**1.0 Principle**

To resolve an ABO grouping discrepancy when the reactions in the red blood cell (RBC) grouping do not match the reactions in the plasma grouping or where expected positive reaction gradings are or exhibit mixed field reactions or reactions that are weak in strength (less than grade 2).

To resolve a discrepancy between historical results and current test results.

1. **Scope and Related Policies**
   1. The results of RBC and plasma tests should agree. Any discrepancy should be investigated and resolved with appropriate documentation before issuing red cells.9.1 Refer to RT.004 – ABO Grouping for specific problems associated with bone marrow transplantation.
   2. If a discrepancy is detected and transfusion is necessary before

resolution, only group O RBC components and AB plasma products are to be issued.

* 1. Previous transfusion records shall be reviewed. Previous results

must be compared with current results for agreement.9.1

* 1. All reagents shall be used and controlled according to the supplier’s

recommendations and procedures.9.1

1. **Specimens**

EDTA anticoagulated whole blood

1. **Materials**

**Equipment:** Serological centrifuge

Block for test tubes

Microscope

**Supplies:** Test tubes – 10 x 75 mm

Serological pipettes

**Reagents:** Screening, panel and/or donor cells

Anti-A, anti-B, anti-A,B

Anti-A1 lectin

A1, A2 and B cells

Normal saline

1. **Quality Control**
   1. See QCA.001 – Quality Control of Reagent Red Cells and Antisera.
2. **Procedure**

**Table NRT.003-1 Overview guide for resolution of ABO Discrepancy**

|  |  |  |
| --- | --- | --- |
| Finding | Possible cause(s) | Go to procedure step: |
| Current results do not match historical ABO grouping | * Unsuitable specimen used for testing (e.g. diluted with IV fluid) * Testing error (incorrect or missed reagent) * Specimen drawn from incorrect patient | 6.1 |
| Plasma grouping is weak (<2) or missing | * Patient antibody levels may be low * Neonatal specimen * HPSC transplant | 6.2 for enhancement methods |
| Plasma grouping has an unexpected or extra reaction(s) | * Cold reactive antibody may be present (allo or auto) * Rouleaux is present | 6.3 |
| RBC grouping has an unexpected or extra reaction(s) | * Cold reactive autoantibody * Acquired B * HPSC transplant | 6.4 |
| RBC grouping is weak (<2) or missing or mixed field | * Recent red cell transfusion of different ABO * Excess blood group substance blocking antigen sites * Weak subgroup of A or B * Disease state that weakens A or B antigen expression * Twin (chimerism) | 6.5 refer to table NRT.003-3 |

* 1. **CURRENT RESULTS DO NOT MATCH HISTORICAL ABO GROUPING:**

6.1.1 Recheck suitability of specimen(s). See PA.002 – Determining Specimen Suitability (e.g., specimens contaminated with IV fluid may produce weak reactions in plasma grouping).

6.1.2 If there is any doubt about the identity or the quality of specimen, collect a new specimen and repeat the ABO grouping.

6.1.3 Recheck reagents.

6.1.3.1 Check the label on the reagent vial(s) to ensure that the correct reagents were used in initial testing.

6.1.3.2 Check reagent appearance for possible contamination by comparing it with an unopened vial of the same reagent (and lot number, if possible). Use a new reagent vial if the current vial appears contaminated.

* + 1. Repeat the ABO grouping.
       1. Prepare a new 3% patient red cell suspension using cells that have been washed twice in normal saline.
       2. If problem is resolved, see Procedural Notes 8.1 and proceed to step 6.6.
    2. Repeat ABO grouping on a new specimen
       1. If the repeated results are the same as the historical results, proceed to step 6.6.
       2. Complete an incident report as per established procedure if a sample labeling or testing error has occurred. As part of the incident investigation, retest any other samples received and/or tested with the sample to identify any additional errors.
    3. If ABO discrepancy remains and transfusion is required STAT, select group O RBC components and AB plasma products until the discrepancy is resolved. Note: all crossmatch procedures must still be followed.
       1. Review the patient’s medical history including transfusions and pregnancies, medication, surgery, diagnosis and transplant. Document the number and ABO of any units transfused, if applicable. If required, call other facilities to get a thorough transfusion/transplant history.
       2. If recent transfusion or obstetrical history provides an explanation for the ABO discrepancy, proceed to step 6.6. If not, refer to Table NRT.003-1 above and proceed to relevant procedure step.

