Special Requirements

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Why are special requirements important?

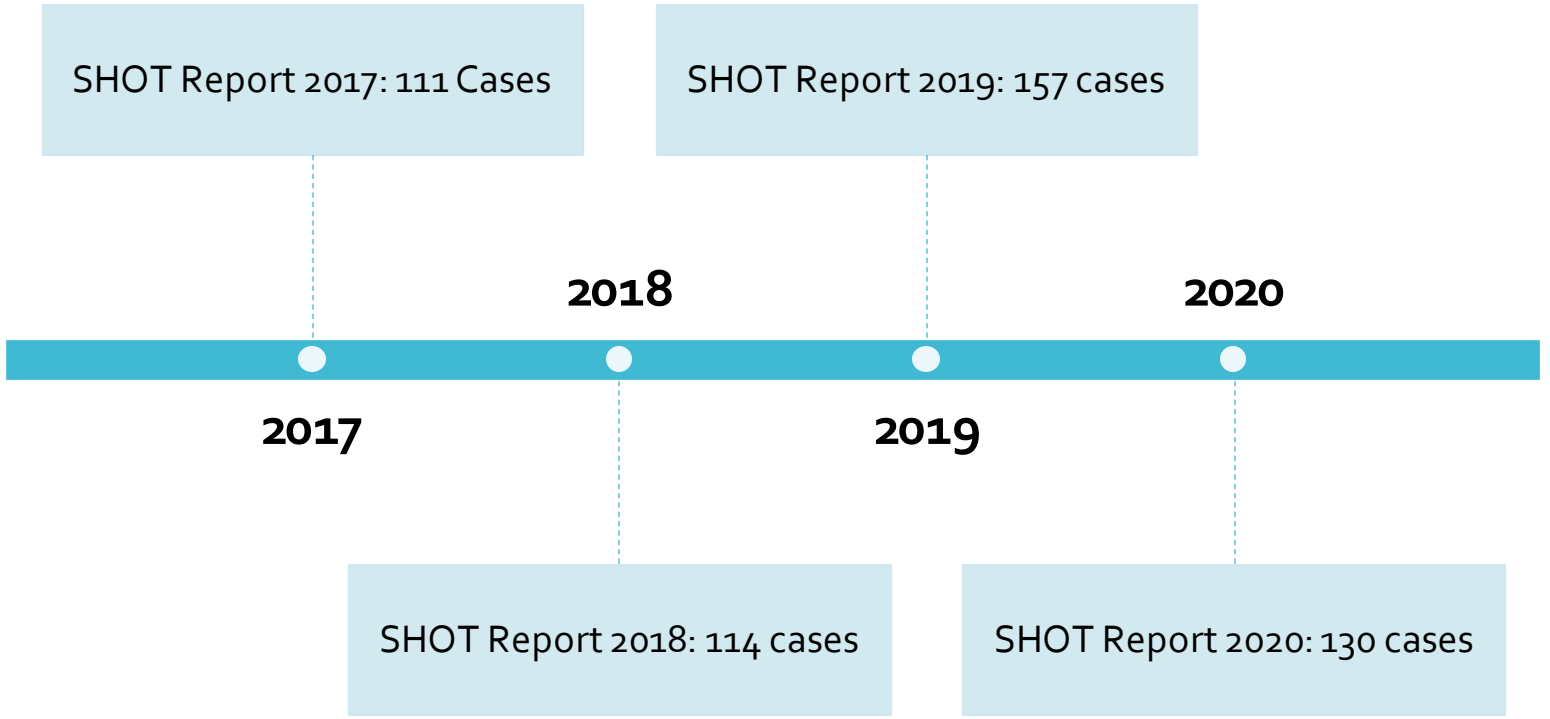
Types of Special requirements

Irradiation

CMV Negative

Phenotype Matched

IBCT- SRNM – Laboratory Errors



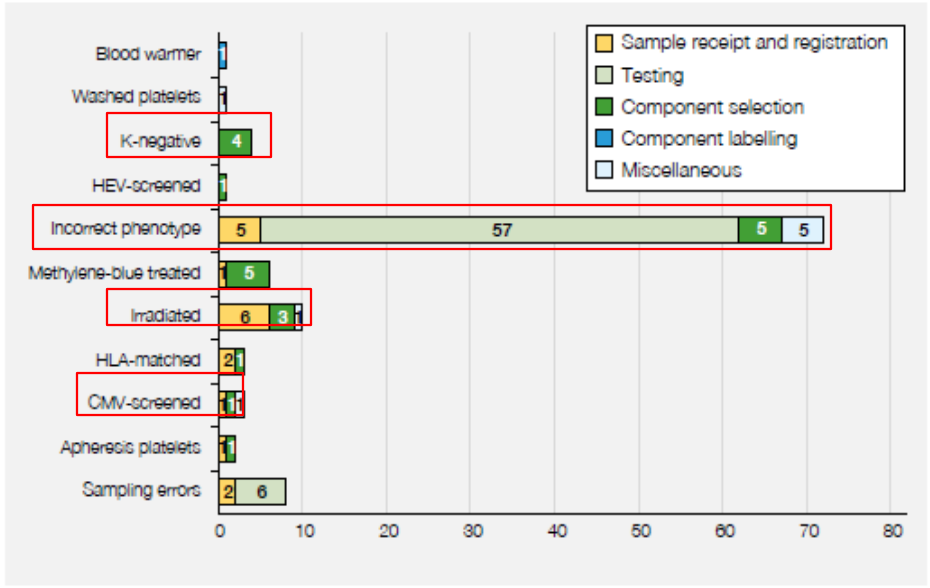
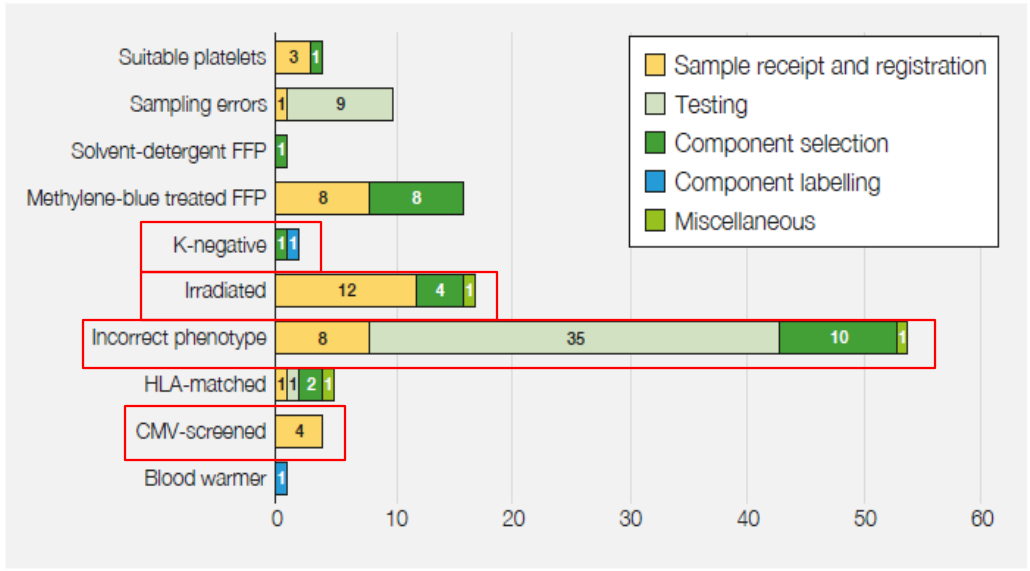


