Wake Forest Baptist Medical Center	Transplant Testing Protocols BB.PROTOCOL.1030.4	Dept:	324311
		Dept Name	Blood Bank
		Effective Date:	3/14/11
		Revised Date:	2/6/2020
Name & Title: CLIA Laboratory Medical Director		Contact:	Julie H Simmons/ Christina S Warren
Signature: G Pompa		Date:	2/11/2020

1. General Protocol Statement:

A. Purpose:

To provide guidelines on testing performed on patients undergoing kidney, bone marrow or stem cell and heart transplants.

B. Responsible Department/Scope:

i. Protocol owner/Implementer: Julie H Simmons/ Christina S Warren
ii. Protocol prepared by: Julie Jackson
iii. Who performs protocol: Department staff/management

C. Definitions: NA

BM: Bone Marrow
HPC: Hematopoietic Progenitor Cells, also referred to as Stem Cells
BMT: Bone Marrow Transplant
BMP: Bone Marrow Protocol

IRR: Irradiated
SCC: Soft Computer Consultants, Blood Bank computer system
PCW: Patient Caution Window in SCC that shows the patient's special needs, antibodies and antigen testing.
NMDP: National Marrow Donor Program
Titration: Semi quantitative method using serial twofold dilutions of serum/plasma to determine the antibody concentration
RT: Room temperature
BMT: Bone Marrow Transplant
TAB1-5: SCC test: Titer current sample for the following antibodies:
(Fya, Fyb, Jka, Jkb, K, k, Jsa, Kpa, S, s, M, N, U, HTLA)
TOAB1-3: SCC test: Titer previous antibody sample for the above antibodies.
TRH: SCC test: Titer current antibody sample for the following antibodies:
(C, E, D, c, e, V, Cw, Goa, Other (Rare antibody)
TBMTD: SCC test: BMT Donor ABO Titer (includes Anti-A, -A1, -B)
TBMTR: SCC test: BMT Recipient ABO Titer (includes Anti-A, -A1, -B)

D. Sections:

I. Kidney Transplant Testing
II. Bone Marrow/Stem Cell Transplant Testing
III. Heart Transplant Testing

2. Protocol:

I. Kidney Transplant Testing

1.0 Kidney transplant accreditation standards require that the recipient and/or donor have ABO/Rh testing performed on two separate samples.

2.0 Kidney **donors** (Group A or AB) are required to have A_1 lectin testing on two separate samples.
Refer to Routine: A_1 Lectin Testing and ABO/Rh Testing

3.0 SCC Test Codes for Kidney testing:

3.1 See chart below for list of kidney tests in SCC.

SCC TESTING FOR KIDNEY TRANSPLANTS					
SCC CODE	**TEST NAME**	**TESTS INCLUDED**	**DONOR OR RECIPIENT?**	**USED FOR:**	**NOTES**
KIDDN	Kidney Donor	ABO RH A1L	**Donor**	Testing donor, 1st sample	
KIDD2	Kidney Donor 2	ABO RH A1L	**Donor**	Testing donor, 2nd sample	
KDX	Kidney patient type and screen	ABO RH ABS	**Recipient**	Initial testing of patient by transplant clinic. Should not include BBID.	
KATSX	Kidney ABOi TSX	ABO RH ABS	**Recipient**	TSX for patient going to OR for ABOi kidney transplant. Should include BBID.	Also includes product code: XIKID to populate the PCW with special messages. See step 9.1
TKDIO	Kidney O Patient ABOi Titer	Recipient Anti-A Titer IgG Recipient Anti-A Titer IgM	**Recipient** Type group O	Testing patient for anti-A antibodies to determine eligibility for a ABOi A2 kidney	IgM anti-A (neutral card) IgG anti-A (DTT treated plasma in IgG card)
TKDIB	Kidney B Patient ABOi Titer	Recipient Anti-A Titer IgG	**Recipient** Type group B		IgG anti-A (IgG gel card)

3.1 A1 lectin testing (A1L) will be performed on all Kidney Transplant **donors** that are group A and/or group AB.

a. Cancel the A1L test in SCC if not needed.

b. The A_1 lectin testing will be documented in the computer system and on "Isohemagglutinin Titrations for Incompatible Kidney Transplants" if applicable.

c. An Antibody Identification Summary sheet will be completed for A_1 negative donors when the second sample is tested.

