ERRATUM

LII. SOME OBSERVATIONS ON THE HAEMOLYTIC ACTION OF CERTAIN QUININE SALTS ON THE ERYTHROCYTES OF DIFFERENT INDIVIDUALS AND ON THE RESISTANCE OF NEWLY FORMED RED CORPUSCLES TO HAEMOLYSIS UNDER THE INFLUENCE OF DISTILLED WATER.

By UPENDRA NATH BRAHMACHARI AND PARIMAL SEN.

The following table is to be substituted for the one on p. 463.

Table showing the haemolytic action of the different salts of quinine upon the red corpuscles of different individuals.

	Quinine dihydrochloride	Quinine hydrochloride	Quinine disulphate	Quinine sulphate	Hydrochloric acid	Sulphuric acid
Man	0.04	0.45	0.055	0.45	0.015	0.025
"	0.05	0.5	0.07	0.5	0.02	0.03
"	0.055	0.45	0.07	0.45	0.02	0.03
"	0.06	0.5	0.0775	0.5	0.025	0.03
"	0.05	0.37	0.07	0.4	0.015	0.025
"	0.085	0.4	0.1	0.45	0.027	0.037
"	0.08	0.3	0.095	0.325	0.03	0.035
"	0.055	0.4	0.07	0.45	0.02	0.03
"	0.085	0.4	0.1	0.5	0.035	0.045
"	0.06	0.3	0.075	0.35	0.025	0.03
"	0.045	0.45	0.06	0.5	0.02	0.03
"	0.035	0.45	0.045	0.5	0.015	0.02
"	0.06	0.3	0.075	0.35	0.025	0.03
"	0.055	0.35	0.07	0.35	0.025	0.035
"	0.07	0.3	0.08	0.35	0.03	0.035
"	0.08	0.35	0.095	0.4	0.035	0.04
"	0.055	0.3	0.07	0.35	0.025	0.03
"	0.05	0.425	0.07	0.45	0.02	0.025
"	0.065	0.35	0.075	0.35	0.03	0.03
Fowl	0.1	0.4	0.12	0.45	0.035	0.045

LII. SOME OBSERVATIONS ON THE HAEMOLYTIC ACTION OF CERTAIN QUININE SALTS ON THE ERYTHROCYTES OF DIFFERENT INDIVIDUALS AND ON THE RESISTANCE OF NEWLY FORMED RED CORPUSCLES TO HAEMOLYSIS UNDER THE INFLUENCE OF DISTILLED WATER.

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(Received May 4th, 1921.)

I. IN the first part of this paper are recorded the observations made by us on the haemolysis of erythrocytes by certain salts of quinine in a series of patients taken promiscuously from the medical wards of a hospital of which one of us is in charge. The research was conducted with a view to determine whether the salts of quinine vary in their haemolytic action on the red corpuscles of different individuals and how far the quinine radicle or the acid portion of a quinine salt is responsible for the haemolysis.

Table showing the haemolytic action of the different salts of quinine upon the red corpuscles of different individuals.

	Quinine dihydro- chloride	Quinine hydro- chloride	Quinine disulphate	Quinine sulphate	Hydro- chloric acid	Sulphuric acid
Man	0.040	0.45	0.055	0.45	0.015	0.025
"	0.050	0.05	0.007	0.50	0.002	0.003
"	0.055	0.45	0.007	0.45	0.002	0.003
"	0.006	0.05	0.0775	0.05	0.025	0.003
"	0.005	0.37	0.007	0.04	0.015	0.025
"	0.085	0.40	0.001	0.45	0.027	0.037
"	0.008	0.03	0.095	0.325	0.003	0.035
"	0.055	0.04	0.007	0.45	0.002	0.003
"	0.085	0.04	0.001	0.05	0.035	0.045
"	0.006	0.03	0.075	0.35	0.025	0.003
"	0.045	0.45	0.006	0.05	0.002	0.003
"	0.035	0.45	0.045	0.05	0.015	0.002
"	0.006	0.03	0.075	0.35	0.025	0.003
"	0.055	0.35	0.007	0.35	0.025	0.035
"	0.007	0.03	0.008	0.35	0.003	0.035
"	0.008	0.35	0.095	0.04	0.035	0.004
"	0.055	0.03	0.007	0.35	0.025	0.003
"	0.005	0.425	0.007	0.45	0.002	0.025
"	0.065	0.35	0.075	0.35	0.003	0.003
Fowl	0.001	0.04	0.012	0.45	0.035	0.045

We shall not enter here into the researches of previous workers on the haemolytic action of quinine salts. The reader is referred to them for comparison of our results on those points in which work has already been done by them.

In all our observations, the experiments were made with solutions of quinine salts in normal saline.

Each observation extended from $2\frac{1}{2}$ to 3 hours, the test tubes containing the mixture of washed corpuscles and quinine solution being kept at 40° . The corpuscles were washed with 0.85 % NaCl.

