

Donation Process

- Hospital notifies OPO of potential donor
- OPO coordinator assesses potential donor and takes over care after brain death
- Laboratories and ancillary tests performed
- Organ placement
- Arranging OR
- Process may take 12-24 hours

Brain Death

- Clinical diagnosis: loss of cortical and brainstem function
 - coma with established cause in absence of hypothermia and CNS depressants
 - absent spontaneous movements without posturing
 - positive apnea test
 - $pCO_2 > 55$ after 3 min. without spontaneous respirations (in absence of muscle relaxants)
 - absent cranial nerve reflexes
 - corneal, oculoccephalic, dilated pupils, oculovestibular, no response to pain in head, absent gag

Brain Death

- Confirmatory tests
 - EEG
 - cerebral blood flow

Non-Heart Beating Donors

- Terminal injury or disease process without brain death
- Life support discontinued and heart allowed to stop

Donor Management

- Cardiopulmonary resuscitation
- Hemodynamic support
 - volume expansion
 - blood, crystalloids
 - vasopressors
 - dopamine, neosynephrine, levophed
 - vasopressin
- Oxygenation and pH

Donor Management

- Thermoregulation
 - hemodynamic instability
 - cardiac arrhythmia, arrest
- Infection control
 - sterile techniques
 - surveillance cultures
 - CXR
 - antibiotic therapy

Donor Management

- Alpha blockers
 - phentolamine, phenoxybenzamine
 - prevent vasospasm and reduce ischemia
- Calcium channel blockers
 - reduce ischemia
- Free T3
 - Reduce ischemia

Donor Management

- Free radical scavengers
 - steroids
 - also membrane stabilizer
 - allopurinol
 - superoxide dismutase
- Prostaglandin E1
 - vasodilator
 - reduces platelet aggregation
 - cytoprotective
 - counter free radical damage

Donor Assessment

- UNOS mandated information
 - age, gender, race, height/weight
 - ABO blood type
 - cause of death
 - history of hospital treatment, current status
 - indications of sepsis
 - social history
 - hemodynamic status
 - bilirubin, AST/ALT, PT, BUN/Cr, electrolytes, CBC, ABG
 - HIV, hepatitis, CMV, HTLV, VDRL/RPR serologies

Donor Assessment

- Sodium
- Albumin
- Length of hospitalization
- Feeding status
- Urine output

Organ Quality

- Surgical assessment remains best tool
- General exploration
- Physical properties of liver
 - color
 - texture
 - consistency
- Arterial vasculature
- Flush
- ? Biopsy

Donor Operation

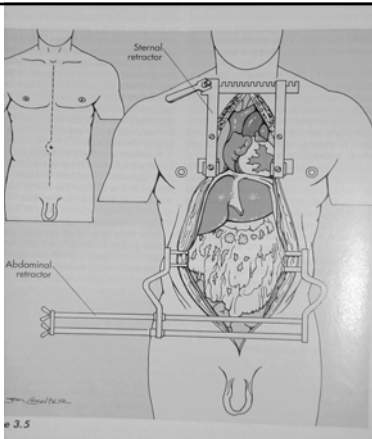
- Often involves several teams
 - heart
 - lung
 - liver
 - pancreas
 - kidneys
- May take from 2-4 hours
- Brain death note and consent

