to the tuberculous lesions nor to the inflammatory reaction (skin test) produced with egg white. The readiness to form hemorrhages in inflammatory areas of various origin is very probably a symptom of the severe illness caused in the sensitive animals by the egg white or tuberculin, which is present in varying degree in the different animals.

There are 2 reasons why we publish these observations before the completion of the work—concerning the general reactions of the tuberculous animals sensitized with egg white—in connection with which they were made. The first is that the observations in their present form make it very probable that the focal reactions which we observe around the tuberculous lesions in the animals killed in tuberculin shock are not the result of a special sensitiveness of the lesions to the tuberculin. There is no reason to doubt the specificity of the tuberculin reaction, but the focal reaction, at least in part, seems to be a non-specific symptom of a certain type of intoxication of the organism. It is well known that focal reactions in tuberculous patients are often caused by various non-specific influences. The other reason for the publication of these observations is that they are in close analogy with the intensification of skin reactions in rabbits after the intravenous injection of bacterial filtrates, as described by Shwartzman[2] and Hanger.[3] The doses of the bacterial filtrate which produced this effect are toxic, (a large percent of the rabbits die after the intravenous injection) and it is possible that the hemorrhagic reaction in the formerly injected skin areas is a result of the intoxication, as seems to be the case in our observations.

## 4918

## Average Valence of the Gelatin Ion Determined by a Modified Theory of Membrane Equilibrium.

R. BEUTNER.

*From the Department of Physiology and Pharmacology, University of Louisville School of Medicine.*

From Donnan's theory[1] we can calculate the depression of the osmotic pressure of a gelatin solution, by the addition of a salt like NaCl. According to this theory this depression should never exceed 50% of the pressure of the colloid electrolyte in complete absence of a diffusible electrolyte. Experimental observations show

[3] Hanger, F. M., PROC. SOC. EXP. BIOL. AND MED., 1928, xxv, 775.

[1] Donnan, F. G., *Z. f. Elektrochem.*, 1911, xvii, 572.

that this is far from being true. As shown by Loeb[2] and others, salt addition depresses the osmotic pressure of gelatin chloride frequently to less than one-tenth of its original size.

Manifestly such a deviation must be due to an insufficiency of the premises of the theory, probably to the too simple assumption of Donnan that the colloidal micellae carry single electrical charges. Calculations based on the assumption of the presence of multiple charges of the colloidal ion—to be published *in extenso* later—show that the *fraction of osmotic pressure which remains after the maximal lowering by a salt excess amounts to* $1/n+1$ *of the pressure in absence of a diffusible electrolyte—where* n *signifies the valence of the colloidal ion;* hence the pressure is depressed to one-half for monovalent, 1/3 for bivalent, 1/11 for 10 valent colloidal ions, etc.

From Loeb's measurements[2] we can figure the osmotic pressure of gelatin chloride by adding to the observed values of osmotic pressure the counterpressure which is due to unequal distribution of the $H^+=$ ions on either side of the membrane. This latter magnitude can also be figured from Loeb's data. By the addition of an excess of HCl practically the entire gelatin is transformed into gelatin chloride. For a 1% solution of gelatin chloride the osmotic pressure is thus figured as about 1520 mm. water column. By the addition of an excess of NaCl this is depressed to as low a value as nearly 23 mm.—all these data being taken from Loeb. The pressure is depressed, therefore, to about 1/66, hence, the gelatin ion must carry approximately a charge 67 times larger than a $H^+$ or $Cl^- =$ ion. This can only be meant as the average charge since colloidal micellae are never of uniform size; gelatin, moreover, is chemically inhomogeneous as proven by Kunitz and Northrop,[3] hence probably of varying composition, and of widely varying molecular size.

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## The Action of Soaps in the Animal Body.

IRVINE H. PAGE AND EDGAR V. ALLEN.

*Aus der chemische Abteilung der Deutsche Forschungs-anstalt für Psychiatre (Kaiser Wilhelm Institute) München.*

In the animal organism the possibility of the formation of soaps from fatty acids and various bases is often present. It is believed

[2] Loeb, J., "Proteins and Colloidal Behavior," New York, 1922.

[3] Kunitz, M., and Northrop, J. H., *J. Gen. Physiol.*, 1929, xii, 379.