Kidney Exchange & Incompatible Transplantation Basics
For Independent Living Donor Advocates

American Foundation for Donation & Transplantation
Essential Donor Team Concepts
Clearwater, Florida  May 2013

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Transplant Nurse Practitioner
Barnabas Health
Why Living Donation?

- In U.S. since 2001 – more living donations than deceased donations
- Living kidney transplants usually last about twice as long as deceased donor transplants
- Quality of the kidney is excellent
  - decreased rates of rejection
  - lower blood levels of immunosuppression required
  - decreased side effects and secondary illnesses
Waiting List Registrations
2001-2011
United States

Source: UNOS Data Slides Spring 2012
Deceased and Living Donors 2001-2011
United States

Source: UNOS Data Slides Spring 2012
Decreas[ed Organ Donation

- Improved trauma care
- Public awareness of speeding
- Drunk-driving penalties
- Safer motor vehicle provisions [Seatbelts, airbags, motorcycle helmets]
- Medical Exclusion
- Actual consent rate 50-60%

Increasing Waiting List

- High Success Rates
- New ESRD Patients: Elderly
- Diabetics
- Retransplants
- Multiorgans
- Pediatrics
What is Kidney Exchange?

How does it work?

- In the first pair, Recipient 1 is not compatible with Donor 1, and in the second pair, Recipient 2 is not compatible with Donor 2.

- However, Donor 1 is compatible with Recipient 2 and Donor 2 is compatible with Recipient 1.
6 Pair Match
2009

- Newark Beth Israel
- Cornell NYP
- Saint Barnabas
30 Pair Exchange
Sunday NY Times Feb 2012

60 Lives, 30 Kidneys, All Linked
Kidney Exchange: It’s not just another living donor transplant...

- But a complex program with its own
  - Clinical
  - Administrative
  - ...and Financial Implications.

- Successful Exchange Programs have strong clinical, administrative, and financial management support.
Educating and Consenting in Exchange
Summary of Steps to Exchange:

- Identify Incompatible Pair
- Educate
- Consent
- Verify & maintain recipient health status
- Workup Donor
- Registry Listing
- Match offers & acceptance
- Cross-matches
- Finalize recipient & donor workups/PATs
- Surgical date & logistic agreements
- Donation/Transplant
Exchange Policy & Procedure
vital components: safety & ethics

- Who/when/how patients are educated
- Who is responsible for all aspects of exchange from identification pair to transplantation
- Pairs satisfy the same medical, psychosocial & ethical selection criteria
- Evaluation of donors
  - no out of state workups
- Confidentiality & anonymity issues
Exchange Policy & Procedure
vital components: safety & ethics

- Registry, match procedures, uses of data

- Shipping of living donor kidneys
  - Risks

- Logistics
  - Simultaneous vs. bridge donation

- What to do if a deceased donor becomes available when an exchange match is scheduled...
Patient Education:
Registry & Matching Info:

- What is a Kidney Exchange Registry?
- What info does it contain?
- You will likely match with a donor/recipient in another state
- What you be told about match donor or recipient
- Your donor medical record
  - When is it sent to the other center?
Larger U.S. Registries:

- Geographical location
  - NEPKE/New England Region

- Philosophy/Methodology
  - APD/Ohio
  - NKR /New York
  - PDN/Mid-West

- UNOS Exchange Pilot
  - Minimal success to date
Utilizing Multiple Exchange Registries

- Centers typically work with one registry
- Registries don’t cooperate with each other
- Matching is highly correlated with the number of pairs within a matching system/registry
- Can’t we all just get along?
Registry Match Offer

NKR Alert - Match Offer Accepted - Commence Cross Matching

Please coordinate with the recipient center to ship donor blood and Donor records (including CT Scans) immediately. The recipient center should record results on the NKR web site by clicking here prior to the deadline.

Ursula, please provide an update on the insurance issue that may block the match in position.

Cross Match Deadline: 12/14/12 15:00

Match Participants

<table>
<thead>
<tr>
<th>Pos</th>
<th>D Ctr</th>
<th>Donor Alias</th>
<th>R Ctr</th>
<th>Recipient Alias</th>
<th>D-ABO</th>
<th>R-ABO</th>
<th>D-Age</th>
<th>R-Age</th>
<th>Recp Avoids</th>
<th>PMP</th>
<th>CPRA</th>
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<th>Match Points</th>
<th>Preselct Status</th>
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<tr>
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<td>Cornell</td>
<td>SMJ86</td>
<td>O</td>
<td>O</td>
<td>54</td>
<td>45</td>
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<td>64</td>
<td>0</td>
<td>0</td>
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<td>23</td>
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</table>
# New Potential Donors

