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The effects of ageing upon germ cells and their development.

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For several years experiments have been made with the germ cells of the tropical sea urchins *Toxopneustes* and *Hippanoe*, and the northern urchin *Arbacia*. The preliminary experiments were made with a view towards obtaining experimental conditions that were optimum and that gave the least variability for freshly removed eggs and sperm from freshly collected sea urchins. Surprisingly large differences were observed among the eggs from different females. These differences involved (1) the size of the eggs, (2) the presence of the jelly layer, (3) rate of membrane formation, and (4) cleavage.

By means of one or more of these criteria it was possible to grade the different freshly collected females according to the physiological condition of their eggs. Eggs of similar physiologic condition showed a minimum variability and the highest correlation with respect to these variants.

When eggs and sperm were removed from their respective bodies and kept under optimum laboratory conditions, the same changes that had begun within the bodies of the sea urchins continued outside of the body.

With increasing age outside of the body the eggs showed progressive changes in size, in loss of jelly, in retarded membrane formation, in decreased total cleavage and decreased rate of cleavage, etc. And the exact degree of change in these regards was ascertained for different intervals up to the death of the eggs.

Still other changes were consequent upon ageing of the eggs, which suggested the nature of the chemico-physical agencies involved in the ageing process: namely, agglutination, fusion of two or more eggs, separation of the blastomeres, and irregular cleavage.

These changes suggested that the excess free HO ions in the sea water was one agency and probably a very important one in causing the dissolution of the jelly, the changes in permeability of the cortical layer of the eggs, the changes in size, and all the

other changes mentioned above, that follow upon long exposure to the free HO ions.

If these ions are responsible for the ageing one should be able to age eggs precociously with hyperalkaline sea water and on the contrary one should be able to retard ageing by rendering sea water neutral. Such experiments were made and made repeatedly. Eggs were aged precociously and showed all the physiologic and developmental changes which I have shown were characteristic of overripe eggs, and on the contrary ageing was retarded by removing the excess HO ions.

The longevity of the eggs was increased either by a reduction of respiration by KCN as proposed by Loeb, Lyon and others, or by the elimination of the excess free HO ions of sea water.

Other changes in ageing eggs were studied, such as the metabolism of the eggs, and the later developmental changes, but these studies will be reported later.

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The influence of thyroidectomy on the blood sugar.

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Considerable uncertainty exists with regard to the relation of thyroid function to carbohydrate metabolism. Some writers report a decrease, others, an increase of alimentary sugar tolerance after thyroidectomy in the dog. This confusion is due to several causes. Injury to the parathyroid bodies, which probably exert a different effect on metabolism from that of the thyroid, has frequently not been excluded. Previous experiments are open to other technical criticisms. The observations have been chiefly confined to urinary examinations.

Accordingly, a study of the blood sugar was made before and after thyroidectomy in a series of dogs. The operations were performed by Dr. J. E. Sweet. At least two parathyroids were isolated in each case. The wounds healed aseptically, and the dogs remained free from tetany. The blood sugar after thyroidec-