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Document Contact	Kelly Sartor
Area	Laboratory-Blood Bank
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Resolution of Rh Discrepancies - Blood Bank

Document Type: Policy

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I. PURPOSE AND OBJECTIVE:

The purpose of this document is to provide the Blood Bank staff with policies and procedures to be used in the resolution of Rh typing discrepancies.

II. SCOPE:

This document applies to patients when an Rh discrepancy is observed, including neonates.

III. INTRODUCTION:

A. Rh discrepancies may occur when:
   1. The Rh of the current sample is not in agreement with the Rh of an historical sample, or
   2. The Rh graded reactions are not valid, or
   3. The graded reactions cannot be interpreted as described in section VIII *Interpretations*, or
   4. Different Rh reactions are obtained on the same sample when using different reagents or methodologies.

B. Some of the more frequently encountered Rh discrepancies may be caused by:
   1. The recent transfusion of RBCs with a dissimilar Rh type
   2. Weak D / partial D patients
   3. Reactive inert monoclonal control in gel testing
   4. Reactive Rh control in tube testing
   5. Wrong Blood in Tube (WBIT) Events

6. Mistyped Samples / Technical error
7. Rouleaux formation or cold reacting antibodies, which may present as a reactive inert monoclonal control (gel) or a reactive Rh control (tube)
8. Variation in activity and composition of commercial testing antisera

IV. CLINICAL SIGNIFICANCE:

A. Rh discrepancies are commonly caused by a weak D expression. Many different mutations may cause the weak D expression. This facility does not differentiate between weak D and partial D; molecular testing by a reference laboratory would be required to do so.

B. Weak D is a quantitative variant of the Rh antigen; a reduced expression of the Rh antigen is displayed on the intracellular RBC membrane.
   1. Most weak D patients do not develop anti-D.

C. Partial D is a qualitative variant of the Rh antigen; some epitopes of the Rh antigen are lacking on the extracellular RBC membrane.
   1. Partial D patients can make anti-D, which may cause hemolytic transfusion reactions and hemolytic disease of the fetus / newborn (HDFN).

D. Due to variable reactivity, and the difficulty to differentiate between weak D and partial D, and the capability of partial D patients to develop anti-D, it is preferable to treat selected weak D and partial D patients as Rh negative for transfusion and Rh Immune Globulin (RhIG) purposes.

E. Weak D testing is not routinely performed on pre-transfusion samples or samples from obstetrical patients although it may be used to resolve a Rh discrepancy.

F. Weak D positive and partial D positive patients are treated in the same manner as described throughout this document.

G. Weak D testing is routinely performed on neonatal samples to determine whether the Rh-negative or weak D positive mother is a candidate for RhIG administration. Refer to site specific Transfusion Medicine policies, *Cord Blood Evaluation* and / or *Rh Typing of Cord Blood Samples* for additional information.

V. DEFINITIONS / ACRONYMS:

A. **Rh discrepancy**: Generic term for a variety of situations in which the interpretation of a patient or donor's Rh results are unclear.

B. **RND (Rh not determined)**: If the Rh typing discrepancy of a patient cannot be resolved at that time, then the patient's Rh type is considered "Not Determined".

C. **Mixed field (MF)**: A sample that contains two (2) distinct populations of red cells, usually as a result of recent RBC transfusions of a dissimilar ABO or Rh type as the patient.
   1. Mixed-field reaction results when one population is agglutinated in testing, while the other population is not. Referred to as “dual population” (dp) by the Vision™.

D. **Rouleaux**: Red cells that assume a stacked-coin formation in testing due to an abnormality with the patient’s serum protein.
   1. Rouleaux is most readily observed on microscopic examination.

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E. **WBIT**: Wrong blood in tube collection error is when a sample is drawn from the wrong patient, so that the identifying information of the patient on the label does not correlate with the patient from whom the blood in the tube was drawn.

F. **Internal Variance**: Report made internally in the Blood Bank for documentation of an incident such as error detected, accident, complaint, unplanned deviation, or incident for review, evaluation, investigation, and correction.