Figure 10.8d: Laboratory errors leading to specific requirements not being met n=111



FFP=fresh frozen plasma; HLA=human leucocyte antigen; CMV=cytomegalovirus

Figure 8.14: Laboratory errors resulting in specific requirements not being met n=114

SHOT 2018

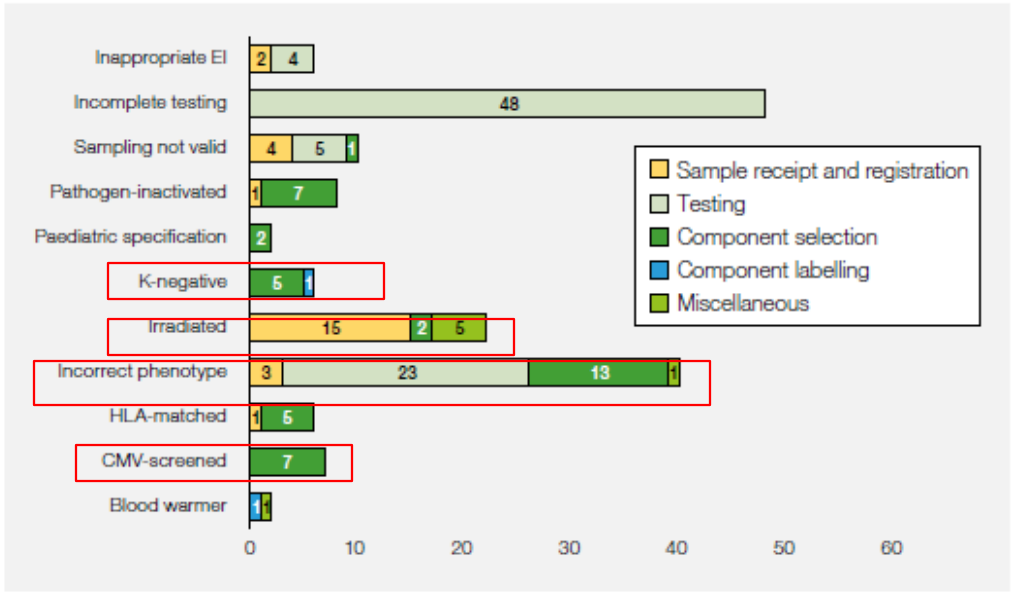


Figure 9.8: Laboratory errors resulting in SRNM n=157

EI=electronic issue; HLA=human leucocyte antigen; CMV=cytomegalovirus

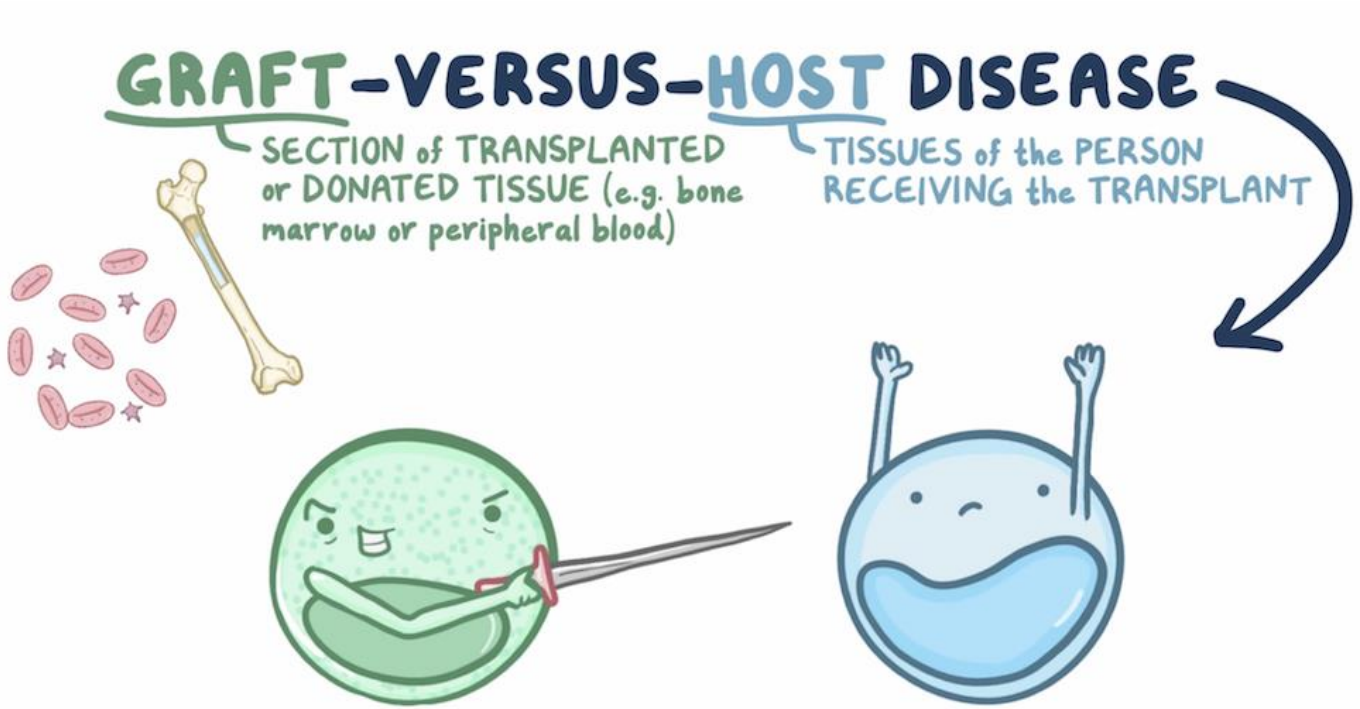
Figure 10.8: Laboratory errors resulting in IBCT-SRNM (n=130)

CMV=cytomegalovirus; HLA=human leucocyte antigen

SHOT 2020

What is Irradiation?

- Blood products are exposed to X-rays or gamma rays
- This exposure inactivates lymphocytes by damaging the DNA leading to an inability to replicate.
- Preventing the donor lymphocytes mounting an immune response in a patient
- Only cellular products require irradiation
