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Thromboplastic and Fibrinolytic Activities in Tissues of the Eye.* (27136)

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To elucidate further the physiological role of the hemostatic balance in the organism we have investigated the thromboplastic and fibrinolytic activities of tissues of the human and the pig eye.

Experimental. Materials. In 6 human eyes (from 4 patients) thromboplastic and fibrinolytic activities were investigated simultaneously. Because of the small size of the pig eye (obtained from freshly killed animals) 2 different series were required. The following components were separated and investigated: lens, vitreous body, cornea, sclera, choroid, retina. Only tissues which appeared to be normal were used.

Methods. Thromboplastic activity was estimated on freshly drawn citrated rabbit plasma and compared with a suspension of human brain as used for prothrombin estimations (after Owren). Samples were prepared by disintegration in a Potter homogenizer followed by freezing at −20°C. Activities of serial dilutions were estimated. Fibrinolytic activity was estimated (in triplicate) by the fibrin plate method (using 0.12% bovine fibrinogen clotted with bovine thrombin (Leo Pharmaceutical Prod., Copenhagen)) in serial dilutions obtained after extraction with KSCN and acid precipitation. Activity was expressed in units of a standard preparation of plasminogen activator prepared from pig heart. Details of methods in(1).

Results. Table I shows the thromboplastic activities recorded. The high activity of choroid and especially of retina is striking. No differences between human eyes and pig eyes are apparent. There is good agreement between estimations on 2 eyes of the same subject. None of the curves suggested presence of inhibitor material.

Table II shows the concentration of plasminogen activator in the tissues. Choroid ranges among the most active tissues so far investigated, whereas retina is in the low or medium range. The distribution of plasminogen activator in eye tissue follows a similar pattern in man and pig.

Though the human material is limited, the uniformity of the data warrants some tentative suggestions. The very low thromboplastic activities and fairly low fibrinolytic activities of the sclera are similar to the conditions previously observed in human joint tissues (fibrous capsular tissue, synovial membrane(2). From a pathological viewpoint the findings could explain the occurrence of endovitreous hemorrhagic processes followed by slow reabsorption. The extremely high fibrinolytic activity of the choroid is not surprising in view of previous findings of high fibrinolytic activity in highly vascularized connective tissue(3), including the meninges(4). Coupled with a high thromboplastic activity this suggests that the choroid is

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excellently fitted for repair of minute injuries by producing rapid coagulation followed by restoration through lysis of fibrin with no excessive formation of connective tissue(5). Similarly the high thromboplastic activity of the retina with only medium fibrinolytic activity could explain why hemorrhage is often followed by organization (retinitis proliferans).

Summary. There are great differences in

TABLE I. Thromboplastic Activity in Tissues of the Eye. Results expressed as percentage of the concentration in the stock solution of human brain thromboplastin as determined by interpolation on the straight line obtained by plotting dilutions of the stock against clotting time on a double logarithmic graph. In 2 of the human subjects both eyes were estimated separately.

	1 Lens	2 Vitreous body	3 Cornea	4 Sclera	5 Choroid	6 Retina
A. Human eyes						
♂ 27 (accident)	9	<1	<1	<1	100	72
"	4	2	<1	<1	90	85
♂ 48 (diabetes, sepsis)	6	3	1	2	160	270
"	18	2	3	2	175	300
♂ 48 (pneumonia)	16	9	<1	<1	38	230
♀ 78 (traumatic cerebral hemorrhage)	<1	16	8	3	54	385
B. Pig eyes						
1	4	1	<1	1	145	220
2	11	4	2	4	62	270
3	8	17	4	—	72	105
4	11	4	2	2	108	195
5	3	—	<1	5	62	130
6	9	1	11	<1	56	130
7	6	2	5	7	48	195
8	7	4	<1	2	145	180
9	6	16	6	2	115	280

TABLE II. Concentration of Plasminogen Activator in Tissues of the Eye. Results expressed in units of a standard preparation (from pig heart) per g fresh tissue as obtained from triplicate estimations of serial dilutions by interpolation on the standard curve in a double logarithmic graph.