**6.2 PLASMA GROUPING IS WEAK (<2) OR MISSING:**

If expected reaction(s) in the plasma grouping are weak (<2) or missing with A1 and/or B cells, see Procedural Notes 8.3 and perform the following enhancement method(s).

6.2.1 ENHANCEMENT METHOD #1: (Increase ratio of plasma to cells)

6.2.1.1 Add two additional drops (for a total of four drops) of patient plasma to the A1 and B cell tubes.

6.2.1.2 Mix and centrifuge tubes at 3400 rpm for 10-15 seconds. Re-suspend, read macroscopically, grade and record results. See RT.001– Reading and Recording Hemagglutination Reactions.

6.2.1.3 If reaction is not enhanced to at least grade 2, increase the

incubation time to 30 minutes at room temperature and

repeat step 6.2.1.2.

6.2.1.4 If the reaction(s) is enhanced to at least grade 2 proceed to

step 6.6.

6.2.1.5 If the reaction is still weaker than grade 2: Do not discard the tubes (A1 and B cells), proceed to enhancement method #2.

6.2.2 ENHANCEMENT METHOD #2: (incubation at 4° C)

6.2.2.1 Set up an auto control: Label a tube with the patient’s family name and ‘Auto’, add 4 drops of the patient’s plasma and 1 drop of the patient’s 3% red cell suspension and mix.

6.2.2.3 Label tubes for group O screening cells (SC1 and SC2), add 4 drops of patient’s plasma and 1 drop of the relevant cell to each tube and mix.

6.2.2.4 Incubate the A1, B tubes from 6.2.1.5, the group O screening cells and the auto control at 4**°** C for 15-30 minutes.9.2

6.2.2.5 After incubation, centrifuge tubes at 3400 rpm for 10-15 seconds. Resuspend the cells, read macroscopically, grade and record results.

6.2.2.6 If the auto control and group O screening cells are negative and

expected reactions with A1 and/or B cells are enhanced

to at least grade 2 (i.e., RBC group “agrees” with plasma

grouping):

6.2.2.6.1 Record the enhancement method used (i.e., 4 drops of plasma 4**°** C incubation).

6.2.2.6.2 Confirm the ABO of donor units if an antiglobulin crossmatch will not be done (i.e., immediate spin or electronic crossmatch).

6.2.2.6.3 Proceed to step 6.6.

Note: if auto control is positive, no interpretation can be made. It may be necessary to perform cold autoabsorption. See SP.016 – Cold Autoabsorption – Using Enzyme Treated Cells.

6.2.3 If reaction gradings are still not enhanced to grade 2, suspect:

* Hypogammaglobulinemia or agammaglobulinemia in an elderly patient
* An immunosuppressed patient

6.2.3.1 Confirm the ABO of donor units if an antiglobulin crossmatch will not be done (i.e., immediate spin or electronic crossmatch).

6.2.3.2 This discrepancy cannot be resolved until further testing is performed. See Procedural Notes 8.4 for possible causes.

6.2.3.3 Refer a serum specimen (do not send plasma) for determination of immunoglobulin levels and have the report reviewed by the TS Medical Director or designate. See step 7.3 - Reporting.

6.3 PLASMA GROUPING HAS AN UNEXPECTED OR EXTRA REACTION(S):

If the plasma grouping has unexpected or extra reaction(s) with A1 and/or B cells, suspect rouleaux or a cold reactive antibody.

