	0.0	5	8.8	52	91.2	57	100.0	100.0	0.0	100.0
02193D	0	0.0	4	28.6	10	71.4	14	100.0	100.0	50.0	50.0
04128D	0	0.0	305	100.0	0	0.0	305	100.0	100.0	18.4	81.6
04730D	0	0.0	230	66.3	117	33.7	347	100.0	100.0	68.9	31.1
05590D	0	0.0	21	100.0	0	0.0	21	100.0	100.0	38.1	61.9
05633D	0	0.0	96	78.0	27	22.0	123	25.2	97.6	77.2	22.8
06106D	0	0.0	216	100.0	0	0.0	216	96.3	96.3	5.6	94.4
06450D	0	0.0	26	68.4	12	31.6	38	100.0	100.0	100.0	0.0
07052D	0	0.0	677	100.0	0	0.0	677	10.5	100.0	46.2	53.8
07138D	0	0.0	8	100.0	0	0.0	8	100.0	100.0	100.0	0.0
07267D	0	0.0	10	100.0	0	0.0	10	100.0	100.0	100.0	0.0
07482D	0	0.0	128	100.0	0	0.0	128	34.4	28.9	62.5	37.5
07525D	0	0.0	155	100.0	0	0.0	155	100.0	100.0	37.4	62.6
08041D	0	0.0	121	99.2	1	0.8	122	100.0	100.0	50.8	49.2
08385D	0	0.0	261	99.2	2	0.8	263	96.2	100.0	99.6	0.4
08514D	0	0.0	146	100.0	0	0.0	146	100.0	100.0	26.7	73.3
09417D	0	0.0	0	0.0	61	100.0	61	100.0	100.0	0.0	100.0
09675D	0	0.0	14	100.0	0	0.0	14	100.0	100.0	100.0	0.0
09847D	0	0.0	131	100.0	0	0.0	131	46.6	46.6	35.9	64.1
10363D	0	0.0	43	100.0	0	0.0	43	0.0	97.7	100.0	0.0
11223D	0	0.0	137	99.3	1	0.7	138	100.0	100.0	12.3	87.7
11352D	0	0.0	97	100.0	0	0.0	97	44.3	100.0	59.8	40.2
11481D	0	0.0	210	92.1	18	7.9	228	99.1	100.0	36.0	64.0

Exhibit B

Laboratory	Typing Method (Class I and II combined)							% of Donors with Reported		Donor type	
	Serology		DNA		DNA and Serology		All Methods				
	N	%	N	%	N	%	N	Cw	DQ	% Living Donors	% Deceased Donors
11911D	0	0.0	92	100.0	0	0.0	92	0.0	81.5	57.6	42.4
12169D	0	0.0	258	99.2	2	0.8	260	98.8	98.8	85.8	14.2
12255D	0	0.0	65	100.0	0	0.0	65	100.0	100.0	100.0	0.0
12556D	0	0.0	129	99.2	1	0.8	130	99.2	100.0	42.3	57.7
12599D	0	0.0	50	98.0	1	2.0	51	100.0	100.0	58.8	41.2
12986D	0	0.0	54	12.5	378	87.5	432	96.3	100.0	42.4	57.6
13760D	0	0.0	103	100.0	0	0.0	103	1.9	100.0	100.0	0.0
14061D	0	0.0	28	100.0	0	0.0	28	21.4	100.0	100.0	0.0
15136D	0	0.0	90	100.0	0	0.0	90	50.0	100.0	52.2	47.8
15566D	0	0.0	67	98.5	1	1.5	68	100.0	100.0	11.8	88.2
15738D	0	0.0	14	1.7	798	98.3	812	99.9	100.0	6.3	93.7
16211D	0	0.0	364	100.0	0	0.0	364	100.0	100.0	46.7	53.3
16598D	0	0.0	0	0.0	157	100.0	157	99.4	100.0	3.2	96.8
17157D	0	0.0	8	4.3	178	95.7	186	63.4	99.5	46.8	53.2
17329D	0	0.0	181	100.0	0	0.0	181	100.0	100.0	100.0	0.0
17544D	0	0.0	54	100.0	0	0.0	54	100.0	100.0	100.0	0.0
18017D	0	0.0	35	100.0	0	0.0	35	100.0	100.0	100.0	0.0
18619D	0	0.0	72	98.6	1	1.4	73	100.0	100.0	8.2	91.8
19178D	0	0.0	230	100.0	0	0.0	230	60.0	68.7	53.5	46.5
19393D	0	0.0	1	0.4	277	99.6	278	0.0	64.4	25.5	74.5
19608D	0	0.0	283	100.0	0	0.0	283	11.7	14.5	100.0	0.0
19737D	0	0.0	1	0.7	138	99.3	139	20.9	100.0	50.4	49.6
20038D	0	0.0	13	100.0	0	0.0	13	0.0	0.0	100.0	0.0
20081D	0	0.0	139	100.0	0	0.0	139	0.0	100.0	46.0	54.0
20167D	0	0.0	355	100.0	0	0.0	355	43.9	98.6	51.8	48.2
20941D	0	0.0	0	0.0	503	100.0	503	60.8	100.0	62.2	37.8
21027D	0	0.0	91	80.5	22	19.5	113	100.0	100.0	25.7	74.3
22661D	0	0.0	44	100.0	0	0.0	44	0.0	2.3	100.0	0.0
23005D	0	0.0	39	100.0	0	0.0	39	2.6	0.0	100.0	0.0
23048D	0	0.0	106	65.8	55	34.2	161	100.0	100.0	32.9	67.1
23349D	0	0.0	231	99.6	1	0.4	232	100.0	100.0	12.5	87.5
23607D	0	0.0	42	60.9	27	39.1	69	60.9	100.0	100.0	0.0
24037D	0	0.0	72	100.0	0	0.0	72	100.0	100.0	100.0	0.0
24080D	0	0.0	2	1.9	104	98.1	106	23.6	100.0	8.5	91.5

