

that this is far from being true. As shown by Loeb² 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 measurements² 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 Forschungsanstalt für Psychiatrie
(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.

by many that soaps formed in the intestine are absorbed as such and act as a means of fat transport in the blood. In many types of pathological process, soap may be produced, as for instance in atherosclerosis, acute hemorrhagic pancreatitis, necrosis of the brain, etc. Soap is often used as an abortifacient, in various therapeutic measures, in the preparation of vaccines, and selective bacterial cultivation.

We have, therefore, made a study in mice, rats and rabbits of the activities of various of these substances. The following soaps were studied: The sodium, monoethanolamine, diethanolamine and triethanolamine salts of capric, lauric, oleic, linoleic, and ricinoleic acids (n/20 aqueous solutions at pH 7.4). This is a preliminary paper, the detailed work appearing in the *Naunyn-Schmiedeberg Archive für experimentelle Pharmakologie*.

Studies on 500 mice, intravenously injected, show the following order of toxicity, the amount required to produce death in 24 hours being taken as the M.L.D. Mono, di and triethanolamine ricinoleate > Na ricinoleate and Na laureate > Na oleate, Na linoleate, mono and diethanolamine oleate, and monoethanolamine caprylate > triethanolamine oleate > Na linoleate and diethanolamine caprylate > triethanolamine caprylate and Na butyrate. The amounts required to produce death within 24 hours when the soaps were injected intraperitoneally were from 2-10 times as great.

Pathologic studies of mice dying within 24 hours as the result of a single soap injection have shown so far only marked and uniform congestion of the viscera and in many cases hemorrhage into the pulmonary alveoli. Large doses of soap are required to produce very evident hemolysis.

Studies on 60 rats injected intraperitoneally 3 times weekly for 6 weeks (50 mg. soap per kg.) showed marked variation in the response to different soaps. Peritoneal adhesions, fatty and degenerative changes in the liver, and degenerative changes in the kidneys were often present. There appears to be a moderately specific response to the individual soaps. It is interesting to note that whereas it is usually assumed that soaps are relatively harmless physiological substances, they are toxic when parenterally injected and the introduction of these substances is followed by a train of pathological tissue changes.

Blood pressure studies with 12 rabbits under amytal anesthesia clearly demonstrate very marked and often prolonged fall in pressure depending on the soap used. Some of the soaps produced very evident rhythm changes especially the ricinoleate soaps. Most of the soaps act to stimulate respiration to a marked degree.

The effect of diethanolamine ricinoleate (2 cc. n/20 solution intravenously) on the permeability of the meninges was tested in 12 experiments with rabbits, using Uranin A as circulating dye. Occipital puncture was performed 3 hours after the intravenous injection of soap and dye. In every case there was a small but definite increase in the dye which was found in the cistern fluid as compared with the fluid from animals in which the dye alone was injected.

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Dissociation of Allergy from Immunity in Pneumococcus Infection.

ARNOLD RICE RICH AND J. HOWARD BROWN.

From the Department of Pathology and Bacteriology, The Johns Hopkins University.

It is commonly believed that allergic hypersensitiveness plays an important and necessary rôle in acquired immunity to bacteria. The idea behind this belief is that the rapid allergic inflammation, which occurs at the site at which bacteria lodge in the sensitized body, prevents the spread and causes the death of the bacteria, while in the non-allergic body in which inflammation develops with less speed and intensity, the bacteria are able to proliferate and to spread more rapidly over the body, being less hampered by the antagonistic forces inherent in the process of acute inflammation. It has, however, been pointed out¹ that there are numerous reasons for questioning the assumed necessity of allergy for the operation of immunity; and, further, that in certain infections, if not in all, it is of considerable importance to know whether or not allergic hypersensitiveness is really necessary for immunity, since tissue destruction is so frequently a direct result of hypersensitiveness of the cells to bacterial products which are relatively innocuous to unsensitized tissues. Rich, Chesney and Turner² have produced immunity in the absence of allergy in experimental syphilis. The present study demonstrates that allergy is not necessary for immunity in pneumococcus infection.

A high degree of allergy in rabbits actively immunized to the pneumococcus can easily be demonstrated by intracutaneous tests. In the present attempt to dissociate allergy from immunity, however,

¹ Rich, *Arch. Int. Med.*, 1929, xliii, 691.

² Rich, Chesney and Turner, to be published.