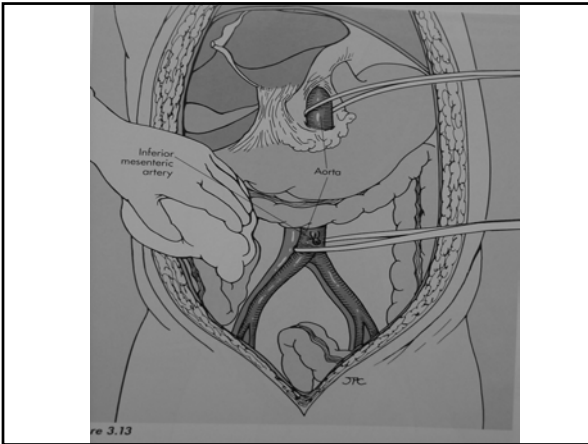
Donor Operation

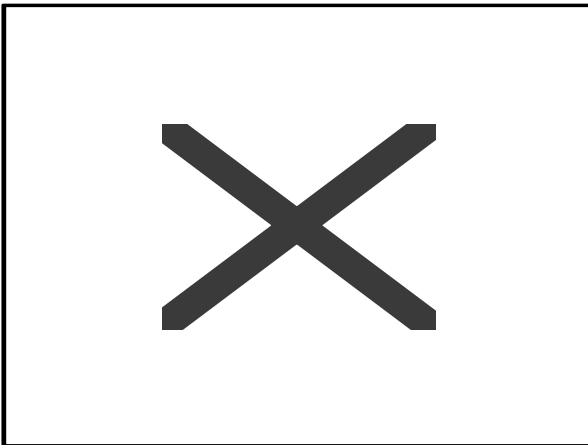
- Midline incision suprasternal notch to pubic symphysis
- General exploration
- Isolation of supraceliac and infrarenal aorta
- Isolation of vena cava

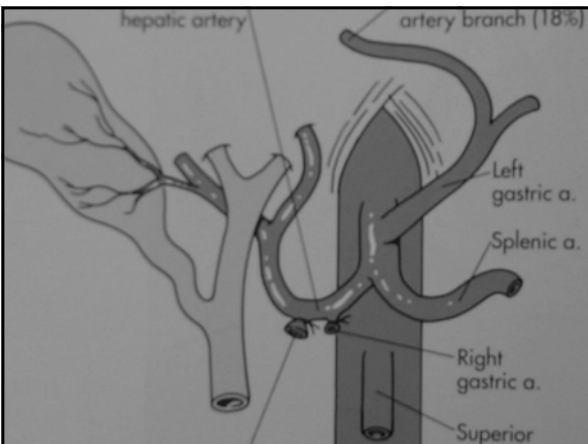
Donor Operation

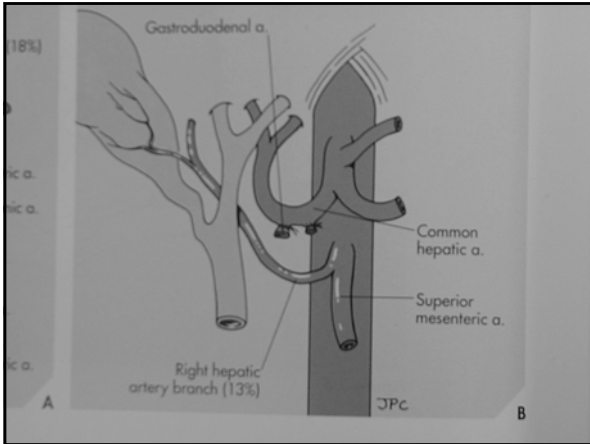
- Dissection of liver
 - ligamentous attachments
 - bile duct and flushing
 - hepatic artery
 - portal vein
- Exsanguination and flushing
- Topical cooling

