

Delayed Blood Coagulation and Absence of Clot Retraction in Collodion Lined Vessels.

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The inhibiting influence of certain surfaces upon the blood coagulation process has been known since 1886 when Freund demonstrated an increased coagulation time for blood collected in vaseline lined vessels.¹ Bordet and Gengou¹ in 1903 reported a similar prolongation in paraffin coated tubes. Neubauer and Lampert² in 1930 determined the coagulation time for blood in contact with a variety of surfaces. They concluded in harmony with the traditional explanation that, excluding other factors, the coagulation time is inversely proportional to the capacity of the surface to become wet, (Benetzbarkeit) that is, to the adhesive force exerted between the blood and the surface. With glass, where there is much adhesion, the coagulation time is shorter than with paraffin where there is very little adhesion.

The anticoagulant property of a collodion surface has apparently not been previously described.

If a test tube lined with collodion is used as a receptacle for freshly drawn blood, the coagulation is delayed usually as long or longer than when a paraffin lined tube is used. Table 1 presents a comparison of coagulation times in glass, paraffin and collodion lined tubes. The blood was removed with a No. 20 guage needle and a dry syringe from the arm veins of healthy adults. Two cc of blood were placed in each tube, and the coagulation time was taken when the blood failed to flow upon tilting the tube to the horizontal position. In the 12 specimens examined, the coagulation time was definitely longer in the collodion than in the glass tubes. In all but 2 instances it was longer in the collodion than in the paraffin tubes, the average being 4.7 minutes longer for the collodion series.

If the traditional explanation, as formulated by Bordet and Gengou and reaffirmed by Lampert, is true one would expect collodion to have a lower coefficient of adhesion than paraffin for blood. Lampert³ has indicated that the adhesive forces acting when blood

¹ Bordet, J., and Gengou, O., *Ann. Inst. Pasteur*, 1903, **17**, 822.

² Neubauer, O., and Lampert, H., *Muench. Med. Wchnschr.*, 1930, **77-1**, 582.

³ Lampert, H., *Die physikalische Seite des Blutgerinnungsproblems*, 1931, Leipzig, Georg Thieme.

TABLE I.
Coagulation Time of Blood in Lined Test Tubes.

Case	Type of surface		
	Glass	Paraffin	Collodion
1	5 min	11 min	12 min
2	7	26	29
3	4	20	31
4	5	18	25
5	10	23	28
6	8	23	16
7	6	10	15
8	7	13	27
9	7	22	28
9a*	8	19	27
10	5	13	15
10a*	4	13	13

*Same subject repeated two days later.

or distilled water wet a particular surface are relatively the same for each of the two liquids. After using a photographic method for recording the menisci, he calculated the adhesion between distilled water and a variety of materials. He expressed his results in units of "Benetzbarkeit." He listed smooth glass as possessing 42 units, platinum 10 units, athrombit 2.4 units and paraffin —7 units. A minus quantity indicates a negative meniscus. Lampert measured a celloidin surface as possessing 42 units. He did not determine the coagulation time with celloidin or collodion which is essentially the same substance, namely pyroxylin. It is easy to determine the force of adhesion between water and collodion or paraffin by the capillary tube method when Westergren blood sedimentation tubes lined with these materials are used. With the formula $T = hdr/2$, the force of adhesion (T) is expressed in grams of force per centimeter, when h is the height of the liquid in cm, d is the density of the liquid, and r is the radius of the tube. By this method the glass-water adhesion is 0.053 g per cm, the collodion-water adhesion is 0.034 g per cm, and the paraffin-water adhesion is —0.037 g per cm. It is evident from this that collodion is an exception to the rule. Its coefficient of adhesion is much higher than that of paraffin and yet blood coagulation is delayed longer with it than with paraffin.

The tubes were allowed to stand for 24 hours at room temperature. There was a complete absence of clot retraction in all of the collodion tubes whereas some retraction took place in all but one of the paraffin tubes. The adherence of the clot to the collodion was so firm that vigorous shaking failed to release it in almost all of the tubes. A little serum collected on the free surface of the clot but never along the tube wall.

Preparation of a Collodion Lined Tube—A test tube 1.5 cm in diameter is filled half full of collodion U.S.P. and then emptied slowly while being rotated. The tube is placed inverted in a wire rack and is allowed to stand for at least 18 hours to give time for the ether and alcohol to completely evaporate. The membrane usually adheres firmly to the glass unless separation begins to take place at the rim.

Summary and Conclusions. The coagulation time of normal human blood on a collodion surface is longer than the coagulation time on a paraffin surface even though the force of adhesion between blood and collodion is much greater than between blood and paraffin. There is no clot retraction in collodion lined tubes.

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Attempt to Propagate Poliomyelitis Virus Through Serial Passage in Cotton Rats by "Spreading Factor of Duran-Reynals."

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Numerous attempts have been made to "adapt" poliomyelitis virus to passage in the eastern cotton rat since Armstrong¹ reported that a strain of virus isolated from one of a number of cases occurring during an outbreak of poliomyelitis in Lansing, Michigan, could be propagated in the variety *Sigmodon hispidus hispidus*. These attempts, including those of Armstrong, to obtain takes with other strains of poliomyelitis virus have failed. Toomey² has recently reported unsuccessful attempts to propagate 9 other monkey adapted strains of this virus. He inoculated 9 groups of *Sigmodon hispidus littoralis* rats, each with one of 9 strains of virus and later when symptoms failed to develop, these animals were shown to be susceptible to the Lansing strain.

Duran-Reynals^{3, 4} has shown that testicular extract ("spreading factor") added to the virus of vaccinia increased the extent of the

¹ Armstrong, C., *Pub. Health Rep.*, 1939, **54**, 1719.

² Toomey, J. A., and Takaacs, W. S., *PROC. SOC. EXP. BIOL. AND MED.*, 1940, **43**, 536.

³ Duran-Reynals, F., *Compt. rend. Soc. de biol.*, 1928, **99**, 6.

⁴ Duran-Reynals, F., *J. Exp. Med.*, 1929, **50**, 327.