	1 Lens	2 Vitreous body	3 Cornea	4 Sclera	5 Choroid	6 Retina
A. Human eyes						
♂ 27 (accident)	0	0	0	6	1080	100
"	0	0	31	31	994	63
♂ 48 (diabetes, sepsis)	0	0	0	35	436	153
"	0	0	<1	66	508	167
♂ 48 (pneumonia)	0	0	7	76	356	19
♀ 78 (traumatic cerebral hemorrhage)	0	0	9	76	259	45
B. Animal eyes (pig)						
1	...	0	4	92	832	205
2	0	0	<1	108	764	173
3	0	0	8	103	980	194
4	0	0	—	97	518	216
5	0	0	3	127	1080	335
6	0	0	10	205	929	281
7	0	0	6	82	1080	252
8	0	0	0	73	335	141
9	—	0	<1	107	799	270
Avg (pig)	0	0	4	110	813	230

the thromboplastic and fibrinolytic activities of the various tissues of the eye (human and pig). High thromboplastic activity was found in retina and choroid, while sclera, cornea, lens and vitreous body were only slightly active. High fibrinolytic activity was observed in choroid while retina had medium or low activity. Sclera was low in fibrinolytic activity and cornea, lens and vitreous body were inactive or nearly inactive. The results suggest a connection between the hemostatic balance in the various tissues and some pathological processes in the eye.

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Oxygen Content and pH of Arterial, Venous and Portal Blood in Dogs After Histamine. (27137)

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Vascular reaction to histamine(1-5) is characterized by capillary hypotonia, change of hydrostatic pressure, increased permeability, arteriolar dilatation and venous constriction. This syndrome may become irreversible in histaminic shock(6). Engorgement of the liver and splanchnic viscera, in dogs given histamine, increased with constriction of hepatic veins(7), may result in stagnant anoxia and damage of gastrointestinal tract.

The purpose of the present work was to study the changes in oxygen content and pH of blood drawn from the femoral artery, femoral and portal veins in dogs after histamine to determine whether stagnant anoxia of splanchnic area occurs after histamine.

Methods. Mongrel male dogs 20 to 24 kg under sodium pentobarbital anaesthesia (30 mg/kg B.W.) and heparinized with 3 mg/kg had the femoral artery and vein cannulated with polyethylene tubes. After subcostal laparotomy the portal vein was cannulated inferior to the junction of superior pancreaticoduodenal vein. After cannulation, pre-treatment samples of blood were drawn.

Histamine dihydrochloride (Roche) was injected intramuscularly (5 mg/kg)(5), immediately after first sampling. Despite the short period of tachypnea and hypotension,

TABLE I. Blood O_2 Content (ml O_2/100 ml Blood) before (0) and after Injection of Histamine* (10, 20, 30 Min.).

	6 histamine treated dogs			4 controls, no treatment		
Time, min.	A	V	P	A	V	P
0	21.48 18.04–23.41	11.01 9.62–12.37	13.21 11.11–13.62	22.95 20.86–25.74	13.55 9.34–17.32	16.00 12.47–20.93
10	20.06 16.54–22.69	9.21 5.02–11.38	12.41 10.79–13.00	22.60 20.55–25.10	13.31 8.69–17.10	16.20 12.67–21.10
20	18.38 15.58–19.55	7.92 3.50–11.30	10.02 7.83–12.31	22.40 20.55–25.14	13.30 8.84–17.10	15.68 12.43–21.00
30	17.19 12.05–18.35	6.71 1.99–10.62	8.88 4.08–11.14	22.95 20.55–25.57	13.00 8.69–17.00	15.31 12.43–20.80

* Histamine dihydrochloride, 5 mg/kg B.W.
A = Femoral artery. V = Femoral vein. P = Portal vein. Avg values and range.