Guidelines for the Blood Transfusion Services

15.2: Clinical applications of blood group molecular typing

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15.2: Clinical applications of blood group molecular typing

Various clinical applications of blood group molecular typing are listed below:

- **Fetal typing:**[1] Typing of fetuses, usually for D, but also K, C, c or E, of alloimmunised women, to assess whether the fetus is at risk of haemolytic disease of the fetus and newborn (HDFN). The DNA source is cell-free fetal DNA in the mother's plasma. This technology is now also applied to high-throughput non-invasive prenatal testing (NIPT) for fetal *RHD* genotype of D negative pregnant women, to determine their requirement for antenatal anti-D prophylaxis.[2]
- **Transfused patients:** Typing of multiply transfused patients, where serological testing cannot be used because of the presence of transfused red cells.
- **Immunoglobulin-coated red cells:** Typing of red cells giving a positive direct antiglobulin test (DAT), usually in patients with autoimmune haemolytic anaemia, to help in the identification of underlying alloantibodies.
- **Determining Rh variants:** Molecular methods are used for identifying Rh variants, especially the weak and partial variants of D, to assist in the provision of the most suitable blood for transfusion.
- **Confirmation of D negative:** Detection of *RHD* in an apparently D negative donor could signal very weak D expression, which could immunise a D negative patient.
- ***RHD* zygosity:** Quantitative PCR can reveal whether a D positive person is homozygous or hemizygous for *RHD*. This cannot be done by serological methods. Testing fathers of fetuses at risk of HDFN provides limited information on the D type of the fetus.
- **Testing when suitable reagents are not available:** Molecular methods can replace serological methods when suitable serological reagents are unreliable or not available, e.g. Dombrock typing of donors.
- **Supporting the serological reference laboratory:** Molecular methods are valuable for supporting the serological reference laboratory in sorting out difficult problems.

15.2.1: Testing donors for multiple blood groups

It is probable that molecular methods will replace serology in the near future for testing donors for multiple blood groups. The new high-throughput molecular technology will be more accurate than serological methods and will probably be more cost-effective. Molecular tests could also be applied to screening for donors with rare blood group phenotypes such as S s U, Lu(b), k, Js(b), Yt(a), Co(a) and Vel.

For prediction of blood group phenotypes from DNA of donors, results should either be confirmed by serological testing or by testing twice by molecular methods. This does not apply to ABO and RhD, which are always determined by serological testing.