* + 1. Set up an auto control: Label a tube with the patient’s family name and ‘Auto’, add 4 drops of the patient’s plasma and 1 drop of the patient’s 3% red cell suspension and mix.

6.3.2 Centrifuge tubes at 3400 rpm for 10-15 seconds and read macroscopically.

6.3.3 Grade and record results. See RT.001 – Reading and Recording Hemagglutination Reactions.

6.3.4 If the auto control is positive and the history reveals a

protein abnormality (e.g., multiple myeloma, macroglobulinemia or infusion of dextran), suspect rouleaux.

6.3.4.1 Perform a saline replacement on the A1, B and autocontrol tubes. See NRT.002 – Saline Replacement. If the expected reaction(s) with A1 and/or B cells is grade 2 or stronger and the autocontrol is negative, the ABO discrepancy is resolved. Proceed to step 6.6.

6.3.5 If the RBC and plasma grouping are still discrepant, proceed to next step.

6.3.6 If the auto control is positive and the diagnosis is viral or mycoplasma pneumonia or cold agglutination disease, suspect an auto anti-I.

6.3.6.1 Repeat the plasma grouping at 37° C. See NRT.001 – Prewarm Technique.

6.3.6.2 If the expected reaction(s) with A1 and/or B cells at 37° C are seen, the ABO discrepancy is resolved. Proceed to step 6.6.

6.3.6.3 If the reaction(s) with A1 and/or B cells at 37° C is weaker than grade 2, the ABO discrepancy still exists: Perform a cold autoadsorption using enzyme treated cells (see SP.016 – Cold Autoabsorption Using Enzyme Treated Cells) if the patient has not been transfused in the last three months. Repeat the reverse grouping using the cold autoabsorbed plasma. See Procedural Notes 8.5. If the discrepancy is resolved proceed to step 6.6.

If the discrepancy is not resolved, see 7.3 – Reporting.

* + 1. If the auto control is negative:
       1. If the patient RBC group tests as group A or AB, type the patient’s cells with anti-A1 lectin.

6.3.8.2 Perform an antibody screen by saline room temperature method.

* + - 1. In addition, set up the following cells by saline room temperature method:
* If the patient’s RBC grouping is group A or AB, set up A1 and A2 cells
* If the patient RBC grouping is group B or AB, set up B cells
  + - * 1. Label the appropriate number of tubes with patient’s family name and name of the cell.
        2. Pipette 2 drops of patient’s plasma into each labeled tube.
        3. Add 1 drop of the appropriate 3% red cell suspension.
        4. Mix and incubate for 30 minutes at room temperature.
        5. After incubation, centrifuge tubes at 3400 rpm for 10 to15 seconds, resuspend and read macroscopically
        6. Grade and record results.Refer to table NRT.003-2 below for interpretation.

**Table NRT.003-2 Guidance on test procedures for resolution of ABO discrepancy**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| If patient  is group | Plasma Reactions | | | | | Suspect |
| Auto | A1 | A2 | B | Screening cells |
| A1 | Neg | Pos | Pos or Neg |  | Positive (some Neg\*) | cold allo |
| A2 | Neg | Pos | Neg |  | All Neg | Anti-A1 |
|  | Neg | Pos | Pos or Neg |  | Positive (some Neg\*) | cold allo |
| B | Neg |  |  | Pos | Positive (some Neg\*) | cold allo |
| A1B | Neg | Pos | Pos or Neg | Pos | Positive (some Neg\*) | cold allo |
| A2B | Neg | Pos | Neg | Neg | All Neg | Anti-A1 |
|  | Neg | Pos | Pos or Neg | Pos | Positive (some Neg\*) | cold allo |
| \* Set up a panel for cold reactive antibodies. See NRT.006 – Antibody Identification of Cold Reactive Antibodies. | | | | | | |

