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The osmotic pressure of colloidal solutions and the influence of electrolytes and non-electrolytes on such pressure.

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Determinations were made of the osmotic pressure of gelatin and egg albumin; the colloids were used (1) in approximately pure solution, and (2) after the addition of various electrolytes and non-electrolytes to the colloidal solution; in this case the substance used was added in the same concentration to the outer fluid of the osmometer so as to pervade the entire system on both sides of the membrane in uniform concentration. The osmotic effects observed under these conditions can be due only to the colloid and not to the added substance. The colloidal solution is found, however, after the addition of an acid, alkali, or neutral salt, to exhibit an altered osmotic pressure, the degree of alteration varying with the nature and concentration of the added electrolyte. Non-electrolytes are found to have no appreciable influence on the osmotic pressure of these colloids.

The osmometer employed is constructed as follows: The membrane is composed of a moderately thick film of nitro-cellulose (celloidin or gun cotton) and is of the form and capacity of a 50 c.c. round bottomed flask; it is made by coating the interior of such a flask with a thin film of a 10 per cent. solution of celloidin in equal parts of alcohol and ether, and then removing the solvent by evaporation and bathing in hot water. Such membranes are strong and inextensible, readily permeable to crystalloids and water, and (if of the proper thickness) almost impermeable to the above proteids. The manometer is a straight narrow glass tube passing through a rubber stopper which is bound by an elastic

band into the neck of the flask-shaped membrane. The latter, after introduction of the colloidal solution, is immersed in a definite volume of the pure solvent (water, or water plus electrolyte used) contained in a battery jar; the jar is covered by a glass plate to prevent evaporation. The manometer tube is clamped in a vertical position. The height to which the column of fluid rises is a measure of the osmotic pressure; a constant height is reached in eighteen hours or less; pressure readings thus obtained may easily be translated into millimeters of mercury, if the specific gravity of the solution within the membrane is known.

The following general results have been gained. Non-electrolytes (sucrose, dextrose, glycerin, urea) have little or no influence on the osmotic pressure of the above colloids. Electrolytes, on the other hand, invariably produce a marked alteration. For example, the osmotic pressure of gelatin is greatly increased by the addition of small quantities of either acid or alkali. Thus in one experiment a 1.5 per cent. solution of gelatin gave a pressure of 8.4 mm. Hg; the same solution with the addition of HCl to $n/410$ concentration gave a pressure of 41.1 mm. Hg; with $n/410$ KOH it gave 26.3 mm. Hg. Egg albumin differs from gelatin in showing a *depression* of osmotic pressure in presence of acid or alkali. In all cases neutral salts *depress* osmotic pressure; in general there is seen a parallelism between the effectiveness of the salts as precipitants and their action in lowering osmotic pressure. The action is less pronounced — for equimolecular concentrations —with alkali metal salts than with salts of alkali earths; heavy metal salts depress to a still greater degree. A typical series with 1.5 per cent. egg albumin and the following potassium salts gave this result: (1) control: 22.6 mm. Hg; (2) same solution + $m/24$ KCl: 4.6 mm.; (3) $m/24$ KBr: 5.0 mm.; (4) KI: 5.4 mm.; (5) KNO_3: 5.7 mm.; (6) KCNS: 6.0 mm.; (7) K_2SO_4: 4.0 mm. The action thus varies with the nature of the anion; in general the order of decreasing effectiveness of anions is somewhat as follows: $SO_4 < Cl < NO_3 < Br < I < CNS$. This order coincides with that found by Hofmeister and Pauli for the action of anions in changing the aggregation-state of proteid solutions. $M/96$ $CaCl_2$ in a typical experiment depressed the osmotic pressure of a 1.5 per cent. albumin solution from 18.8 mm. Hg (control)

to 5.4 mm. Other alkali earth chlorides showed similar action. Heavy metal salts, short of the concentrations that cause precipitation, are still more effective as depressants.

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Hemolysis in eclampsia.

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There are several reasons suggesting that a hemolytic agent of placental origin may be of essential importance in eclampsia. The occurrence of methemoglobinuria, the possible relation of the hepatic thromboses to hemolyzed red cells, the resemblance between the eclamptic lesions and those produced by the injection of eclamptic serum or of immune hemolytic serum in rabbits, the possible origin of the eclamptic toxin from the placenta which normally possesses a hemolytic ferment, the marked hypertrophy and desquamation of the syncytium at term and during labor, and the relief of the symptoms in many cases as soon as the placenta is removed, all tend to indicate a hemolytic agent derived from the placenta as a factor in the disease.

In order to obtain some information regarding this subject I examined the placenta in fifteen cases of eclampsia, and the circulating blood and the viscera of several fatal cases for evidence of hemolysis. If any marked degree of hemolysis had occurred during life one would expect to find evidences of it in fresh emulsions of placental blood made shortly after delivery. Spreads of the blood on glass slides were also examined for evidence of agglutination and hemolysis, and sections of the placenta hardened in Orth's fluid were examined. Several normal placentas were first tested, and in these no evidences of hemolysis appeared immediately or after three to fifteen hours in the thermostat. In spreads and sections of normal cases the red cells often appeared moderately clumped without being fused. In only one of the eclamptic placentas was evidence of hemolysis secured, and this occurred in a fatal case in which, also, similar evidence was found in the uterine, portal and hepatic veins. The urine was bloody.