# Applicable Laboratory(s)):

North Carolina Baptist Hospital (NCBH)

Lexington Medical Center (LMC)

Davie Medical Center (DMC)

Wilkes Medical Center (WMC)

High Point Medical Center (HPMC)

Westchester

Clemmons

# Procedure Statement

The purpose of this policy is to provide guidelines on testing performed on patients undergoing kidney, bone marrow or stem cell and heart transplants.

# Scope

This policy applies to Blood Bank Department staff and management.

# Definitions

1. Policy: As defined in the Policy on Creating and Amending Policy, a statement of principle that is developed for the purpose of guiding decisions and activities related to governance, administration, or management of care, treatment, services or other activities of WFBH.  A policy may help to ensure compliance with applicable laws and regulations, promote one or more of the missions of WFBH, contain guidelines for governance, and set parameters within which faculty, staff, students, visitors and others are expected to operate.
2. WFBH Lab System: Wake Forest Baptist Lab System is a health system that includes Wake Forest Baptist Medical Center and all affiliated organizations including Wake Forest University Health Sciences (WFUHS), North Carolina Baptist Hospital (NCBH), Lexington Medical Center (LMC), Davie Medical Center (DMC), Wilkes Medical Center (WMC), High Point Medical Center (HPMC), Lab at Westchester and Lab at Clemmons.
3. **BM:** Bone Marrow
4. **HPC:** Hematopoietic Progenitor Cells, also referred to as Stem Cells
5. **BMP:** Bone Marrow Protocol
6. **IRR:** Irradiated
7. **SCC:** Soft Computer Consultants, Blood Bank computer system
8. **PCW:** Patient Caution Window in SCC that shows the patient’s special needs, antibodies and antigen testing.
9. **NMDP:** National Marrow Donor Program
10. **Titration:** Semi quantitative method using serial twofold dilutions of serum/plasma to determine the antibody concentration
11. **RT:** Room temperature
12. **SCTCT:** Stem Cell Transplant Cellular Therapies (Bone Marrow Transplant)
13. **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)

1. **TOAB1-3:** SCC test: Titer previous antibody sample for the above antibodies.
2. **TRH:** SCC test: Titer current antibody sample for the following antibodies:

(C, E, D, c, e, V, Cw, Goa, Other (Rare antibody)

1. **TBMTD:** SCC test: BMT Donor ABO Titer (includes Anti-A, -A1, -B)
2. **TBMTR:** SCC test: BMT Recipient ABO Titer (includes Anti-A, -A1, -B)

# Policy Guidelines

# Sections:

I. Kidney Transplant Testing

II. Bone Marrow/Stem Cell Transplant Testing

III. Heart Transplant Testing

1. **Kidney Transplant Testing**
2. Kidney transplant accreditation standards require that the recipient and/or donor have ABO/Rh testing performed on two separate samples.
3. Kidney **donors** (Group A or AB) are required to have A1 lectin testing on two separate samples.

*Refer to BB-POL-0002: Anti-A1 Lectin Testing Information and Protocols.*

*Refer to BB-POL-0001: ABO/Rh Protocol*

1. SCC Test Codes for Kidney testing:
   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 | 1. 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) |

* 1. A1 lectin testing (A1L) will be performed on all Kidney Transplant **donors** that are group A and/or group AB.
     1. Cancel the A1L test in SCC if not needed.
     2. The A1 lectin testing will be documented in the computer system and on "Isohemagglutinin Titrations for Incompatible Kidney Transplants" if applicable.
     3. An Antibody Identification Summary sheet will be completed for A1 negative donors when the second sample is tested.