## National Kidney Registry

[Website Screenshot]

### Recipients

<table>
<thead>
<tr>
<th>Alias</th>
<th>ABO</th>
<th>Age</th>
<th>Wt</th>
<th>Avoids</th>
<th>Matches Accepted</th>
<th>Matches Declined</th>
<th>Matches Pending</th>
<th>Total One-Ways</th>
<th>% Reviewed</th>
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<td>MARFRI</td>
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<td>61</td>
<td>59</td>
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<td>0</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>0%</td>
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### Compatible Donors

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<thead>
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<th>PMP</th>
<th>State</th>
<th>ABO</th>
<th>Age</th>
<th>Wt</th>
<th>HLA</th>
<th>Med Notes</th>
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<td>read</td>
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<tr>
<td>151</td>
<td>CA</td>
<td>O</td>
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<td>76</td>
<td>10</td>
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<tr>
<td>16</td>
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<td>O</td>
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<td>0</td>
<td>read</td>
<td>CC</td>
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<td>O</td>
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<td>33</td>
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<td>O</td>
<td>64</td>
<td>68</td>
<td>25</td>
<td>read</td>
<td>CC</td>
</tr>
</tbody>
</table>

### Preferences

- D Age
- D Wt
- HLA Match
- Travel
- ABO

<table>
<thead>
<tr>
<th>Status</th>
<th>View</th>
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<td>Pending</td>
<td>View</td>
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<td>Pending</td>
<td>View</td>
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<tr>
<td>Pending</td>
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<td>Pending</td>
<td>View</td>
</tr>
<tr>
<td>Pending</td>
<td>View</td>
</tr>
</tbody>
</table>

[Table with additional columns for status and view]
Matching is an active process - we don’t just wait for a match to happen anymore...
Matching Analysis

Swap Expert for BETGER

Basics

Based on your current pair match power (PMP) score of 22, you have a 50% probability of receiving a match offer from the National Kidney Registry (NKR) within 143 days, a 84% probability of receiving a match offer within 339 days, and a 98% probability of receiving a match offer within 534 days. Once a match offer is accepted, if everything goes as planned, your transplant should take place within one to two months from match offer acceptance.

<table>
<thead>
<tr>
<th>PMP Range</th>
<th>WT Stdev</th>
<th>Sample Size</th>
<th>WT Mean</th>
<th>Mean +1 Stdev</th>
<th>Mean +2 Stdev</th>
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<td>260+</td>
<td>60</td>
<td>85</td>
<td>40</td>
<td>121</td>
<td>201</td>
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<td>100-260</td>
<td>67</td>
<td>180</td>
<td>61</td>
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<td>246</td>
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<td>143</td>
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<td>181</td>
<td>Unknown</td>
<td>Unknown</td>
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</table>

Some simple thing(s) that you and your transplant center can do to reduce your wait time to transplant and improve your odds of a better match in the NKR program, include the following:

1. Reviewing 100% the potential donors in the pre-select function will improve your odds. Currently only 73% of the donors that are biologically compatible to you have been reviewed.
2. Your paired donor(s) may be called at any time for a blood draw in order to run a cross match test. If your donor is immediately available for blood draws, it will improve your odds.

Paired Donors

<table>
<thead>
<tr>
<th>Alias</th>
<th>Age</th>
<th>Blood Type</th>
<th>Match Power</th>
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</thead>
<tbody>
<tr>
<td>REUJAM</td>
<td>57</td>
<td>B</td>
<td>1.8</td>
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You will reduce your wait time to transplant and improve your odds of a better match if you enroll another paired donor in the system. The most powerful paired donors are “O” blood types so make any potential “O” blood type paired donors a priority for donor work-up and enrollment.

Preferences

<table>
<thead>
<tr>
<th>Preference</th>
<th>Current Value</th>
<th>Default Value</th>
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<tr>
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<td>70</td>
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<td>Min Donor Age</td>
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<td>None</td>
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<tr>
<td>Min Donor Weight</td>
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<td>None</td>
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</table>

Based on your low pair match power score, you should relax your recipient preferences (e.g. maximum donor age, etc.) in order to
Patient Education:
Surgery Schedule & Travel Information:

- Donations occur simultaneously when possible
  - Ensure no donor reneges
  - Time zone changes

- The donated kidneys are transported ground or air
  - Risks
    - Possible delay in function of organ caused by cold ischemic time
    - Accidental complete loss of organ due to transportation accident
    - It is the discretion of only the Transplant Surgeon and Team to proceed with or stop surgical removal or transplantation
Logistics of Kidney Exchange
going it done safely

