

A microscopic view of red blood cells, showing their characteristic biconcave disc shape. The cells are densely packed, with some in sharp focus and others blurred in the background, creating a sense of depth. The color is a deep, vibrant red.

Fetal Genotyping Leeds Teaching Hospitals Experience

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Rh Blood Group System

- 1939 Levine and Stetson
 - Rh blood group system
 - Chromosome 1
- 1940 Landsteiner and Weiner
 - LW blood group system **IT WASN'T ME**
 - Chromosome 19

Haemolytic Disease of the Fetus & Newborn (HDFN)

- Serious HDFN
 - Anti-D, anti-c and anti-K
- Mild to moderate
 - Others active at 37°C
- Clinical signs
 - Hyperbilirubinaemia
 - Anaemia
 - Hepatomegaly/splenomegaly
 - Hydrops fetalis

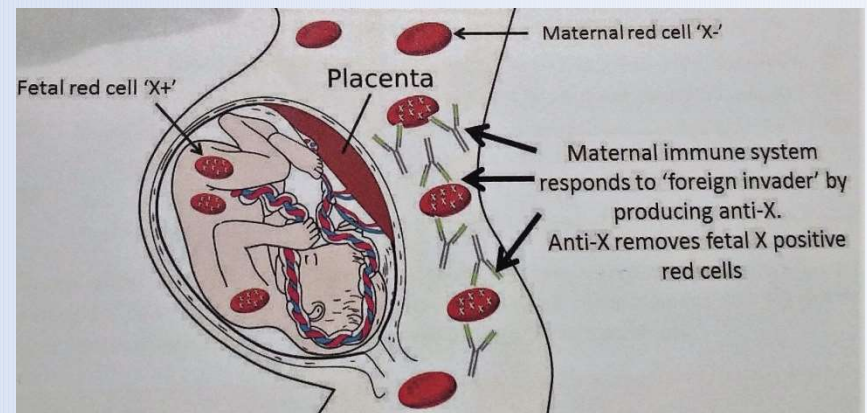


Image: Qureshi, R (2015) *Introduction to Transfusion Science Practice*, British Blood Transfusion Society, 6th Edition.

NICE guidelines

- Routine antenatal anti-D prophylaxis (RAADP)
 - Two doses at 28 weeks and 34 weeks
 - One dose between 28 to 30 weeks
- High-throughput non-invasive prenatal testing (NIPT) for fetal *RHD* genotype
(<http://www.nice.org.uk/guidance/dg25>)

cffDNA

- Fetal DNA in maternal plasma
 - 1997 Lo *et al* showed 3-6% fetal DNA
 - 2008 Lun *et al* showed ~19% fetal DNA
- Syncytiotrophoblasts undergoing apoptosis
- Real-time Quantitative PCR used to detect *RHD*

Benefits

- Substantial reduction in the use of anti-D immunoglobulin
- Women with an RhD negative fetus spared unnecessary exposure
- Cost
 - D-gam 500 IU £33.75
 - Rhophylac 1500 IU £39.50
 - Clinic time is reduced
 - cffDNA testing

Accuracy

- *Finning K et al 2008*
 - 1869 samples
 - 95.7% correct fetal RhD phenotype predicted
 - 3.4% unobtainable/inconclusive
 - 0.8% false positive
 - 0.1% false negatives
- Risks
 - False positive
 - False negative

Leeds Teaching Hospitals

- Booking bloods - Group & Antibody screen
- Laboratory identifies all RhD Negative ladies – list to ANC
- cffDNA offered ~ 16 weeks
- cffDNA sent to laboratory - NHSBT - IBGRL
- List of all cffDNA received sent weekly to ANC
- ANC upload results onto PPM/spreadsheet
- Letter to midwife and patient with outcome
- Test post delivery cord samples – highlight discrepancy

Outcomes

- Fetus is Rh D negative
 - No anti-D appointment
 - 28 weeks as normal
 - No PSE testing required
- Fetus is Rh D positive
 - Managed as per Rh D positive pathway
 - Anti-D appointment generated
- Sample inconclusive
 - Manage as per Rh D positive pathway
- Sample not tested
 - Repeat required – 2 repeats maximum

Issues

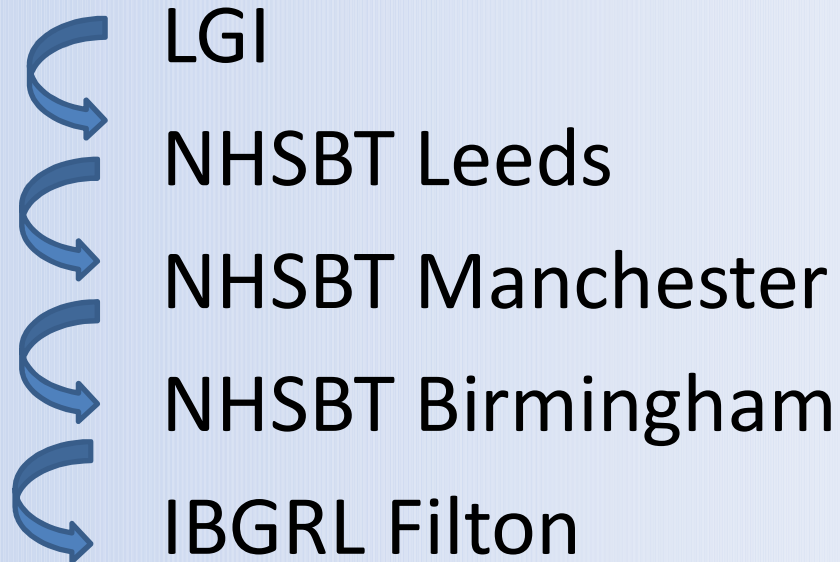
- Laboratory Information Management Systems
 - Very old Apex based
 - Complicated to extract information
- Overcome by adding additional test code for all antenatal patients
- Weekly lists performed
 - Breakdown workload for ANC
 - Women book at various gestational ages

