

THE UCLA VIRTUAL CROSSMATCH EXCHANGE

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Background

- The sensitivity and specificity of solid phase assays have given rise to the Virtual Crossmatch (VXM).
- By providing a means to detect and assess the strength of donor specific antibodies (DSA), solid phase assays have the potential to increase the accuracy of VXM predictions.

- However, the variability among assays and in center practice create the potential for discordance.

Goal

- Compare virtual crossmatch predictions among labs and correlate the predictions with flow crossmatch outcome.

Method

September 2015 – May 2016

Year	Exchange no.	Labs	# Sera sent	Donor	Race	# VXM	
2015	006	10	4	001	Caucasian	16	
				002	Hispanic		
				003	Hispanic		
				004	Cauc/Hisp		
Year	Exchange no.	Labs	# Sera sent	Donor	Race	# VXM	
2016	007	12	2	001	Hispanic	8	
				002	Blck/Hisp		
				003	Filipino		
				004	Black		
	008	15	2	2	001	Hispanic	8
					002	Blck/Hisp	
					003	Caucasian	
					004	Filipino	

For each exchange,

- T/B VXM predictions
- Luminex SAG
- cPRA
- Predicted TX risk assessment

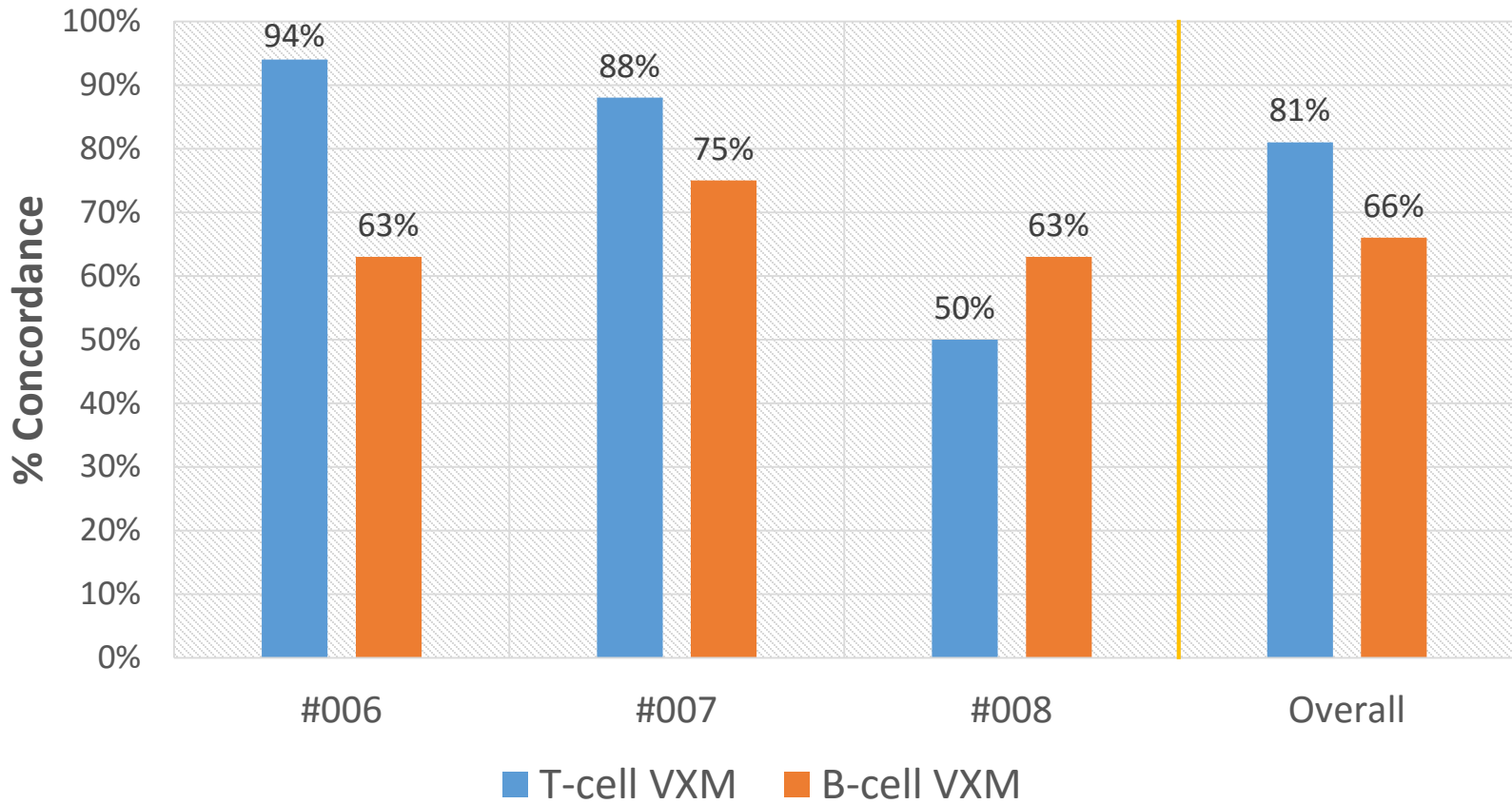
Total:

- 32 sets VXM
- 2 actual FXM

Virtual Crossmatch

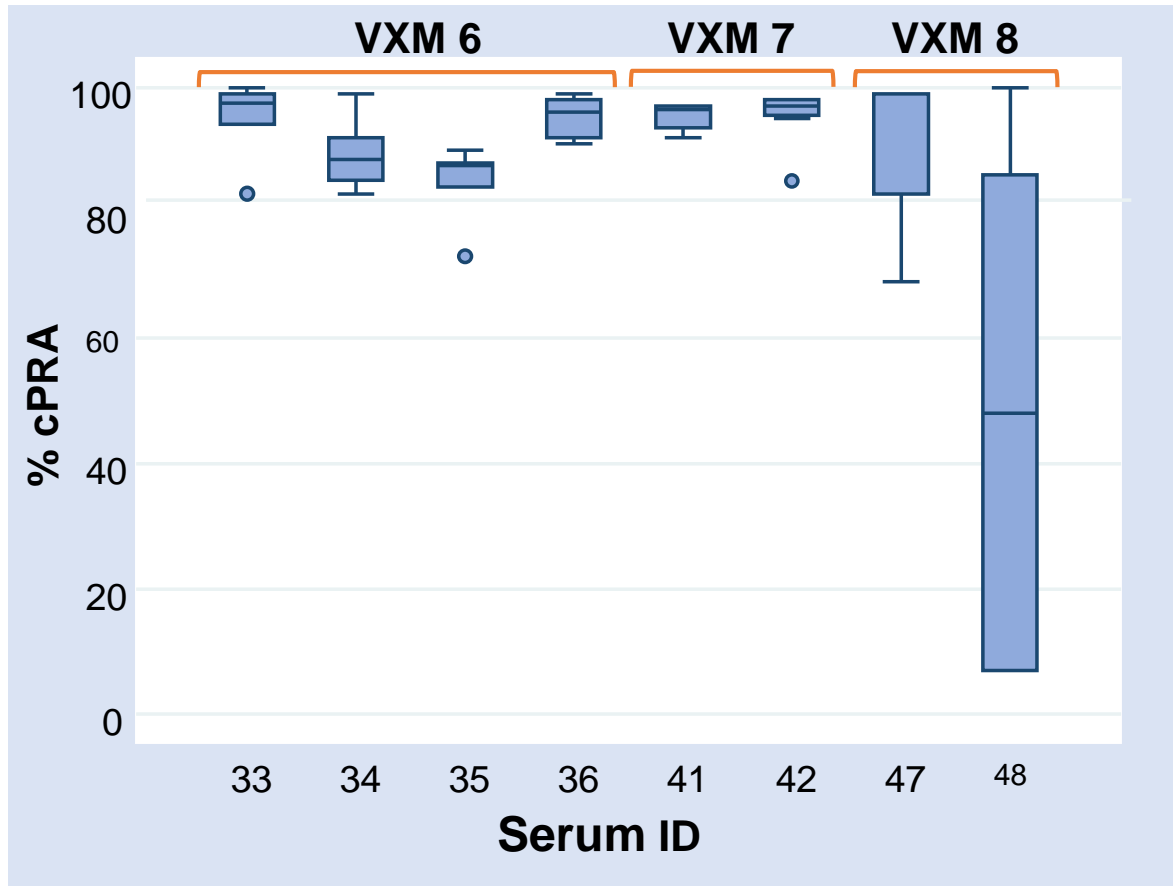
(Results – part I)