Exhibit B

Laboratory	Typing Method (Class I and II combined)							% of Donors with Reported		Donor type	
	Serology		DNA		DNA and Serology		All Methods				
	N	%	N	%	N	%	N	Cw	DQ	% Living Donors	% Deceased Donors
24166D	0	0.0	614	96.4	23	3.6	637	100.0	100.0	35.0	65.0
25370D	0	0.0	0	0.0	1	100.0	1	0.0	100.0	100.0	0.0
26230D	0	0.0	0	0.0	20	100.0	20	5.0	100.0	100.0	0.0
26402D	0	0.0	0	0.0	367	100.0	367	45.2	98.4	22.1	77.9
26488D	0	0.0	496	84.9	88	15.1	584	100.0	100.0	5.5	94.5
26703D	0	0.0	304	99.3	2	0.7	306	20.3	81.7	52.6	47.4
26875D	0	0.0	34	28.3	86	71.7	120	0.0	0.0	26.7	73.3
27047D	0	0.0	57	100.0	0	0.0	57	71.9	100.0	100.0	0.0
27692D	0	0.0	18	4.1	421	95.9	439	23.7	100.0	40.3	59.7
28079D	0	0.0	45	95.7	2	4.3	47	95.7	100.0	70.2	29.8
28165D	0	0.0	119	48.8	125	51.2	244	100.0	100.0	26.2	73.8
28724D	0	0.0	0	0.0	17	100.0	17	100.0	100.0	100.0	0.0
29025D	0	0.0	92	100.0	0	0.0	92	100.0	100.0	27.2	72.8
29928D	0	0.0	50	50.0	50	50.0	100	35.0	100.0	19.0	81.0
30358D	0	0.0	19	95.0	1	5.0	20	100.0	100.0	100.0	0.0
30616D	0	0.0	40	100.0	0	0.0	40	100.0	100.0	100.0	0.0
31390D	0	0.0	95	100.0	0	0.0	95	100.0	100.0	100.0	0.0
31906D	0	0.0	638	99.8	1	0.2	639	100.0	100.0	30.7	69.3
32121D	0	0.0	0	0.0	93	100.0	93	6.5	86.0	29.0	71.0
33798D	0	0.0	167	33.6	330	66.4	497	99.0	100.0	55.9	44.1
34959D	0	0.0	470	97.5	12	2.5	482	72.0	75.3	75.3	24.7