ANALYTICAL REVIEW

Synonyms for Components Influencing Blood Coagulation

By C.-B. Laurell, M.D.

SEVERAL plasma components of importance for the understanding of the blood coagulation mechanism have been discovered during the last ten years. Each new factor has received different names, probably because the rapid development in this field has taken place simultaneously at different laboratories working independently of each other. Owing to this great variation in terminology the literature pertaining to blood coagulation is now quite difficult to follow for all but extreme specialists. This probably delays the spreading of the newer knowledge; it is unfortunate since several of the recent observations are or will be of clinical importance.

In this article an attempt has been made to collect the terms which seem to be synonyms for the same components. They have been arranged in four groups with regard to the different phases in blood coagulation which they influence (compare fig. 1). Prothrombin is converted to thrombin in the presence of calcium by the components in Group A. This reaction is rather slow but Group A substances also activate components in Group B and the final reaction product formed during the reaction between the plasma substances of Group B serves as an accelerator for the activation of prothrombin by A substances. Group C represents components affecting the reaction velocity between fibrinogen and thrombin. Group D includes factors of importance for the stability of fibrin.

GROUP A

These are substances which in the presence of calcium convert prothrombin to thrombin.

1. Intracellular substances of different origin. The degree of purity of the preparations used varies but all contain lipids. The different synonyms used in the literature are found in table 1.

2. A plasma factor (table 2), which is either in a precursor state or combined with an inhibitor, belongs to this group. This is the only known component that does not show normal activity in blood from patients with hemophilia.

Quick is of opinion that a platelet factor (thromboplastinogenase) is necessary for the activation of plasma thromboplastinogen. Conley considers a rough surface sufficient for the activation of his thromboplastin precursor. The low activity of plasma thromboplastin in blood from patients with hemophilia depends, according to Tocantins, upon the occurrence in their blood of a plasma thromboplastin inhibitor in higher concentration than is normally the case.

GROUP B

These are components accelerating the formation of thrombin from prothrombin in the presence of thromboplastin.
1. A partially purified factor derived from platelets (platelet accelerator). 
2. A factor in native plasma. This is a precursor (proconvertin) which is activated during the initiation of blood coagulation to convertin. Convertin activates another plasma precursor (proaccelerin) to accelerin. Accelerin greatly increases the velocity with which thrombin is formed from prothrombin in the presence of thromboplastin. Synonyms for the convertin and accelerin systems are found in tables 3 and 4.

Proconvertin is the component in the blood coagulation system which decreases first during dicoumarol therapy. Its solubility and adsorbability are rather similar to that of prothrombin. This factor was, therefore, generally overlooked until recently and the term prothrombin has often been used for a mixture of prothrombin and convertin (proconvertin).

Accelerin is rather unstable. It occurs in insufficient concentrations in rare cases of parahemophilia. Thrombin seems to be able to activate proaccelerin in the absence of convertin.

**Table 1.** Synonyms for the Intracellular Factors Used to Initiate Blood Coagulation

<table>
<thead>
<tr>
<th>Thromboplastin*</th>
<th>Thrombokinase†</th>
<th>Cytozyme¹</th>
<th>Thromboplastic protein²</th>
<th>Thrombokinin³</th>
</tr>
</thead>
</table>

* Anglo-American literature. † Continental literature.

Prothrombin was called thrombozyme¹ by Nolf (1908, 1948) and prothombin B in some of Quick’s publications.

Names which have been used for mixtures of components: Prothrombokinase (Milstone)³⁹ is probably proaccelerin plus plasmathromboplastin. In the presence of calcium, thrombokinase is formed. This is not the usually accepted thrombokinase. Proserozyme³⁶ is probably prothrombin plus proaccelerin. Serozyme³⁶ is probably prothrombin plus accelerin. Prothrombokinin³ covers proconvertin plus...
proaccelerin. Plasma thrombokinin covers plasma thromboplastin plus convertin plus accelerin. Prothrombin converting factor (Jacox's term) is hard to classify. It has some properties in common with accelerin.

