T activation

Thomsen-Friedenreich Antigen

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T activation


- In vitro polyagglutination first described by Hubener in 1925 then Thomsen in 1927

- Thomsen’s graduate student Friedenreich in 1930 defined the underlying mechanism and called it T haemagglutination after Thomsen
**T activation**

- Acquired and transient condition
  - Polyagglutination is a result of a variety of neuraminidase producing bacterial, viral, or protozoa infections
  - Removal of N-acetyl neuraminic acid residues on portions of glycophorin A and B chains of the MN, Ss, and other RBC disialylated tetrasccharides to expose T cryptantigen
T activation
RBC surface molecules

Image by proprofs.com  Google images
T activation
RBC Surface molecules

Key:
- N = NH2 terminal
- C = COOH terminal
- $\sim$ = N-glycan
- $\bigcirc$ = GPI-linkage

(a) Extracellular domain
(b) Membrane-spanning helices
(c) Cytosolic domain

Figure 10-15
Molecular Cell Biology, Sixth Edition
© 2008 W.H. Freeman and Company
**T activation Testing Method**

AABB Technical Manual Method 2-16

- **Principle**: Saline extracts of seeds react with specific carbohydrates on red cells membranes and make useful typing reagents that are highly specific at appropriate dilutions.

- **Reagents**: Seeds may be obtained from health-food stores, pharmacies, or commercial seed companies. The seeds should be raw.

**Procedure**: Grind seeds in a food processor or blender until the particles look like coarse sand. A mortar and pestle may be used or seeds can be used whole.

2. In a large test tube or small beaker, place ground seeds and 3 to 4 times their volume of saline.

3. Incubate at room temperature or 4 to 12 hours stirring occasionally.

4. Transfer supernatant fluid to a centrifuge tube, centrifuge 5 minutes to obtain a clear supernatant. Collect and filter the supernatant fluid, and discard seed residue.

5. Test dilutions of extract to find the dilution for the desired activity.
# T activation

## Reactions between Lectins and Polyagglutinable Red Cells

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>Th</th>
<th>Tk</th>
<th>Tn</th>
<th>Cad</th>
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<tr>
<td>Dolichos biflorus</td>
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<tr>
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<tr>
<td>Salvia horminum</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
T activation
CBC’s IRL TAT

• Per Shay, Jack, & Mary in IRL at CBC

• The initial screen takes 2 – 3 hours
  – If positive with screen, 5 – 8 hours or longer for identification

• They use mostly homemade reagents at IRL that may have been made and frozen ahead of time for different cases. Not may commercial lectin panels on the market

• Use donor tested Plasmas and Cord plasmas and frozen control cells
T activation
Transfusion Guidelines

- Test for T activation on pretransfusion specimens especially in neonates
- If Positive: Wash all cellular products (RBC and Platelets)
- Avoid if possible any plasma containing products
  - Vit K infusion or low titer anti-T FFP

Specification SPN204/1.1 Diagnosis and Management of T Antigen Activation. Author: Dr Edwin Massey

- Some papers recommended exchange transfusion with washed cells and albumin

2001 Blackwell Science Ltd, British Journal of Haematology 112; 259-263
T activation
2 case studies

• **Patient: T, W**
  - 4 years old
  - Transferred from an outside ED
  - Acute Respiratory failure
  - Left side pleural effusion
  - Left side pneumonia

• **Patient: E, G**
  - 8 month old
  - Transfer from a smaller area hospital
  - Pneumococcal meningitis and bacteremia
  - Altered mental status with possible seizures
  - Leukopenia
  - Bilateral fluid collections with Rt. Frontal area subdural bleed
T activation
Diagnosis T,W

- Type and Screen ordered
- Our results were discrepant. Suspect Cold reactive antibody. T activation also ordered at the same time as T/S
- Specimen sent to IRL at Community Blood Center
T activation
Patient: T, W lab data

OCT/30/13

• Testing performed by IRL at the Community Blood Center:
• Investigate ABO Typing Problem:
• The patient's red cells were spontaneously agglutinated by saline. This agglutination was circumvented by washing the patient's cells with 37°C saline. With the warm washed cells, the patient was found to be group O, Rh positive.
• The patient's warm washed cells are coated with complement. An IgG-specific antiglobulin reagent was nonreactive. An eluate was not prepared from this sample. The patient’s plasma was found to contain a cold reactive autoantibody; no alloantibodies were detected. Cold autoantibodies are not usually clinically significant.
• The patient’s warm washed cells were reactive with the plasma from 12 random group O donors and nonreactive with plasma from 4 group O cord blood samples. Her cells were also reactive with the following lectins: Arachis hypogea and Baneirea II. The results of these tests indicate the patient's cells are polyagglutinable. The pattern of the reactivity is consistent with Tk polyagglutination. If transfusion is required, washed red cell products should be provided; plasma containing components should be avoided.
T activation

Patient: T, W lab data
T activation
Patient: T, W lab data

BUN

Creatinine

C Reactive Prot
T activation
Patient: E, G lab data

APR/30/13

Antibody Identification by the IRL department at Community Blood Center:

- The patient’s cells were reactive with the plasma from six group O donors. His cells were also reactive with the following lectins: Arachis hypogaea, Glycine soja, Salvia Sclarea and Saliva horminum. The results of these tests indicate the patient’s cells are polyagglutinable. The pattern of reactivity is not consistent with a single type of polyagglutination this may indicate that the patient has mixed forms of polyagglutination or an uncharacterized form of polyagglutination. If transfusion is required, washed products should be provided; plasma containing components should be avoided.
T activation
Patient: E, G Hgb lab data

Hgb 10.5-13.5 gm/dL
T activation
Patient: E, G lab data
T activation
Patient: E, G lab data

BUN

Creatinine

C Reactive Prot
T activation

In Summary

• Polyagglutination caused by the removal of portions of glycophorin A and B by neuraminidase producing pathogens to expose a cryptic antigen “T” on RBCs, platelets, glomeruli and other tissues

• More common in children than adults

• Self limiting but can cause hemolytic events in rare cases

• Wash all cellular products and avoid plasma containing products like FFP.