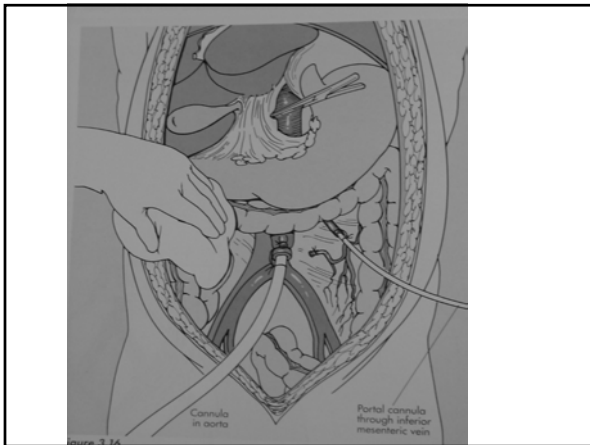


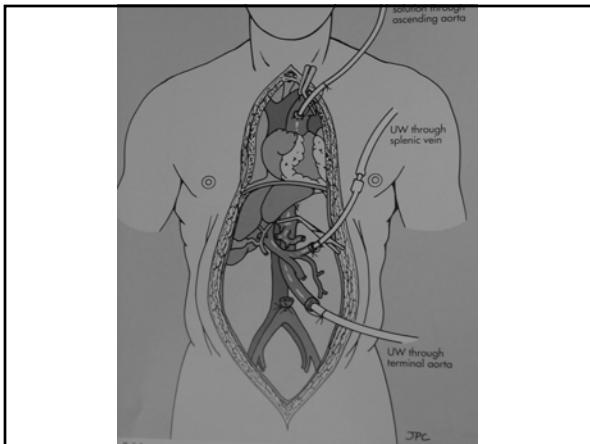


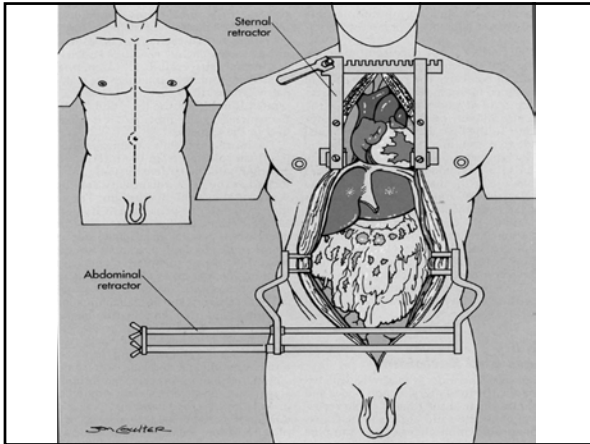


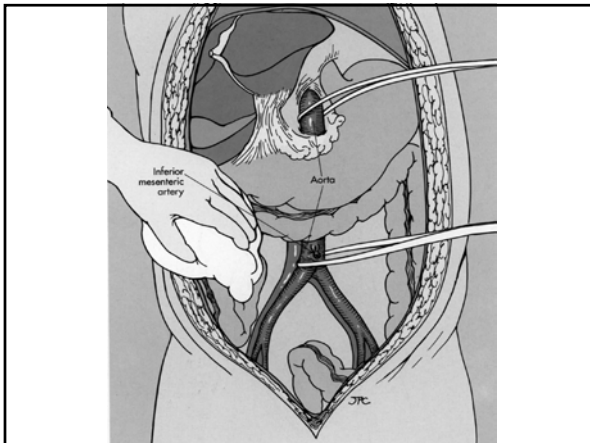


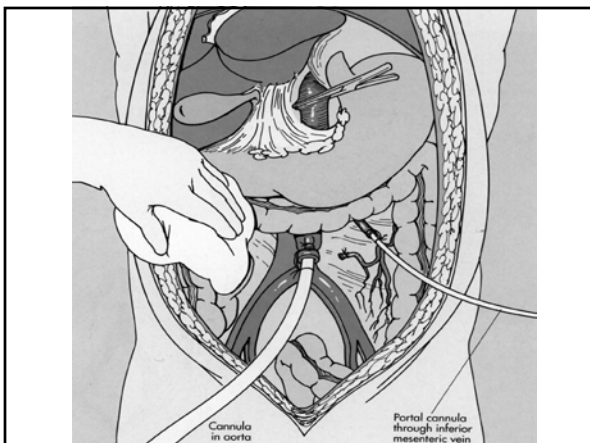


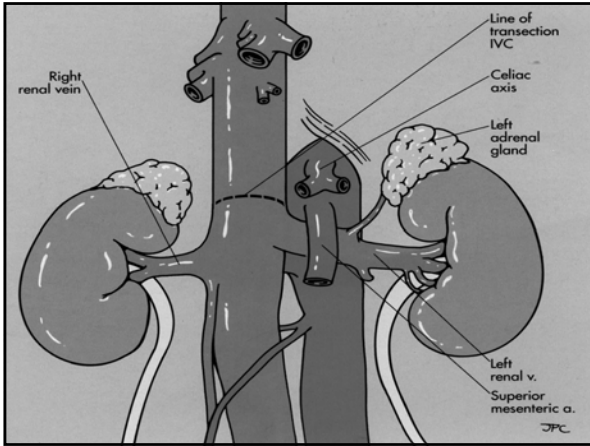


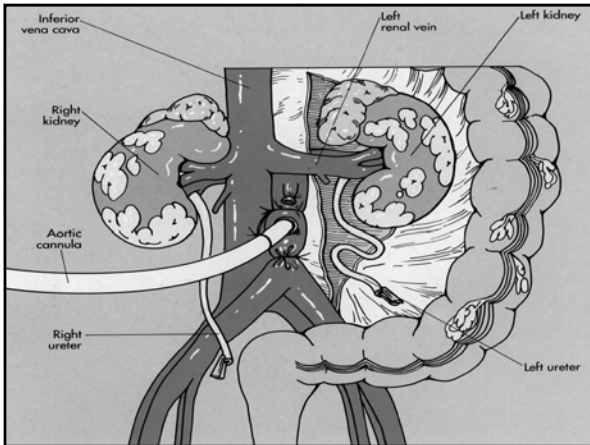


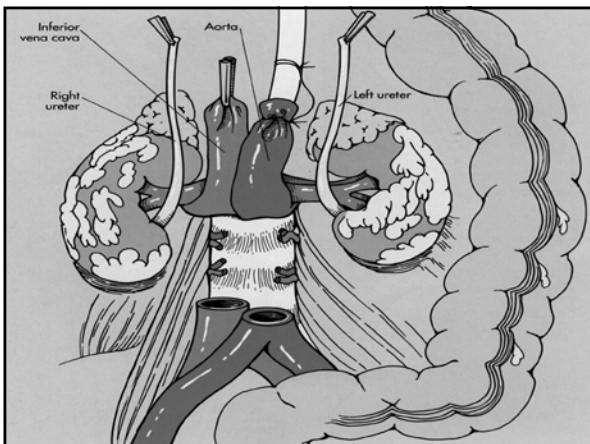


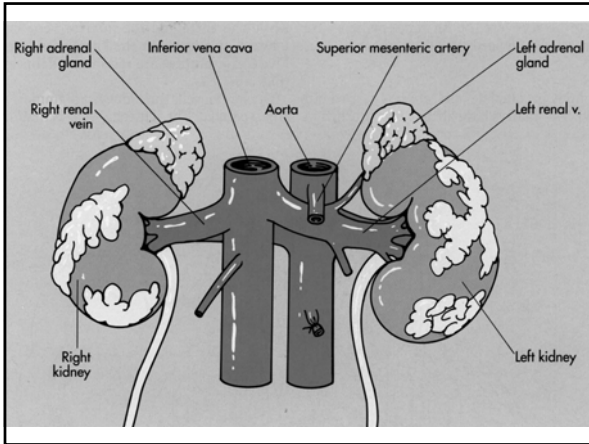


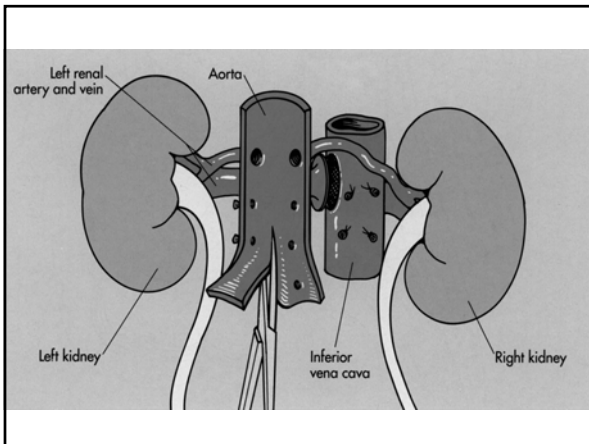












Organ Preservation

- Hypothermia
 - slows metabolism
 - inhibits catabolic enzymes
 - inhibits ATP dependent ion pumps
 - cellular edema

University of Wisconsin Solution

- Lactobionate
 - impermeant
 - Ca^{++} chelator
 - inhibits Ca^{++} dependent processes
 - phospholipases, proteases, endonucleases
 - iron chelator
 - reduce oxygen free radical production/reperfusion injury

University of Wisconsin Solution

- High K^+ , low Na^+ concentration
 - helps prevent intracellular K^+ depletion and Na^+ accumulation
 - not necessary to prevent cell swelling
- Phosphate
 - H^+ buffer, ATP precursor
- Hydroxyethyl starch (HES)
 - colloid to suppresses cell swelling
 - not necessary for simple cold storage

University of Wisconsin Solution

- Adenosine
 - precursor for ATP
- Glutathione
 - oxygen free radical scavenger
- Allopurinol
 - xanthine oxidase inhibitor
- Magnesium
 - enzyme cofactor

University of Wisconsin Solution

- Dexamethasone
 - membrane stabilizer

Donor Selection

- Liver
 - ABO
 - HLA
 - size
- Kidney/Pancreas
 - ABO
 - HLA

Arranging the Transplant

- Notification of patient
- Coordinator notifies team members
 - ICU
 - OR
 - blood bank (requires 4-6 hours notice)
 - anesthesia
 - perfusion
- Continual dialogue between donor/recipient teams for timing

