

## PRETRANSFUSION COMPATIBILITY TESTING

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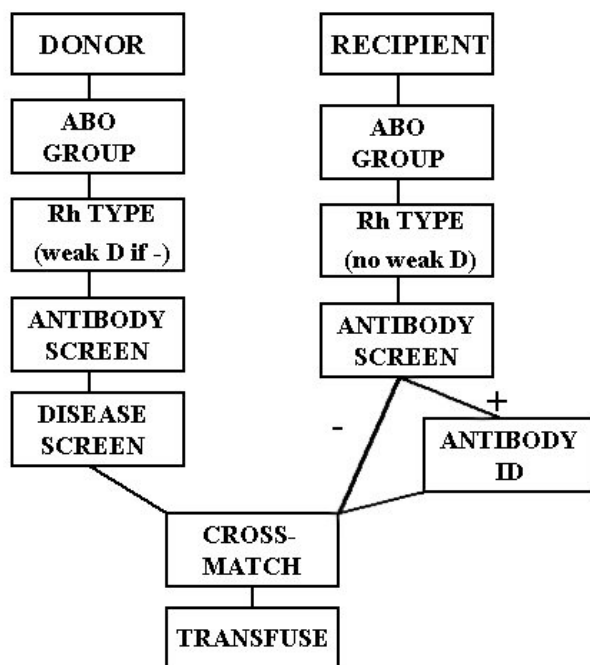
### Objective

Prevent hemolytic transfusions resulting from the transfusion of

- ♦ ABO mismatched RBC
- ♦ RBC bearing antigens to which the recipient has been sensitized, and has formed a potentially clinically significant alloantibody

### Overview

Two-armed process, testing of both the donor unit and the recipient to ensure compatibility:



Evaluation of the donor includes

- Testing of the donor unit for infectious diseases
- ABO/Rh typing and antibody screen.

Evaluation of the recipient includes

- ABO/ Rh typing
- Antibody screen. Perform antibody identification if antibody screen is positive to determine the identity of the antibody, so units lacking the corresponding antigen(s) are provided.

Crossmatch

- Tests the compatibility of the recipient's serum with RBCs from potential donor unit
- The crossmatch serves to:
  - Reconfirm ABO compatibility

- Reconfirm compatibility when antigen negative units are selected for patients with alloantibodies
- Detect the presence of antibodies to low-frequency antigens which might not be detected by the antibody screen

## Recipient Specimen Requirements

- Labeling: Specimen must be labeled at the time of collection with:
  - Two unique patient identifiers
    - Must have means of positive identification of patient at time of collection: e.g. wristband
  - Phlebotomist identifier
  - Date
- Useful clinical information
  - Transfusion history, pregnancy history: helpful in assessing the risk of pre-existing alloantibodies, risks for delayed hemolytic transfusion
  - Sex, age, clinical diagnosis, ordering MD
  - Likely urgency of transfusion
- Check-type Policy
  - To ensure that ABO incompatible units are not issued, in non-emergent situations, release of RBC products requires the blood type to be established on *two separate occasions*. This can be accomplished by:
    - Establish consistency between the historical blood type and the current blood type
    - If no previous blood type on record, need another *separately drawn* specimen to confirm ABO blood type (this is referred to as the Check-Type sample at UCLA)
- Age of Specimen
  - Specimen must be  $\leq 3$  days old, if patient has been transfused or pregnant in the past 3 months.
  - This is so that recently formed alloantibodies in a potentially sensitized patient can be detected prior to transfusion.
  - For inpatients, it's simpler to require that all patient's specimens to be  $\leq 3$  days old
  - For outpatients, if patient has not been transfused or pregnant in the past 3 months, specimens  $\leq 30$  days old can be used
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- Storage of Specimen
  - Required by AABB to retain specimen (refrigerated) for 1 week post transfusion.
  - This allows additional work to be done on the specimen if needed
  - Serves as the "pretransfusion sample" in transfusion reaction work-ups.

- Segments associated with the unit are also retained for 7 days post transfusion per AABB requirement.