* + - 1. If an anti-A1 has been identified, crossmatch for compatible donors if blood is required.
      2. If the results of the antibody screen are positive, perform a panel. See NRT.006 – Antibody Identification of Cold Reactive Antibodies.
         1. If the antibody identification demonstrates a specific cold reactive alloantibody(ies) (e.g., anti-M, -Lea, -Leb, -P1, -N), repeat the plasma grouping at 37° C.
         2. If the expected reaction(s) with A1 and/or B cells is grade 2 or stronger at 37° C the discrepancy is resolved, proceed to step 6.6.
         3. If the expected reaction(s) with A1 and/or B cells is weaker than grade 2 at 37° C, repeat the plasma grouping using A1 and B cells that are lacking the antigen to the identified antibody (37° C not necessary). Plasma grouping cells lacking the antigen may be selected by antigen typing group A and B donor units with the corresponding commercial antisera. See Procedural

Notes 8.7.

If the discrepancy is resolved, interpret ABO and proceed to step 6.6.

* + - * 1. If the discrepancy is still not resolved see 7.3 – Reporting.

6.4 RBC GROUPING HAS AN UNEXPECTED OR EXTRA REACTION(S):

* + 1. Wash the patient red cells twice with normal saline. If a cold reactive agglutinin is suspected, use saline warmed to 37° C to wash the cells.
    2. Resuspend the cells to 3%.
    3. Repeat the ABO grouping using the 3% washed patient cell

suspension.

* + 1. Record that the second ABO grouping has been done on a

3% washed cell suspension (and, if applicable, with saline

warmed to 37C).

* + 1. If the problem is resolved, see Procedural Notes 8.6. Interpret ABO and proceed to 6.6.
    2. If the problem remains and the patient appears to be group

AB, consider acquired B antigen. In this case:

* + - 1. Antigen type the patient cells using anti-A1 lectin. Acquired B antigen red cells type as A1. See Procedural Notes 8.9.1.
    1. If acquired B antigen has been excluded or if the patient

does not appear to be group AB, try repeating the ABO

group using one of the following:

* Antisera from a different manufacturer
* Monoclonal antisera

See Procedural Notes 8.9 for possible causes for the extra reaction in the forward grouping.

* + 1. If the discrepancy is still not resolved. See 7.3 – Reporting.

**6.5 RBC GROUPING IS WEAK (<2) OR MISSING REACTION(S):**

If the expected positive reaction(s) in the RBC grouping is weak (<2) or missing with anti-A and/or anti-B:

* Check if the patient has been transfused with non-ABO group specific RBC components in the last three months
* Check for cloudiness of the supernatant in the anti-A and/or anti-B tubes of the RBC grouping tests. If cloudiness is noted, read the ABO tubes microscopically checking for mixed field reaction(s)
* If mixed field is detected and the patient has been transfused

with non-group specific RBC components in the last 3 months and a pre-transfusion sample is still available:

* + 1. Perform an ABO grouping on a specimen collected before the transfusion of non-group specific donor unit(s), if available.

If a pre-transfusion specimen is not available see 7.3 – Reporting.

