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WHAT IS GERM PLASM?[1]

By Professor GEORGE T. HARGITT

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THE term germ plasm has become a common term. It is used by laymen as well as biologists with such diverse connotations that one can never be sure just what is meant. Weismann[2] developed a definite and specific meaning for germ plasm. As a result of his study of acquired characters and from his attempt to find an explanation of development and heredity which would be more satisfactory than the physiological units of Spencer or the gemmules of Darwin, he worked out an elaborate and logical hypothesis. Whether acceptable or not, his hypothesis merits high praise as an outstanding biological contribution which has stimulated observation, experiment and enormous discussion.

Weismann's germ plasm theory may be briefly outlined in the following points: Hereditary characters are produced by specific particles or substances called determinants, located in the chromosomes of the nucleus. Each independently variable character of an organism is due to a single kind of determinant, whether in a single cell or a group of similar cells. The germ cells alone contain all the determinants of a species needed at any and all periods of the life history of an organism, including complete or partial determinants of ancestors.

At the first cleavage of the egg two cells are produced, one of which is the primordial germ cell which takes no part in ontogeny, but remains unchanged to produce the germ cells of the individual at the appropriate time. This primordial germ cell is therefore a sample of the fertilized egg and its products will be exactly like it. The other cleavage cell is the starting point for the rest of the complex organism. During continued divisions the determinants are gradually

[1] Address of the vice-president and chairman of the Section on Zoology of the American Association for the Advancement of Science, Cleveland, September 13, 1944.

[2] A. Weismann, "The Germ Plasm." Translated. New York, 1893.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN EASILY CONSTRUCTED HEPP OSMOMETER

INTEREST in the use of gelatin as a blood substitute has emphasized the need for a rapid method for measuring colloidal osmotic pressures (C.O.P.). Hepp[1] has described a method in which the volume of fluid in the so-called outer chamber is exceedingly small, thereby insuring a relatively rapid attainment of equilibrium. The following is a description of a simplified form of this osmometer that is relatively easy to construct.

Fig. 1 represents a cross-section of the osmometer.

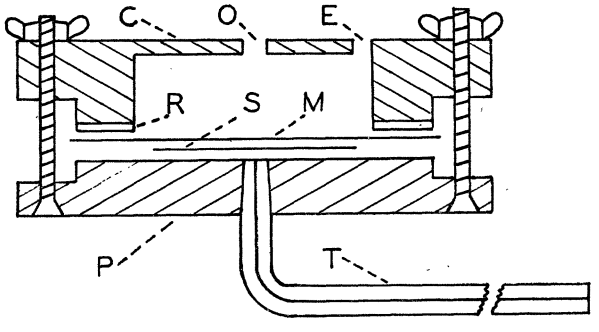

FIG. 1. A diagram of the osmometer showing relative positions of the membrane and silk cloth.

P is a circular platform made of lucite with an opening in the center into which a glass tube (T) can be inserted after warming the lucite in water. The end of tube (T) should be flush with the surface of the lucite. It is not necessary to taper that part of tube (T) that fits into platform (P). Leaks can be prevented by liberal application of DeKhotinsky cement to the base of this junction. The top part of the osmometer (C) is also made of lucite. The over-all diameter of the lucite pieces is 8 cm. The inside diameter of C is 4 cm and the width of the part of C in contact with the rubber gasket (R) is 1 cm. The diameter of the lumen of the glass tube (T) is 1 mm. A layer of ultrafiltrate or other appropriate fluid is placed on P, and a piece of silk cloth (S) and a membrane (M) previously soaked in the fluid are placed on top. Care must be taken to exclude air bubbles from under the membrane. The two pieces of lucite are fastened together by means of eight screws. The screws are threaded into P and act as guides in bringing C into contact with P. This procedure prevents the formation of wrinkles in the membrane. The rubber gasket (R) is necessary to prevent leaks between the lucite and the membrane. The experimental solution is placed in the chamber through opening (O). The fluid beneath the membrane is continuous with fluid in tube (T). The osmometer is placed on an appropriate platform in a constant temperature box (variation of air temperature $\pm$ 0.5° C.) with the tube (T) protruding to the outside through an opening in the box. Pressure (usually negative) is applied by means of a manometer (with large reservoirs to prevent uncontrolled changes in pressure) to tube (T), and the movement of the meniscus in tube (T) is observed with a microscope equipped with an ocular micrometer. A magnification of 80 × is satisfactory. The pressure is adjusted until the meniscus moves slowly in a given direction and its rate of movement is determined. The pressure is changed (by about 20 mm of H_2O) so that the meniscus moves in the opposite direction, and its rate is again determined. The equilibrium pressure is calculated by interpolation. Equilibrium pressure is determined at intervals until a constant value is reached (usually within 10 to 15 minutes with plasma or serum, but not until 2 to 3 hours with gelatin). The C.O.P. is the sum of the interpolated pressure and the hydrostatic and capillary pressures of the fluids in the manometer (determined by the usual methods). With this method a number of osmometers may be used with only one microscope and one manometer, the tubes (T) being clamped off in between readings. The osmometer can be emptied through opening (E). The openings (O and E) are partially covered during a determination to prevent evaporation. For further details the articles of Hepp[1] and Peters and Saslow[2] should be consulted.

Cellophane (300 gauge) and collodion membranes have been used in measuring the C.O.P. of gelatin solutions.[3] In the writer's experience the Cellophane membranes show less variation in permeability (determining rate of passage of saline through the membrane under a given hydrostatic pressure) than do collodion membranes prepared under carefully controlled environmental conditions. However, a completely satisfactory membrane for the measurement of the C.O.P. of gelatin has not been found.

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[1] O. Hepp, *Z. ges. exper. med.*, 99: 709, 1936.

[2] E. Peters and G. Saslow, *Jour. Gen. Physiol.*, 23: 177, 1939.

[3] Lawson, Hampden and W. S. Rehm, *Am. Jour. Physiol.*, 140: 431, 1943.

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