Recipient Operation

- General anesthesia
- Hemodynamic monitoring
 - pulmonary artery catheter
 - arterial catheter
- Transfusion therapy
 - PRBC, FFP, platelets, cryoprecipitate
 - hemoglobin
 - prothrombin time, thromboelastogram(TEG)

Hepatectomy

- General exploration
- Incision of ligamentous attachments
- Division of bile duct
- Division of hepatic artery
- Dissection of portal vein
- Dissection of vena cava

Anhepatic Phase

- Venovenous bypass
- Worsening of coagulopathy
- Assure hemostasis of retroperitoneum

Implantation

- Suprahepatic vena cava
- Infrahepatic vena cava
- Portal vein
- Hepatic artery
- “Piggyback”

Reperfusion

- Portal flushing
 - crystalloid
 - blood
- Cardiac arrhythmia
- Hemodynamic instability
- Hemostasis

Biliary Reconstruction

- Choledochocholedochostomy
- Roux-en-y
- ? Biliary drain
- Cholangiogram

Special Considerations

- Portal vein thrombosis
 - SMV graft
 - portocaval anastomosis
- Aortic graft

Postoperative Care

- Intensive care unit
- Anesthesia not reversed
- Hemorrhage
- Vascular patency
- Immunosuppressive therapy
 - CYA, FK 506
 - steroids
 - Azathioprine, Mycophenolate Mofetil

Postoperative Care

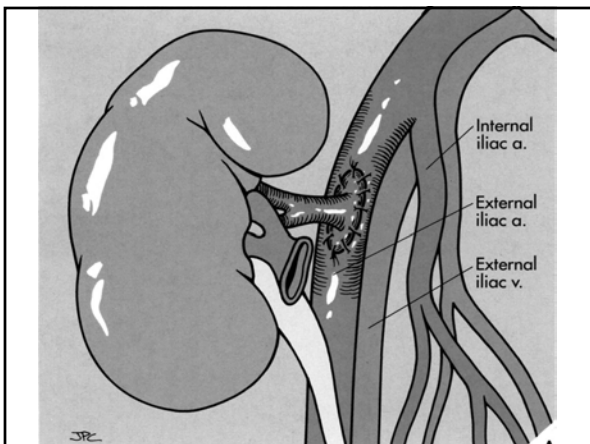
- 1-2 days in ICU
- 5-10 days on ward
- Physical therapy
- Nutritional repletion
- Prophylactic antibiotics
- Immunosuppressive adjustment

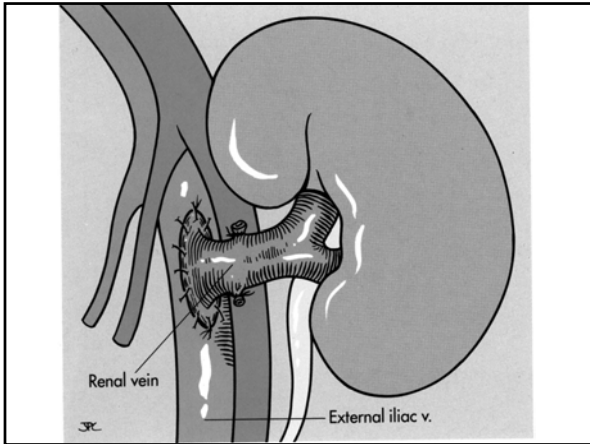
Operation-Recipient

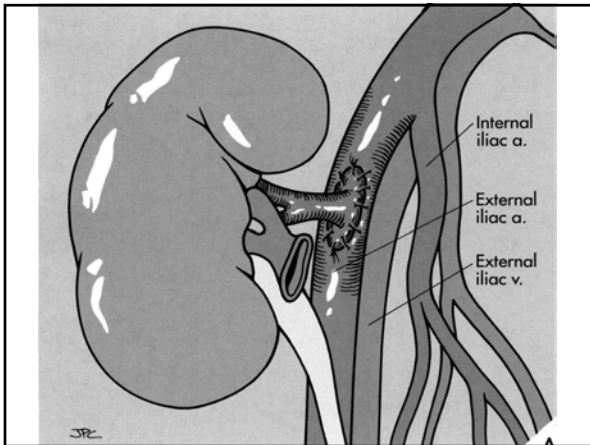
- Pre-op studies
 - CXR, EKG, CBC, chem.panel
 - ? need for dialysis
 - immunosuppressives
 - antibiotics
- Intra-op management
 - maintain BP
 - volume repletion