4.0 All Antibody Identification Summary sheets with Kidney Patient/Donor testing will be reviewed by management.

4.1 Management or designee will order "BOUT" for any patient results to be reviewed by medical director or pathologist to charge for the review.

5.0 The Medical Director will enter a comment into WakeOne that the donor is A_1 negative after the second sample is tested.

5.1 A_1 positive donors do not need a comment.

6.0 When requested, an anti-A titer will be performed on Group B and Group O recipients to determine eligibility for an A2 kidney:

6.1 For list of tests see Chart in step 3.0

6.2 Cells selected for anti-A titers will be fresh as possible A2 cells

6.3 When patient has other non ABO antibodies, the A2 cells must be antigen negative for the other antibody to avoid interference with the ABO titer.

6.4 Titers with A2 cells should be resulted with Anti-A titer either IgG and IgM.

6.5 The Medical Director will enter a comment into WakeOne for the recipient and/or donor titration of all isohemagglutinins.

a. Management or designee will order "BOUT" for any patient results to be reviewed by medical director or pathologist to charge for the review.

Refer to Specials: Titrations

6.6 The target Anti-A antibody prior to transplant is <8.

7.0 All isohemagglutinin (anti-A) titrations for kidney patients will be performed in gel and reported in computer system and on "Isohemagglutinin Titrations for Incompatible Kidney Transplants" card.

Refer to Attachment A: Isohemagglutinin Titrations for Incompatible Kidney Transplants

8.0 Aliquots of serum/plasma should be stored frozen at -25 to -35C until 1-year post transplant and are left in the storage box in freezer labeled: Kidney Patients.

9.0 At transplant of an A2 or A2B kidney to a B or O recipient two processes will occur to inform the Blood Bank that a transplant is about to occur:

9.1 This test will be ordered: **Type and Crossmatch Incompatible Kidney (KATSX)**

a. This will be used for blood products like a regular TSX.

b. When the Type and Crossmatch Incompatible Kidney is ordered a fake product order will also be placed which will trigger two messages to be added to the patient's PCW:

Incompatible Kidney Recipient	12/16/19 14:53 by 2913
Transfuse Plasma AB	12/16/19 14:53 by 2913

c. Transfusion support pre and post-transplant must take into consideration the ABO type of the recipient and donor. The recipient should be given their ABO type of packed cells, any type of platelets, and **Group AB plasma**.

d. *Titers may also be requested but do not have to be completed prior to start of kidney transplant.*

9.2 An email will be sent to this email address: ABOIncom_Kidney_DL@wakehealth.edu

a. This is a group email which includes:

i. the front desk email (BBFRONT)

ii. Blood Bank manager

iii. Blood Bank assistant manager

iv. BBIS

v. Blood Bank Supervisor

vi. Medical director

II. Bone Marrow/Stem Cell Transplant Testing

1.0 All patients for bone marrow/stem cell transplant must be flagged for Irradiation needs by entering these two special messages in the patient's PCW in SCC: Bone Marrow Protocol (BMP) and Irradiated Products Only (IRR).

1.1 For allos, other special message codes as to the blood product types that patient can receive are placed in the patient's PCW in SCC.

1.2 Other codes for allos:

TRFAB:	Transfuse AB plasma
TRPAB:	Transfuse AB platelets or washed A, B, O
TR_A:	Transfuse A red blood cells
TR_AN:	Transfuse A neg red blood cells
TR_B:	Transfuse B red blood cells
TR_BN:	Transfuse B neg red blood cells
TR_FA:	Transfuse plasma A/AB
TR_FB:	Transfuse plasma B/AB
TR_O:	Transfuse O red blood cells
TR_ON:	Transfuse O neg red blood cells
TR_PA:	Transfuse A/AB platelets or washed B/O
TR_PB:	Transfuse B/AB platelets or washed A/O

1.3 For patients that have one of the codes listed above for a particular red blood cell type management will enter the following fake antibody on the patient.

a. Go to Patient > Edit > Antibodies

b. Add new antibody: CHECK UNIT ABORH AGAINST PCW (<CKAB)

c. This will trigger an exception box to appear when issuing any red cell to the patient. The exception is to be answered by the tech to document that they have verified that the ABORh of the unit matches the special requirements in the patient's PCW

Refer to Special: BM/HPC Procedures and Protocols

2.0 The nurse coordinators for the bone marrow program initiate the Request to Place Patient on BMP form.

2.1 The techs assigned to Bone Marrow Lab will enter Bone Marrow Protocol (BMP) and Irradiation (IRR) in the patient's PCW in SCC so that all products are irradiated.

