1. Row 1 = R₂R₂
   Row 2 = r'r
   Row 3 = R₁r
   Row 4 = rr

2. Answer = b (False)

Notes:
The author outlines his approach to dealing with warm reactive autoantibodies. Initial information sourced includes:
- How strongly reactive is the autoantibody?
- Are all the panel cells reactive?
- Are the panel cells equally reactive?
- With the DAT, what is coating the red cells e.g. IgG, C3 or both?
- What is the strength of the DAT reaction?

Next step is to determine if the antibody is causing haemolysis and further tests would include Hb, HCT, reticulocyte count, LDH, bilirubin and haptoglobin.

Review of a blood film is also most important.

If transfusion support is required, then additional serological work may be required. The primary concern in this case is the identification of underlying blood group alloantibodies.

The author’s hospital is a children’s hospital so alloantibodies can often be excluded on the basis of non-exposure to a stimulating event such as pregnancy or previous transfusion.

The additional serological issues that need to be considered are:
- Adsorption studies to exclude underlying alloantibodies – should be performed if time permits.
- Phenotyping – can be used to select suitable units for transfusion so that the development of alloantibodies can be avoided. The author recommends matching for Rh, Kell, Duffy, Kidd and MNS systems however ‘matching for the most immunogenic and/or clinically significant antigens (e.g. Rh, K antigen, Kidd system) makes the most sense.’
- Crossmatching - ‘Crossmatching excessive numbers of units to identify those that are “least incompatible” provides no proven clinical benefit for patients. In other words “incompatible is incompatible”.’
- Autoantibodies with defined specificities. Occasionally autoantibodies demonstrate specificity for a blood group antigen in a relative or absolute sense. ‘Although it is tempting to “honor” the specificity of these autoantibodies by providing antigen negative units of blood, it is unclear if these RBC’s have enhanced survival in the recipient.’
- Autoantibodies associated with weakly reactive or non-reactive DATs. ‘I consider other less common etiologies of hemolysis: for example drug-associated hemolysis; hemolysis due to an IgA autoantibody, a Donath-Landsteiner antibody (as with paroxysmal cold hemoglobinuria) or warm reactive autoantibodies with unusual thermal amplitude; or even hemolysis that is not actually immune mediated (e.g. associated with a haemolytic toxin, as with a brown recluse spider envenomation or an overwhelming bacterial infection).’
- The author notes that a careful patient history is required particularly in relation to medication such as second generation cephalosporins.
- Follow-up studies – ‘Patients who have persistent warm-reactive autoantibodies represent a potential “resource sink” for the transfusion service.

In conclusion, ‘On initial presentation, it is important to understand the serologic and clinical features of the autoantibody as these will be helpful in determining the breadth of the blood bank investigation, both at presentation and with follow-up testing. It is important to make judicious use of effective ancillary studies, such as adsorption and phenotyping, but those studies that have no demonstrated value for patient care (e.g. reliance on units that are least incompatible, elution studies, in-vivo crossmatching) should be discouraged and avoided.’
3. Answer = b (False)


Discussion:
Anti-Wr(a) is an antibody to a low incidence antigen and the authors state a frequency of 1:56 to 1:100 in healthy volunteer blood donors, (Greendyke et al., 1977; Isset & Anstee 1998; Garraty, 2002). ‘In a prospective study, anti-Wr(a) was found in 46 of 787 (5.84%) individuals (blood donors, pregnant women and hospitalised patients) without other anti-RBC antibodies and 32 of 161 (19.9%) patients with alloantibodies (Schonewille et al., 2003).’

The authors also note that ‘Anti-Wr(a) antibodies usually have a low clinical relevance; indeed, they can rarely cause haemolytic disease of newborn (HDN) and haemolytic transfusion reactions (HTRs) (Cherian et al., 2007).’

The authors conclude by saying ‘In conclusion, in our opinion the presence of a Wr(a) cell in the screening panel for patients serum pre-transfusion evaluation is not justified and it causes an undue increase in cost and time to unit release.’

4. Answer = c


Discussion:
The authors present a case of a 72 year old Caucasian woman with myelodysplasia who typed as D+ and initially developed anti-K, E and Cw and then later anti-D.

The author discusses the possible causes of anti-D in D positive subjects including

- Passive anti-D following plasma, IVIG, RhIg
- Alloantibodies from passenger lymphocytes in donor organ – organ transplant from D- to D+ recipient
- Autoantibody to D antigen
- Alloantibodies or alloantibodies to LW
- Alloantibody to epitope absent from normal D protein

Authors note: ‘Many individuals, however, were found to have RBCs that agglutinated poorly with common anti-D reagents, but demonstrated the presence of all known epitopes. These D+ RBCs were called “weak D” in preference to D−. Weak D RBCs express fewer D molecules per RBC, a finding that accounted for their weak agglutination with reagent antibodies.’

In summary the author notes that ‘The antibody had clinical and serological characteristics of an alloantibody. After RHD and RHCE genotyping, the patient was found to have the RHD\textsuperscript{weak D \text{type 21}} RHCE\textsuperscript{Ce/RHCE\textsuperscript{ce genotype (RHD\textsuperscript{weak D \text{type 21}} phenotype). Although most patients with a weak D phenotype do not produce alloanti-D, patients who carry the rare weak D type 21 in the absence of a normal RHD allele appear susceptible to the production of D alloantibodies.’

5. Answer

<table>
<thead>
<tr>
<th>Red cell phenotype</th>
<th>Prevalence in Caucasians %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fy(a+b-)</td>
<td>20</td>
</tr>
<tr>
<td>Fy(a-b+)</td>
<td>30</td>
</tr>
<tr>
<td>Fy(a+b+)</td>
<td>50</td>
</tr>
<tr>
<td>Fy(a-b-)</td>
<td>0 (rare)</td>
</tr>
</tbody>
</table>


Discussion:
Both FY and RH gene loci reside on chromosome 1. Fya and Fyb are antithetical antigens produced by codominant alleles FYA and FYB. Four phenotypes are defined by the corresponding antibodies, anti-Fya and anti-Fyb – see table above. It should be noted that the frequency of the Fy(a-b-) phenotype in blacks is 80%.
Both anti-Fy<sup>a</sup> & anti-Fy<sup>b</sup> cause immediate and delayed haemolytic transfusion reactions; with respect to HDFN the author notes ‘Hughes et al. reviewed the clinical outcome of 18 pregnant women between 1959 and 2004 in whom anti-Fy<sup>a</sup> was the only alloantibody identified and the fetus was Fy(a+). Significant HDFN was identified in 2 of 18 (11%) pregnancies, resulting in exchange or intrauterine transfusion. Maximum serum titres in these cases were 32 and 128. Hydrops fetalis was not identified in any fetus and no deaths attributable to HDFN were reported. A rare case of HDFN caused by anti-Fy<sup>b</sup> has been reported.’

The author discusses the clinical importance of the system. The Duffy antigen receptor for chemokines (DARC) appears to have two functions. Firstly as a receptor for chemokines a role that is as yet not clearly defined and also as a receptor for Plasmodium vivax. Red cells with the Fy(a-b-) phenotype were found to be resistant to P. vivax and this is evident in West Africa where P. vivax malaria is absent and 95% of the population is Fy(a-b-).

6. **Answers**

| Agglutination of A1 red cells | b |
| Agglutination of N+ red cells | c |
| Confirm O<sub>Rh</sub> blood group | a |

7. **Answer = c**

8. **Answer = b**


These guidelines may be accessed through the National Blood Authority website - enter NBA guidelines

9. **Answer = e**


10. **Anti-K + Fy<sup>a</sup>**