1. All Antibody Identification Summary sheets with Kidney Patient/Donor testing will be reviewed by management.
   1. Management or designee will order “BOUT” for any patient results to be reviewed by medical director or pathologist to charge for the review.
2. The Medical Director will enter a comment into WakeOne that the donor is A1 negative after the second sample is tested.
   1. A1 positive donors do not need a comment.
3. When requested, an anti-A titer will be performed on Group B and Group O recipients to determine eligibility for an A2 kidney:
   1. For list of tests see Chart in step 3.0
   2. Cells selected for anti-A titers will be fresh as possible A2 cells
   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.
   4. Titers with A2 cells should be resulted with Anti-A titer either IgG and IgM.
   5. The Medical Director will enter a comment into WakeOne for the recipient and/or donor titration of all isohemagglutinins.
      1. 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 BB-SOP-0066: Titrations*

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

1. 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: Isohemagglutinin Titrations for Incompatible Kidney Transplants*

1. At transplant of an A2 kidney to a B or O recipient two processes will occur to inform the Blood Bank that a transplant is about to occur:
   1. This test will be ordered: **Type and Crossmatch Incompatible Kidney (KATSX)**
      1. This will be used for blood products like a regular TSX.
      2. 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:



* + 1. 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**.
    2. Titers may also be requested but do not have to be completed prior to start of kidney transplant.
  1. An email will be sent to this email address: [ABOIncom\_Kidney\_DL@wakehealth.edu](mailto:ABOIncom_Kidney_DL@wakehealth.edu)
     1. This is a group email which includes:
        1. the front desk email (BBFRONT)
        2. Blood Bank manager
        3. Blood Bank assistant manager
        4. BBIS
        5. Blood Bank Supervisor
        6. Medical director

1. **Bone Marrow/Stem Cell Transplant Testing**
2. Patients scheduled for Stem Cell Transplant are placed on Bone Marrow Protocol to assure they are given leukoreduced and irradiated products.
3. 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). Typically this and the following codes are entered by management.
   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.

*Refer to Attachment 1: ABO/Rh Incompatible Bone Marrow Transplantation Transfusion Recommendations*

* 1. 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. 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.
     1. Go to Patient > Edit > Antibodies
     2. Add new antibody: CHECK UNIT ABORH AGAINST PCW (<CKAB)
     3. 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 BB-SOP-0114: BM HPC Procedures*

1. The nurse coordinators for the stem cell program initiate the Request to Place Patient on BMP form.
   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. Testing is ordered by the techs assigned to Bone Marrow Lab.

*Refer to BB-SOP-0114: BM HPC Procedures*

1. SCTCT Patients for **Autologous** Donation will have the ABO/Rh confirmed on the specimen.
   1. This request is generated by the techs assigned to bone marrow lab.
   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. The type of transplant and date of transplant should be entered in the computer system by management.
   4. "BMP" and "IRR" codes should be present in the patient’s PCW in SCC as in Step #1. This should be verified.
   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 SCT-FORMS-0107: Request to Confirm Group and Type*

1. Patients and donors are tested for ABO Group, Rh type and antibody screen.
2. SCTCT Patients with **Allogeneic** Donors will have the ABO/Rh confirmed on the donor product (BM or HPC).
   1. The techs assigned to Bone Marrow Lab will order the test(s) and fill out a “Request to Confirm Group and Type” form
      1. SCC test code: GTXBM
      2. SCC test code for an ABORh recheck on a donor: TPLCK
   2. The donor sample is tested for ABO/Rh forward and reverse, antibody screen and weak D testing, if indicated.
   3. The type of transplant and transplant date should be entered into the computer system.
      1. Add a Note to Tech special message in the patient or donor’s PCW and add the following information for either patient or donor:
         1. For patient: Type of Transplant, NMDP# of Donor, ABO/Rh of Donor, Date of transplant must be entered in computer system.
         2. For Donor: Type of Transplant, NMDP# of Donor, ABO/Rh of Donor, Date of transplant must be entered in computer system.
   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.
3. Patients and/or donors who have antibodies and/or positive DAT will be further tested for RBC genotype.
4. Recipients of **Allogeneic** transplants must have a crossmatch performed with the donor to determine compatibility.
   1. Samples must be properly identified.

*Refer to BB-SOP-0114: BM-HPC Procedures*

* 1. The techs assigned to Bone Marrow Lab will order the test and fill out a “Crossmatch Bone Marrow Donor with Recipient” form.
     1. SCC Test Code: XMBM

*Refer to SCT-FORMS-0148: Crossmatch Bone Marrow Donor with Recipient*

* + 1. Both the recipient and donor should be tested for ABO/Rh and weak D if indicated, antibody screen and Identification if needed.
  1. The crossmatch is performed between the donor and recipient at both immediate spin (IS) and antiglobulin (gel or PEG testing).
  2. The Donor Current type should be cross referenced with the Donor Prior type in SCC and noted on the request form.
  3. 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 BB-SOP-0114: BM HPC Procedures*

1. Upon identification of the recipient and potential donor, the Bone Marrow Techs complete the Allogeneic Transplant Checklist.
2. **SCTCT Titrations**
   1. When patient is ABO incompatible with the SCTCT donor, the isoagglutinins of the patient are titered depending on the donor’s type. **Patients receiving Group O SCTCT do not need to be titered**.