2.2 Testing is ordered by the techs assigned to Bone Marrow Lab.
Refer to Specials: BM/HPC Procedures and Protocols

3.0 BMT Patients for **Autologous** Donation will have the ABO/Rh confirmed on the specimen.

3.1 This request is generated by the techs assigned to bone marrow lab.

3.2 The recipient's sample is tested for ABO/Rh forward and reverse, antibody screen and Identification (if needed), and weak D testing, if indicated.

3.3 The type of transplant and date of transplant should be entered in the computer system by management.

3.4 "BMP" and "IRR" codes should be present in the patient's PCW in SCC as in Step #1. This should be verified.

3.5 Results are entered in SCC and are also recorded on the "Request to Confirm Group and Type" form. The form is returned to Bone Marrow Lab.

Refer to Attachment C: Request to Confirm Group and Type

4.0 BMT Patients with **Allogeneic** Donors will have the ABO/Rh confirmed on the donor product (BM or HPC).

4.1 The techs assigned to Bone Marrow Lab will order the test(s) and fill out a "Request to Confirm Group and Type" form

a. SCC test code: GTXBM

b. SCC test code for an ABORh recheck on a donor: TPLCK

Refer to Attachment C: Request to Confirm Group and Type

4.2 The donor sample is tested for ABO/Rh forward and reverse, antibody screen and weak D testing, if indicated.

4.3 The type of transplant and transplant date should be entered into the computer system.

a. Add a Note to Tech special message in the patient or donor's PCW and add the following information for either patient or donor:

i. For patient: Type of Transplant, NMDP# of Donor, ABO/Rh of Donor, Date of transplant must be entered in computer system.

ii. For Donor: Type of Transplant, NMDP# of Donor, ABO/Rh of Donor, Date of transplant must be entered in computer system.

4.4 Results are entered in SCC and are also recorded on the "Request to Confirm Group and Type" form. The form is returned to Bone Marrow Lab.

Refer to Attachment C: Request to Confirm Group and Type

5.0 Recipients of **Allogeneic** transplants must have a crossmatch performed with the donor to determine compatibility.

5.1 The techs assigned to Bone Marrow Lab will order the test and fill out a "Crossmatch Bone Marrow Donor with Recipient" form.

a. SCC Test Code: XMBM

Refer to Attachment D: Request Form- Crossmatch Bone Marrow Donor with Recipient

5.2 Both the recipient and donor should be tested for ABO/Rh and weak D if indicated, antibody screen and Identification if needed.

5.3 The crossmatch is performed between the donor and recipient at both immediate spin (IS) and antiglobulin (gel or PeG testing).

5.4 The Donor Current type should be cross referenced with the Donor Prior type in SCC and noted on the request form.

5.5 Results are entered in SCC and are also recorded on the "Request to Confirm Group and Type" form. The form is returned to Bone Marrow Lab.

Refer to Specials: BM/HPC Procedures and Protocols

6.0 Upon identification of the recipient and potential donor, the Bone Marrow Techs complete the Allogeneic Transplant Checklist.

Refer to Attachment E: Allogeneic Transplant Checklist

Refer to BMT:Allo: Completion of the Allogeneic Transplant Checklist

7.0 BMT Titrations

7.1 When patient is ABO incompatible with the BMT donor, the isoagglutinins of the patient are titered depending on the donor's type. **Patients receiving Group O BMT do not need to be titered.**

Refer to Attachment 3: Titration Protocol for BMT recipients and donors

7.2 SCC Orders for isohemagglutinin titers:

a. See chart below
b. Cancel any tests not needed

SCC BMT ABO TITER TESTS		
SCC CODE	**TEST NAME**	**TESTS INCLUDED**
TBMTD	BMT Donor ABO Titer	Anti-A titer Anti-A1 titer Anti-B titer
TBMTR	BMT Recipient ABO Titer	Anti-A titer Anti-A1 titer Anti-B titer

7.3 Use fresh reverse cells routinely for BMT titrations.

a. Cells selected for anti-A testing will be fresh as possible A1 and A2 cells
b. Cells selected for anti-B testing will be fresh as possible B cells

7.4 **When patient has other non ABO antibodies, the A1, A2, B cells must be antigen negative for the other antibody to avoid interference with the ABO titer.**

7.5 All titers will be performed using **gel method 40 minutes** at 37C.

a. DO NOT use gel ficin treated cells

7.6 Record titer endpoint in SCC

7.7 **The titer endpoint should be recorded as a whole number–** not number 1 and semicolon **(1:)**

Example: Correct titer interpretation: 8
Example: Incorrect titer interpretation: 1:8

7.8 Record titer interpretation when NO serological reactions are detected as:

a. **Interp: "negative".**

7.9 **Note:** a significant difference in titers is three or more dilutions.