- Factors to consider when reviewing match offer:
  - Donor center location
    - What is direct flight time (do not use connecting flights)
    - What is ground transport time to & from airport
      - Avoid rush hour
  - Anatomy of donor
canopy/other risks
Shipping Kidneys

- **Specialized Courier:**
  - Arranges flights/backup flights
    - Charter flight in emergency
  - Transport kidney to/from airport
    - Communicates pickup/in transit/arrival ETA
  - Knows airport logistics –tendering kidney
  - Proprietary Hot Line to Airlines Control Centers & Management to:
    - pre-alert airlines, request lifeguard status and obtain real time information
GPS tracking

email notification

---

From: alert@contigo.com [alert@contigo.com]
To: [Redacted]
CC: [Redacted]

Subject: Location notification - NKR5

Location notification - NKR5

Last location:
4355 Clayton Ave, St Louis, St Louis (city), MO

Heading: N/A

10:00:43AM EDT 03/31/2011
0 MPH

***DO NOT REPLOY TO THIS EMAIL***
Coordinator to Coordinator: communication

From: Jennifer Colletta [Colletta_Jennifer@bjc.org]  
To: Morgievich, Marie  
Cc:  
Subject: NKR  
Attachments:  

Marie, Update.  
X-clamp time 0900.  
Sterling Courier confirmed pick up of Kidney at 0930.  
On schedule to make 11:59 flight.  
Dr. Surendra Shenoy has the phone # to your Surgeon.  

Jc  

Jennifer Colletta RN BSN CCTC  
Transplant Coordinator  
Barnes Jewish Hospital  
314-362-5365  
800-333-9906  
You have the power to donate life.  
Be an organ and tissue donor.  

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The kidney’s on the move
Contingency Plan POLICY for Alternative Placement of Live Donor Organs

- Recipient surgery: Surgeon performs incision & blood vessel dissection of recipient prior to removal of living donor organ.

- Surgeon makes decision – unable to proceed with placement of the procured organ into recipient.

- Surgeon makes decision whether donor organ is able to be alternately placed into another recipient.

- The organ is placed on ice for preservation until donor & recipient have sufficiently recovered from anesthesia and donor able to give informed consent for alternate placement of organ.

- NJOTSN contacted for preservationist & to initiate a match run with the SBMC waitlist.
Contingency Plan  POLICY
for Alternative Placement of Live Donor Organs

- In case of paired exchange transplant - donor kidney is flown in from another center & recipient is unable to receive the organ:

  - Same procedure will be followed:
    - Sharing Network contacted to initiate match run with SBMC waitlist
    - No consent would be required from an outside donor as the recipient is unknown to them.
Safety in Operating Room

- Hand off communication: location of kidney is always discussed by team

- Transplant Surgeon brings kidney from one room to the next – never anyone else

- Kidney is never placed in slush machine
OR Safety

- Surgeon takes ice from slush machine and places on kidney in a small receptacle
- This small receptacle containing the organ is placed on the scrub nurses table - never directly in the slush machine
- Always a separate surgeon for donor & recipient cases (LRD)
- Nursing staff do not handle organs
OR Safety

- Items are not removed from the OR while a case is in progress unless expressly communicated, this includes, equipment, excess garbage, tables etc.
  - Excludes specimens which are covered under our specimen policy

- The slush machine is in operation (making ice) until the pt. leaves the OR.
What is Compatible Share?

- In this program, a compatible donor/recipient pair may be offered the opportunity to participate in a kidney exchange.
- A compatible pair may choose this option because:
Compatible Share
A compatible pair may choose this option because:

- Chance to improve the recipient’s long term outcome with:
  - younger donor kidney
  - improved compatibility

- An altruistic opportunity:
  - exchange would allow one or more incompatible pairs the opportunity to be transplanted.
Impact of Compatible Pairs
More compatible pairs, more liquidity, more transplants

Technology is advancing our ability to match pairs...

Liquidity = Number of matching possibilities you can find at one time in the pool
Compatible Share: Case Study

Compatible Pair

Recipient:
- Joseph: 54 y.o. male  BG A
- Dx Glomerular Disease: FSGS, premodality
- Compatible donor

Donor:
- Laura, 50 y.o. wife, BG O

Agreed to compatible share –
- Would like advantage but not necessary
Compatible Share: Case Study

- 2 Incompatible Pairs:
  - **Recipient:** Darlene, 61 y.o. female, DM, HD May ‘10, BG O, multiple dialysis accesses failing
  - **Donor:** Leticia, 33 y.o. daughter, BG O
    - HLA/Cross-match incompatible
  - **Recipient:** Sharon, 56 y.o. female, Type II DM, HD 4/12, BG O
  - **Donor:** Khalena, 36 y.o. daughter, BG A
    - ABO/Blood group incompatible
Case Study: Compatible Share
Start with 1 compatible, 2 incompatible pairs

Recipients

Donors

Compatible Pair

HLA Incompatible Pair

ABO Incompatible Pair
Case Study: Compatible Share

Finish with 3 compatible pairs

Recipients

Donors

Compatible Pair

Compatible Pair

Compatible Pair
Why Incompatible Transplant?