* + - 1. Record ABO group performed on both specimens.
      2. Report the ABO group performed on the pre-transfusion specimen and proceed to step 6.6. See Procedural Notes 8.8.
    1. If mixed field agglutination is noticed and the patient has not been transfused in the last 3 months, review the diagnosis and see Procedural Notes 8.10 for possible causes of mixed field agglutination.
    2. If there is no mixed field agglutination, wash the patients cells 2 times with saline and repeat the RBC grouping on the washed cell suspension.
       1. If the discrepancy is resolved by additional washing, excess blood group substance in patient plasma neutralizing the anti-A or anti-B reagents in the RBC grouping tests (e.g., mucin producing adenocarcinomas) may be the possible cause. Interpret ABO and proceed to step 6.6.
       2. If the discrepancy is not resolved see 7.3 – Reporting.
    3. To enhance the detection of weakly expressed antigens:
       1. Incubate the washed patient red cells with anti-A and anti-B for 15 minutes at room temperature.
       2. Centrifuge at 3400 rpm for 10-15 seconds.
       3. Gently resuspend the red cell button and examine macroscopically for agglutination.
       4. If discrepancy is resolved, interpret ABO and proceed to step 6.6.
       5. If discrepancy is not resolved proceed to 6.5.5
    4. To enhance the detection of weakly expressed antigens using enzyme treated cells:
       1. Treat the patient’s red cells with a proteolytic enzyme such as ficin or papain. Prepare a 3% suspension of patient enzyme treated cells.
       2. In parallel enzyme treat group O cells as a control. Prepare a 3% suspension of the group O cells.
       3. Test the enzyme treated cells (patient and control) with a human source of anti-A and anti-B. (note – most monoclonal blood grouping reagents must not be used to test enzyme treated red cells, refer to manufacturer insert.) Use 1 drop of patient 3% cell suspension with 2 drops each anti-A and anti-B. Use 1 drop of group O 3% cell suspension with 2 drops each anti-A and anti-B.
       4. Centrifuge at 3400 rpm for 10-15 seconds. Read macroscopically and record results.
       5. If discrepancy is resolved, interpret ABO and proceed to step 6.6.
       6. If discrepancy is not resolved proceed to 6.5.6.
    5. To enhance the detection of weakly expressed antigens by adsorption and elution:
       1. Label four 12 x75 mm test tubes with the following information: Label one tube with the patient’s family name, one tube A control, one tube B control and one tube as O control.
       2. Wash 1 mL of patient packed red cells at least 3 times with normal saline. Remove and discard the supernatant saline after the last wash. Similarly, for controls wash 1 mL of packed group A, group B and group O red cells at least 3 times with normal saline.
       3. Add 1 mL of reagent anti-A (if a weak variant of A is suspected) or 1 mL of anti-B (if a weak variant of B is suspected) to the washed patient packed cells. Add 1 mL of reagent anti-A to the washed group A packed cells. Add 1 mL of reagent anti-B to the washed group B packed cells. Add 1 mL of reagent (either anti-A or anti-B) used to coat patient cells to the washed group O packed cells (control).
       4. Mix the red cells with the reagent antibody and incubate at 4° C for 1 hour mixing occasionally.
       5. Centrifuge each tube to pack the red cells. Remove all supernatant reagent.
       6. Transfer the red cells to clean labeled test tubes.
       7. Wash the cells at least 8 times with large volumes (10 mL or more) of cold (4° C) normal saline. Save an aliquot of the final wash supernatant fluid from each to be tested in parallel with the eluate.
       8. Use an elution method suitable for recovery of ABO antibodies. See NRT.011 Lui Freeze – Thaw Elution to prepare eluates.
       9. Centrifuge to pack the red cells and transfer each supernatant eluate to a clean labeled test tube.
       10. Test each eluate and final wash solution in parallel with 3 examples of group O cells, 3 examples of group A1 cells and 3 examples of group B cells.
       11. To test the eluate and last wash add 2 drops of eluate or last wash to 1 drop of test red cells. Centrifuge at 3400 for 10-15 seconds. Examine for agglutination.
       12. If nonreactive, incubate 15 to 30 minutes at room temperature. Centrifuge at 3400 rpm for 10-15 seconds. Examine for agglutination.
       13. If still nonreactive, incubate at 37° C for 15 minutes and carry through to indirect antiglobulin phase. Read microscopically and record results.
       14. If discrepancy is resolved, interpret ABO and proceed to step 6.6.
  1. Perform a final clerical check.
     1. Ensure that the specimen label information for each specimen tested coincides with the information on the corresponding test tubes (ABO tubes).
     2. Ensure that the specimen label information for each

specimen tested coincides with the information on the corresponding request form.

* 1. Report the process and conclusion of the investigation on the request form or in the computer. Sign or initial and record the time of completion and date. See 7.0 – Reporting.

