Trials and Tribulations when sourcing blood with rare red cell phenotypes

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Australian Red Cross Blood Service

- Aims to provide rare blood to patients according to the Deed of Agreement by which the blood service operates
What is rare?

- Rare donor defined by the blood service as
  - “a donor with a phenotype with an incidence of < 1 in 500 in the general population”
Request for blood with a rare red cell phenotype, what do we do?
Find fresh blood within Australia

- Currently in stock

- Contact eligible donors to donate
  (depends on how urgently blood is required)

If there is no fresh blood available???
Check current frozen inventory
Sourcing donations for the frozen inventory

• Homologous Inventory for use by all patients
  - Random donations with rare phenotypes found in routine tests
  - Fresh units sourced for a particular patient that haven’t been transfused and are frozen to avoid being wasted

• Autologous inventory
  - Blood is frozen specifically for patient’s own use
<table>
<thead>
<tr>
<th>Phenotype</th>
<th>Quantity</th>
<th>Prevalence in certain ethnic populations</th>
</tr>
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<tbody>
<tr>
<td>r’r’</td>
<td>15; 4 grp A, 2 grp B</td>
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<tr>
<td>k neg</td>
<td>16</td>
<td>Caucasians</td>
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<tr>
<td>Fy^a-b^-</td>
<td>14; 8 grp A, 1 grp B</td>
<td>Blacks&gt;Arabs/Jews&gt;Mediterraneans&gt;Caucasians</td>
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<tr>
<td>S-s-</td>
<td>4</td>
<td>Blacks</td>
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<td>Lu^a+b^-</td>
<td>13</td>
<td>Any</td>
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<tr>
<td>Co^a-</td>
<td>13; 6 grp A</td>
<td>Papua New Guineans&gt;Melanésians&gt;Caucasians</td>
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<tr>
<td>Vel neg</td>
<td>17; 4 grp A</td>
<td>Swedes</td>
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<td>Gerbich neg</td>
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<td>Papua New Guineans&gt;Melanésians&gt;Caucasians</td>
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<td>In^b-</td>
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<td>Indians</td>
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<thead>
<tr>
<th>Phenotype</th>
<th>Quantity</th>
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<tr>
<td>r”r”</td>
<td>3</td>
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<tr>
<td>Kp^b-</td>
<td>7; 5 grp A</td>
<td>Caucasians&gt;Japanese</td>
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<tr>
<td>Jk^a-b^-</td>
<td>9; 4 grp A</td>
<td>Polynesians&gt;Finns&gt;Japanese</td>
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<tr>
<td>P (prev. Tja neg)</td>
<td>1 grp A</td>
<td>Japanese&gt;Finns&gt;Israelis</td>
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<tr>
<td>Lu^a-b^-</td>
<td>16</td>
<td>Any</td>
</tr>
<tr>
<td>Bombay</td>
<td>5</td>
<td>Indians&gt;Japanese</td>
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<tr>
<td>Parabombay</td>
<td>3</td>
<td>Reunion Islanders/Indians</td>
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<tr>
<td>Adult I neg</td>
<td>7; 1 grp A</td>
<td></td>
</tr>
<tr>
<td>Yt^a-</td>
<td>12; 9 grp A</td>
<td>Arabs&gt;Jews</td>
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<tr>
<td>Rh null</td>
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* All grp O unless indicated
What is involved in maintaining cryopreserved red cells?

- Collaborative effort involving:
  - **The Processing department** - glycerolise and freeze cells, store and release units when required
  - **Red Cell Reference** – review inventory, restock when low and discard donations greater than 10 years
  - **Transfusion Medicine Specialists (TMS)** – review non conforming units, and authorise units for release
Limitations of frozen inventory

- Advances in viral technology +
- Changes to blood safety requirements
  - current vCJD donor exclusion policy
  - implementation of universal leucodepletion
- Non conforming units in frozen inventory
- Weigh out potential harm to the patient of no transfusion vs potential risk of transfusing a non conforming unit
- Such units can only be released with an appropriate disclaimer
Limitations of frozen inventory

- Ideally the inventory be progressively updated with donations that comply!
Limitations of frozen inventory continues...

- Time constraints to freeze and thaw units
  - Guidelines recommend units frozen within 7 days post collection
    - Recent exception with Quality approval Bombay units frozen 11 days post collection
  - Frozen cells once thawed have a shelf life of 24 hours
  - To thaw units, requires a minimum of 4 hours
- Yield from frozen cells is less than fresh
- Units cannot be refrozen once thawed
No match in inventory, what next?

- Frozen inventory in other states; Perth and Sydney
- Directed donations from relatives
- Importing blood from overseas
  - Sources with similar donor guidelines
  - Transport logistics – missed flights from US due to changeover in LA
  - No software to download data logger information
What rare red cell phenotypes have been requested in Reference

- Inb neg
- Jk(a-b-)
- Former Tja neg
- Yta neg
- Bombay
- U neg
- Sickle patient requiring C neg, E neg, S neg, Fy(a-b-) blood

- To name a few…
Rare red cell phenotypes requested in Reference

- Large proportion are ante-natal patients

- “Pregnancy is not an absolute contraindication, but collection of autologous blood from a pregnant woman would rarely be considered medically appropriate” ANZSBT Guidelines for autologous blood collection Apr 2002

- From 2006 -2013
  - 7 Inb neg requests
  - all ante-natal
  - 99.9 % population are Inb pos
Recurrent Jk(a-b-) request

- A very well known ante-natal patient in Reference
- First presented in October 2001
- Ongoing patient for 8 years, 35 samples tested and 4 known pregnancies!

- **Jk(a-b-)**: Rare in most populations, found in **0.9% Polynesians**

- **anti-Jk3** is a rare cause of HDN, but the first documented case in Mrs. Kidd's newborn was fatal. Blood Groups and Red Cell Antigens   Laura Dean

- Of all blood requested for ante-natal cases – seldomly used!
Soo..take home messages…

- Appreciation of work involved to find blood with a phenotype that is found in only 0.01% of the Caucasian population

- The importance of having a large donor database with rare red cell phenotypes to source fresh units as required

- Donor diversity to match the ever increasing patient diversity
Acknowledgements

• Team in Processing, Red Cell Reference Serology and TMS for all their hard work

• Our illustrious leader, Jenny Condon