

Immunology of transplantation

Transplantation

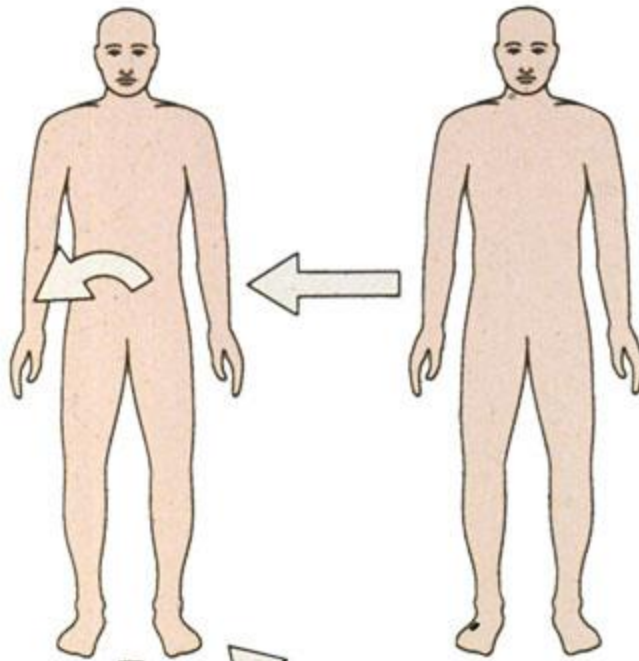
- A procedure in which an organ/s, tissue or a group of cells are removed from one organism (the donor) and transplanted into another organism (the recipient), or moved from one site to another site in the same organism.

Types of transplantation

- Autotransplantation –within one organism
- Allotransplantation- between one species
- Xenotransplantation- between two different species

autograft

from one part
of the body
to another
e.g. trunk
to arm

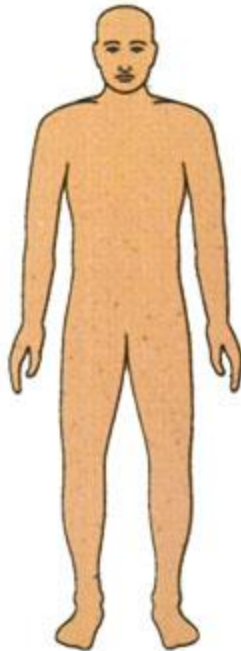


isograft

between
genetically
identical
individuals
e.g.
monozygotic
twins, or
within an
inbred strain

