### **COMPUTERIZED VIRTUAL CROSSMATCH FOR SOLID ORGAN TRANSPLANT DONOR SELECTION: EVALUATION OF VXMATCH**

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## BACKGROUND

- mTilda VxMatch (HLA Data Systems) is a commercially available software system that integrates multiple HLA databases to perform virtual crossmatch and post-transplant DSA surveillance.
- VxMatch programmatically integrates data stores
   (bolow) containing donor typings and regining.

## AIM

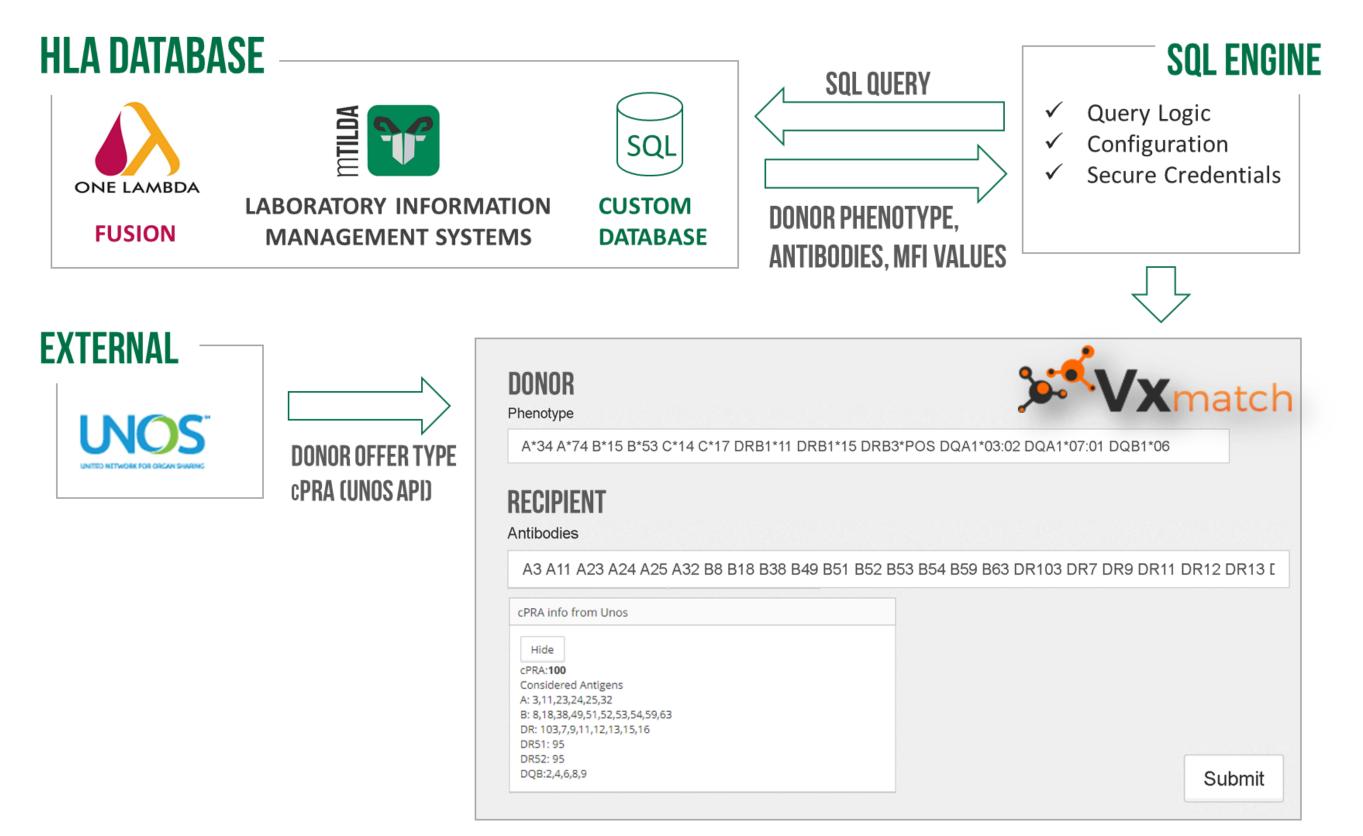
For heart and lung transplantation, a prospective crossmatch (XM) may not be possible unless a local donor is available. Our transplant center has used virtual crossmatch (vXM) to select deceased donors for heart and lung transplantations for more than ten years, which has allowed us to accept donors from outside our organ procurement territory. The vXM was done by manually checking the recipient's HLA antibody profiles within our HLA lab database against the donor's HLA typing to identify if the recipient has any donor-specific antibodies (DSA) in the most recent serum tested and in historical sera. To ensure no DSA was present vXM was manually done by multiple transplant professionals at different stages for each sensitized recipient when a donor offer was available. We recently deployed a computerized virtual crossmatch system, VxMatch, from laboratory informatics vendor HLA Data Systems. VxMatch programmatically integrates our lab database (mTilda) containing donor typings and recipient antibodies and constructs visualizations of reactivity trends, recent and historical DSA. MFI cut-offs of antibodies and data retrieval ranges can be customized as needed. The aim of the validation is to evaluate VxMatch performance.