ABOi Transplant       HLAi Transplant
(Blood Group Incompatible)       (Tissue Incompatible)

- Deepening crisis of organ availability
- Modest gains in deceased donation
- 36% probability that any 2 individuals will be incompatible
  - Eliminates 1/3 potential living donors
  - If ABO incompatibility was eliminated additional 1500 LD transplants could be performed annually
THE PROGRAM FOR INCOMPATIBLE TRANSPLANTS

1. BLOOD GROUP INCOMPATIBILITY

CONFIRMATION OF EDUCATION

The following information will review what you have learned in the education program. This session was developed in order to fully inform you about what an incompatible kidney transplant means, the risks and benefits of receiving such a transplant based on your specific incompatibility results, and a basic overview of the process involved.

In addition to this education session, you have already undergone general education regarding kidney transplant and will also undergo education with your Transplant Coordinator that specifically outlines your pre and post transplant protocol schedule for blood draws, plasmapheresis, intravenous immunoglobulin infusions, and other testing or therapies that may be required.

Overview

- Kidney transplantation allows a patient with chronic kidney disease to avoid dialysis or to become dialysis free. It can also greatly enhance quality of life and increase life expectancy. Because of these benefits, there is a great desire for those with kidney disease to receive a kidney transplant.

- Many patients have living kidney donors who are blood type incompatible but are otherwise acceptable donors. However, until recently, the only option for these patients was to wait 3 to 7 years for a compatible deceased donor kidney or to enter a living donor kidney exchange program.

- The Program for Incompatible Transplants offers some potential recipients the option to receive a living donor kidney from an incompatible donor. Depending on the type and degree of incompatibility, medical technology may be able to overcome those immune system responses that cause transplant rejection and possible loss of the transplant.

- An incompatible transplant can be more complicated, and present a higher risk than a compatible transplant and require increased time and effort on the part of the recipient and the transplant team. As a potential recipient you have been informed about the increased risk of such a transplant as well as the visits, therapies, diagnostics tests and procedures that this type of transplant requires.
An incompatible transplant can be:

- More complicated
- Present a higher risk than a compatible transplant
- Require increased time and effort on the part of the recipient and the transplant team
- Additional visits, therapies, diagnostics tests and procedures
Consenting: Incompatible Transplant

- The risk factors of this type of transplant relate to the risk of rejection, infection and loss of the transplanted kidney.

- The information provided is based on current knowledge of this procedure.
Consenting: Incompatible Transplant

- **Insurance/Finance Responsibilities**
  - Many insurance companies cover all or most of the costs related to the incompatible transplant. Your insurance will be reviewed by the Financial Coordinator and she will discuss any direct costs or financial responsibilities that you may incur.
If your donor has a different blood group, this is called blood group incompatibility.

A transplant performed with a blood group incompatible donor results in immediate loss of the transplant due to what is called, hyperacute rejection.

This is a serious condition because the transplanted kidney suddenly forms blood clots, becomes large, begins to bleed and has to be removed immediately.
Determining Compatibility:

- Blood Group and Tissue Compatibility
- Blood Group: You and your donor have been determined to be Blood Group Compatible
- Tissue Compatibility:
  - Tissue Typing:
  - Crossmatching:
Consenting: Incompatible Transplant

HLAi

• Donor Specific Antibody (DSA).
  ○ The term used for the antibodies that are directed against the donor’s HLA. If found, the levels or titers of these DSAs are calculated.

• Crossmatch Methods.
  • These are done to determine the significance of the DSAs. There are two methods:
    - CDC Crossmatch
    - Flow Crossmatch
Consenting: Incompatible Transplant
ABOi & HLAi

- **Principles of Treatment**
- **Plasma Exchange** (also known as Plasmapheresis)
- **Intravenous Immunoglobulin** (IVIG)
- **Medications**
  - When you are hospitalized for the transplant procedure you will receive several medications that reduce the likelihood of rejection. These medications are named Thymoglobulin and Rituximab. After you receive the kidney transplant you will also receive medications named Prograf, CellCept, and Prednisone.
After the Transplant Procedure

- You will continue with the plasma exchange and intravenous immunoglobulin therapy for approximately 4 to 7 treatments.
- This allows us to continue to remove the blood group antibody and reduce the likelihood of serious rejection.
- A high risk of rejection continues for at least 3 months after your transplant procedure and will decrease in time after that.
- There is always a risk you will experience rejection in the future.
Consenting: Incompatible Transplant ABOi & HLAi

After the Transplant Procedure

- Continue with the plasma exchange and intravenous immunoglobulin therapy for approximately 4 to 7 treatments.