1. **Reporting**
   1. Interpret and report all resolved discrepancies as described in

RT.004 – ABO Grouping.

* 1. Record all procedure(s) (and results obtained) used to resolve the

discrepancy (e.g., additional plasma, 4° C incubation, cold autoadsorption, prewarm technique, washing of red cell suspension, etc.).

* 1. If the discrepancy is still not resolved, a report should be sent

stating “ABO cannot be determined at this time”. If blood components are required, group O red cell and group AB plasma components should be prepared. Consult with the TS Medical Director or designate.

1. **Procedural Notes**
   1. Technical causes for ABO typing discrepancy:

* Antisera was not added or the wrong antisera was used
* Cell suspension too strong
* Centrifugation insufficient or excessive
* Tube shaken too vigorously and small agglutinins were dispersed
* Failure to resuspend entire cell button
* Reading (microscopic) inappropriate
* Small clots in specimen mistaken for agglutination
  1. If it is not obvious where the problem exists, consider the following:
     1. ABO reactions are usually strong. Suspect that weak results are questionable.
     2. Problems in plasma grouping are more common.
     3. More than one problem may exist. Example: a weak subgroup of A may have anti-A1 in plasma.
  2. Causes for weak (i.e., weaker than grade 2) or missing reactions in the plasma grouping:
     1. Neonatal patients sometimes do not demonstrate anti-A and/or anti-B until three to six months of age.9.2
     2. If the patient is elderly or immune suppressed, suspect hypogammaglobulinemia or agammaglobulinemia.
  3. If the reactions are not enhanced to at least grade 2 after 4°C incubation, consider the following:
     1. Some patients, especially if elderly, may have low levels of immunoglobulins (hypo- or agammaglobulinemia).
     2. The possibility that the patient has received a bone marrow or hematopoietic stem cell transplant (e.g., a group A patient who has received a group O transplant will type as group O in the forward grouping but may not have an anti-A). In this

case, consult the facility where the transplant occurred for any recommendations on transfusion protocol or follow your hospital policy.

* 1. In cases where there is a strong cold reactive autoantibody, three

or four cold autoadsorptions may be necessary. Autoadsorption should only be done if the patient has not been transfused in the last three months.

* 1. Repeating the ABO grouping on a 3% washed cell suspension will

resolve the discrepancy if it is due to:

* Strong cold autoagglutinin (if washed with 37C saline)
* Rouleaux
* Wharton’s jelly
* Artefacts – fibrin, other debris
  1. ABO group should not be reported when expected

reactions with A1 and/or B cells are weak or grade 1 by normal saline replacement or prewarm technique.

* 1. When a patient has been transfused with non-group specific blood,

group specific blood may not be compatible due to passive ABO antibodies. In these cases, non-group specific, group compatible blood should be crossmatched until anti-A and/or anti-B is no longer demonstrable by IAT crossmatch.

* 1. Other causes for extra reaction(s) in the RBC grouping

when repeating the ABO grouping on a 3% washed cell suspension does not resolve the discrepancy include:

* + 1. Acquired B antigen is a rare condition where group A antigen sites are transformed by bacterial enzymes, resulting in B-like activity when tested with human source anti-B. The reactions obtained with the anti-B sera are usually weaker than the reactions obtained with the anti-A, and the auto control is negative. This transformation is sometimes seen in group A1 patients who have carcinoma of the colon or inflammatory bowel disease, septicemia, etc. This condition has only been reported in group A1 patients.9.2  Note: Acquired B antigen is not detected when using monoclonal ABO antisera.
    2. Polyagglutinable red cells may be agglutinated with anti-A, anti-B and/or anti-A,B prepared from human source. Use of monoclonal antisera resolves the discrepancy. Human anti-sera naturally contain antibodies that react with antigens exposed on polyagglutinated red cells (e.g. anti-T) while monoclonal anti-sera do not.9.2
    3. Antibody-sensitized red cells can spontaneously aggregate or agglutinate in ABO grouping media because of the colloidal nature of the reagents. An elution method should be done to remove the antibody coating the red cells. Repeating the ABO grouping using eluted red cells should resolve the problem. Alternatively if human source antisera was used the use of monoclonal antisera may also resolve the problem.
    4. Rarely, human source antisera may contain antibodies to a low incidence antigen that may be present on the patient’s red cells. Repeating the ABO grouping using antisera from different manufacturers or using monoclonal antisera should resolve the problem.
    5. Antibodies in patient plasma against dyes or drugs in grouping antisera. Repeating the ABO grouping with antisera from different manufacturers may resolve the problem.
  1. Possible causes for mixed field reaction in the RBC grouping:
     1. Recent transfusion with non-group specific donor units.
     2. ABO grouping from patients who have received an