  - Packed Red Cells
  - Platelets
  - Granulocytes



Signs and symptoms: skin rash, fever, diarrhoea, liver dysfunction and bone marrow failure

Typically occurs 10-14 days after transfusion; almost always fatal

Who is at risk?

Neonates/Infants

- Intrauterine transfusion (red cells and platelets)
- Routine ‘top up’ transfusion following IUT
- Neonate exchange blood transfusion
- Congenital immunodeficiencies in infants and children
- Cardiac surgery in neonates and infants
- Acquired immunodeficiency states in childhood

Drug Induced

- Patients treated with purine analogues
- Patients treated with alemtuzumab (campath 1H-anti-CD 52) or anti-thymocyte globulin (ATG)
- Chimeric antigen receptor T-cell (CAR-T) therapy

Close HLA Match

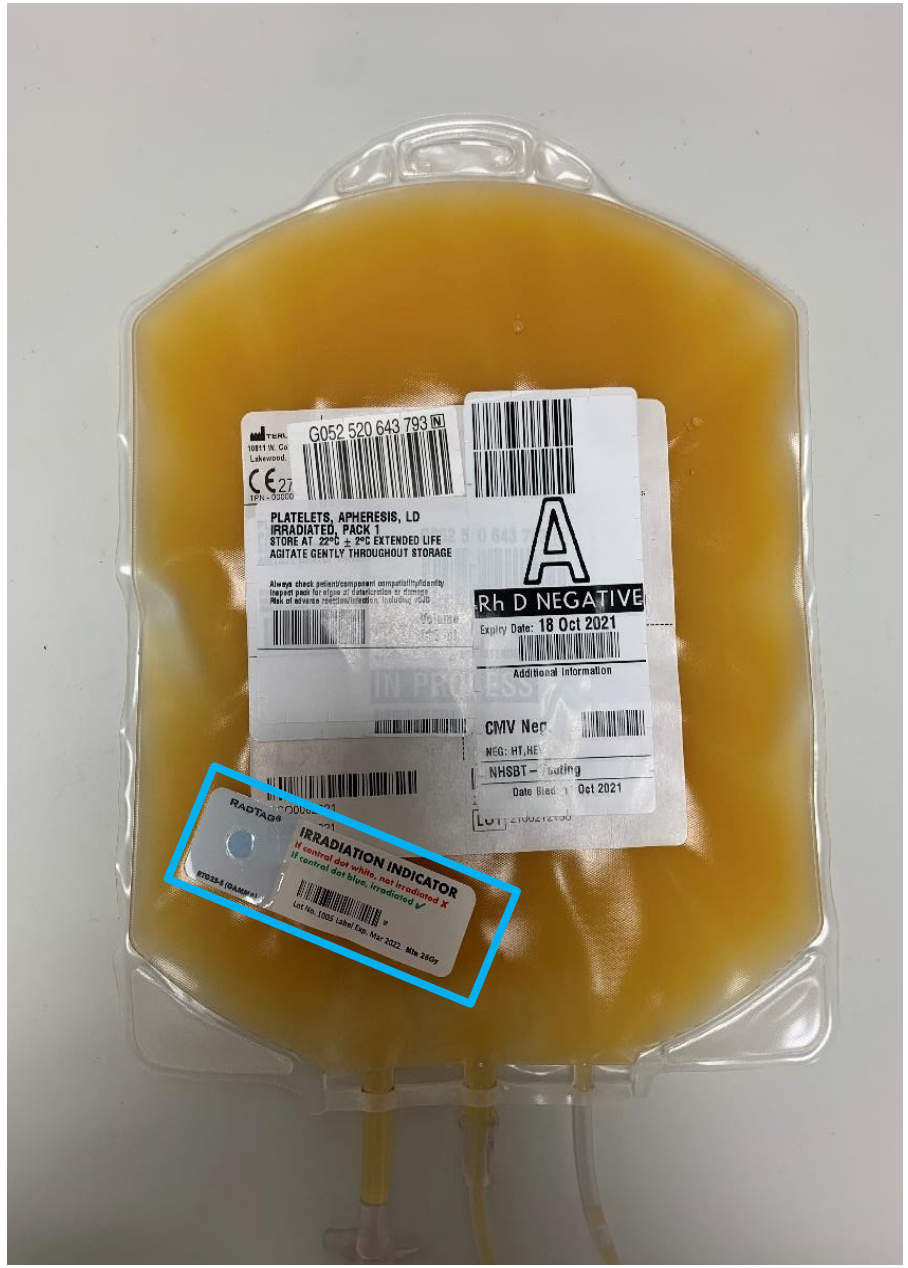
- Patients receiving HLA-selected platelets
- Transfusions from 1st or 2nd degree relatives

