face of red blood cells in concentration insufficient to cause hemolysis greatly increases the time of hemolysis in a time-fragility test. When saponin is adsorbed by erythrocytes in a non-hemolytic concentration the time of hemolysis by hypotonic saline solutions is decreased. This increased and decreased fragility demonstrates the presence of the hemolytic agent definitely in connection with the red blood cell surface, and bears further evidence that hemolysis by agents of this type is an adsorption phenomenon. The difference of castor oil soap and saponin in producing a decrease and increase in fragility would seem to indicate that there is a difference of mechanism of hemolysis even in those hemolytic agents acting by surface adsorption. We have found a great difference of susceptibility to the action of soap and saponin in the case of human, sheep and bovine erythrocytes, and a similar variation is also observed in our time-fragility tests.

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The fragility of erythrocytes in obstructive jaundice and pernicious anemia.

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Our previous work demonstrating the action of small amounts of hemolytic substances as castor oil soap and saponin in decreasing and increasing the fragility of red blood cells would seem to have some bearing upon the fragility test as used in medical diagnosis. The preliminary work to determine the rôle of adsorption hemolysis in clinical conditions is here reported.

Bile from various animals has been used as a hemolytic agent for various animal erythrocytes and we have found its action to be very variable in different samples. The surface tension of bile solutions has also been studied and its surface tension reducing property is likewise very variable.

There is a very marked relation between the time of hemolysis and relative surface tension. Some samples of bile have shown a decrease in surface tension upon dilution with salt solution and coördinate with this has occurred a decrease in the time of hemolysis. When erythrocytes are treated with non-hemolytic concentrations of bile, the fragility of the cells are sometimes greatly decreased and sometimes increased. This corresponds with clinical findings and adsorption of bile elements on the surface of the red blood cells appears responsible for the changes in fragility observed.

In pernicious anemia a decreased or normal fragility of red blood cells is found. W. P. Larson suggested some years ago to the author that the hemolytic agent was probably a substance with a marked surface tension reducing property. In our experiments we determined carefully by means of a time-fragility test the fragility of the cells from pernicious anemia and the fragility of normal human cells from a blood of the same group. The normal cells were then treated with the serum from the pernicious anemia patient for varying lengths of time. These treated cells were then washed several times in salt solution and their fragility again measured. It was found that the treated normal cells showed a marked decreased fragility and in this respect appeared identical with pernicious anemia cells. Dilution of the pathologic serum gave similar results in varying degrees. These experiments lend some additional evidence to the view that the hemolytic agent is present in the serum. If it is the hemolytic agent which is responsible for the decreased fragility, the adsorption upon normal cells becomes a means of identification of the hemolytic factor in further experimental work.

The results reported from this laboratory upon hemolysis by soap, saponin and bile tend to show that the clinical fragility test is no indication whatever of a corresponding condition of the red blood cells. An erythrocyte partially hemolyzed by bile or by castor oil soap has an increased resistance to hemolysis by hypotonic salt solution.

Thus, any change in the fragility of erythrocytes in a clinical test, whether increased or decreased, must be interpreted as an indication that the red cells are being subjected to an accelerated hemolysis.