

and bring about osmotic equilibrium, before sufficient water can pass in to liberate the hemoglobin. This is indicated by the following: Normal red blood cells transferred successively to solutions of lower salt concentration may be finally introduced into a 0.3 per cent NaCl solution without liberation of hemoglobin.

A decreased fragility of erythrocytes, then, represents not a greater strength but an inability to maintain an osmotic difference from the surrounding solution because of greater permeability of the cell wall to the contained salts. That soap-treated cells have an increased permeability coördinated with a decreased fragility, is shown by successive transfer to more dilute salt solutions, when the cells will not liberate hemoglobin in 0.15 NaCl solution. Electrical resistance measurements of cells treated with castor oil soap, measurements made with H. O. Halvorson, and the specific resistances calculated with MacDougall's formula for disperse systems,<sup>3</sup> have given values about half as great as those found by MacDougall and Green<sup>4</sup> for normal cells (2000 ohms). This is another indication of the increased permeability of cells exhibiting decreased fragility.

The above mechanism of the fragility test based on experimental results allows a satisfactory explanation of the decreased fragility in hypotonic salt solution found typically in the case of pernicious anemia. The blood cells in pernicious anemia are injured cells and are being subjected to an accelerated hemolysis.

## 149 (2672)

### The fragility of human erythrocytes after treatment with pernicious anemia serums.

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It has been previously reported from these laboratories<sup>1</sup> that the resistance of normal cells to hemolysis by hypotonic saline solution is greatly increased by treating the normal cells with

<sup>3</sup> MacDougall, F. H., *Science*, 1924, lix, 403.

<sup>4</sup> MacDougall and Green, *J. Infect. Dis.*, in press.

<sup>1</sup> Green, *Proc. Soc. Exp. Biol. and Med.*, 1923, xv, 291-292.

serum from a pernicious anemia patient whose erythrocytes show an increased resistance with the same test. Further experiments in which the cells were treated with various dilutions of the serum made with physiologic salt solution show the effect to be marked when the serum is diluted 1 to 500, sometimes appreciable when diluted 1 to 1000, but usually absent when diluted 1 to 2000. The activity of the serum varied in this respect in different cases. The results of a typical experiment are given below. All cells were washed in salt solution before performing the test.

## EXPERIMENTAL DATA.

CHART 1.

Concentration of NaCl	Hemolysis time for patient's cells (pernicious anemia)	Normal cells	Normal cells treated with pernicious anemia serum.					
			Serum undiluted	Serum diluted 1:10	Serum diluted 1:100	Serum diluted 1:500	Serum diluted 1:1000	Serum diluted 1:2000
0.30%	20.2 sec.	12.4 sec.	17.4 sec.	64.6 sec.	34.3 sec.	21.6 sec.	19.2 sec.	12.8 sec.
0.35%	Trace in 3 hrs.	17.6 sec.	25.4 sec.	Trace in 3 hrs.	Partial hemolysis in 3 hours.	3600 sec.	120 sec.	17.2 sec.
0.40%	No hemolysis	48.8 sec.	No hemolysis	No hemolysis	No hemolysis	No hemolysis	300 sec.	43.4 sec.
0.45%	No hemolysis	No hemolysis	No hemolysis	No hemolysis	No hemolysis	No hemolysis	No hemolysis	No hemolysis

CHART 2.

Concentration of NaCl	Patient's cells	Normal cells	Normal cells treated with pernicious anemia serum.					
			Serum undiluted	Serum diluted 1:10	Serum diluted 1:100	Serum diluted 1:500	Serum diluted 1:1000	Serum diluted 1:2000
0.30%	48.4 sec.	13.4 sec.	36.2 sec.	31.6 sec.	19.4 sec.	13.6 sec.	13.2 sec.	12.8 sec.
0.35%	109.8 sec.	17.4 sec.	48.3 sec.	43.2 sec.	38.2 sec.	18.5 sec.	18.3 sec.	18.9 sec.
0.40%	No hemolysis	39.6 sec.	122.5 sec.	68.0 sec.	52.6 sec.	40.2 sec.	39.0 sec.	40.2 sec.
0.45%	No hemolysis	360 sec.	No hemolysis	Trace in 3 hrs.	543 sec.	398 sec.	382 sec.	335 sec.

These experiments indicate that there is some agent present in the blood serum of an individual with pernicious anemia which affects the red cells to give them the characteristic decreased fragility to hypotonic salt solution, and this agent may be present in an amount sufficient to have an appreciable effect when the serum is diluted a thousand times.

In an earlier paper it was reported<sup>2</sup> that blood cells treated with a weak solution of castor oil soap showed, before the liberation of hemoglobin, the decreased fragility to hypotonic salt solution characteristic of pernicious anemia. This would indicate that the substance in pernicious anemia serum which brings about the decrease in fragility of normal cells when immersed in it, may be the hemolytic agent responsible for the anemia.

### 150 (2673)

#### The effect of quinidine on interauricular conduction and irritability in the terrapin's heart.

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Numerous investigators have demonstrated that quinidine decreases the irritability of the heart muscle and the auriculo ventricular conduction. We have recorded the contractions of both auricles in the terrapin, and find that, although much stronger stimuli (rhythmic make-and-break shocks) are required to cause extrasystolic responses after intraventricular injections of 1-2 mg. quinidine sulphate than before, there is no marked disturbance of conduction of spontaneous contractions or of rapid rhythmic extrasystoles from right auricle to left auricle. This indicates that quinidine depresses irritability more than it depresses intra- and inter-auricular conductivity; and renders it probable that in auricular fibrillation it rather suppresses the genesis of ectopic impulses than that it blocks the conduction of circus move-

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<sup>2</sup> Green and Evans, PROC. SOC. EXP. BIOL. AND MED., 1923, xv, 290-291.