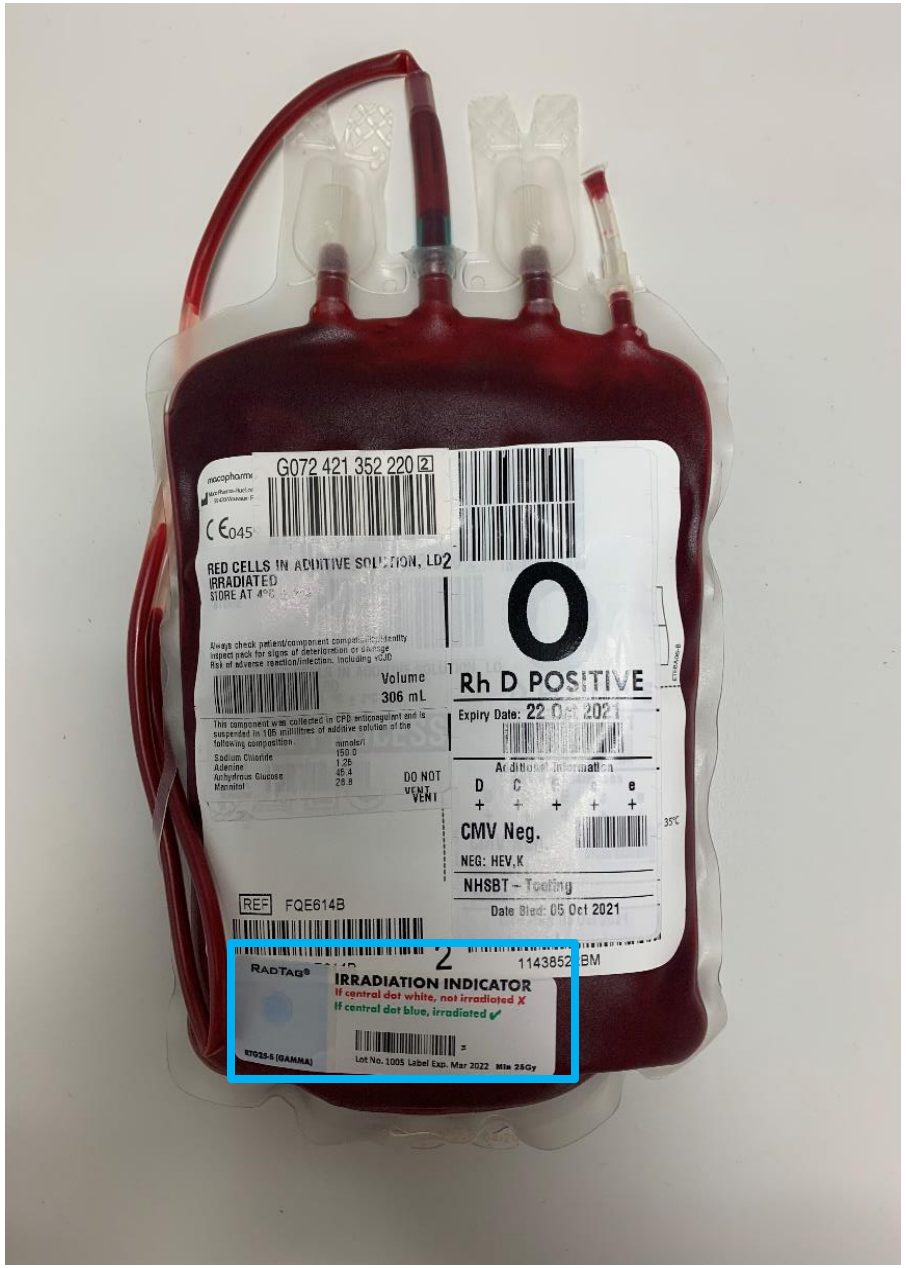
Disease

- Hodgkin's Lymphoma

Transplant

- Recipients of allogeneic stem cell transplants
- Autologous stem cell transplants; or CAR-T cells


PLATELETS, APHERESIS, LD
IRRADIATED, PACK 1
STORE AT 22°C ± 2°C EXTENDED LIFE
AGITATE GENTLY THROUGHOUT STORAGE
A
Rh D NEGATIVE
Expiry Date: 18 Oct 2021
Additional Information
NHSBT – Testing
IRRADIATION INDICATOR
If central dot white, not irradiated X
If central dot blue, irradiated ✓


RED CELLS IN ADDITIVE SOLUTION, LD
IRRADIATED
Volume
306 mL
O
Rh D POSITIVE
CMV Neg.
NEG: HEV,K
NHSBT – Testing
Date Bled: 05 Oct 2021
IRRADIATION INDICATOR
If central dot white, not irradiated X
If central dot blue, irradiated ✓

What components are selected for irradiation?