G. **QSR (Quality Safety Report)**: Report made in the hospital incident reporting system (i.e. RL Solutions) regarding any process / incident inconsistent with the routine operation of the hospital or the routine care of patients in any setting. This includes errors that result in actual or potential injury to a patient or visitor, including near misses or unsafe conditions.

H. **Designee**: Any Blood Bank technical director, or transfusion medicine fellow.

VI. POLICIES:

A. Flowchart for Resolution of Rh Discrepancies

1. Upon encountering any Rh discrepancy, the technologist shall follow the *Flowchart for Resolution of Rh Discrepancies* in the *Procedure* section of this document.

B. Unresolved ABO or Rh Discrepancies

1. If the Rh discrepancy remains unresolved then refer to the section *Unresolved Rh Discrepancies-Transfusion Required* in Transfusion Medicine policy, *Resolution of ABO and Rh Discrepancies*, which indicates that Rh-negative RBCs should be used if transfusion is necessary.

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C. Resolution of Rh Discrepancies for Patients who have Recently been Transfused

1. If the patient has been transfused with Rh dissimilar RBCs in the last 90 days, refer to Transfusion Medicine policy, *Resolution of ABO or Rh Discrepancies for Patients who have been Recently Transfuse*d. The patient's Rh testing may appear as a mixed-field / dual population reaction in this case.

D. Resolution of Rh Discrepancies when the Inert Monoclonal Control and / or the Tube Control is Reactive

1. If the inert monoclonal control is reactive in gel testing, attempt to resolve the discrepancy by typing in the tube method.
2. If the Rh control is reactive in tube testing, attempt to resolve the discrepancy as follows:
    a. Repeat the typing using a washed cell suspension.
    b. If necessary, the cell suspension may be washed several times, and may be washed with warm saline.
    c. If the inert control is reactive when performing Weak D Testing (AHG), perform a tube DAT. If this DAT is positive, the test is invalid and the patient must be considered RND until resolved with Rh D molecular genotype or repeat Weak D testing performed at a later date. If necessary

consult the Medical Director.

E. Resolution of Rh Discrepancies for Patients who are Weak D Positive

1. **Initial Weak D Positive Interpretation**
    a. After other potential Rh discrepancy causes have been considered, the patient shall be considered weak D positive if the following conditions are met:
        i. The gel Rh reaction is w+, 1+, 2+, or 3+ and the inert monoclonal control is non-reactive, or
        ii. The tube Rh reaction is w+ or 1+ and the Rh control is non-reactive, or
        iii. The tube Rh reactions with antisera from two different manufacturer's do not agree. Example If a neonate tests negative with Ortho reagent and positive with Gamma, they will be interpreted as Weak D.
        iv. The gel and tube results do not agree when testing the same sample. For example:
            A. In one method (most likely the gel) the patient appears to be Rh positive, and in the other method (most likely the tube) the patient appears to be Rh negative on the same sample.
            B. The weak D test of a neonatal sample is found to be positive (the weak D test was performed to determine maternal RhIG candidacy).
            C. If anti-D is identified in a patient who otherwise appears to be Rh positive, consider the possibility that the patient is a partial D or that the patient has a warm autoantibody with D-like specificity. It may be necessary to consult the Medical Director.
2. **Patients Who are Historically Weak D Positive**
    a. The Blood Bank computer may indicate that the patient is historically weak D positive by a special message, or the Rh of record (on the demographic screen) may indicate that the patient is weak D positive.
    b. It is helpful to remember the phrase “once a weak D, always a weak D.” If a patient is historically weak D positive, the following policies apply:
        i. The Rh of all subsequent ABO/Rh or NPR tests will be interpreted as weak D positive, regardless of the Rh reactions observed with the subsequent samples. In some case, this will require a supervisor override.
        ii. The applicable canned message should be added to the ABO/Rh test as described in the section, *Canned Messages for Patients who are Weak D Positive or with Unresolved Rh Discrepancies*.
        iii. The Rh of record (on the demographic screen) shall remain “weak D positive,” regardless of the Rh reactions observed on subsequent samples.
        iv. Weak D testing is not required on subsequent samples of patients who are historically weak D positive.
3. **Weak D Testing**
    a. Weak D Testing is not indicated for the following:

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i. Weak D testing is not indicated for routine pre-transfusion testing or for obstetrical patients.

ii. Weak D testing is not indicated for patients who have developed anti-D.

