XXIX. AN INVESTIGATION INTO THE PHYSICO-CHEMICAL MECHANISM OF HAEMOLYSIS BY SPECIFIC HAEMOLYSINS. No. II. THE ELECTRICAL CONDUCTIVITY OF SENSITISED CORPUSCLES AND THE ACTION OF INORGANIC FERMENTS OR METAL-SOLS UPON THEM.

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In my previous communication [1913] I pointed out that in the process of haemolysis by specific haemolysins, the amboceptor molecules are at first adsorbed into the pores in the walls of the erythrocytes and subsequently a true chemical combination takes place between these and the molecules of the corpuscular walls.

Observations have since been carried on to determine the electrical conductivity of the sensitised corpuscles as compared with the unsensitised ones. The following methods were adopted.

Sheep's corpuscles after being washed with normal saline were treated with six times the working dose of anti-sheep amboceptor and the mixture kept for a variable period, from two to twenty-four hours, in the ice-chamber. Subsequently the corpuscles were centrifuged and thoroughly washed with normal saline. In a second series of observations the sensitised as well as the unsensitised corpuscles were suspended in 5% glucose solution and then separated by centrifugalisation.

The conductivity of the corpuscles was measured by Kohlrausch's method and the following results were obtained. In all cases the conductivity was calculated at 26° C.

TABLE I.

The electrical conductivity of the sediment of corpuscles from the emulsion in normal saline.

(a)	(1)	Unsensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 360$
	(2)	Sensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 300$
(b)	(1)	Unsensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 300$
	(2)	Sensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 120$
(c)	(1)	Unsensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 190$
	(2)	Sensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 160$

TABLE II.

The electrical conductivity of the sediment of corpuscles from the emulsion in 5 % glucose solution in distilled water.

(a)	(1)	Unsensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 250$
	(2)	Sensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 100$
(b)	(1)	Unsensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 70$
	(2)	Sensitised corpuscles	$K (26^{\circ} \text{ C.}) \times 10^5 = 38$

It will be seen from the above tables that the adsorption of amboceptor by erythrocytes was followed by a diminution of the electrical conductivity of the corpuscles and this was specially marked when the sediment of corpuscles was obtained from an emulsion in isotonic glucose solution.

In the case of the sediment from the suspension in normal saline, the conductivity is mainly due to the ions still in contact with the corpuscular walls. Therefore the corpuscular walls of the sensitised corpuscles obstruct the passage of the ions more than the unsensitised ones. In the case of the sediment from glucose solution, the conductivity is mostly due to the envelopes. From these the conclusion follows that the walls of the sensitised corpuscles conduct electricity worse than those of the unsensitised ones.

From the above it may be assumed that the diminution of conductivity of the corpuscular walls in the case of sensitised corpuscles is due to the action of amboceptor on the walls and therefore that at least a portion of the amboceptor is in some sort of combination with the corpuscular walls in sensitised corpuscles.

Action of inorganic ferments or metal-sols upon sensitised corpuscles.

A series of experiments was undertaken to determine the action of catalysts, such as animal charcoal and platinum black, upon sensitised corpuscles. No haemolysis was brought about by their action. Colloidal solution of iodine (Collo-Iode of Dubois) also gave negative results. Various

metal-sols were mixed in varying concentration with the sensitised corpuscles. The following have, up to the present time, been used. Electargal and electro-selenium prepared by Clin and Co. (Paris), collo-sol silver and collo-sol mercury prepared by Oppenheimer and Sons.

Up to now, all such experiments with colloids have failed to bring about haemolysis of the sensitised corpuscles.

CONCLUSIONS.

(1) In the process of adsorption of amboceptor by the erythrocytes, it is in the corpuscular walls that the molecules of the amboceptor remain adsorbed.

(2) The electrical conductivity of the corpuscular walls of the amboceptor-loaded corpuscles is less than that of normal erythrocytes.

(3) Metal-sols, as well as other catalysts, such as animal charcoal, platinum black, colloidal iodine do not bring about any haemolysis of sensitised corpuscles.

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REFERENCE.

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