- Red Cells
  - Neonates
    - Must be less than 5 days bled from donor
    - Transfused within 24hours of irradiation
  - Adults
    - Less than 14 days bled when irradiated
    - Expire 14 days post irradiation
- Platelets
  - Can be irradiated at any stage and stored for normal shelf life
- Granulocytes
  - Irradiated as soon as possible after production and used with minimum delay

Advantages

vs

Disadvantages

Advantages

- Prevention of transfusion associated GvHD
- Irradiation of platelets does not clinically change the platelet function

Disadvantages

- Reduced red cell storage life
- Increase haemolysis and potassium leakage
- Potassium levels are twice as high in irradiated red cells
- Cost

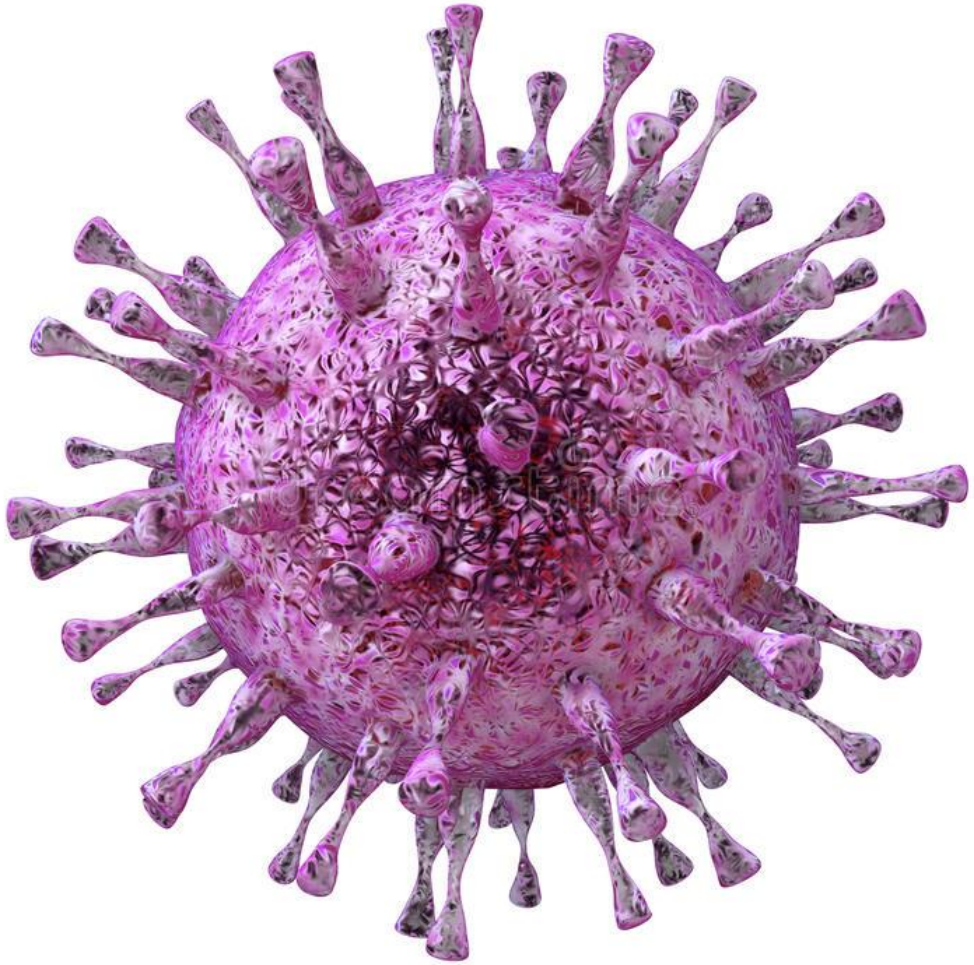
CMV - Cytomegalovirus

Type of herpes virus

Common virus that is usually harmless

Leads to life long infection in all age groups

50-60% of adults are CMV IgG positive



Severe disease may occur in individuals with impaired immunity

- Foetuses/Neonates
  - Sensorineural hearing loss
  - Cerebral palsy
  - Spontaneous abortion, Still Birth, Fetal hydrops
  - Ophthalmic complications
  - Death
- Immunosuppressed patients that have not previously been infected with CMV
  - Fever, Shortness of Breath
  - Pneumonia
  - Retinitis
  - Encephalitis
  - Neuropathy

Leucodepletion

- CMV is Transmitted through white cells in components
- In the UK blood components have been leucodepleted since November 1999
- This reduces the risk of transmitting CMV
  - Risk is not completely eliminated
- Immunocompromised patients should receive leucodepleted products not CMV Negative

Who requires CMV negative blood components?

- Intrauterine transfusions (IUT)
- Elective transfusion in pregnancy
  - (not during labour or delivery!)
- Neonates – up to 28 days **post expected delivery date**
- Granulocytes if patient is CMV negative (IgG)