*Refer to Attachment: Titration Protocol for SCTCT recipients and donors*

* 1. SCC Orders for isohemagglutinin titers:
     1. See chart below
     2. Cancel any tests not needed

|  |  |  |
| --- | --- | --- |
| **SCC SCTCT 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 |

* 1. Use fresh reverse cells routinely for SCTCT titrations.
     1. Cells selected for anti-A testing will be fresh as possible A1 and A2 cells
     2. Cells selected for anti-B testing will be fresh as possible B cells
  2. **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.**
  3. All titers will be performed using **gel method 40 minutes** at 37C or automated on Vision Max.
     1. DO NOT use gel ficin treated cells
  4. Record titer endpoint in SCC
  5. **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

* 1. Record titer interpretation when NO serological reactions are detected as:
     1. **Interp: “negative”.**
  2. **Note:** a significant difference in titers is three or more dilutions.
  3. 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.
  4. Other non ABO antibodies of patient and donor need to be titered when the donor or patient respectively have the corresponding antigen.

1. **SCTCT DONOR & RECIPIENT TESTING PROTOCOL**
   1. Perform isohemagglutinin titers as needed based on incompatibility

*Refer to Attachment: Titration and Processing for SCTCT Recipients and Donors*

* 1. SCTCT Testing in SCC:
     1. All tests are ordered under the recipient’s MRN/encounter.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SCTCT TESTS IN SCC** | | | | |
| **SCC CODE** | **TEST NAME** | **TESTS INCLUDED** | **DONOR OR RECIPIENT SAMPLE?** | **NOTE** |
| **TSXBM** | Type and Screen SCTCT 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 SCTCT 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 SCTCT 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** | SCTCT Donor ABO Titer | Anti-A  Anti-A1  Anti-B titers | **Donor** | Cancel any titers not needed |
| **TBMTR** | SCTCT 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** |  |

* 1. If any other antibodies are present:
     1. Perform antibody identification
     2. Titer any antibody found
        1. Order TAB1-5 or TOAB1-3 for other antibody titers as needed

*Refer to* *BB-SOP-0066: Titrations*

* + 1. Send sample to BCW for red cell genotype (RRGEN)
    2. Inform SCTCT Medical Director

1. All blood specimens from patient and donors will be retained in SCTCT lab

for 2 years after collection.

1. **Heart Transplant Testing**
2. Heart transplants require that ABO/Rh testing be performed on the organ as expeditiously as possible to prevent damage to the organ.
3. SCC test codes for Heart Transplant Testing:
   1. HRT1 (Heart Recipient Group/type)
   2. HRT2 (Heart Recipient Group/type – second typing)
   3. HRTDN (Heart donor Group Type)
4. Time is critical. The technologist must evaluate the situation and determine the best course of action.
   1. Computer ordering and entry can be done after the fact.
   2. A manual requisition should be created to record test results if it cannot be entered into the computer right away.
   3. ABO/Rh testing and ABO/Rh recheck should be performed immediately and documented on requisition by two separate techs.
   4. A copy of the requisition can be given to the OR if needed.

# 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

# Related policies/procedures (navex)

# Attachments/Linked documents (title 21)

Titration and Processing for SCTCT Recipients and Donors

Attachment 1: ABO/Rh Incompatible Bone Marrow Transplant Transfusion Recommendations.

BB-POL-0002: Anti-A1 Lectin Testing Information and Protocols.