Columns (1), (2), (3) and (4) show the strength of the solution of a quinine salt (g. per 100 cc.) in which the red corpuscles begin to haemolyse in the course of $2\frac{1}{2}$ to 3 hours. Columns (5) and (6) show the percentage of HCl or H_2SO_4 in a solution calculated in terms of quinine dihydrochloride or quinine disulphate in which the same amount of acid is present. Thus 0.015 % hydrochloric acid means the amount of hydrochloric acid present in 100 cc. of normal saline containing 0.015 g. of quinine dihydrochloride.

From the above the following conclusions may be drawn:

(1) Quinine dihydrochloride is the most haemolytic of the quinine salts shown in the table.

(2) The acid salts are more haemolytic than the corresponding neutral salt.

(3) Free hydrochloric acid or free sulphuric acid is more haemolytic than a solution of quinine dihydrochloride or quinine disulphate containing the same amount of hydrochloric acid or sulphuric acid respectively.

It will be seen that the presence of the quinine radicle in a quinine salt retards the haemolytic action of the acid present in the salt.

From the above table it will be seen that the erythrocytes of different individuals vary differently in their resistance to haemolysis under the influence of a quinine salt and it is quite possible that we might come across an individual in whom the resisting power of the red corpuscles was still lower. Black-water fever is therefore likely to occur in those individuals in whom the erythrocytes are least resistant to the action of a quinine salt either owing to disease or to a natural weakness on their part in resisting the action of the acid portion of a quinine salt.

In our observations we have found that fowl's corpuscles are more resistant to haemolysis under the influence of a quinine salt than the average red corpuscles of man and therefore any conclusion drawn from observations on the haemolytic action of quinine salts in lower animals may be fallacious, if applied to the case of man.

Attempts have been made by us to determine whether the haemolytic power of a quinine salt is diminished by the presence of glucose in its solution. One such experiment has, up to the time of writing, been made in the case of the fowl and the following results obtained:

Commencing haemolysis of fowl's red corpuscles was obtained with:

(1) 0.1 % solution of quinine dihydrochloride, (2) 0.4 % solution of quinine hydrochloride, (3) 0.12 % solution of quinine disulphate all in normal saline.

(2) 0.12 % solution of quinine dihydrochloride, (2) 0.45 % solution of quinine disulphate, (3) 0.14 % solution of quinine disulphate, all in normal saline containing 5 % glucose.

It is thus seen that glucose retards the haemolytic action of salts of quinine.

II. The second part of this paper refers to a series of observations made to determine the resisting power of the red corpuscles present after repeated bleeding to haemolysis under the influence of distilled water.

In this Journal and in his *Studies in Haemolysis* one of us described a method of determining the fragility of the red corpuscles which may be briefly described as follows:

One part of blood is treated with two parts of distilled water and the proportion of haemoglobin in the undissolved corpuscles to that of the total volume of blood taken is estimated. This gives a factor which is fairly constant under normal conditions and may be termed the relative haemoglobin-value of the resistant corpuscles. In the case of the fowl, this factor was estimated to be 16.85 as an average of a large number of observations.

To obtain absolutely identical conditions, the blood of the fowl in each case was washed three times with 0.85 % NaCl solution, so that the osmotic pressure of the suspending fluid of the corpuscles in each case was exactly the same.

The corpuscles after repeated bleeding were obtained in the following way:—the fowls were repeatedly bled from their veins in the wings till the total quantity of blood removed amounted to 30 to 50 cc. The haemoglobin-value of the resistant corpuscles after repeated bleeding was estimated seven days after the last bleeding and compared with their haemoglobin-value before bleeding.

The following experiments were performed:

I. Weight of fowl—14 $\frac{3}{4}$ oz. Total amount of blood removed after bleeding for four times = 27 cc. Haemoglobin-value of resistant corpuscles before bleeding = 17, after bleeding = 35.5.

II. Weight of fowl—3 lbs. 5 $\frac{1}{2}$ oz. Total volume of blood removed after repeated bleeding for five times = 44 cc. Haemoglobin-value of the resistant corpuscles before bleeding = 15, after bleeding = 37.

III. Weight of fowl—3 lbs. 12 oz. Total volume of blood removed after repeated bleeding for four times = 34 cc. Haemoglobin-value of the resistant corpuscles before bleeding = 17, after bleeding = 32.5.

IV. Weight of fowl—3 lbs. 14 oz. Total volume of blood removed after repeated bleeding for six times = 54 cc. Haemoglobin-value of the resistant corpuscles before bleeding = 11, after bleeding = 20.5.

V. Weight of fowl—3 lbs. Total volume of blood removed after repeated bleeding = 41 cc. Haemoglobin-value of the resistant corpuscles before bleeding = 10, after bleeding = 17.7.

It will be seen that in all the above cases, the resistant corpuscles were increased after repeated bleeding, thus proving that red corpuscles obtained under these conditions are more resistant to haemolysis than under normal conditions.