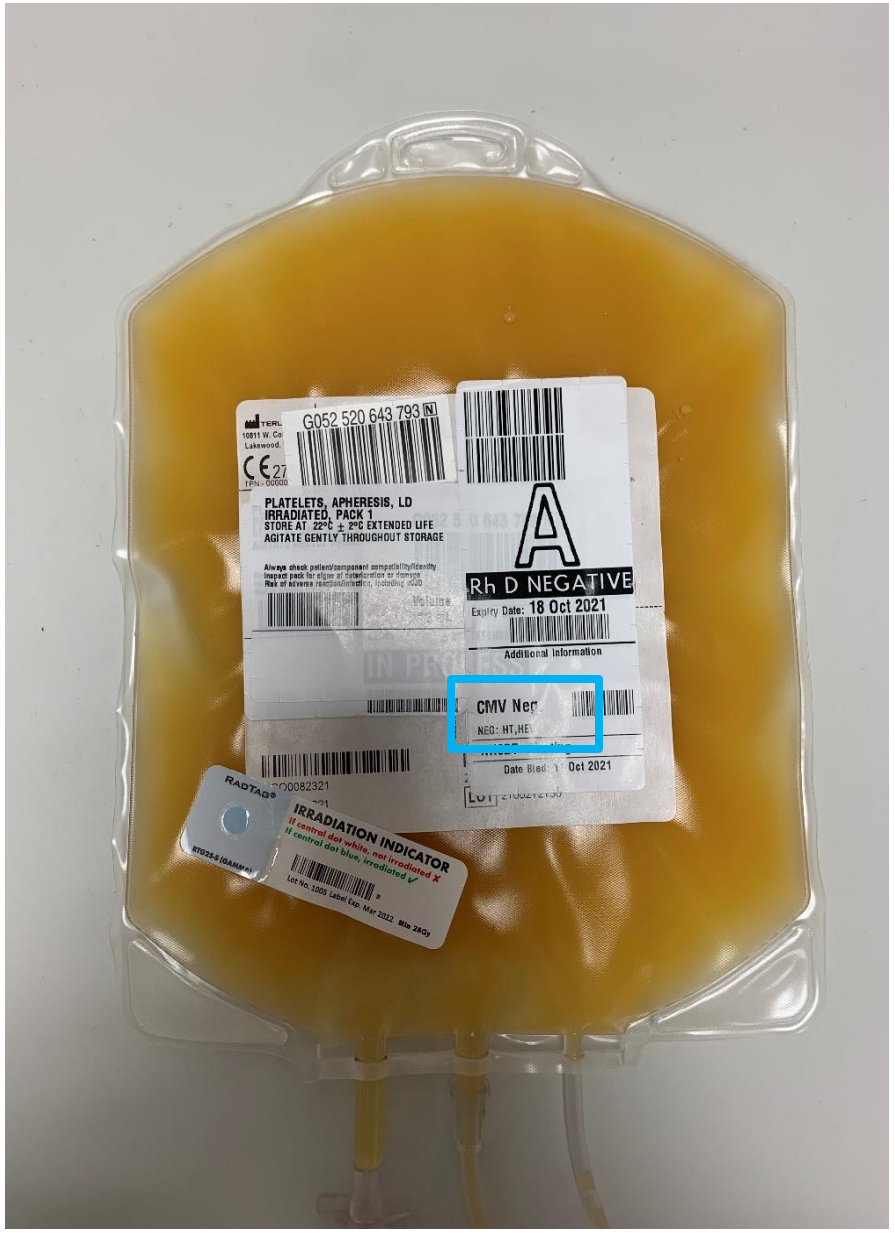
What is a CMV- Product

Donors are negative for CMV IgG antibodies

A percentage of donors are screened to provide an available stock for hospitals

Younger donors are selected for screening as CMV IgG positivity increases with age


G052 521 451 629 A
RED CELLS IN ADDITIVE SOLUTION LD
STORE AT 4°C ± 2°C
Always check patient/component compatibility/identity
Inspect pack for signs of deterioration or damage
Risk of adverse reaction/infection, including vCJD
Volume
277 mL
This component was collected in CPD anticoagulant and is suspended in 105 millilitres of additive solution of the following composition.
mmols/l
Sodium Chloride 150.0
Adenine 1.25
Anhydrous Glucose 45.4
Mannitol 28.8
DO NOT VENT
O
Rh D NEGATIVE
Expiry Date: 26 Oct 2021
Additional Information
D C E c e
+ + − + +
CMV Neg.
NEG: HEV,K
NHSBT – Filton
Date Bled: 21 Sep 2021
REF FQE614B
2MAFQE614B
2
11441390BM


G052 520 643 793 N
PLATELETS, APHERESIS, LD
IRRADIATED, PACK 1
STORE AT 22°C ± 2°C EXTENDED LIFE
AGITATE GENTLY THROUGHOUT STORAGE
A
Rh D NEGATIVE
Expiry Date: 18 Oct 2021
Additional Information
CMV Neg
NEG: HT,HE
Date Bled: Oct 2021
IRRADIATION INDICATOR
If central dot white, not irradiated X
If central dot blue, irradiated ✓

Who requires phenotyped blood?

Table A3. Likely clinical significance of red cell alloantibodies, and recommendations for the selection of blood for patients with their presence

System	Specificity	Likely clinical significance in transfusion	Recommendation for selection of red cells for transfusion[1]
ABO	Anti-A_1	No	IAT crossmatch compatible at 37 °C
Rh	Anti-D, -C, -c, -E, -e	Yes	Antigen negative
Rh	Anti-C^w	No	IAT crossmatch compatible[2]
Kell	Anti-K, -k	Yes	Antigen negative
Kell	Anti-Kp^a	No	IAT crossmatch compatible[2]
Kidd	Anti-Jk^a, -Jk^b	Yes	Antigen negative
MNS	Anti-M (active 37 °C)	Yes	Antigen negative
MNS	Anti-M (not active 37 ° C)	No	IAT crossmatch compatible at 37 °C
MNS	Anti-N	No	IAT crossmatch compatible at 37 °C
MNS	Anti-S, -s, -U	Yes	Antigen negative
Duffy	Anti-Fy^a, -Fy^b	Yes	Antigen negative
P	Anti-P_1	No	IAT crossmatch compatible at 37 °C
Lewis	Anti-Le^a, -Le^b, -Le^{a+b}	No	IAT crossmatch compatible at 37 °C
Lu	Anti-Lu^a	No	IAT crossmatch compatible at 37 °C
Diego	Anti-Wr^a (anti-Di3)	Yes	IAT crossmatch compatible[2]
H	Anti-HI (in A_1 and A_1B patients)	No	IAT crossmatch compatible at 37 °C
All	Others active by IAT at 37 °C	Yes	Seek advice from Blood Centre

[1] Where antigen negative red cells are recommended these should also be compatible in an IAT crossmatch.

