

resistant, though in their case, too, the protective action of plasma can be demonstrated.

The resistance of the red cells to mechanical injury has little if any relation to their resistance to hypotonic salt solution. For example, the corpuscles of the dog, though much more easily destroyed by shaking than those of the sheep, will withstand a hypotonic salt solution in which the laking of sheep cells is pronounced. With the bloods of different individuals of the same species a similar lack of parallelism in the two resistances has been noted.

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### **The protection of fragile erythrocytes against mechanical injury.**

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In the preceding paper the fact has been stated that erythrocytes handled in salt solution undergo an injury which does not take place when they are in plasma. This has suggested tests of various substances for a protective action. We have found that the addition to Ringer's solution of gelatin in very small quantity— $\frac{1}{8}$  of 1 per cent.—protects the red cells completely, and that their prolonged sojourn in it is no more harmful than in plain Ringer's. Dog corpuscles which break down almost at once when shaken in Ringer's solution, resist prolonged shaking when in the gelatin-Ringer's. Corpuscles of the dog, rabbit and sheep, washed in this fluid and placed in ordinary Ringer's, remain intact much longer than when washed in the latter. Dog erythrocytes may keep several days, whereas when washed in plain Ringer's solution they break down within a few hours. Only in the case of human red cells does the protection afforded by gelatin seem unnecessary during washing. These cells last quite as well when handled in plain Ringer's.

That the erythrocytes of certain species differ markedly as regards the time they remain intact when washed and placed in isotonic salt solution, is well known. The experiments with the

gelatin-Ringer's solution show that this is due for the most part to differences in the fragility of the erythrocytes. Corpuscles of the several species in question, protected with gelatin during washing and placed in plain Ringer's, differ relatively little in their period of survival.

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**Experimentally fused embryos with special reference to giant larvæ formation, changes of symmetry, and changes of synchrony.**

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Experimentally fused groups of two or more eggs of the sea-urchin *Arbacia punctulata* were studied individually from the blastula stage through the larval stage as late as the 14-day larvae. These isolated groups were studied with respect to the behavior of the three major tissues, body wall, gut and skeleton, and, of the processes taking place I wish to mention briefly only three.

1. Contrary to the views of Boveri and DeHaan two fused eggs may develop into a single giant larva even when the axes and symmetry of the two eggs or blastula or gastrula are not in the position of two blastomeres of an egg. A considerable number of fused pairs of eggs were followed through their entire development, in which the axes of the two numbers diverged 35 to 135 degrees from each other, yet these eggs gave rise to single giant larvæ.

Some of the processes involved in the transformation of two asymmetrically fused eggs include (1) change of symmetry, (2) retardation, (3) repression of one of the members, (4) absorption of one or more parts, (5) conflict of the skeleton centers, (6) size and rate factors in development.

2. There is a definite tendency for the two members to grow unequally, the one becoming increasingly small, though the rate of development is little or not affected. The law of synchrony as developed by recent investigators certainly does not apply in these grafts, and the regulative changes are due in largest part to the other factors enumerated.