- This allows us to continue to remove the blood group antibody and reduce the likelihood of serious rejection.

- A high risk of rejection continues for at least 3 months and will decrease in time after that.

- There is always a risk you will experience rejection in the future and therefore you will need to be monitored carefully.
Consenting: Incompatible Transplant ABOi & HLAi

- Information
  - Transplant Rejection
  - Kidney Biopsy
    - best way to diagnose rejection
    - as soon as this diagnoses is made, you will be hospitalized and treated with plasma exchange and IVIG therapy.
    - Other medications to treat the rejection may be discussed at that time depending on the type and severity of the rejection episode.
Consenting: Incompatible Transplant ABOi & HLAi

Long Term Follow Up

- The post-transplant period will involve:
  - Repeated blood tests required to measure the blood group antibody level.
  - Frequent visits by a transplant doctor in the transplant clinic.
  - Kidney biopsy will be done at certain intervals to check the status of your new kidney.
  - The schedule of these tests and procedures will be determined according to your specific treatment plan.
Patient Education: 
What does Incompatible mean?

**Blood Group**

<table>
<thead>
<tr>
<th>Blood group</th>
<th>Recipient</th>
<th>Donor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood group</td>
<td>A</td>
<td>A or O</td>
</tr>
<tr>
<td>Blood group</td>
<td>B</td>
<td>B or O</td>
</tr>
<tr>
<td>Blood group</td>
<td>O</td>
<td>O &amp; maybe A2</td>
</tr>
<tr>
<td>Blood group</td>
<td>AB</td>
<td>A or B or AB or O</td>
</tr>
</tbody>
</table>

A: 20% are A2 subtype
80% are A1 subtype
Blood Groups: New Science

- We have antibodies against other blood groups
  - O’s have Anti-A and Anti-B antibodies
  - A’s have Anti B-antibodies & B’s have Anti-A antibodies

- Measured in titers
  - Titer 1:2, 1:4, 1:8, 1:16, 1:32 doubles each time...
  - 1:32 stronger then 1:16
  - How many times does it take to wash out the antibody?

- Antibodies removed by plasmapheresis & IVIG
  - Typically 4 pre-op and 3 post-op

- A2 blood group very similar to O blood group
  - Almost a compatible transplant in some cases
ABOi Transplantation: Removal of antibodies

- **Plasmapheresis**
  - Removal of large quantities of plasma (which contains antibodies)
  - Replacement with albumin & fresh frozen plasma
  - Similar access requirements as in dialysis

- **IVIG (intravenous immunoglobulin)**
  - Derived from plasma of thousands of donors
  - Reduces antibody levels pre-transplant
  - ? Mechanism
Tissue Incompatible Transplant
AKA HLAi

- Blood group is compatible
- Tissue Incompatibility: + Crossmatch

- Recipient and Donor blood mixed to see if recipient reacts to donor’s HLA
- + Crossmatch reaction means recipient is reacting to donor’s HLA and high risk to reject donor kidney

- Pt. becomes sensitized with
  - Previous pregnancy
  - Blood transfusions
  - Previous transplants
Plasmapheresis treatments
Required pre and post txp
IV Immune Globulin (IVIG)

Infusion required pre & post txp
Lessons in Kidney Exchange: matching

- **Easy matchers:**
  - A & B mismatch
  - Low PRA

- **Difficult matchers:**
  - O recipients
  - High PRA – any blood group
  - Incompatible exchange may be necessary

- **Exposure to hundreds of pairs:**
  - Increases matches, esp. higher PRA
  - Main reason to work with multiple registries
Decisions Pathways
Exchange or Incompatible Transplant

Consider
- Recipient response to treatment for incompatible txp (Plasmapheresis, IVIG, Thymoglobulin)
  - Older recipient
  - HIV +, Hepatitis +
  - Hypercoagulable
- Donor needs & schedule
- Relationship of donor to recipient
- Recipient & donor personality
Alternative Programs in Living Donation

In summary...

- New Programs
- New Advances
- New Challenges
  
  *For patient education, evaluation & advocacy*