BB-POL-0001: ABO/Rh Protocol

BB-SOP-0066: Titrations

BB-SOP-0114: BM HPC Procedures

SCT-FORMS-0148: Crossmatch Bone Marrow Donor with Recipient

# Revision Dates: Review Change Summary as represented in Title 21.

**Titration and Processing for SCTCT Recipients and Donors**

**ATTACHMENT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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  AB  AB  A  B | A  B  O  O  O | Anti-B  Anti-A1 and anti-A  Anti-A1, anti-A, anti-B  Anti-A1 and anti-A  Anti-B |  | ABO Compatible (Minor incompatibility)  **Red cells** acceptable for transfusion, if crossmatch compatible.  **Plasma** not acceptable for transfusion  *Processing* – Plasma Depletion |
| A  B  O  O  O | AB  AB  AB  A  B |  | Anti-B  Anti-A1 and anti-A  Anti-A1, anti-A, anti-B  Anti-A1 and anti-A  Anti-B | ABO Incompatible (Major Incompatibility)  **Plasma** acceptable for transfusion, if donor antibody screen is negative.  **Red cells** not acceptable for transfusion  *Processing* – Red Cell Depletion |
| B  A | A  B | Anti-B  Anti-A1 and anti-A | Anti-A1 and anti-A  Anti-B | ABO Incompatible (Major/Minor Incompatibility)  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. |

***Attachment 1: ABO/Rh Incompatible SCTCT Transfusion Recommendations***

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Recipient** | **Donor** | **Preparative Regimen and Post Infusion** | | | | | | |  | **Recipient Red Cells Undetectable** | | |
| **ABO Major Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** | **3rd** | **4th** | **1st** | **2nd** |  |  |  |
| O | A | O | A | AB | \*B |  | A | AB | A | A | A |
| O | B | O | B | AB | \*A |  | B | AB | B | B | B |
| A | AB | A | AB | \*A | \*B |  | AB |  | AB | AB | AB |
| B | AB | B | AB | \*B | \*A |  | AB |  | AB | AB | AB |
| O | AB | O | AB | \*A | \*B |  | AB |  | AB | AB | AB |
|  | | | | | | | | |  | | |
| **ABO Minor Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** | **3rd** | **4th** | **1st** | **2nd** |  |  |  |
| A | O | O | A | AB | \*B | \*O | A | AB | O | O | O |
| B | O | O | B | AB | \*A | \*O | B | AB | O | O | O |
| AB | O | O | AB | \*A | \*B | \*O | AB |  | O | O | O |
| AB | A | A | AB | \*A | \*B | \*O | AB |  | A | A | A |
| AB | B | B | AB | \*B | \*A | \*O | AB |  | B | B | B |
|  | | | | | | | | |  |  |  |
| **ABO Major/Minor Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** | **3rd** | **4th** | **1st** | **2nd** |  |  |  |
| A | B | O | AB | \*A | \*B | \*O | AB |  | B | B | B |
| B | A | O | AB | \*B | \*A | \*O | AB |  | A | A | A |
|  | | | | | | | | |  | | |
| **No Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** | **3rd** | **4th** | **1st** | **2nd** |  |  |  |
| A | A | A | A | AB | B | O | A | AB | A | A | A |
| B | B | B | B | AB | A | O | B | AB | B | B | B |
| O | O | O | O | A | B | AB | O | A/B/AB | O | O | O |
| AB | AB | AB/A | AB | A | B | O | AB | A\*\* | AB | AB | AB |
|  | | | | | | | | |  | | |
| **Rh Major Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** |  |  | **1st** |  |  |  |  |
| Negative | Positive | NEG | NEG | POS |  |  | NA |  | POS | POS | NA |
|  | | | | | | | | |  | | |
| **Rh Minor Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | **1st** | **2nd** |  |  | **1st** |  |  |  |  |
| Positive | Negative | NEG | POS | NEG |  |  | NA |  | NEG | NEG | NA |
|  | | | | | | | | |  | | |
| **No Rh Incompatibility** | | **RBC** | **PLTS** | | | | **PLSMA** | | **RBC** | **PLTS** | **PLSMA** |
|  | 1st | 2nd |  |  | 1st |  |  |  |  |
| Negative | Negative | NEG | NEG | POS |  |  | NA |  | NEG | NEG | NA |
| Positive | Positive | POS | POS | NEG |  |  | NA |  | POS | POS | NA |

\*These platelets may require washed or volume reduction prior to issue, consult with medical director.

\*\*Consult with medical director.