



# Reducing Liver Transplant Rejection Rates with Bone Marrow

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## Background

- An immune system, with antibodies known as antigens, will reject an organ if it is recognized as a foreign object.
- Organ rejection rates can be lowered using immunosuppressant drugs. This also increases the risk of infection.
- The recipient has a higher chance of developing cancer from the immunosuppressant drugs.

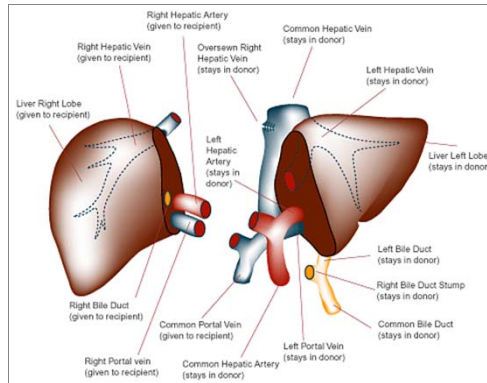


Figure 1. Division of the liver between the patient and the donor. Source: USC Live Donor Liver Transplant.

## Living Donor Liver Transplants (LDLT)

- A living person donates 50% to 75% of his or her liver, which grows to full size in both the donor and recipient. (Fig 1.)
- The quality of the liver may be better because living donors are generally young, healthy adults who have gone through a complete medical evaluation. (Fig 4.)
- The ischemic time (cold time outside the body) on the organ is minimal, which causes less damage to liver tissue.
- Living donors increase the available donor pool. (Fig 2.)

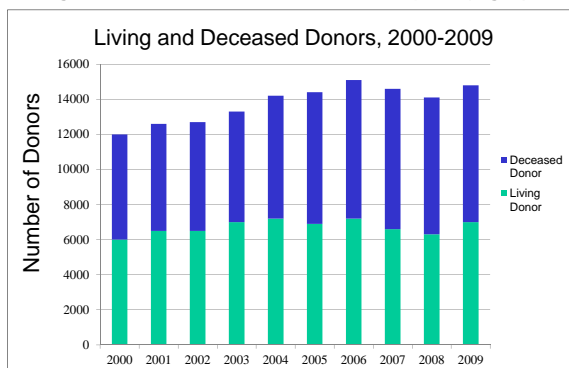


Figure 2. Number of living versus deceased donors. Source: OPTN/SRTR Annual Report.

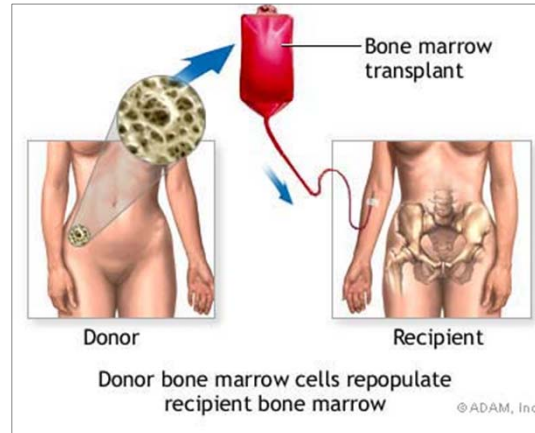


Figure 3. Location bone marrow is taken from donor and given to recipient. Source: 2010 CHXA Bone Marrow Transplantation.

## Bone Marrow Transplant

- The organ recipient's bone marrow is weakened and the donor's bone marrow is used to repopulate the recipient's bone marrow. (Fig 3.)
- People receiving organ transplants are much less likely to reject them if they also receive some bone marrow from the organ donor.
- The donor's immune system becomes temporarily mixed with the recipient's immune system, chimerism, after having a bone marrow transplant.
- The presence of immune system cells from the donor help convince the recipient's system not to attack the new organ. (Table 1.)
- By reducing the body's tendency to reject a new organ, bone marrow cells allow lower doses of immunosuppressant drugs to be used.

## Liver Transplantation in the United States, 1999-2008

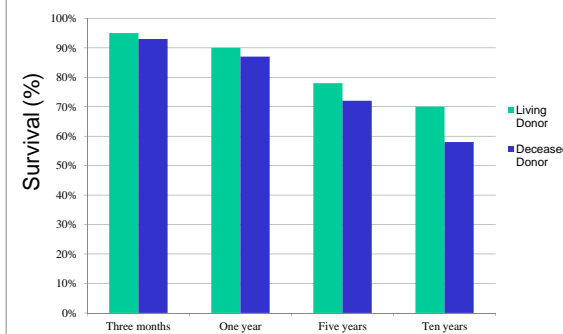


Figure 4. Patient survival after an organ transplant from living donors and deceased donors. Source: 2009 OPTN/SRTR Annual Report.

## Negative Bone Marrow Transplant Aspects

- Short term risks are pneumonia, other infectious diseases, excessive bleeding, liver disorder caused by blocked blood vessels, and transplant rejection.
- The donor's bone marrow launches an immune-mediated attack against the recipient's tissues, in 40% to 50% of the recipients. It is known as acute graft versus host disease. It is more frequently found in mismatched patients.
- Approximately 25-50% of bone marrow transplant recipients develop long-term complications.

Patient Age/Sex	Primary disease	SOT donor BMT donor	Conditioning regimens	Immuno-Suppression	Time between SOT to BMT	Outcomes	Follow-up
43 Years Female	Breast cancer liver metastasis	Orthotopic liver AUTO	CY/TBI	Pred No	85 days	Alive and well	13 months
55 Years Female	Multiple myeloma renal failure	6/6 sister same	RI Cytoxan/Thymic radiation	CSA/ATG	Same day	Alive and well off CSA by day 73	6 months
18 Years Male	Cholangiopathy Hyper-IgM syndrome	Orthotopic liver 6/6 unrelated	Flu/Mel	Pred/FK rATG/Pred	34 days	Mild GVHD Alive and well	13 months

Table 1. Three case studies that show successful patients after having both a solid organ transplant and a bone marrow transplant. Source: *Bone Marrow Transplantation* (2003) 31,633-642.

## Conclusions

- LDLT recipients have a higher survival rate overtime.
- Bone marrow transplants with a liver transplant would reduce the risk of organ rejection. The risks of a bone marrow-liver transplant are smaller than the risks that come from having a liver transplant alone.

## Acknowledgments

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## References

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