7.10 Freeze aliquots of serum/plasma at -25C to -30C for 1 year.

7.11 When isohemagglutinins from the patient are incompatible with the donor, titration of the patient's isohemagglutinins will provide a basis of the strength and hemolytic ability of the antibody as the patient engrafts the donor's cells.

7.12 Other non ABO antibodies of patient and donor need to be titered when the donor or patient respectively have the corresponding antigen.

8.0 BMT DONOR & RECIPIENT TESTING PROTOCOL

8.1 Perform isohemagglutinin titers as needed based on incompatibility
Refer to Attachment F: Titration and Processing for BMT Recipients and Donors

8.2 BMT Testing in SCC:

a. All tests are ordered under the recipient's MRN/encounter.

BMT TESTS IN SCC				
SCC CODE	**TEST NAME**	**TESTS INCLUDED**	**DONOR OR RECIPIENT SAMPLE?**	**NOTE**
TSXBM	Type and Screen BMT Donor	ABOD RHD ABSD	**Donor**	The ABOD and RHD are designed as Donor tests that do not interfere with the patient's historical ABO and Rh
GTXBM	ABO/Rh BMT Donor	ABO/Rh forward typing	**Donor**	Results do not interfere with the patient's historical ABO and Rh
TPLCK	Transplant ABO CK	ABO/Rh forward typing	**Donor**	This is ordered to confirm the ABORh when there is no previous history. (Do not order an ABOCK as this will affect the patient's historical ABORH)
WEAKD	Weak D	Weak D	**Donor or Recipient**	Add on test in SCC when donor or recipient is Rh negative
XMBM	XM BMT Pt/Donor	ABOD RHD ABSD XMBMT	**Donor, Donor XM with Recipient's plasma**	The ABOD and RHD are designed as Donor tests that do not interfere with the patient's historical ABO and Rh
TBMTD	BMT Donor ABO Titer	Anti-A Anti-A1 Anti-B titers	**Donor**	Cancel any titers not needed
TBMTR	BMT Recipient ABO Titer	Anti-A Anti-A1 Anti-B titers	**Recipient**	Cancel any titers not needed
TSX	Type and Screen	ABO RH ABS	**Recipient**	
GTX	Group and Type	ABO RH	**Recipient**	
ABOCK	ABO Recheck	ABORH	**Recipient**	

8.3 If any other antibodies are present:

a. Perform antibody identification

b. Titer any antibody found

i. Order TAB1-5 or TOAB1-3 for other antibody titers as needed
Refer to Titrations:BB.SP.1004

c. Send sample to BCW for red cell genotype (RRGEN)

d. Inform BMT Medical Director

III. Heart Transplant Testing

1.0 Heart transplants require that ABO/Rh testing be performed on the organ as expeditiously as possible to prevent damage to the organ.

2.0 SCC test codes for Heart Transplant Testing:
- 2.1 HRT1 (Heart Recipient Group/type)
- 2.2 HRT2 (Heart Recipient Group/type – second typing)
- 2.3 HRTDN (Heart donor Group Type)

3.0 Time is critical. The technologist must evaluate the situation and determine the best course of action.
- 3.1 Computer ordering and entry can be done after the fact.
- 3.2 A manual requisition should be created to record test results if it cannot be entered into the computer right away.
- 3.3 ABO/Rh testing and ABO/Rh recheck should be performed immediately and documented on requisition by two separate techs.
- 3.4 A copy of the requisition can be given to the OR if needed.
  Refer to Routine: ABO/Rh Testing

3. Review/Revised/implemented:

All protocols must be reviewed as stated in the Document Change Control protocol. All new protocols that have major revisions must be signed by the Department Chairman. All reviewed protocols with minor revisions can be signed by the designated section medical director or designee.