(below) containing donor typings and recipient antibodies and constructs visualizations of reactivity trends, recent and historical DSA.

 Lab-specific customization of queries allows for tailored MFI cut-offs and data retrieval ranges.

## DATA INTEGRATION



## MANUAL vXM CO

PRA ← Class 1 ▼ Sho ← Class 2 ▼ cPF	w Curre A Treated	nt Peak 6 mon	Peak	Untreated	Current NEG	Peak 6 mon	Peak  29%		UNOS cPRA	Update Last Update	
Cumulative Abs	19% A25 A26 A6	6 B18 B64 B65 (upda	ited 1/3/17)								
Current Abs	C 0% NEGATIVE	(PREV DONOR - A1	B13 B57 Cw6 DR7	DQA1*02 DQ	2 DQ9 DPB1	*03:01/104:01	DPB1*17:0	01/131:01) (SD 1/1/17, dfc)			
<sup>o</sup> ossible Abs	0					Current Possib	le Abs – C				
Oonor Specific Abs	0					Safe Antigens	0				
Excluded Pheno Agr	ns					Prev Txp Mism	atch Agns	A1 B13 B57 Cw6 DR7 DQA1*	02 DQ2 DQ9 DP3 DP17		٦ĵ

#### On-Call Overview Virtual Crossmatch Documentation

#### Transplant Deceased Donor Offer Verification Record for Unacceptable Antigens

r Information: 8 Donor ID: <u>xxxxx</u> External ABO: O Match ID: <u>xxxx</u>

Dono	r HL	A Typi	ing																
A	I	1	В	B	ж	<u>C</u>	w	D	R	DR51/	52/53	DQ	Al	DQ	B1	DP	Al	DP	B1
2	68	65	60	6	6	10	8	13		52		01		6		01		03:01	04:01

#### Candidate Information:

Recipient Name: XXXXXX Potential Recipient HLA Typing						Recipie	ent M	RN: <u>x</u>	XXXX	Organ: LU External ABO:				:					
I	A	] ]	В	Î	<u>Sw</u>	C.	W	D	R	DR51	/52/53	DQ	Al	DQ	Bl	DP	Al	DP	Bl
2	2	60	49	6	4	10	7	4	11	52	53	03	05	7	8	01	02	04:02	13:0

### Cotential Recipient's Current HLA Antibodies Serum Date: 12/15/16 Current HLA Antibodies in SERUM UNDILUTED

### **COMPUTERIZED vXM**

e - • ×	
×	Patient Phenotype
<ul> <li>Secure   https://mportal.mtilda.com/mportal/vxm#</li> <li>★ f? N = ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲</li></ul>	A*03:DEJT A*11:EAMP B*07 B*44:EAPE C*07:DZXJ C*07:ECCR DRB1*04:EAPT DRB1*04:EAPV DRB4*01:DWH DRB4*01:FDX DQB1*03:EACM DPB1*04:01
son / Donor Phenotype Info	
al)	
B*15 B*53 C*14 C*17 DRB1*11 DRB1*15 DRB3*POS DQA1*03:02 DQA1*07:01 DQB1*06	
4 A*74 B*15 B*53 C*14 C*17 DRB1*11 DRB1*15 DRB3*POS DQA1*03.02 DQA1*07.01 DQB1*06	cPRA info from Unos
scular• select Serological• son / Donor Notes	Hide cPRA:100 Considered Antigens A: 3,11,23,24,25,32 B: 8,18,38,49,51,52,53,54,59,63 DR: 103,7,9,11,12,13,15,16 DR51: 95 DR52: 95 DQB:2,4,6,8,9
, search for Greatly, Appreciated	
podies	Enter Antibodies
oodies to consider in the Virtual Crossmatch below. This list can be preloaded if you have a database connection set up with HLA ms:	Enter antibodies to consider in the Virtual Crossmatch below. This list can be preloaded if you have a database connection set up with HLA Data Systems:
es contraction de la contracti	A3 A11 A23 A24 A25 A32 B8 B18 B38 B49 B51 B52 B53 B54 B59 B63 DR103 DR7 DR9 DR11 DR12 DR13 DR15 DR16 DR51 DR52 DQ2 DQ4
rological Select Molecular Submit	Select Serological- Select Molecular- Submit
•	