allograft

between
different
members
of the same
species
e.g. Mr Smith
to Mr Jones



xenograft

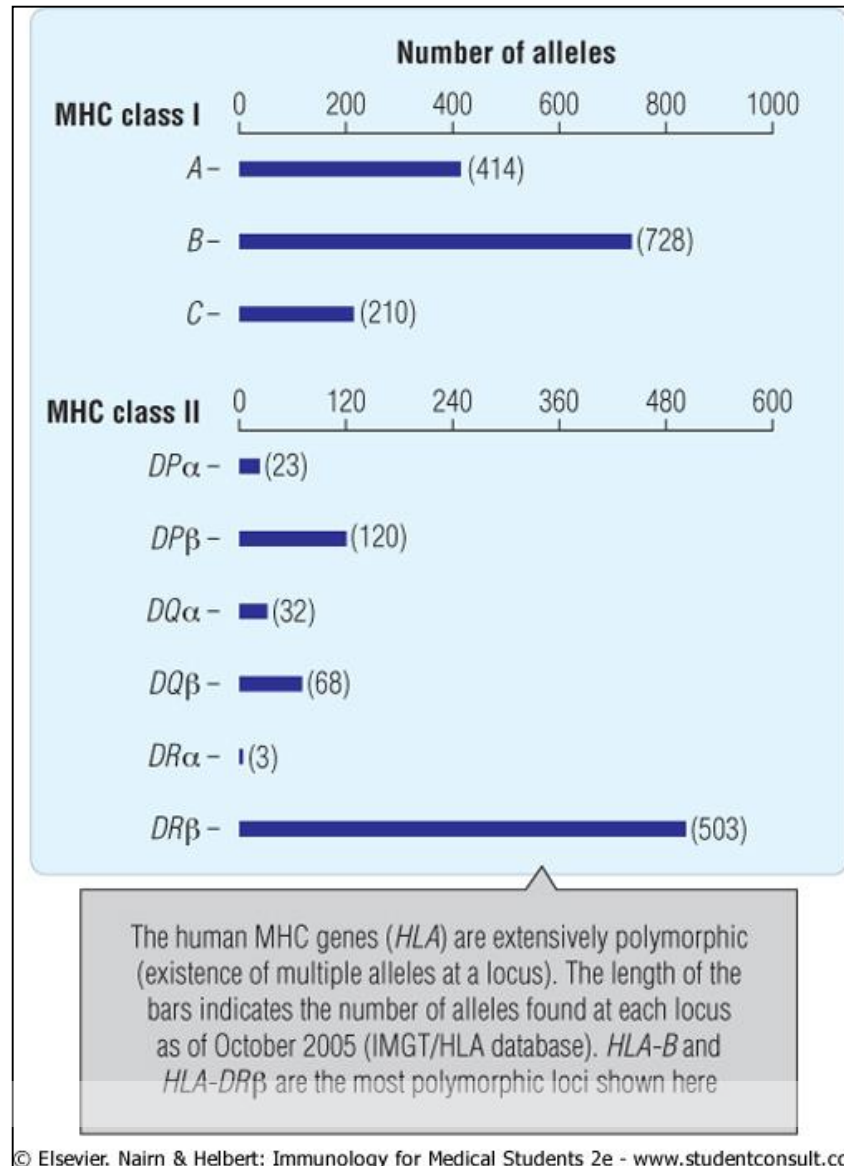
