**COMPATIBILITY TESTING PROTOCOLS (SEROLOGIC ASPECT)**

**A. TESTING DONOR SAMPLE**
- ABO grouping, Rh typing, transmissible disease, unexpected Ab screen

**B. TESTING PATIENT SAMPLE**
- Use same unique ID# for each Px (+ ID)
- Draw blood samples carefully, avoid hemolysis of sample
- Don’t use in vitro hemolyzed sample (can mask hemolysis caused by Ag-Ab complex that activate complement to completion)
- If patient has in vivo hemolysis, take care of the extent
- Can use serum/plasma
- Plasma Disadvantages:
  - Possible formation of fibrin clots
  - Difficult to distinguish from true agglutination
  - Plasma anticoagulants may inactivate complement (some Ab may not be detected)
- Plasma Advantages:
  - Ease of handling
  - 10 mL of blood is usually sufficient
- Label tubes (tamper proof)
  - Legible & indelible writing
  - Px full name
  - Unique ID# or barcode
  - Date of sample collection
  - Phlebot’s initial or sign
- Avoid contamination
  - Don’t draw from IV tubing lines
  - Draw venous samples from infusion site, not above it (disconnect IV for 5-10 min, discard first 10mL)
  - Test samples as soon as possible after collection
  - Separate serum as soon as possible from RBC after sample has clotted
  - Samples may be kept at 1-6°C
  - Patient’s RBC can be obtained clotted/anticoagulated
  - Wash samples with physiological saline to remove plasma/serum
  - Use 2-5% RBC suspension

**INTERPRETATION OF RESULTS**
- Button of RBC: resuspend
- Tilt & wiggle method: ideal
- Initial tilt = (+)/(-) reaction
- Jagged/firm button edge: (+) agglutination
- Smooth swirling of free cells: (-) agglutination
- Violent/excessive shaking = false negative

**CAUSES OF (+) RESULT IN SEROLOGIC CROSSMATCH**
- All incompatible donors, (+) Antibody screening
- High incidence donor antigen
- Multiple antibodies in px serum
- 1 incompatibly donor, (-) antibody screening
- Low incidence donor antigen
- (-) Antibody screening
- Naturally occurring Antibody in px serum
- Passively acquired ABO agglutinins (because of BM transplant, or non ABO specific transfusion)
CAUSES OF (+) PRETRANSFUSION TESTING

<table>
<thead>
<tr>
<th>Antibody screen</th>
<th>Crossmatch</th>
<th>Auto ctrl</th>
<th>DAT</th>
<th>CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>--- Incompatible IS</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>DONOR RBC + ABO incompatible</td>
</tr>
<tr>
<td>--- Incompatible AHG</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>DONOR RBC + Polyagglutinable</td>
</tr>
<tr>
<td>+ Compatible</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>Autoantibody/ID</td>
</tr>
<tr>
<td>+ Incompatible</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>Alloantibodies</td>
</tr>
<tr>
<td>+ Incompatible</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>Antibody causing delayed hemolytic or HTR</td>
</tr>
</tbody>
</table>

COMPUTER CROSSMATCH

Benefits:
- safe
- annual savings
- reduce sample requirements
- reduce handling of biological materials
- elimination of false reaction

IF
- SF Antibody is present
- Select Antigen (-) units, do IAT Crossmatch
- No SF Antibody, more than 1 ABO/Rh on file
- do electronic crossmatch

PRETRANSFUSION TESTING IN SPECIAL CIRCUMSTANCES

Emergency
- shorten incubation time (LITT)
- Inject Rh Ig to prevent anti-D formation
- MO sign waiver authorizing

Transfusion Of Non Group Specific

Compatibility Testing for Transfusion of Plasma
- no need compatibility testing
- need if in large volume (IS)

Intrauterine Transfusion

- Compatibility with MOM’S antibody (can cross placenta)
- use MOM’S Serum

Neonatal Transfusion

- <4000g birth weight
- Compatibility with MOM’s antibodies in infant’s circulation (37°C reactive)
- can use infant’s blood if ABO & Rh are not involved in fetomaternal incompatibility
- Antibody detection: use MOM’S Serum, BABY’S serum
- no need crossmatch
- fresh blood, max 7 days old

