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Anomalies In Blood Groups

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ANOMALIES IN BLOOD GROUPS.

Submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in the department of Science, Carroll College, Helena Montana.

Before being able to set forth the atypical reactions and conditions which have been noted in the human blood groups, it will be necessary to show briefly the manner in which human blood is classified and the typical reactions on which this classification is based. To begin, all individuals may, in regard to isoagglutination, be divided into four well defined groups. These blood-group characteristics were found to be due to the constitution of the blood itself and were found to remain unchanged throughout life. They are inherited according to the Mendelian Laws.

Several methods of designation are in use, of which the following table will show the correlation between them.

<table>
<thead>
<tr>
<th>Jansky Numbering</th>
<th>Moss Numbering</th>
<th>Designation by letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>IV.</td>
<td>0.</td>
</tr>
<tr>
<td>II.</td>
<td>II.</td>
<td>A.</td>
</tr>
<tr>
<td>III.</td>
<td>III.</td>
<td>B.</td>
</tr>
<tr>
<td>IV.</td>
<td>I.</td>
<td>AB.</td>
</tr>
</tbody>
</table>

The characteristics of the groups (using designation by letters) are shown in the following table in which (+) denotes agglutination, and (−) no agglutination.

<table>
<thead>
<tr>
<th>Sera of Group</th>
<th>Cells of Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.</td>
<td>A.</td>
</tr>
<tr>
<td>A.</td>
<td>-</td>
</tr>
<tr>
<td>B.</td>
<td>-</td>
</tr>
<tr>
<td>AB.</td>
<td>-</td>
</tr>
</tbody>
</table>

It is very evident then, that an unknown blood can easily be grouped by using known sera of
groups A and B. The great importance of this ability to group the blood rapidly and simply is easily seen. A knowledge of the group is of vital importance before transfusions from one person to another can be made.

It is in this connection, the grouping of the unknown bloods, that the subject of atypical reactions and conditions arises. From the beginning of the studies on the subject of blood grouping, the existence of differences other than those of the typical blood-group scheme has been recognized. Some of these peculiarities are Pseudoagglutination, Autoagglutination, Deficient Reactions, and Cold Agglutinins. These are reactions or phenomena due in a great part to the existing conditions in which they take place. There also exist several conditions which may be referred to as Marked Anomalous Reactions which are only very rarely encountered. All of these atypical reactions occur but rarely, and many of them are no doubt due to irregular technique or result from mistaking certain phenomenal reactions for typical isoagglutination.

The first of these atypical reactions which we will consider here is that one which has been given the name of Autoagglutination. It has been observed that when a quantity of sera and the erythrocytes of the same individual are kept at "ice-box" temperature, most of the cells will, after some time, settle in clumps. As the temperature increases the reaction is found to diminish and, as a rule, the
Clumping is not to be found at all at 37° Centigrade. The active principle is absorbed by the cells at the lower temperature, and the increase in temperature sets it free. This phenomena may be demonstrated by a simple procedure. The agglutinated cells are kept at "ice-box" temperature and washed with an ice-cold saline solution. They are then placed in another saline solution at room temperature and it will be found that the clumps break up, with the result that the cells are suspended in the liquid. The liquid is then centrifuged and the supernatant fluid is found to contain the agglutinin.

Its presence may be demonstrated by adding cells to the fluid and chilling it, whereupon the phenomena of the clumping of the cells will be seen to repeat itself. This absorption of the active principle and the changing effect of the temperature upon the reaction serve to distinguish Autoagglutination from another atypical reaction; that of Pseudoagglutination. A high degree of Autoagglutination has been observed in certain pathological conditions such as anemia, syphilitic cirrhosis, and trypanosomiasis.

Another of these atypical reactions which has attracted a great deal of attention and which through the research of Fahraeus has been used in practical medicine, is that of Pseudoagglutination. It was observed that in some diseases, especially those resulting in an inflammatory condition, that the erythrocytes had a great tendency to settle,
the blood meantime forming a buffy coat. This phenomena is explained by the fact that there is an increased capacity of the serum which causes the erythrocytes of the same individual or of other individuals to form clumps. The resulting clumps closely resemble those produced by true agglutination.

Shattock has shown that this form of clumping in Pseudoagglutination, will disappear upon slight dilution of the serum and is, consequently, readily able to be distinguished from isoagglutination. A phenomenon similar to pseudoagglutination may be produced by the addition of certain colloidal substances such as gum arabic or gelatin to blood suspensions.

A number of atypical cases have been referred to as "Deficient Reactions", due to the fact that in these cases the agglutinins expected from the rule of groups have seemingly been deficient. It is thought possible that in rare instances, there is a deficiency of agglutinins. However, many of these cases are discredited on the ground that the observer had overlooked or failed to notice weak reactions.

It was mentioned before in connection with the phenomena of Autoagglutination, that a serum agglutinates the individual’s corpuscles as well as those of others of the same species. In a number of cases differences have been noticed in the degree of the reaction, and this would seem to indicate a certain specificity. Thus it is possible to demon-
strate two kinds of group A corpuscles, whose sera will react with different degrees of intensity upon each other. By using the same test irregular variations have been noted in the corpuscles of groups B and 0.

Autoagglutination, which disappears upon warming has been shown many times, but this cold agglutination is so much more sensitive to changes of temperature, that it is only very rarely encountered in the ordinary routine work.

Hirschfeld and von Dungren found that the supernatant fluid of a group B serum with individual group A corpuscles reacted on some but not upon other red cells of group A. This indicated to them the fact, later confirmed by several workers in the same field, that there existed a subdivision of group A. It is generally held that the corpuscles of group A are qualitatively different, but as yet the truth of this hypothesis is not known, although the phenomenon definitely exists.

Marked Anomalous Reactions which compare in intensity to atypical isoagglutination are only rarely encountered in the usual tests. A few cases of this may be cited here.

Landsteiner and Mitt have described two bloods which belonged to group AB, but due to the absence of certain properties, their sera acted upon a number of specimens of group A blood. The sensitivity of these reactions to changes in temperature was intermediate between cold and common agglutination. In
other similar cases of group AB blood, the agglutinins found, behaved in the same manner as cold agglutinins.

Another case of an intense anomalous reaction has been described by Ottenberg and Johnson. The blood of a donor was, according to its properties, classified as group B. The serum of this blood contained, besides the normal agglutinin, an abnormal agglutinin which reacted on a number of corpuscles of groups 0 and B. The transfusion of this blood into an anemic patient resulted in a grave hemolytic accident.

In conclusion it may again be brought to notice that most of these conditions are of a phenomenal nature and not often encountered. The field of study in blood-grouping is by no means exhausted and advancement in this field will have a noticeable effect upon the science of Medicine.
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