VXM Concordance Rates



Concordance > 80% Agreement

Distributions of center-derived cPRAs



Individual VXM results Results

Exchange 008						
Ctr	CPRA	Virtual T-cell Prediction	Class I DSA (MFI)	Virtual B-cell Prediction	Class II DSA (MFI)	Risk Assessment
1		Weak Positive	A68(2300)	Positive	DR52(1180), DQ8(2500)	Acceptable
2	69	Negative	no DSA	Positive	DQ8(4325)	Unacceptable
3		Negative	no DSA	Positive	DQB1*03:02(4901)	Unacceptable
4	99	Positive	A68(2204)	Positive	DQB1*03:02(3694)	Unacceptable
5	99	Positive	no specificities assigned	Positive	no specificities assigned	Unacceptable
6	94	Positive	A68(3352)	Positive	DQ8(4410)	Unacceptable
7	95	Positive	A68(3187)	Positive	DQ8(3321)	Acceptable
8	91	Positive	A68(3507)	Positive	DQ8(4553)	Unacceptable
9	69	Negative	A68(2285)	Negative/ Borderline	DQ8(3626)	Acceptable Moderate Risk
10		Positive	A68(2623)	Positive	DQ8(4021), DR52(1604)	Unacceptable
11	99	Positive	A*68:02(848)	Positive	DQB1*05:01/ DQB1*02:01(812), DQB1*03:01/ DQB1*03:02(3174)	Unacceptable
12	99	Negative	no specificities assigned	Positive	DQB1*03:02(7982)	Unacceptable
13	92	Negative	A68(1886)	Negative	DQ8(3302)	Unacceptable
14	83	Negative	no DSA	Positive	DQ8(4537)	Unacceptable
15		Positive	A68(1469)	Negative	no DSA	Unacceptable

Donor - HLA genotype: A*30:02-A*68:03-B*08:01-B*39:05-C*07:01:01G-C*07:02:01G/DRB1*03:01-DRB1*04:07:01G-DRB3*02:02:01G-DRB4*01:01:01G-DQB1*02:01-DQB1*03:02-DPB1*04:02:01G
 DSA reported: A68 (2507 ± 854), DQ8 (4296 ± 1399), DR52 (1174 ± 563)

Virtual Crossmatch

(Results – part II)

Concordance

class I/class II DSA > 7,000


Exchange	Donor	Serum no.	T-cell Prediction (n)	class I DSA	B-cell Prediction (n)	class II DSA	Predicted Risk Assessment
6	1	34	Neg (10/10)	no DSA	Pos (10/10)	DR1(10844)	Unacceptable (9)
	1	35	Neg (9/9)	no DSA	Neg (8/9)	no DSA	Acceptable (8) Undetermined (1)
	3	34	Neg (10/10)	no DSA	Pos (10/10)	DQ6(21319)	Unacceptable (9)
	4	34	Neg (10/10)	no DSA	Neg (10/10)	no DSA	Acceptable (9)
	4	36	Pos (9/10)	B38(3794), B49(2491)	Pos (10/10)	DR53(4095), DP1(5378)	Unacceptable (9)
7	1	42	POS (12/12)	A31(12702)	POS (12/12)	DR7(17861)	Unacceptable(12)
	2	41	POS (12/12)	A2(20090)	POS (12/12)	DR17(16359)	Unacceptable (12)
	2	42	POS (12/12)	A36(8038)	POS (12/12)	DQ4(5458), DQ2(3969)	Unacceptable(12)
	4	42	POS (12/12)	A30(16010)	POS (11/12)	DQ7(19783)	Unacceptable(12)
8	2	47	POS (15/15)	A26(7600), A11(3397)	POS (12/15)	DR52(1124)	Unacceptable (15)
	2	48	POS (15/15)	B27(7276)	POS (13/15)	DR52(3146), DR18(1714), DR13(1601)	Unacceptable (15)

