Antibody Identification - Anti-E and Anti-S Case Study

A 90 year old man suffered internal injuries when he fell two stories while shoveling snow from his roof. He is scheduled for an emergency splenectomy. A Type and Screen is ordered with a reflex to antibody identification if indicated. He was transfused during WWII and following open heart surgery ten years ago but has no other relevant medical history.

Expected Results

<table>
<thead>
<tr>
<th>Sample EDU-01 ABO / Rh</th>
<th>Sample EDU-01 Antigen Type</th>
<th>Sample EDU-02 Antibody Screen</th>
<th>Sample EDU-02 Antibody ID</th>
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</thead>
<tbody>
<tr>
<td>O POS</td>
<td>S-E-</td>
<td>POS</td>
<td>Anti-S, Anti-E</td>
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</table>

Discussion

Anti-E

The Rh blood group is one of the most complex blood groups known in humans. From its discovery 70 years ago, it has become second in importance only to the ABO blood group in the field of transfusion medicine. The significance of the Rh blood group is related to the fact that the Rh antigens are highly immunogenic. While the D antigen is most immunogenic, c is the next most likely Rh antigen to elicit a response followed by E, C and e. Although these five principal Rh antigens are responsible for the majority of clinically significant antibodies, over 50 Rh antigens have been characterized since they were reported in the 1940s. Rh antigens can be detected early in fetal development and are fully developed at birth. Reactivity with Rh antigens is enhanced by treating the red cells with the enzymes ficin, papain, bromelin and trypsin. Many examples of anti-E appear to be naturally occurring and it is often found present in sera containing anti-c. The frequency of the E antigen is 29% in Caucasians; 22% in Blacks and 39% in Asians.

General characteristics of Rh antibodies include:

- Most are IgG (all subclasses have been reported).
- May show dosage – reacting stronger with cells possessing a double dose of the corresponding antigen.
- It is not uncommon to see multiple Rh antibodies in a patient.
- Do not bind complement, however rare exceptions have been reported.
- Reactivity is enhanced when tested with enzyme treated red cells.
- Mild to severe transfusion reactions.
- Significance in varying degrees in Hemolytic Disease of the Fetus and Newborn (HDFN).
Anti-S

The S antigen was discovered in 1947 after implementation of antiglobulin testing. It is named after Sydney, Australia where the first example of the antibody was identified. Although a distinct antigen, it appeared to be genetically linked to M and N which had been identified in the late 1920s. Molecular genetics has now proven that there is a close linkage between the M, N, S and s antigens. The genes encoding the MNS antigens are located on chromosome 4. The S antigen is located on a well-characterized glycoprotein called glycophorin B. Forty-six antigens have been identified in the MNS system making it nearly equal in size and complexity to Rh. The frequency of the S antigen is 55% in Caucasians and 31% in Blacks. The S antigen is not readily degraded by proteolytic enzymes; however, commercially available enzyme treated antibody red cells are sufficiently treated to abolish reactivity with anti-S. Care should be taken to adequately quality control red cells treated with enzymes. The S antigen is sensitive to trace amounts of chlorine so appropriate procedures should be in place if sodium hypochlorite is used to clean cell washers.

Most examples of anti-S are IgG reactive at 37°C and antiglobulin, although IgM examples may be encountered. Some are optimally reactive at 10-22°C and some may bind complement. Anti-S is considered clinically significant and has been implicated in severe hemolytic transfusion reactions and mild to severe HDFN.

Since this patient has anti-E and anti-S, 12-15 donor units would need to be screened to find two units that are E-, S-.

References


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