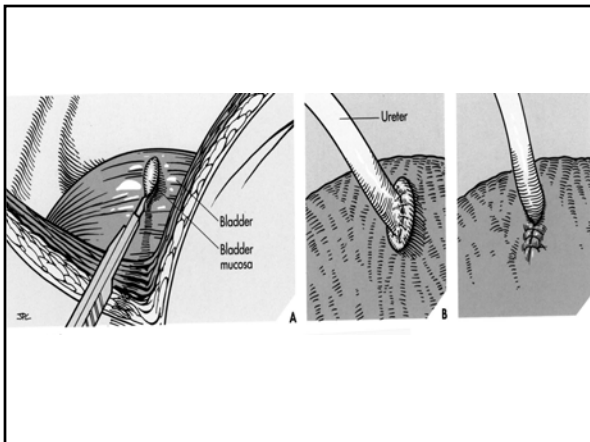
Operation-Recipient

- Retroperitoneal approach
- Isolate iliac artery/vein
 - ligation of lymphatics
- Ureteral anastomosis









Postoperative Care

- Early
 - urine output
 - bleeding
 - renal study
 - cardiopulmonary

Immunosuppression

Corticosteroids

- anti-inflammatory
- sequestration of T cells into lymphoid tissue
- inhibits production of T cell promoting cytokines
- doses of 250-1000 mg peri-transplant
- doses of 5-10 mg chronically

Immunosuppression

Corticosteroids

- adverse reactions
 - cataracts, glaucoma
 - Na⁺/fluid retention
 - HTN
 - muscle weakness
 - PUD
 - Cushing syndrome
 - osteoporosis, avascular necrosis hip, compression Fx

Immunosuppression

Antimetabolites

- Azathioprine (Imuran)
 - interferes with DNA/RNA synthesis
 - inhibits differentiation/proliferation of T & B lymphocytes
 - adverse reactions
 - leukopenia, nausea, neoplasia
 - 100-150 mg qd
 - largely replaced by mycophenolate mofetil

Immunosuppression

Antimetabolites

- Mycophenolate Mofetil (Cellcept)
 - selectively inhibits inosine monophosphate dehydrogenase in de novo pathway of purine synthesis
 - this is uniquely essential for T & B lymphocyte proliferation and function
 - adverse reactions
 - leukopenia, diarrhea, vomiting
 - 500-1000 mg bid

Immunosuppression

Calcineurin Inhibitors

- Cyclosporine (Sandimmune, Neoral)
 - produced by fungus *Beauveria nivea*
 - preferential inhibition of T lymphocytes by inhibiting production & release of IL-2
 - adverse reactions
 - renal toxicity, HTN, tremor/neurotoxicity, hirsutism, gum hyperplasia
 - dose 5-10 mg/kg bid
 - trough level 300-350 early, 200-250 late

Immunosuppression

Calcineurin Inhibitors

- FK 506 (Prograf, Tacrolimus)
 - macrolide antibiotic
 - inhibits IL-2 production
 - adverse reactions
 - renal toxicity, tremor/headache/neurotoxicity, diarrhea, nausea, HTN, hyperglycemia
 - .05-.1 mg/kg bid
 - trough level 10-15 early, 5-10 late

Immunosuppression

Antibody Preparations

- Polyclonal
 - ATGAM
 - Thymoglobulin
- Monoclonal
 - Muromonab CD3 (OKT3)
 - Basiliximab (Simulect)
 - Daclizumab (Zenapax)

Immunosuppression

Antibody Preparations

- Polyclonals
 - multiple antibody preparations directed against T lymphocyte antigens
 - deplete number of circulating cells
 - inhibit cell function
 - monitor CD2 & CD3 cells for effect

Immunosuppression

Antibody Preparations

- OKT3
 - Murine antibody directed against CD3 antigen
 - inhibits CD3-TCR interaction
 - prevents antigen recognition and activation
 - cytokine release syndrome
 - neurologic effects
 - sensitization

Immunosuppression

Antibody Preparations

- Basiliximab/Daclizumab
 - chimeric/humanized antibody
 - high affinity binding to α chain of IL-2 receptor
 - inhibits IL-2 binding and IL-2 mediated activation of T lymphocytes
 - no cytokine release syndrome