A. Some partial D patients are capable of developing anti-D.

b. Weak D testing on a neonatal sample is indicated to determine whether a Rh negative or weak D positive mother is a candidate for RhIG administration.

c. Although weak D testing is not routinely performed, it may be used to resolve a Rh discrepancy.

i. For example: The historical record indicates that the patient was Rh positive. Current testing by both the gel and tube methods appear to indicate that the patient is Rh negative. The weak D test is performed on the current sample, and indicates that the patient is weak D positive.

Refer to Transfusion Medicine Policy, Weak D Testing

4. **Canned Messages for Patients who are Weak D Positive or with Unresolved Rh Discrepancies**

a. The technologist should add the appropriate canned message to the patient's ABO/Rh test, depending on the patient's age / sex / description, and whether the patient is weak D positive (code starts with **WK+**) or whether the patient has an unresolved Rh discrepancy (code starts with **RND**).

b. Females within childbearing age (≤ 50 years old):

i. **WK+CB**: The patient may be weak D or partial D positive. Rh negative RBCs will be used if transfusion is necessary. Patient may be a RhIG candidate. Consult the Blood Bank with any questions.

ii. **RNDCB**: Unable to determine the Rh. Rh negative RBCs will be used if transfusion is necessary. Patient may be a RhIG candidate. Consult the Blood Bank with any questions.

c. Males ≤ 18 years old:

i. **WK+YM**: The patient may be weak D or partial D positive. If transfusion is necessary, the Blood Bank will attempt to provide Rh negative RBCs.

ii. **RNDYM**: Unable to determine the Rh. If transfusion is necessary, the Blood Bank will attempt to provide Rh negative RBCs.

d. Females > 50 and males > 18 years old

i. **WK+OL**: The patient may be weak D or partial D positive. The Rh of any RBCs that may be required for transfusion will be based on Transfusion Medicine procedures.

ii. **RNDOL**: Unable to determine the Rh. The Rh of any RBCs that may be required for transfusion will be based on Transfusion Medicine procedures.

e. Neonates delivered at Beaumont to Rh-negative or weak D positive mothers

i. **WK+B**: This neonate may be weak D or partial D positive. If transfusion is necessary, the Blood Bank will provide Rh negative RBCs. The obstetric patient may be a RhIG candidate. Consult the Blood Bank with any questions.

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ii. **RNDB**: Unable to determine the neonate's Rh. If transfusion is necessary, the Blood Bank will provide Rh negative RBCs. The obstetric patient may be a RhIG candidate. Consult the Blood Bank with any questions.

f. Add **DVAR** canned message to the result for the first time Rh discrepancy.

5. **Crossmatching for Weak D Positive Patients and Patients with Unresolved Rh Discrepancies**
   a. Determine the appropriate donor Rh, as indicated in the table, *Rh Selection of RBCs and Platelets*.
   b. For weak D positive patients, an electronic crossmatch may be performed.
   c. For patients with unresolved Rh discrepancies, a serologic crossmatch is required by the computer system. An immediate-spin crossmatch may be performed.
   d. If the patient has unexpected antibodies in addition to an unresolved Rh discrepancy, then antihuman globulin crossmatches (usually by the gel method) are required; refer to Transfusion Medicine policy, *Policies for Providing Red Blood Cells to Patients with Unexpected Antibodies*. Because a gel crossmatch is performed in this case, it is not necessary to also perform an immediate-spin crossmatch.
   e. Rh positive RBCs shall not be issued if the patient has anti-D.

6. **Transfusion of Components that are not Rh Compatible**
   a. The Blood Bank will attempt to dispense RBCs and platelets as described in the section above, *Crossmatching for Weak D Positive Patients and Patients with Unresolved Rh Discrepancies*. However, if RBCs or platelets that are not Rh compatible must be dispensed, then the patient's physician must be notified after the event if the patient is:
      i. A female 50 years old or less, or
      ii. A male 18 years old or less.
   b. If Rh incompatible products are issued, then the technologist shall:
      i. Submit a variance report.
      ii. Suggest the use of WinRho or Rh Immune Globulin.

