Weak D Case Study

A 32 year old female enters the emergency department in labor. While obtaining the patient’s history, it is discovered that this is her first pregnancy. The patient also states that she has not been seen by an obstetrician during the entire pregnancy.

Maternal workup done on admission:

<table>
<thead>
<tr>
<th>ABO/Rh</th>
<th>Anti-A</th>
<th>Anti-B</th>
<th>Anti-D (AHG)</th>
<th>A1 cells</th>
<th>B cells</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4+</td>
<td>4+</td>
</tr>
</tbody>
</table>

**Antibody Screen**

| Cell I | 0 |
| Cell II| 0 |

**Direct Antiglobulin Test**

| Polyspecific AHG | 0 |

The patient is admitted to the labor and delivery unit and gives birth to a 6 lb. 10 oz. baby boy. A cord blood sample (Sample EDU-01) is delivered to the blood bank for testing.

Participants were asked to perform an ABO Group, Rh Type, and Direct Antiglobulin Testing on the cord blood cells. The expected results are listed below.

**Cord Blood Results (Sample EDU-01)**

<table>
<thead>
<tr>
<th>ABO/Rh</th>
<th>Anti-A</th>
<th>Anti-B</th>
<th>Anti-D (Immediate Spin)</th>
<th>Anti-D (AHG)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2+</td>
</tr>
</tbody>
</table>

**Direct Antiglobulin Test**

| Polyspecific AHG | 0 |

**The Rh System and the D antigen**

After the ABO system, the Rh system is the most important blood group system in transfusion medicine with D being the most immunogenic Rh antigen. Testing for the D antigen is included as part of routine donor and patient typing with “Rh positive” and “Rh negative” referring to the presence or absence of the D antigen on red blood cells. The D antigen is distinguished from other blood group antigens in that it is composed of at least 30 epitopes distributed along the extracellular portions of the RhD protein.
Weak D Case Study (cont.)

The expression of the D antigen is altered in an estimated 1-2% of individuals of European ethnicity, higher in individuals of African ethnicity. There are two forms of the altered D antigen; Weak D and Partial D.

Weak D
Weak D expression is a result of mutations in the internal, or transmembrane, portions of the RhD protein. Weak D is considered a quantitative alteration resulting in red blood cells which express the entire D antigen complex in reduced quantities. Typically, these red blood cells show no agglutination with routine anti-D reagents unless the indirect antiglobulin test is performed. Since these red blood cells express the entire D antigen complex, these patients do not typically produce anti-D. Thus, these patients do not require D negative blood for transfusion or RhIg prophylaxis.

Partial D
Partial D is considered a qualitative alteration because these red blood cells demonstrate a normal number of D antigen sites; however, the cells lack one or more epitope of the D antigen complex. These red blood cells are agglutinated by some, not all, monoclonal anti-D reagents and also usually demonstrate similar reaction strength as normal D positive red blood cells. Since these red blood cells do not express a complete D antigen complex, these patients are capable of producing anti-D alloantibodies directed against the epitope or epitopes which the cells do not express. As a result, it is recommended that these patients receive D negative blood and RhIg prophylaxis.

Testing for D
Partial D expressions are usually detectable by direct testing with some anti-D reagents. There are some monoclonal anti-D reagents available which detect weak D directly; however, the indirect antiglobulin test is usually required to detect the D antigen using routine anti-D reagents. To avoid a possible alloimmunizing event due to a weak D expression, weak D testing is required for ALL D negative blood donors. Weak D testing is NOT required for D negative blood recipients.

Our case demonstrates a D negative mother with a weak D positive infant. Since pregnancy can be a sensitizing event, it is recommended that weak D testing be performed on cord samples from infants who type as D negative directly born to D negative mothers. It is also recommended that D negative mothers of weak D positive infants receive RhIg prophylaxis.
Weak D Case Study (cont.)

References

This case study and antibody discussion was provided by Hemo bioscience (www.hemobioscience.com), the manufacturer of these Blood Bank proficiency samples.