(n) = number of labs

Discordance

Exchange	Donor	Serum no.	T-cell Prediction (n)	class I DSA	B-cell Prediction (n)	class II DSA	Predicted Risk Assessment
6	2	33	Pos (10/10)	B61(16584), A2(5284)	Pos (7) Neg (3)	no DSA	Unacceptable (9)
	2	34	Neg (10/10)	no DSA	Pos (6) Neg (4)	DQ4(4000)	Acceptable (5) Unacceptable (4)
	3	33	Pos (9/10)	B48(18675)	Pos (6) Neg (4)	no DSA	Unacceptable (8) Acceptable (1)
	3	35	Pos (5) Neg (4)	B48(4145)	Neg (7/9)	no DSA	Unacceptable (4) Acceptable (4) Undetermined (1)
7	3	42	POS (11/12)	A11(4844)	POS(9) NEG(2) Borderline(1)	DP1(2775), DP5(5688)	Unacceptable(11) Acceptable(1)
	4	41	NEG(6) POS(4) Boderline(2)	B41(2205)	POS(8) NEG(4)	DP402(4386)	Unacceptable(8) Acceptable(4)
8	1	47	POS (9) NEG (6)	A68(2442)	POS (12) NEG (3)	DQ8(4325)	Unacceptable (12) Acceptable (3)
	3	48	NEG (10) POS (2) Borderline (3)	B7(1172)	NEG (8) POS (6) Borderline (1)	DR52(3146), DR51(1600)	Acceptable (8) Unacceptable (6) Undetermined (1)