**Table 2.—Synonyms for the Plasma Factor of Importance for the Initiation of Blood Coagulation.**

<table>
<thead>
<tr>
<th>Plasma thromboplastinogen</th>
<th>Plasma thromboplastin</th>
<th>Plasma thrombokinase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma prothrombokinase</td>
<td>Plasma prothrombin</td>
<td>Plasma prothrombinase</td>
</tr>
<tr>
<td>Precursor of plasma thrombotropic factor</td>
<td>Plasma thromboplastic factor</td>
<td></td>
</tr>
<tr>
<td>Plasminogen</td>
<td>Antihemophilic globulin</td>
<td>Thromboctylosin</td>
</tr>
<tr>
<td>Thrombokatalysin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Left column: precursor. Right column: activated component. Middle column: terms including both precursor and activated component.

**Table 3.—Synonyms for the Proconvertin-convertin System**

<table>
<thead>
<tr>
<th>Proconvertin</th>
<th>Convertin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum prothrombin conversion accelerator precursor</td>
<td>Serum prothrombin conversion accelerator (Spca)</td>
</tr>
<tr>
<td>Factor VII</td>
<td>Co-thromboplastin</td>
</tr>
<tr>
<td>Prothrombin accelerator</td>
<td>Co-factor V</td>
</tr>
</tbody>
</table>

Left column: precursor. Right column: activated substance. Middle column: terms including both.

The prothrombin conversion factor according to Owen and Bollman possibly belongs to this group.

**Table 4.—Synonyms for the Plasma Substance Which Accelerates the Conversion of Prothrombin to Thrombin in the Presence of Thromboplastin**

<table>
<thead>
<tr>
<th>Proaccelerin</th>
<th>Accelerin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor V</td>
<td>Factor VI</td>
</tr>
<tr>
<td>Plasma Ac-globulin (accelerator)</td>
<td>Serum Ac-globulin</td>
</tr>
<tr>
<td>Pro-prothrombminase</td>
<td>Prothrombinase</td>
</tr>
<tr>
<td>Prothrombinogenase</td>
<td>Thrombinogenase</td>
</tr>
<tr>
<td>Plasma prothrombin-conversion-factor (PPCF)</td>
<td>Serum accelerator</td>
</tr>
<tr>
<td>Accelerator factor</td>
<td>Prothrombin A</td>
</tr>
<tr>
<td>Labile factor</td>
<td>Thrombogène</td>
</tr>
<tr>
<td>Co-factor of thromboplastin</td>
<td></td>
</tr>
</tbody>
</table>

Left column: precursor. Right column: activated component. Middle column: terms including both.

**Group C**

1. Thrombin can be inactivated by a normal plasma component (antithrombin). The reaction product is usually called metathrombin. Heparin can also inhibit thrombin if a normal plasma component (thrombin-co-inhibitor) is present.

2. The velocity of the reaction between fibrinogen and thrombin can be increased by addition of fibrinoplastic agents. Examples: gum acacia, polyvinyl alcohol, starch, dextran.
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GROUP D

Fibrin can be digested and dissolved by a proteolytic plasma enzyme (plasmin). This occurs normally in an inactive form (plasminogen) in plasma. Other names for plasmin are found in table 5. Plasminogen can be activated by intracellular activators (fibrinokinase), but also by enzymes produced by some bacteria. Certain strains of streptococci produce this enzyme in relatively high concentrations. When derived from streptococci it is called streptokinase (tryptokinase) and from staphylococci staphylokinase. In older literature they are both called fibrinolysin as it was supposed that the bacterial factor itself was the proteolytic enzyme. Some authors have on the other hand used the term fibrinolysin as the denomination of plasmins.

The term antiplasmin (antitryptase) covers at least two different plasmin inhibitors in normal plasma. Antifibrinolysin is used both for antiplasmin and for antistreptokinase.

No hints have been made here concerning the reaction mechanisms for the different steps of blood coagulation, as this field up to now is only superficially explored and as this subject falls outside the scope of this paper. Furthermore, there has been no regard here for the question of priorities.

**Table 5.**—Synonyms for the Proteolytic Plasma Enzyme

| Plasminogen | Plasmin
| Profibrinolysin | Fibrinolysin
| Tryptogen | Tryptase (serum-tryptase)
| Prolysin | Lysin

Left column: precursor. Right column: active enzyme.

REFERENCES

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