between
members of
different
species
e.g. monkey
to man



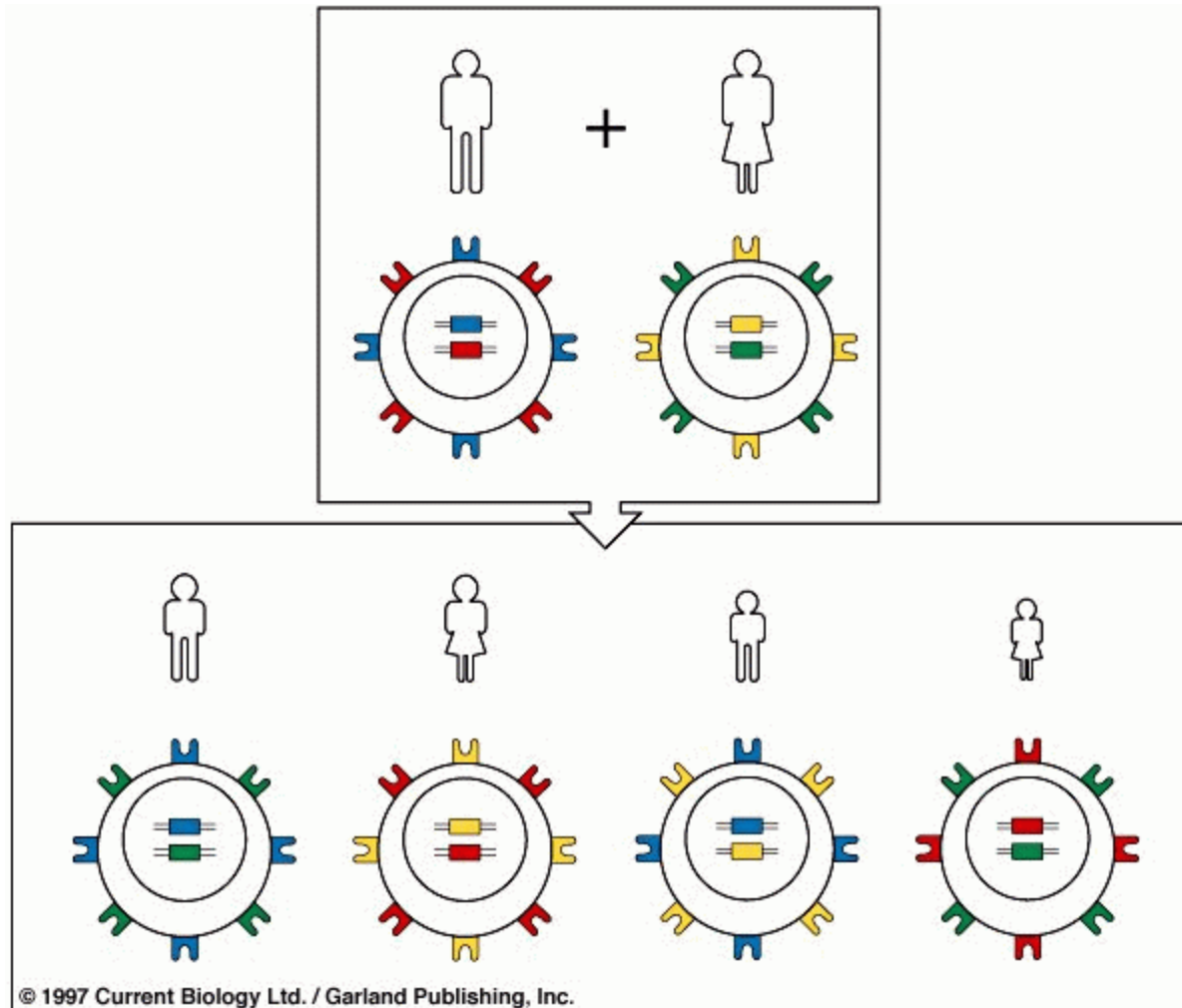
Success rate of transplantation in humans