Sample labelling

- Zero tolerance
 - Forename
 - Surname
 - DOB
 - NHS/Hospital number
 - Signed and dated
- Surname changes
- Incomplete information
 - Gestational data

Sample criteria

- Must not be refrigerated
- Must not have other tests done prior
- Must reach IBGRL within 7 days



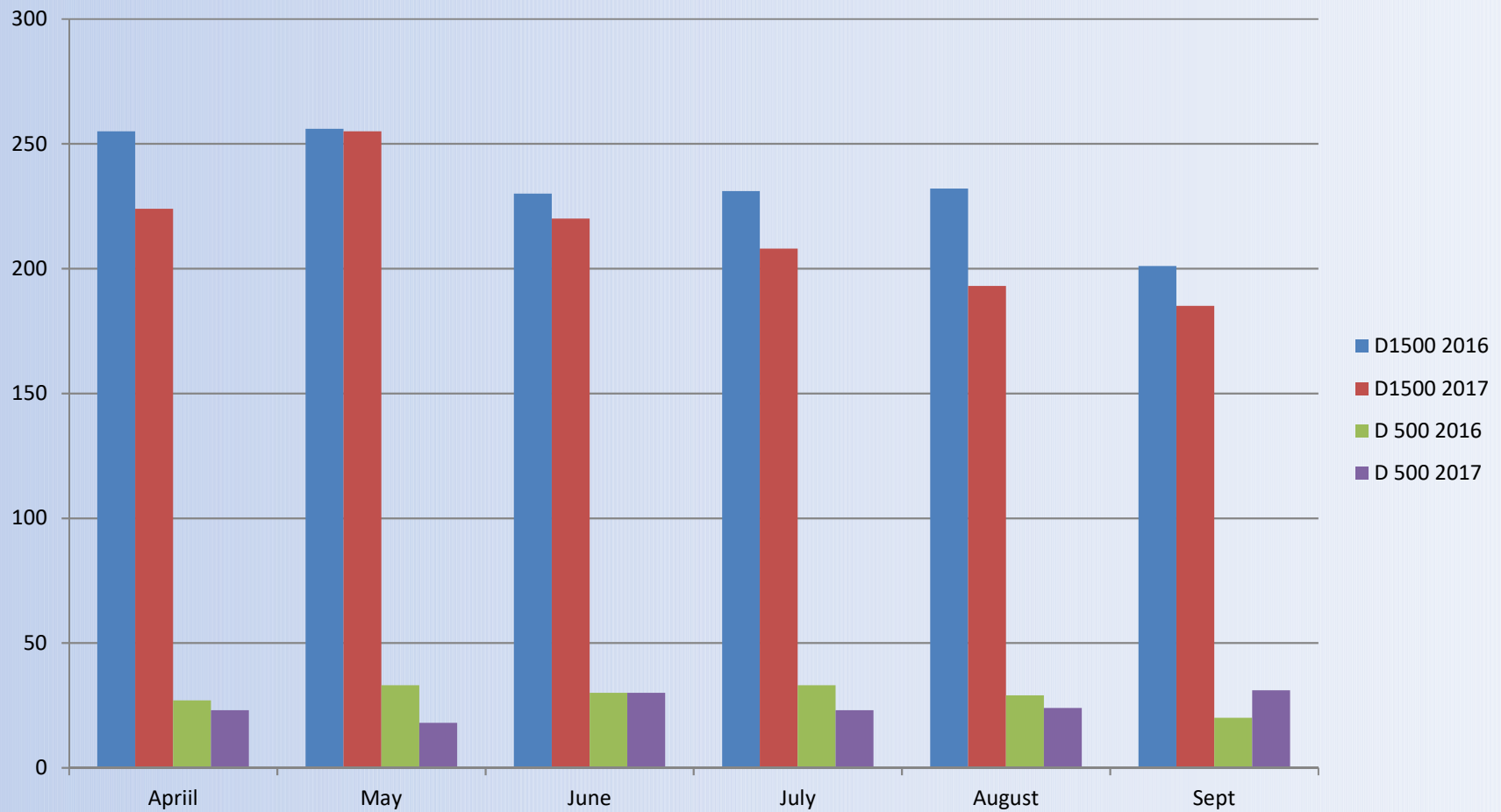
Anti-D issues

- Maternity assessment sending Anti-D and Kleihauer requests for PSE - fetus predicted to be RhD negative
- Patient asking for Anti-D - fetus predicted to be RhD negative
 - Confidence in test
 - Norm

Statistics

- 463 ladies offered cffDNA
- 254 Rh D Positive (54.8 %)
- 158 Rh D Negative (34.1 %)
- 19 inconclusive (4.1 %)
- 32 Not tested/Not applicable (6.9 %)
 - Transport issues
 - 2 x sample repeats
 - Moved out of area
 - Declined (n=3)

Statistics continued....



Cell free fetal DNA