Massive Transfusions
- admin of 8-10 RBC units to adult in less than 24 hr
- acute admin of 4-5 RBC units in 1 hr
- WB/ Packed RBC infused within 24hr exceeds Px total blood volume:
- eliminate compatibility testing

- Antibody is not demonstrable
- dilution in large volume of plasma
- if Antibigen (+) units are infused:
- rapid rise in Ab titer level
- destruction of donor RBC

Specimens with Prolonged clotting Time
- caused by coagulation abnormalities
- associated with disease/medication (heparin)
- Fibrin clot formation
- ---mostly clotted serum is added to saline suspended RBC
- Accelerate complete coagulation
- ---add thrombin
- 1 drop of thrombin (50 U/ml) to 1 ml plasma = induce clotting
- protamine sulfate = counteract heparin effects

Preoperative Autologous blood
- Autologous transfusion = removal and storage of blood or components from donor for donor.

LIMITATIONS OF COMPATIBILITY TESTING

- Compatible cross match is not a guarantee
- In vivo compatibility:
- DONOR RBC + 51Cr label/ 99Tc = measure likelihood of successful transfusion when in vitro testing is inconclusive

BLOOD INVENTORY MANAGEMENT

Pretransfusion testing schemes

<table>
<thead>
<tr>
<th>Test scheme</th>
<th>Test performed</th>
<th>advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>No order</td>
<td>None</td>
<td>-No specimen has been collected</td>
<td></td>
</tr>
<tr>
<td>Hold clot</td>
<td>None</td>
<td>Specimen has been collected</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>ABO, Rh</td>
<td>Specimen has been collected</td>
<td></td>
</tr>
<tr>
<td>Type &amp; Hold</td>
<td>ABO, Rh, Antibody detection-ID</td>
<td>-Compatible blood can be provided</td>
<td></td>
</tr>
<tr>
<td>Type &amp; Screen</td>
<td>ABO, Rh, Antibody detection-ID, RBC unit phenotyping, crossmatch</td>
<td>-Routine pretransfusion testing has been performed</td>
<td></td>
</tr>
<tr>
<td>Crossmatch</td>
<td>ABO, Rh, Antibody detection-ID, RBC unit phenotyping, crossmatch</td>
<td>-Compatible blood can be provided</td>
<td></td>
</tr>
</tbody>
</table>

FUTURE OF PRETRANSFUSION TESTING

- Microplates
- Column gel technology
- std. pipetting of reagents, specimen
- reading of claretination rx
- reviewing stable rx upto 24hr
- reduce spin vol
- longer turnaround time for ABO determination
- less sensitive in ABO antibodies detection
- Molecular testing
- 1 card + 4 columns(Anti-A, anti-B) ----- 1 card + 6 wells
- Nucelic acid amplification
- PCR
- Automated flow cytometry
- sensitive, accurate, specimen turnaround time

SUMMARY

- Most fatal cause of TR : Clerical error
- Sample & forms : Px FullName, Unique ID#
- Writing: legible, indelible
- Date of collection: written on sample
- Transfusion sample: collected 3 days prior
- Specimen: 2 unique Px identifier (date, initials)
- ABO grouping, Rh typing, Antibody screening
- When 2 blood types are on file for Px & Ab screen (-):
  - Electronic crossmatch can replace IS
- (+)Crossmatch: incorrect ABO grouping of Px/donor, alloantibody/ autoantibody, DAT+ donor, rouleaux
- Emergency:
  - uncrossmatched, Onegative
  - uncrossmatched, Opposite packed RBC (if beyond childbirness age)
  - type-specific uncrossmatched RBC
- Plasma product units: NO NEED for compatibility testing
- Transfusion to fetus:
  - compatibility testing using mom’s sample
  - donor unit: lack antigen against maternal’s antibody
  - Onegative donor for the unknowns
- Transfusion to infant:
  - compatibility testing: use mom’s sample
  - initial sample from infant type for ABO (front) & Rh
  - donor unit: compatible with mom & baby