## Recipient/Patient Testing

### ABO and Rh Typing

- ABO front and back types, must resolve discrepancy if present.
  - Front (cell)type: Recipient RBC+ reagent anti-A, and anti-B
  - Reverse/Back (plasma) type: Recipient plasma/serum + reagent A1 and B RBC's
- Rh typing: If D negative, weak D testing (to detect weakly expressed D antigen that might be missed by routine D typing) NOT required on recipient. (*There is no harm in giving a weak D positive patient D negative units*)
- Check records to see prior typing exists. If not, need a "Check Type" specimen.

### Antibody Screen/Identification

- Goal: To screen for and identify unexpected, clinically significant RBC antibody
- Antibody screen
  - Test patient plasma/serum against 2 or 3 group O screening cells with various significant RBC antigens represented on at least one cell (e. Rh, Kell, Duffy, Kidd, S/s Blood Group antigens)
- Perform antibody identification (ABID) if screen is positive. ABID panel usually consists of 10-12 reagent cells to allow determination of antibody specificity
- Check records for previously identified antibodies :
  - Previously identified antibodies should be honored and appropriate units lacking the specific antigen(s) should be selected. Even if current sample fails to demonstrate the antibodies.
- Methods:
  - Test may be done in an "enhancement" medium that enhances the antibody-antigen interactions, as compared to in normal saline:
    - LISS (Low ionic strength saline): decrease zeta potentials
    - PEG(polyethylene glycol): displaces H<sub>2</sub>O molecules
  - Read test (look for agglutination or hemolysis) at different phases:
    - IS phase (immediate spin):
      - Two drops serum +two drops of 2-5% RBC solution mixed together in tube, immediately centrifuge for 15-30 sec and examine
      - Detects room temperature-reactive antibodies, which are predominantly IgM (often clinically insignificant antibodies).
      - This phase is not performed by many labs.
    - After Incubation at 37C
      - Incubate for a specified time. Incubation time is shorter when enhancement (LISS, PEG) solution used. Examine for agglutination and hemolysis as above.
      - Some IgG antibodies start to show reactivity at this phase
    - Anti-Human Globulin Phase (AHG)

- After AHG (Coomb's reagent) is added and incubation, spin and read.
- Designed to further enhance IgG reactivity

## Donor /Unit Testing

### ABO and Rh Typing

- ABO forward and reverse typing as above.
- Rh Type
  - ◆ Donor RBC plus anti-D reagent, look for agglutination
  - ◆ All Rh(D) negative units must be checked for weak D antigens to avoid sensitization of a Rh(D) negative recipient
  - ◆

### RBC Alloantibody Screen/Antibody Identification

- Test donor serum against screening reagent cells as above for patient testing
- If positive: Can only use RBC units.
  - Plasma may be discarded or sent for fractionation of other plasma derived products, e.g: albumin.
  - Platelets: Discarded. Platelet products contain significant amounts of plasma.
  - Donor not eligible to donate platelets or plasma in the future

### Additional Testing on the Unit Performed at the Transfusing Facility

- Repeat ABO (front and back) type
- Repeat Rh type, check Rh negative unit for weak D

## Crossmatch (XM)

- Purpose: Assures the compatibility of the recipient's serum with RBCs from potential donor units
- If antibody screen on the recipient is positive: MUST perform XM at antiglobulin phase, i.e. A "full crossmatch".
- If antibody screen is negative: AHG phase CM not required, but MUST confirm ABO compatibility by performing XM in one of the two following ways:
  - Immediate spin crossmatch
    - Done at room temp, spin immediately after mixing donor RBC and recipient serum/plasma
    - Essentially only detects ABO incompatibility
    - Occasionally may get interference from other room temp reactive IgM antibodies (e.g. Anti-Lewis, M), which are not clinically significant
  - Electronic crossmatch
    - Must use an electronic blood bank information system that can verify ABO and Rh compatibility
    - Only checks for ABO compatibility
    - Requirements of the system used for electronic XM:

- FDA-approved
- Validated on-site to show only ABO compatible units will be selected
- Logic alerts user when there are ABO discrepancies between donor and recipient, or between donor ABO/Rh type on file and based on confirmation tests
- Method to verify accuracy of data entry
- ABO type on patient done twice: this could be twice on the current specimen, or on two different specimens, or once on a current specimen and there is ABO group info on record