7. **Policy Against Editing the Patient's ABO or Rh in the Demographic Screen**
   a. The only time the ABO or Rh may be edited in the Blood Bank computer under Patient / Edit / Demographic without the approval of the Medical Director is to edit the Rh to weak D positive, if indicated.
      i. If a patient's demographic screen is populated with the incorrect ABO/Rh due to a clerical or testing error, the ABO or Rh may be blanked out by a lead technologist or supervisor without Medical Director approval. This does not apply to patients that have a historical ABO/Rh but currently have an unresolved ABO/Rh discrepancy.
         A. Edits to the patient's demographic require supervisor access.

Rh Selection of RBCs and Platelets			
Recipient's Rh	**Recipient Age / Sex**	**Preferred Rh Donor**	**Alternate Donor**

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Rh Negative	Any	Rh Negative	See supplement below
Rh Positive	Any	Rh Positive	Rh Negative
Weak D Positive	Neonate (< 4 months old)	Rh Negative	See supplement below
	Females ≤ 50 years	Rh Negative	See supplement below
	Males < 18 years	Rh Negative	See supplement below
	Females > 50 and males ≥ 18 years old	Rh Positive (In order to preserve the Rh Negative blood supply, these lower risk patients should receive Rh Positive RBCs for transfusion)	Rh Negative
Unknown or unresolved Rh discrepancy	Any	Rh Negative	See supplement below
Supplement: The patients with the notation to see this supplement should be transfused with Rh negative RBCs and platelets if at all possible. However, in some cases it may become necessary to transfuse Rh positive RBCs or platelets; e.g., if the Rh negative RBC supply is depleted during an emergency or massive transfusion or if there are no Rh negative platelets in inventory. If Rh positive RBCs or platelets must be transfused refer to policy VI.E.6, *Transfusion of Components that are not Rh Compatible*.			

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VII. PROCEDURE:

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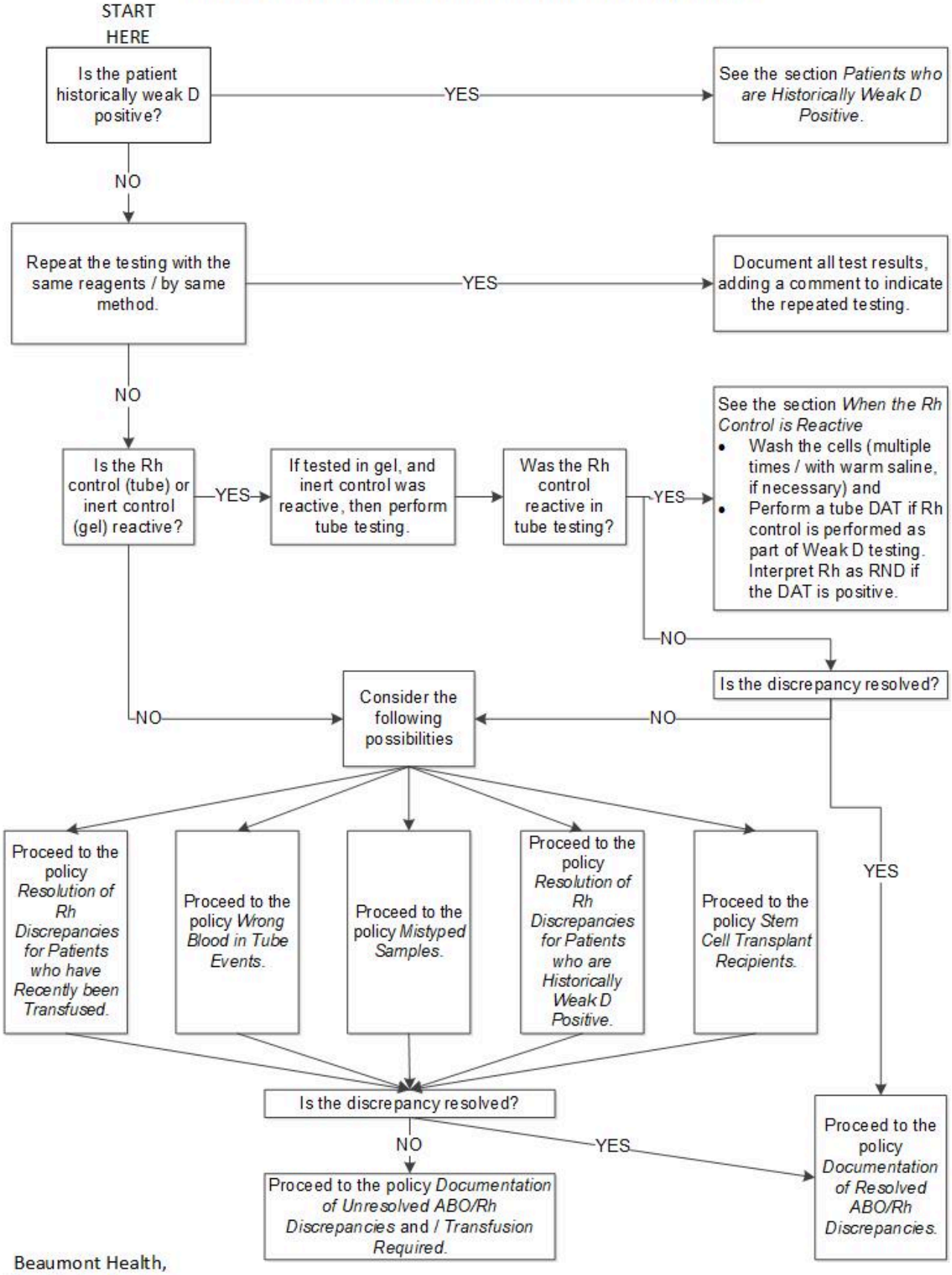
Flowchart for the Resolution of Rh Discrepancies