[2] These recommendations apply when the antibody is present as a sole specificity. If present in combination, antigen negative blood may be provided by the blood centre, to prevent wastage of phenotyped units. This guidance is also suitable for patients undergoing hypothermia during surgery (Klein and Anstee, 2005b).

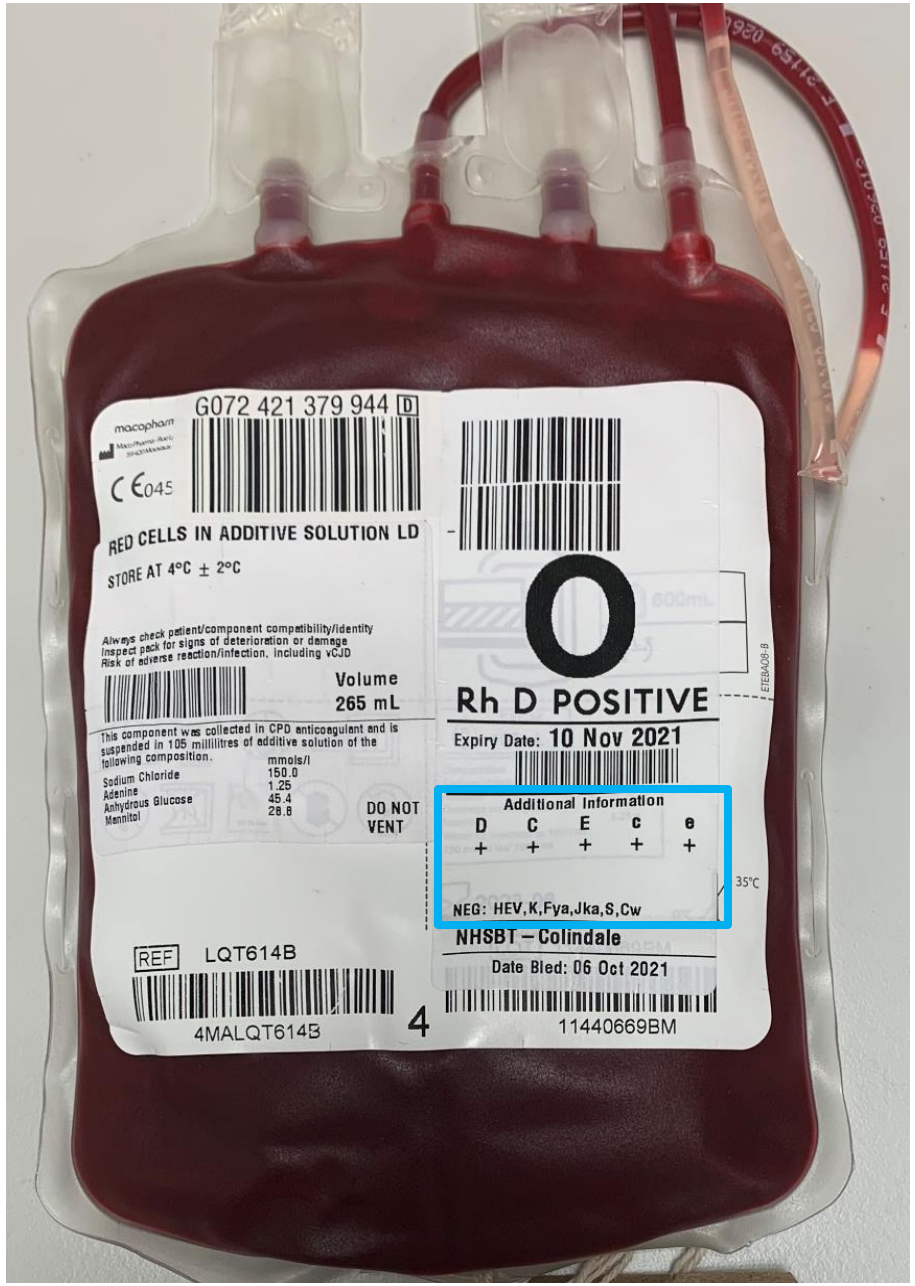
Patients with red cell antibodies

Sickle Cell Disease, Thalassemia and chronic transfusion programs

- The most frequent adverse event reported was SRNM.
- Extended phenotype should performed prior to any transfusions
- Rh/K antibodies are the most antigenic blood group systems therefore matching their phenotype reduces the likelihood of antibody production
- Not providing extended Rh and Kell-matched units increases the risk of alloimmunisation

K- Red Cells for Women <50

- K antigen can cause HDFN
  - Results in Severe fetal anaemia
  - Anti-K is predominantly IgG which can cross the placenta
    - Anti-K targets fetal red blood cell precursors and leads to suppression of production


G072 421 379 944 D
macopharm
RED CELLS IN ADDITIVE SOLUTION LD
STORE AT 4°C ± 2°C
Always check patient/component compatibility/identity
Inspect pack for signs of deterioration or damage
Risk of adverse reaction/infection, including vCJD
Volume
265 mL
This component was collected in CPD anticoagulant and is suspended in 105 millilitres of additive solution of the following composition.
mmols/l
Sodium Chloride 150.0
Adenine 1.25
Anhydrous Glucose 45.4
Mannitol 28.8
DO NOT VENT
O
Rh D POSITIVE
Expiry Date: 10 Nov 2021
Additional Information
D C E c e
+ + + + +
NEG: HEV,K,Fya,Jka,S,Cw
NHSBT – Colindale
Date Bled: 06 Oct 2021
35°C
REF LQT614B
4MALQT614B
4
11440669BM