Tissue transplanted	5-year graft survival*	No. of grafts in USA (1999)
Kidney	80–90%	13,429 (12,483)
Liver	40–50%	4698
Heart	70%	2234 (2185)
Lung	30–40%	934 (885)
Cornea	~70%	~40,000†
Bone marrow	80%	23,500‡

Polymorphism of HLA antigens



Co-dominant expression of HLA genes

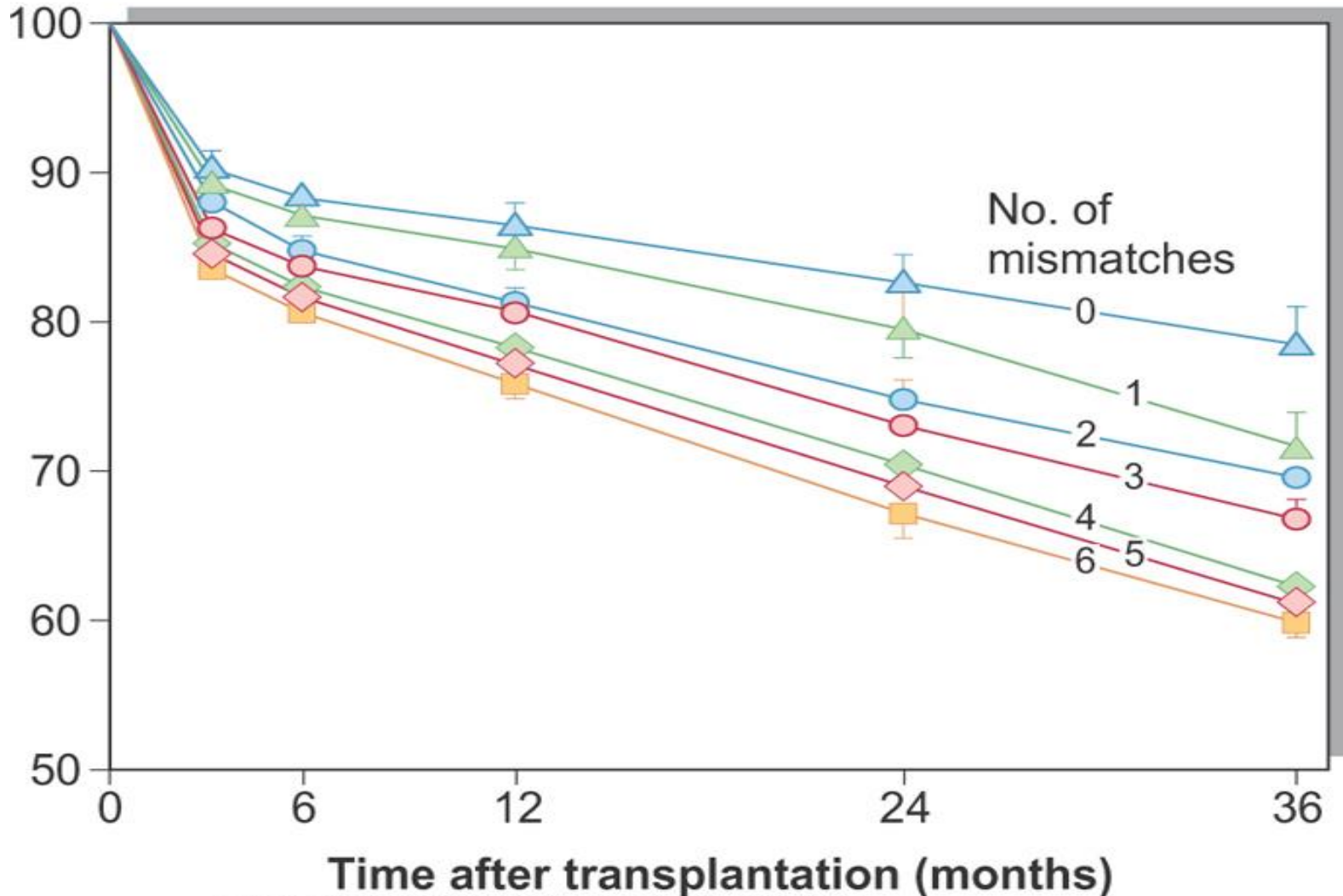


Investigations before solid organ transplantation

- ABO blood groups compatibility
- Negativity of cross match test
- HLA „similarity“ (does not play a significant role in heart and liver transplantation)

Effect of HLA-identity on kidney graft survival

Graft-survival rate
(% total grafts)



Cross match test

- Used for detection of recipient's antibodies against donor's antigens (mainly HLA antigens)
- Donor's leukocytes + patient's plasma
- Positive – antibodies bind to leukocytes – can be detected e.g. by flow cytometry
- Positivity contraindicates transplantation

Types of graft rejection

- Hyperacute - minutes to hours after transplantation. Caused by pre-formed recipient antibodies against HLA antigens of the donor. Irreversible.
- Acute - several days to months after transplantation. Mainly T-cell mediated. Usually reversible by aggressive immunosuppression.
- Chronic - years after transplantation. Continuous decrease in graft function. Irreversible. Mechanism unknown.

The most frequent types of organ transplantation

- Heart
- Kidney
- Liver
- Lungs
- Pancreas
- Cornea
- Many other organs
- Extremities, face...

Hematopoietic stem cells transplantation

- Indications: malignancies, bone marrow failure, primary immunodeficiencies.
- “Whole“ bone marrow or separated CD34+ cells can be used.
- The most significant complication: graft-versus host reaction (GVHR).
- Optimal HLA-matched donor is required.

Graft-versus host reaction (GVHR)

- Immunological reaction of transplanted T-cells against recipients (HLA) antigens.
- Skin, liver, intestine predominantly affected.
- Milder forms can be treated by immunosuppression, severe forms may be fatal.
- Can be induced by transfusion of non-irradiated blood to immunodeficient patients (primary immunodeficiencies, leukemia...).