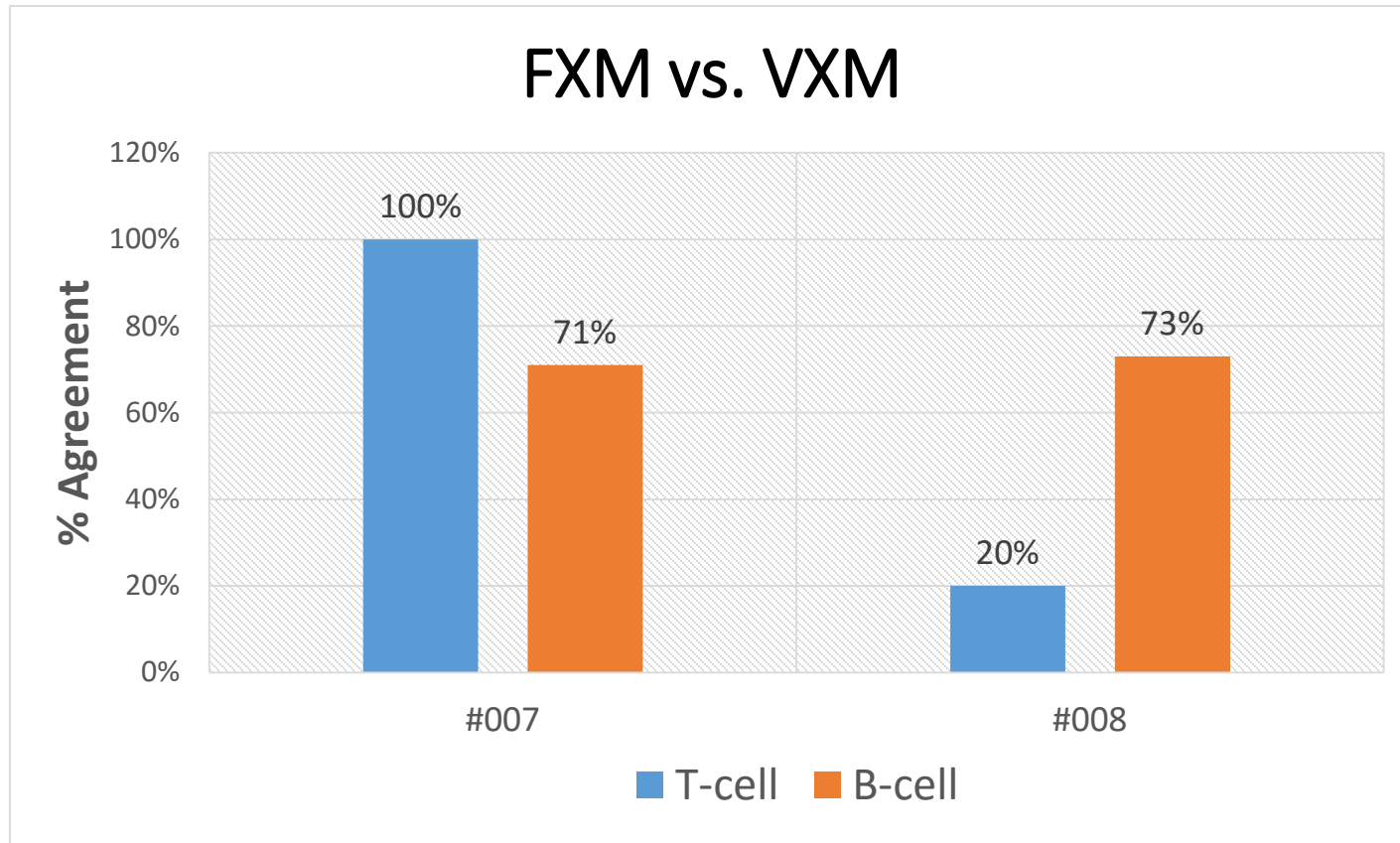
class I/class II
DSA <4500

 < 80% Agreement

Donor 2 – HLA genotype: A*02:01-A*68:01:02G-B*40:20-B*51:02-C*03:04-C*08:01:01G/ DRB1*08:02, DRB1*14:06, DRB3*01:01-DQB1*03:01-DQB1*04:02-DPB1*04:02-DPB1*04:02:01G

Actual FXM vs. VXM Concordance

Concordance



FXM – Flow cytometric crossmatch

VXM – Virtual crossmatch

FXM results vs. VXM predictions

Exchange 007

Exchange 006

Actual Flow Crossmatch Serum 40 vs. Cell 37					Virtual Crossmatch Patient MX-033 vs. Donor 3				
No. Labs	T-Cell RESULT	Class I DSA (MFI)	B-Cell RESULT	Class II DSA(MFI)	No. Labs	T-cell Prediction	Class I DSA (MFI)	B-cell Prediction	Class II DSA(MFI)
7	POS (7)	B48 (15929), Cw8(2367)	POS (7)	no DSA	7	POS (7)	B48(18270), Cw8(2810), A68(1183)	POS (5), NEG (2)	no DSA

Donor - HLA genotype: A*68:01-A*68:02-B*53:01-B*48:01-C*04:01:01G-C*08:01:01G/ DRB1*04:03-DRB1*13:02-DRB3*03:01-DRB4*01:01:01G-DQB1*03:02-DQB1*06:04-DPB1*04:01:01G-DPB1*04:02:01G