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VIII. INTERPRETATIONS:

Valid Graded Reactions

Method	Test	Valid graded reaction
Tube method	Rh typing	0, W+ to 1+, or 2 to 4+
	Tube control	0
Gel method	Rh typing	0, W+ to 3+, 4+
	Inert control	0

Rh Typing Interpretation

Method	Anti-D Graded Reactions	Control	Rh Interpretation
Gel	0	0	Negative
	W+ to 3+	0	Weak D/Partial D
	4+	0	Positive
Tube	0	0	Negative
	W+ to 1+	0	Weak D/ Partial D
	2+ to 4+	0	Positive
Gel or Tube	Any strength	reactive (any strength)	**RND

***RND:** If an Rh discrepancy remains unresolved after completion of the investigation as described in the Procedure, Flowchart for the Resolution of Rh Discrepancies, then a Lead Technologist, Supervisor, or Technologist with appropriate computer access will interpret the Rh test as RND (Rh not determined).*

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IX. REFERENCES:

1. AABB, *Technical Manual,* current edition.
2. AABB, *Standards for Blood Banks and Transfusion Services*, current edition.

Approval Signatures

Step Description	Approver	Date
	Muhammad Arshad: Physician	4/4/2022
	Ryan Johnson: OUWB Clinical Faculty	3/25/2022
	Jeremy Powers: Chief, Pathology	3/22/2022

	Ann Marie Blenc: System Med Dir, Hematopath	3/16/2022
	Vaishali Pansare: Chief, Pathology	3/16/2022
	John Pui: Chief, Pathology	3/16/2022
Policy and Forms Steering Committe (if needed)	Kelly Sartor: Supv, Laboratory	3/16/2022
Policy and Forms Steering Committe (if needed)	Gail Juleff: Project Mgr Policy	3/9/2022
	Craig Fletcher: System Med Dir, Blood Bank	3/8/2022
	Anji Miri: Supv, Laboratory	3/1/2022
	Rebecca Thompson: Medical Technologist Lead	2/13/2022
	Michael Rasmussen: Supv, Laboratory	2/11/2022
	Kelly Sartor: Supv, Laboratory	2/9/2022
	Teresa Lovins: Supv, Laboratory	2/9/2022
	Karrie Torgerson: Supv, Laboratory	2/9/2022
	Brooke Klapatch: Medical Technologist Lead	2/9/2022
	Kelly Sartor: Supv, Laboratory	2/9/2022