DOUBLE TROUBLE IN THE RARE CARTWRIGHT WORLD (YT ISBT 011) ANTI-Yt\textsuperscript{a} AND ANTI-Yt\textsuperscript{b} CASE STUDIES

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CARTWRIGHT BLOOD GROUP SYSTEM: ISBT011

- First described in 1956 by Eaton and Colleagues
- 2 Antigens – $Yt^a$ and $Yt^b$
- Point mutation in the acetylcholinesterase gene on Chromosome 7q
- $Yt$ antigens are denatured after treatment with DTT (Dithiothreitol)
- $Yt$ antigens may be absent or have decreased expression on PNH patients
## CARTWRIGHT BLOOD GROUP SYSTEM

### ANTIGEN INCIDENCE

<table>
<thead>
<tr>
<th>Phenotype</th>
<th>% Occurrence</th>
<th>% Bloods Reacting With Anti-Yta</th>
<th>% Bloods Reacting With Anti-Ytb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yt (a+b-)</td>
<td>91.9</td>
<td></td>
<td>99.7</td>
</tr>
<tr>
<td>Yt (a+b+)</td>
<td>7.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yt (a-b+)</td>
<td>0.3</td>
<td></td>
<td>8.1</td>
</tr>
<tr>
<td>Null Phenotype Yt (a-b-)</td>
<td>NOT FOUND</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CARTWRIGHT BLOOD GROUP SYSTEM - ANTIodies

- Anti-Yt\textsuperscript{a} and Anti-Yt\textsuperscript{b}
- IgG class antibodies
- Both are relatively rare
- Optimally detected at the IAT phase
- Capable of crossing placenta
CARTWRIGHT ANTIBODIES
CLINICAL SIGNIFICANCE

Anti - Yta
- Single specificity
- Anti-Yta common in Jewish descent
- None to moderate delayed reactions
- Not associated with HDN

Anti - Ytb
- Found with other antibodies
- Very rare
- Not associated with HTRs and HDNs
- Not associated with Haemolytic Disease of the Newborns, as Yt expression on Cord cells is weaker
CARTWRIGHT ANTI- Yt\textsuperscript{a} – CASE STUDY 1

- 71 yo, Female
- Ethnicity: Turkish
- A RhD pos
- Previously detected Anti-Yt\textsuperscript{a} in 1986 by Reference Lab ARCBS, WA. Family study performed
- 2014 TKR in Perth: Yt(a-) red cell units obtained (1 from son)
  - Hb dropped 128 to 99 post op – No Transfusion
- April 2017 TK revision, uneventful
  - Hb dropped 119 to 97 – No Transfusion
Cartwright Anti- Y\textsuperscript{a} – Case Study 1

Laboratory Investigations (June 2017)

- Panagglutination with Screen cells and Panel cells
- Anti-Y\textsuperscript{a} was detected by Papain, RAM-IAT and BioRad LISS/Coombs by ARCBS WA Reference Lab
- DAT Negative
CARTWRIGHT ANTI- Yt\textsuperscript{a} – CASE STUDY 1

- 2\textsuperscript{nd} Knee repair June 2017
- ARCBS Reference Lab, Surgical team, Haematologist, Transfusion Lab – open communication
- Hb dropped 129 to 65 post op – Symptomatic
- ARCBS organised frozen thawed Yt\textsuperscript{a} neg units (DeGlycerolised RBCs)
- 4 units transfused (1x ONEG, 2x OPOS & 1x APOS)
- Discharged with ongoing folate checks and planned iron infusions
CARTWRIGHT ANTI- \textbf{Yt}^b – CASE STUDY 2

- 30 yo
- Pregnant (G4P3)
- A_2B RhD pos
- Elective caesarean at 38 weeks
- Previous history of Anti-Fy^a
- Fy^a titre remained between 1:8 and 1:4
- Anti-Yt^b was detected at 36 weeks gestation
**CARTWRIGHT ANTI- Yt<sup>b</sup> – CASE STUDY 2**

**Laboratory Investigations**
- Plasma reacted weakly with Yt(b+) Screen and Panel cells

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### Abtectcell III 0.8% Antigen Composition Sheet

| Cell No | Reference No | Rh Phen | A | B | C | E | c | C<sup>+</sup> | K | k | K<sup>p</sup> | Fy<sup>a</sup> | Fy<sup>b</sup> | Jk<sup>a</sup> | Jk<sup>b</sup> | M | N | S | P<sub>1</sub> | La<sup>a</sup> | La<sup>b</sup> | Lu<sup>a</sup> | Lu<sup>b</sup> | Co<sup>+</sup> | Exp | Additional Typings |
|---------|--------------|---------|---|---|---|---|---|---------|---|---|----------|----------|----------|--------|--------|---|---|---|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1       | 3008966      | R<sub>R</sub><sub>1</sub> | + | 0 | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | Yt(b+) |
| 2       | 3439473      | R<sub>R</sub><sub>2</sub> | + | 0 | + | 0 | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3       | 3280826      | r<sup>r</sup> | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Auto    |              |         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

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### Phenocell B 0.8% Antigen Composition Sheet

| Cell No | Reference No | Rh Phen | A | B | C | E | c | C<sup>+</sup> | K | k | K<sup>p</sup> | Fy<sup>a</sup> | Fy<sup>b</sup> | Jk<sup>a</sup> | Jk<sup>b</sup> | M | N | S | P<sub>1</sub> | La<sup>a</sup> | La<sup>b</sup> | Lu<sup>a</sup> | Lu<sup>b</sup> | Co<sup>+</sup> | Exp | Additional Typings |
|---------|--------------|---------|---|---|---|---|---|---------|---|---|----------|----------|----------|--------|--------|---|---|---|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1       | 2265064      | R<sub>R</sub><sub>1</sub> | + | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 |
| 2       | 2021907      | R<sub>R</sub><sub>1</sub> | + | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3       | 2000254      | R<sub>R</sub><sub>2</sub> | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4       | 1004917      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5       | 2088249      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6       | 2275039      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7       | 2260094      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8       | 4391401      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9       | 1341185      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10      | 2053318      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11      | 4745200      | + | 0 | + | 0 | 0 | 0 | 0 | + | 0 | 0 | + | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Auto    |              |         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
Cartwright Anti- Yt\textsuperscript{b} – Case Study 2

Laboratory Investigations – Cont’d

- Anti-Yt\textsuperscript{b} was detected by PEG-IAT and BioRad LISS/Coombs by ARCBS Reference Lab, WA

- Patient and red cells not typed for Yt\textsuperscript{b} antigen due to lack of typing antisera

- 4x A RhD pos, Fy(a-), K- RBCs were AHG crossmatched for c-section – NOT USED

- Baby
  - Well
  - DAT Negative
  - AB RhD pos
  - > 3 Kgs
CARTWRIGHT BLOOD GROUP SYSTEM - CONCLUSION

- Double trouble with Anti-Yt\(^a\) and Anti-Yt\(^b\) in 2017
- Anti-Yt\(^b\) not associated with HTRs or HDNs
  - Clinically insignificant
- Anti-Yt\(^a\)
  - None to mild/moderate reactions
  - Delayed transfusion reactions possible
  - Case by case basis
  - AHG XM Yt(a-) cells advisable
- Patient ethnicity useful during investigation stages
- Genotype by Beadchip – not available currently
- DNA sequencing for Genotype confirmation may be used
REFERENCES


THANK YOU

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