allogeneic bone marrow or hematopoietic stem cell

transplant may give mixed field results during the transplant

period. For some patients, the mixed field will remain

indefinitely.

* + 1. Fetomaternal hemorrhage.
    2. Some weak subgroups (e.g., A3) may exhibit mixed field reactions.9.2

* + 1. Altered expression of A and/or B antigens (weakened or missing) due to disease (e.g. Leukemia/malignancy) when the previous ABO grouping does not agree with the current grouping and the patient diagnosis suggests a reason for the change.9.2
    2. Some polyagglutinable red cells such as Tn-activated cells may exhibit mixed field reactions.
    3. Twin: chimerism (very rare).
  1. See tables NRT.003-3 and NRT.003-4 on pages 19 and 20 for: Findings Typical of Weak A or B Phenotypes and other ABO variants and Some Anomalous or Uncommon ABO Typing Results.

1. **References**
   1. CSTM Standards for Hospital Transfusion Services Version 3 – February 2011. Canadian Society for Transfusion Medicine, 5.3.1.1, 5.3.1.4, 5.3.2.2.
   2. Roback JD, ed. American Association of Blood Banks Technical Manual, 17th ed. Bethesda, MD: American Association of Blood Banks, 2011: 370-371, 878-884.
   3. Judd’s Methods in Immunohematology 3rd Edition; 2008:515-558
   4. Transfusion Medicine Broadsheet – Identifying and Resolving ABO Testing Discrepancies. QMPLS 2004-03-30:1-5.
2. **Revision History**

|  |  |
| --- | --- |
| **Revision Date** | **Summary of Revision** |
| March 1, 2014 | * Revised manual name * Revised procedure name to ‘ABO Discrepancies’ * Changed forward grouping to RBC grouping and reverse grouping to plasma grouping * Section 2.1 and 7.1 changed RT.001 to RT.004 * Section 5.1 changed to refer to QCA.001 * Section 6 renumbered to improve flow * 6.2.1.2 changed PA.006 to RT.001 * 6.2.3.3 changed Medical Chief to TS Medical Director * Updated list of references to include latest editions/versions |

