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THE CONSTITUTION OF PROTOPLASM[1]

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AMONG the variety of elements which partake in the constitution of the cell, the nucleus is the largest single body and the one which has lent itself to the most successful investigation. The nucleus was seen as early as 1781 by Fontana, but it was not until the principles of the cell theory were established by Schwann, Remak and Virchow that its role in cell economy could take its full significance. With Flemming, Strasburger and van Beneden began a series of brilliant investigations on the nucleus, which culminated in the discovery of the phenomenon of mitosis and the demonstration of the unique role which the chromosomes assume in heredity. The success met with in the study of the nucleus was undoubtedly due to the circumstance that its structures were able to withstand the action of the fixatives which had come into use during the nineteenth century. This typical resistance of the nucleus to these agents and the nuclear affinity for basic dyes can in turn be traced to a substance present in abundance in all nuclei and segregated in the chromosomes during division, namely, thymonucleic acid.

The usual fixatives which had proved eminently suitable for the preservation of the nuclear framework destroyed the cytoplasmic structures, an effect due chiefly to the high concentration of acids and of alcohol which they contained. The artefacts so produced gave rise to erroneous views on the organization of protoplasm, such as the reticular and the froth theories. The outstanding advance in the study of cytoplasm came with the work of Altmann and his followers, who recognized the destructive action of acids and introduced bichromate as a fixative. This improve-

[1] Paper presented at the Gibson Island Conferences of the American Association for the Advancement of Science, Gibson Island, August 21, 1942.

bath until the odor of acetone could no longer be detected. The hydrosol was cooled in an ice bath to about 5° C. Upon standing overnight in an ice chest, a yellow substance separated from the sol. When subsequently centrifuged at 4,500 RPM for 15 minutes, all the material was precipitated, leaving a clear supernatant liquid. The precipitated material was washed several times with water, the water decanted, the precipitate redissolved in acetone, filtered, redispersed into water, and the acetone removed as before. Centrifuging caused a clear, yellow, resin-like substance to collect at the bottom of the centrifuge tube. The resin was gathered on a stirring rod and removed from the tube for drying. From ten grams of dry plant material, 400 milligrams of dried resin were obtained, or a yield of about 4 per cent. on a dry weight basis.

Coagulation Tests of Calonyction Resin with Castilla Latex

The Castilla latex used in the following experiments was received from Mexico and labeled "Latex Castilla por de Pichucalco," and was collected on September 15, 1942. The shipment arrived in Washington on October 14, 1942, in apparently good condition. Ten milliliters of undiluted latex were measured in a graduate, poured into a 30 ml beaker and the desired amount of sol added for coagulative tests. The beakers were kept covered to diminish surface oxidation of the latex during the time of the test. When coagulation occurred, the rubber was separated from the serum at the end of 14 hours, washed several times in water, and weighed after being superficially dried in a low temperature oven. In some cases, the serum also was evaporated to dryness for rubber content determination. Resin and rubber analyses were made by the Bailey-Walker method using acetone and benzene as solvents for resins and rubber, respectively.

A sol containing 0.82 mg of resin per milliliter of water, and another sol containing 0.47 mg of resin per milliliter were prepared by first dissolving the resin in a small amount of acetone, dispersing the resin into water with stirring, removing all the acetone by warming, and then making the sol to a known volume with water. Tables I and II illustrate the coagulating powers of these sols, and the composition of the coagulum and serum.

TABLE I

Coagulative Power of a Calonyction Resin Sol Containing 0.47 mg of Resin Per Milliliter of Water. Ten Milliliters of Latex Used in All Tests

Ml of sol	Mg of nacta resin	Time of coagulation	Weight of rubber in grams
1.0	0.47	None in 12 hours	0
2.0	0.94	None in 12 hours	0
4.0	1.88	Begins in 30 minutes	2.35
8.0	3.75	Begins in 10 minutes	2.95
16.0	7.52	Begins almost at once	2.68

TABLE II

Coagulative Power of a Calonyction Resin Sol Containing 0.82 mg of Resin Per Milliliter of Water. Ten Milliliters of Latex Used in All Tests

Ml of sol	Mg of nacta resin	Time of coagulation	Per cent. rubber coagulated	Coagulum			Serum	
				Weight in grams	Per cent. resins	Per cent. rubber	Weight in grams	Per cent. rubber
0.5	0.41	None in 14 hours	0	0	...	....	10.32	...
1.0	0.82	None in 14 hours	0	0	...	....	10.32	...
2.0	1.64	10 minutes ±	20.7	2.14	5.60	72.34	8.18	5.63
4.0	3.28	5 minutes ±	23.3	2.41	6.37	58.27*	7.91	1.78
8.0	6.56	2 minutes ±	23.4	2.42	7.07	76.60	7.90	0.78

* Benzene extraction of rubber not complete after 32 hours.

These data are suggestive of the use that this resin may find in the commercial production of Castilla rubber. Since, however, absolutely fresh latex has been unavailable, we are hesitant in predicting the coagulative powers of Nacta resin under field conditions, and for this reason, we are withholding comment and interpretation of the data contained in the tables until the results of further trials on fresh latices have been ascertained.

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BOOKS RECEIVED

Gemmill, Chalmers L. *Physiology in Aviation.* Illustrated. Pp. vii + 129. Charles C Thomas. $2.00.

Hyslop, J. M. *Infinite Series.* Illustrated. Pp. xi + 120. Interscience Publishers. $1.75.

Knapp, E. J. *Basic Physics for Pilots and Flight Crews.* Illustrated. Pp. v + 118. Prentice-Hall. $1.65.

McCrea, W. H. *Analytical Geometry of Three Dimensions.* Illustrated. Pp. vii + 144. Interscience Publishers. $1.75.

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Wilks, S. S. *Mathematical Statistics.* Illustrated. Pp. 284. Princeton University Press. $3.75.

Winning, J. *Heat Treatment of Metals.* Illustrated. Pp. 99. Chemical Publishing Company, Inc. $1.50.