Historical Reactivity
B Render Graphs

## METHODS

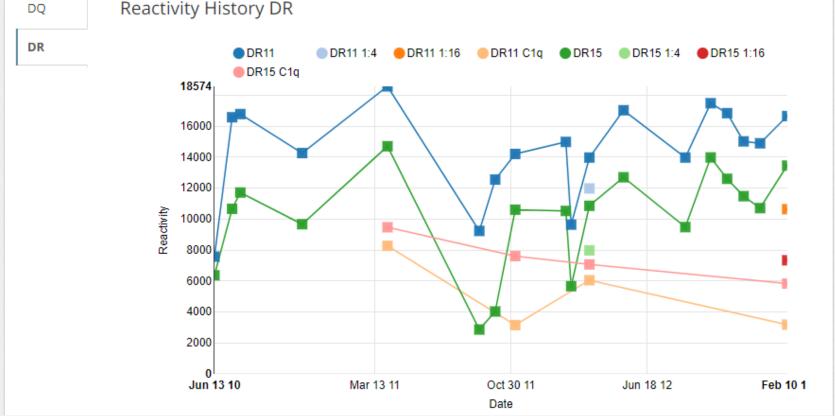
A total of 55 vXMs were performed manually for sensitized recipients and re-analyzed by using the new program VxMatch. 35 of the 55 patients have calculated panel reactive antibodies (cPRA) equal to or greater than 80%.

Organ	# of VXM	DSA Neg	DSA Pos
Kidney	28	11	17
Lung	23	17	6
Heart	2	0	2
Intestine	2	2	0
Total	55	30	25

(PREV DONOK AI BIS BS/ CW0 DR/ DRSS DQAI*02 DQ2 DQ9 DPAI*01 DPAI*02 DPBI* 03:01, 17:01)	DQ: DQ6
Does this donor have any identified unacceptable HLA antigens for this recipient due to current antibodies based on current known donor HLA typing? (Check the applicable)	DR: DR11 DR15
YES X NO X Exception: annot evaluate for _prev donor ag_	
List of donor unacceptable HLA antigens:Shares DPA1*01 DPB1*03:01 with prev Donor	Recent Screen
B. Potential Recipient's Cumulative HLA Antibodies Cumulative HLA Antibodies	B Recent Screen DSA DR
A25 A26 A66 B18 B64 B65	DR 20,000.0
Does this donor have any identified unacceptable HLA antigens for this recipient due to cumulative antibodies based on current known donor HLA typing? (Check the applicable)          X       YES       NO       Exception: cannot evaluate for         List of donor unacceptable HLA antigens;       B65(<2100 6/2014)	16,653.00 13,456.00 5,834.00 3,181.00

Possible DSA List

Serological



# RESULTS

We found a 100% concordance for identification of DSA between manual vXM and computerized VxMatch. It took less than 5 minutes to complete the VxMatch while the conventional vXM took 30 minutes on average. For each identified unacceptable antigen, VxMatch provides detailed information, including antibody specificities, mean fluorescence intensity (MFI), serum date and a graph showing the MFI changes of DSA over time. The VxMatch can operate in two different modes: a technologist's level and supervisory level. The supervisory module allows us to review each individual bead carrying potential unacceptable HLA antigen at alpha chain, beta chain, or allele level. This VxMatch can also be used to identify the sera, for example the serum with peak DSA, for final crossmatch and the ability to track the change of DSA post-transplant.

DR11 C1q 02/11/13



Our validation suggests that this new computerized VxMatch program is a clinical user-friendly, reliable and powerful tool for virtual crossmatch donor selection and post-transplant DSA management.