4. Related Protocols:

Specials: BM/HPC Procedures and Protocols

5. References:

Gloor, James M. et.al *A Comparison of Splenectomy versus Intensive Posttransplant Antidonor Blood Group Antibody Monitoring without Splenectomy in ABO-Incompatible Kidney Transplantation.* Transplantation, Volume 80, Number 11, December 15, 2005

6. Attachments:

Attachment A: Isohemagglutinin Titrations for Incompatible Kidney Transplants
Attachment B: ABO Incompatible Renal Transplant Recommendations Table
Attachment C: Request to Confirm Group and Type
Attachment D: Request Form- Crossmatch Bone Marrow Donor with Recipient
Attachment E: Allogeneic Transplant Checklist
Attachment F: Titration and Processing for BMT Recipients and Donors

7. Revised/Reviewed Dates and Signatures:

See Document Change Control

Document Change Control			
Title: Transplant Testing Protocols			
Previous title:			
Written date	9/26/12	**Written by:**	J.Simmons
Validation date	11/9/12	**Validation by**	A.Molnar
Reviewed date	11/13/12	**Reviewed by**	MJones
Approved date	11/14/12	**Approved by**	EFadeyi
Approved date		**Approved by**	
Effective date in use	11/15/12	**In use by**	MJones

Revisions

Revised Date	By	MD Date	By	MD Date	By	Review Date	By	Effective Date	By
9/29/15	JHS	10/8/15	GP	10/6/15	EF	10/5/15	JHS	10/8/15	JHS
Validate Date	**By**	**Revisions :** Put into standard format with only 1 document change control. Added ordering PFLTR for BMT patients and kidney transplants to procedure.							
10/1/15	MRJ								

Revised Date	By	MD Date	By	MD Date	By	Review Date	By	Effective Date	By
6/20/17	JHS	6/28/17	GP	6/29/17	EF	6/28/17	MRJ	6/30/17	JHS
Validate Date	**By**	**Revisions:** Updated for SCC. Updated attachments							
6/28/17	AR								

Revised Date	By	MD Date	By	MD Date	By	Review Date	By	Effective Date	By
9/14/18 2/6/20	JHS/ JJ			2/10/20	EF	2/7/2020 JJ		2/28/2020 JJ	
Validate Date	**By**	**Revisions:** Updated for Incompatible Kidney. Moved some transplant protocols to this protocol from titrations protocol. Reorganized the format for BMT Donor and Recipient. Added Att F. added new fake antibody <CKAB and new Kidney tests. Updated change in non-ABO titer names.							
2/6/20	LW								

Locations		**Out of Use: Date:**		**By**	
		Reason			

Reviews: Record date/initials

Date	Initials	Date	Initials	Date	Initials	Date	Initials
9/15/13	gp						
10/21/13	js						
11/22/17	JHS						

Titration and Processing for BMT Recipients and Donors

RECIPIENT	DONOR	TITRATION ON:		PROCESSING - To be determined by the Medical Director
		DONOR (TBMTD)	RECIPIENT (TBMTR)	
ABO/Rh identical	ABO/Rh identical			No processing required
AB	A	Anti-B		ABO Compatible (Minor incompatibility)
AB	B	Anti-A1 and anti-A		**Red cells** acceptable for transfusion, if crossmatch compatible.
AB	O	Anti-A1, anti-A, anti-B		**Plasma** not acceptable for transfusion
A	O	Anti-A1 and anti-A		*Processing* – Plasma Depletion
B	O	Anti-B		
A	AB		Anti-B	ABO Incompatible (Major Incompatibility)
B	AB		Anti-A1 and anti-A	**Plasma** acceptable for transfusion, if donor antibody screen is negative.
O	AB		Anti-A1, anti-A, anti-B	**Red cells** not acceptable for transfusion
O	A		Anti-A1 and anti-A	
O	B		Anti-B	*Processing* – Red Cell Depletion
B	A	Anti-B	Anti-A1 and anti-A	ABO Incompatible (Major/Minor Incompatibility)
A	B	Anti-A1 and anti-A	Anti-B	Neither **Red Cells or Plasma** acceptable for transfusion
				Processing – Red Cell and Plasma Depletion
Rh negative	Rh positive			*Processing* – Red Cell Depletion. Only if patient demonstrates preformed allo anti D. Otherwise, consider Rh Immune Globulin.
Rh positive	Rh negative			No *processing* required unless the donor has anti - D then plasma depletion.