**Table NRT.003-3**

Findings Typical of Weak A or B Phenotypes and other ABO variants

MF = Mixed Field Agglutination F/E = Fixation Elution

\* = Papain treated cells maybe agglutinated by anti-A and anti-B

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TYPE | Cells with:  -A -B -A,B | | | Plasma with cells:  A1 A2 B | | | Saliva contains:  A B H | | | Comments: |
| A3 | MF | 0 | MF-2 | 0-1 | 0 | 4 | w | 0 | 1 | MF not always present with –A, B |
| Ax | 0-w | 0 | w-2 | 0-1 | 0 (F/E+) | 4 | 0(Axw) | 0 | 1 | Use Ax (own) cells for inhibition. Reactions with –A,B significant (always agglutinated) |
| Am\* | 0 (F/E+) | 0 | 0-w | 0 | 0 | 4 | 1 | 0 | 1 | By definition, only F/E+; saliva secretes much A |
| Ay\* | 0 | 0 | 0 | 0 | 0 | 4 | w | 0 | 1 | Weaker than Am; same characteristics |
| Aend | MF | 0 | MF | 0-1 | 0 | 4 | 0 | 0 | 1 | Slow reaction time, very small agglutinates in sea of free cells. Slide test best |
| Ael | 0 (F/E+) | 0 | 0 | 1 | 0-1 | 4 | 0 | 0 | 1 | By definition no agglutination but F/E+ |
| B3 | 0 | MF | MF | 3 | 2 | 0 | 0 | W | 1 | As for A types (substitute B for A) |
| Bx | 0 | 0-w | 0-1 | 3 | 2 | 0 or w | 0 | 0(Bxw) | 1 |
| Bm | 0 | 0  (F/E+) | 0 | 3 | 2 | 0 | 0 | 1 | w |
| Bel | 0 | 0  (F/E+) | 0 | 3 | 2 | 0 or w | 0 | 0 | 1 |
| Oh | 0 | 0 | 0 | 4 | 4 | 4 | 0 | 0 | 0 | Anti-H in plasma reacts with all normal O cells; no H in saliva; no H on cells |
| Ah | 0-1 | 0 | 0-1 | 4 | 4 | 4 | 0 | 0 | 0 | Cells agglutinated by anti-H; anti-H in plasma. Bh also described |
| AHm | 0-w | 0 | w-2 | 0-1 | 0 | 4 | 1 | 0 | 1 | No H on cells; H in saliva. BH also described |
| Acq. B | 4 | 1-MF | 4 | 0 | 0 | 4 | 1 | 0 | 1 | Dolichos +; BSII+ |

**Table NRT.003-4**

# Some Anomalous or Uncommon ABO Typing Results

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ANTI- | | | | | RBC | | | | | Secretor  Status† | Probable  Phenotype |
| A | A1 | B | A,B | H\* | A1 | A2 | B | 0 | AUTO |
| + | 0 | 0 | + | s | + | 0 | + | 0 | 0 | A&H | A2 with anti-A1 |
| (+) | 0 | + | + | w | + | 0 | 0 | 0 | 0 | A, B&H | A2B with anti-A1 |
| mf | 0 | 0 | mf | w | 0 | 0 | + | 0 | 0 | A&H | A3 |
| 0 | 0 | 0 | (+) | s | + | 0 | + | 0 | 0 | H | Ax with anti-A1 |
| e | 0 | 0 | e | s | 0 | 0 | + | 0 | 0 | H | Ae1 |
| w | 0 | 0 | w | s | 0 | 0 | + | 0 | 0 | A&H | Am |
| w | 0 | 0 | w | 0 | (+) | + | + | + | 0 | - | Ah |
| w | 0 | 0 | w | 0 | 0 | 0 | + | 0 | 0 | A&H | Amh |
| 0 | 0 | w | w | s | + | + | 0 | 0 | 0 | B&H | Bm |
| 0 | 0 | w | w | 0 | + | + | + | + | 0 | - | Bh |
| 0 | 0 | w | w | 0 | + | + | 0 | 0 | 0 | H | Bmh |
| 0 | 0 | 0 | 0 | 0 | + | + | + | + | 0 | H | 0h |
| 0 | 0 | 0 | 0 | 0 | + | + | + | 0 | 0 | A&H | 0mh |
| mf | + | 0 | mf | s | + | + | + | 0 | 0 |  | 0, Tn |
| + | (+) | (+) | + | w | 0 | 0 | + | + | 0 |  | acquired B |
| (+) |  | (+) | (+) |  | + | + | + | + | + |  | inconclusive\*\* |

\* = reactions of U. europaeus anti-H

s = strong; w = weak; 0 = nonreactive

† = antigens in the saliva of Se individuals

() = reactions may be less than the normal grade 3 or grade 4

\*\* = as seen with cold-reactive autoantibodies

mf = mixed field; + = agglutination

e = reactions seen only by adsorption/elution tests