Q8(b)

What do you understand by blood group systems? How is HLA system different from those based on red cell antigens?

UPSC Civil Services Mains 2022 · Anthropology GS 1 · 15 marks · Age, sex and population variation as genetic marker

9.6 Age, sex and population variation as genetic marker: ABO, Rh blood groups, HLA Hp, transferrin, Gm, blood enzymes. Physiological characteristics-Hb level, body fat, pulse rate, respiratory functions and sensory perceptions in different cultural and socio-economic groups.

Core demand of the question

- What do you understand by blood group systems? How is HLA system different from those based on red cell antigens?
- Write about 200 words for 15 marks

Revision summary

A blood group system is a locus of cell-surface antigens.

ABO and Rh are red-cell systems for transfusion.

HLA is the MHC on leukocytes, used in graft matching.

HLA polymorphism dwarfs ABO.

Anthropology used both as population markers, not as races.

Introduction

A blood group system is a set of antigens on blood cells, inherited at one genetic locus or cluster, that can raise antibodies. ABO and Rh are red-cell systems. HLA is a white-cell system of a different biological job.

Body

Red-cell systems

- **Landsteiner** found ABO. Rh, MN, Duffy, and others followed. They sit on erythrocytes and matter in transfusion and haemolytic disease of the newborn.
- Anthropology used ABO maps, after **Hirszfeld** and **Boyd**, as population markers. They are poor race types.

HLA

- Human Leukocyte Antigen genes sit in the MHC on chromosome 6. They present peptides to T cells. Matching them matters in **graft** survival, not in ordinary packed-red-cell transfusion.
- HLA is vastly more polymorphic than ABO. That diversity is immune history, including pathogen pressure.
- Disease associations (ankylosing spondylitis and HLA-B27) have no ABO parallel in strength.

Contrast

- Red-cell groups are mostly carbohydrate or protein badges on the erythrocyte. HLA is an immune recognition system on leukocytes and tissues.
- Both are genetic polymorphisms. Only HLA is the transplant barcode.

Flow diagram

Blood groups -> Red cell ABO Rh

Blood groups -> MHC white cell

Red cell ABO Rh -> Transfusion

MHC white cell -> Transplant immunity

Conclusion

Blood group systems are inherited antigen families. Red-cell systems guide transfusion. HLA guides immunity and transplantation and is not a red-cell blood group in the Landsteiner sense.

Facts & figures

Landsteiner

Discovered ABO (1901) and later work leading to Rh, founding transfusion safety.

MHC

Major histocompatibility complex; HLA is the human MHC class I and II set.

HLA-B27

Strong association with ankylosing spondylitis, a clinical use beyond typing grafts.

Boyd

Used blood groups to classify world populations without restoring nineteenth-century races.