Exchange 008

Exchange 007

Actual Flow Crossmatch Serum 45 vs. Cell 44					Virtual Crossmatch Patient MX-041 vs. Donor 4				
No. Labs	T-Cell Result	Class I DSA(MFI)	B-Cell Result	Class II DSA(MFI)	No. Labs	Virtual T-cell Prediction	Class I DSA (MFI)	cell Prediction	Class II DSA (MFI)
12	POS (10) NEG (1) Equivocal (1)	B41(2162)	POS (11) Equivocal (1)	DP402(5088)	12	NEG (6), POS (4), Borderline (2)	B41(2025)	POS (8) NEG (4)	DP402(3951)

Donor HLA genotype: A*03:01, A*30:01, B*41:02, B*42:02, C*17:01:01G, C*08:04, C*15:03/
DRB5*01:01, DQB1*06:02, DQB1*03:01, DPB1*04:02:01G, DPB1 *105:01

Conclusion

- Multiple or strong DSA
 - Good concordance observed among positive crossmatch predictions
 - Good concordance between actual crossmatch and virtual crossmatch predictions
- Weak DSA
 - Variability in the reporting of DSA
 - Variability in crossmatch predictions
 - Variability among Actual FXM outcome vs. VXM predictions

- Thus, educational activities such as the UCLA Virtual Crossmatch Exchange are important tools to ensure quality control standards for crossmatch testing methods.

Acknowledgements

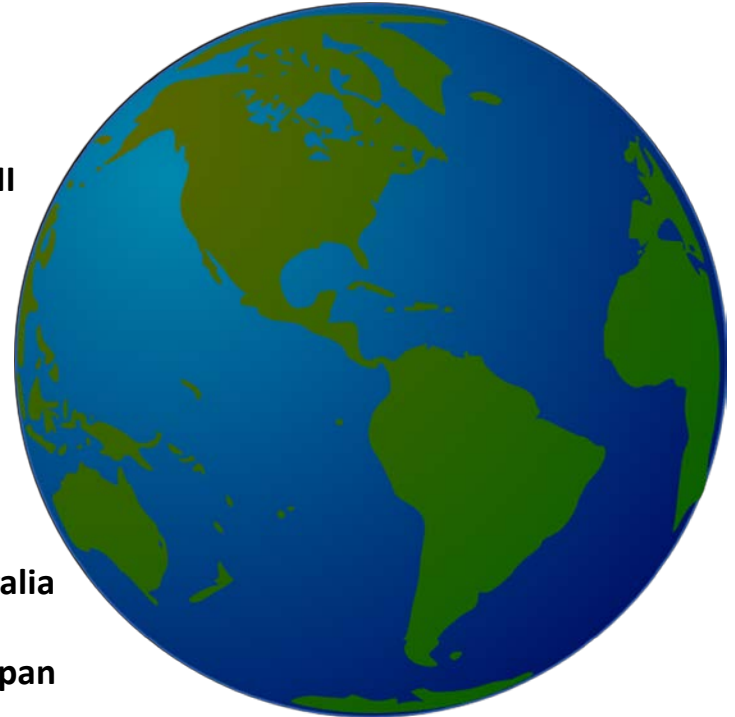
Acknowledgments

U.S. Participants

- **Barnes-Jewish Hospital - St Louis, MO**
- **Brigham and Women's Hospital – Boston, MA**
- **Duke University Medical Center – Durham, NC**
- **Georgetown University Hospital – Washington, DC**
- **Hahnemann Hospital-Tenet – Philadelphia, PA**
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- **Mayo Clinic – Rochester, MN**
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- **Texas Medical Specialty, Inc. - Dallas, TX**
- **UCLA Immunogenetics Center - Los Angeles, CA**
- **UCSF Immunogenetics Laboratory - San Francisco, CA**

International Participants

- **Australian Red Cross Blood Service - West Melbourne, VIC, Australia**
- **Christian Medical College & Hospital - Tamil Nadu, India**
- **Hyogo Prefectural Nishinomiya Hospital, Nishinomiya, Hyogo, Japan**
- **Medizinische Hochschule Hannover – Hannover, Germany**
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Thank You