G072 421 379 944 D
RED CELLS IN ADDITIVE SOLUTION LD
STORE AT 4°C ± 2°C
Volume
265 mL
O
Rh D POSITIVE
Expiry Date: 10 Nov 2021
Additional Information
D C E c e
+ + + + +
NEG: HEV,K,Fya,Jka,S,Cw
NHSBT – Colindale
Date Bled: 06 Oct 2021
REF LQT614B
4MALQT614B
4
11440669BM
G072 421 379 944 D
SELECTED PRODUCTS
C D E c̄ ē Cw
+ + + + + –
M N S s̄ P1
+ – +
Lea Leb Lua Lub K
–
k Kpa Kpb Fya Fyb
–
Jka Jkb A1 HT HEV
– + – –
NHSBT – Colindale
08 – Oct – 2021 09:35

What requirements need prescribing?

- Irradiation
- CMV negative (other than for neonates / IUT)
- Extended red cell phenotype

The Hospital Transfusion Laboratory automatically selects

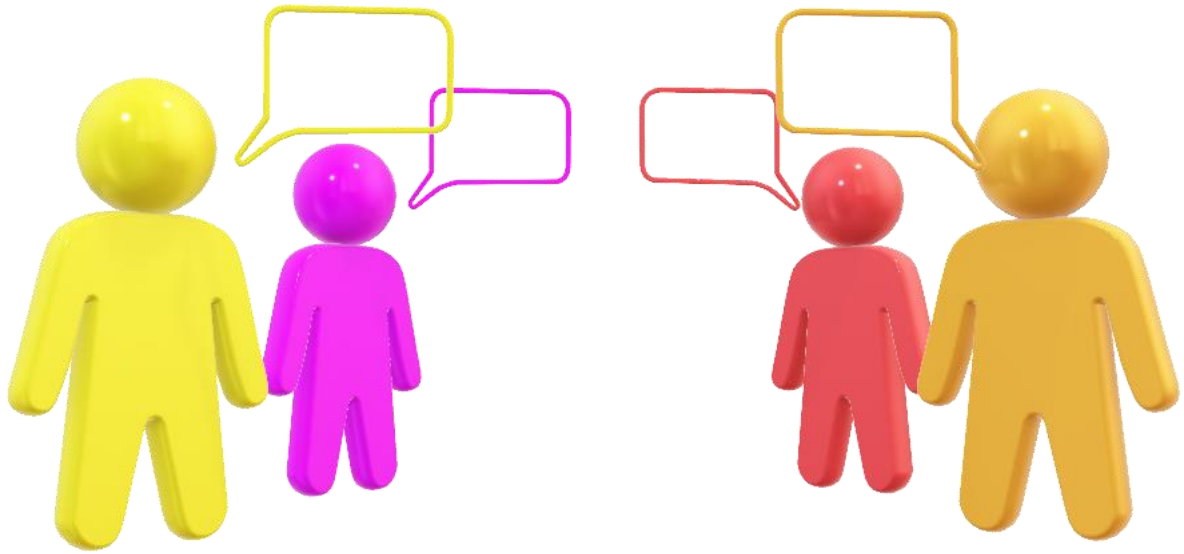
- Phenotyped units
- Red cells <5 days old for neonatal exchanges/large volume transfusions
- CMV negative components – if told pregnant

Discussion

How does the clinical team inform the laboratory that a patient needs special requirements?

Discussion

How are special requirements communicated within the laboratory?



Case Study 1

- A patient in his 80s, with a history of Hodgkin lymphoma, in ICU required a red cell transfusion.
- Request stated need for irradiated blood
- Non-irradiated blood was issued remotely through Hemobank 80®. The requirement for irradiated blood was overlooked at collection, however it was identified by the healthcare support worker and nurse at the patient's bedside.
- The investigation also noted that the application of flags in LIMS is not uniform and has caused confusion
- SHOT 2019

Case Study 2

- A pregnant woman (19 weeks) was having a liver transplant
- The red cells requested and transfused were not CMV negative because the blood transfusion laboratory was unaware the patient was pregnant
- The requestor did not select CMV negative or indicate that the patient was currently pregnant on the request form
- This was discovered when documented on the second request form, after the initial red cells had already been given
- There was no historical record in the transfusion laboratory for this patient
- SHOT 2014

Case Study 3

- A child with sickle cell disease received 2 units of red cells that were compatible, but not phenotype matched (for full Rh & K), and a further 2 units 6 years later, again not phenotype matched
- Six months later, following a further request it was noted that the patient had developed anti-C
- Further testing identified the patient as C negative (Ror=cDe/cde) and that she had initially been transfused a C positive unit
- The BMS had failed to follow the standard operating procedure (SOP) to have a phenotype performed in the first instance prior to red cell issue
- SHOT 2014

Case Study 4

- A telephoned request was taken for red cells for a <10-year-old girl, but full details were not entered onto the telephone request form at the time of request
- The request was taken by a lone overnight worker who was interrupted by a bleep so did not complete the task by looking up the record on the LIMS.
- Subsequently the LIMS became unavailable due to a planned downtime. A second BMS later issued the red cells while the LIMS was still unavailable, so the patient was looked up on the in-house specific requirement back-up file which stated that the specific requirements were for CMV-screened and irradiated cellular components. This was then written on the request form.
- A red cell unit was crossmatched, issued and transfused. When the LIMS was back up and running it was noted that the additional requirement for K-negative units, due to patient gender and age, had been overlooked and a K-positive unit had been transfused.
- SHOT 2017

Any Questions?

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