— which attack and destroy the integrity of the red corpuscles, and other chemically undefined bodies, — bacterial hemolysins, which act in the same manner, and the more indirect action of certain complexes defined as intermediary body and complement. I have shown previously that certain soaps and fatty acids — of the oleic series, chiefly — can play the part of complements in hemolysis. The experiments based upon this fact led me to the study of the ferment lipase as the direct or indirect cause of hemolysis. I found in the course of this study that lipase is, under some conditions, an efficient hemolytic agent which acts, however, not directly upon the red corpuscles, but indirectly through the liberation from available fats of the active fatty acids. Neutral fats, the higher glycerides, are not hemolytic, but they become so under the influence of lipase.

If one drop of triolein, or a corresponding amount of fat from the dog or guinea-pig, or a small quantity of tripalmitin or crotin, is added to 2 c.c. of a 5 per cent. suspension of washed red corpuscles and 1 c.c. of the lipase solution be added, hemolysis will occur. Neither the lipase nor the fats alone are lytic. Lecithin cannot replace the fats mentioned. The hemolysis is non-specific. Serum of the dog and the guinea-pig, and, to a less extent, of the ox are rendered non-specifically hemolytic by the action of lipase.

Potassium cyanide and sodium fluoride in 1 : 10,000 solution inhibit the action of lipase on the fats, and calcium chloride removes the lytic agent from an active mixture. Since the bile salts are known to increase lipolysis, the effects of the sodium salts of cholic, glycocholic and taurocholic acids in 1/500 *N* solutions were tested on lipolytic hemolysis. The rate of hemolysis was accelerated.

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On the mechanism by which water is eliminated from the blood capillaries in the active salivary glands.

By **A. J. CARLSON, J. R. GREER** and **F. C. BECHT.**

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1. There is a spontaneous flow of lymph from the quiescent parotid gland of the horse. The quantity is never great but it was

evident in all of our nine experiments. It is probable that part of the lymph that flows from the neck lymphatics in an anesthetized dog with all the salivary glands at rest comes from the salivary glands. This fact necessitates a limitation of Asher's theory of lymph production.

2. When the parotid of the horse is thrown into activity by stimulation of the cranial secretory nerves or by injection of pilocarpin into the blood there is no appreciable increase in the output of lymph from the gland as compared with that from the gland at rest. This is true both of the spontaneous flow and of the flow aided by direct massage of the gland.

3. The activity of the submaxillary does not appreciably influence the flow of lymph from the neck lymphatic in the dog. This conclusion is based on experiments on thirteen dogs. If the activity of the submaxillary gland increases the output of lymph from the neck ducts, the increase is too slight to be detected by our present method, and is not one-tenth of the saliva eliminated by the gland, as Barcroft's observations would seem to demand. Our experiments were made on the spontaneous flow; on the flow aided by movements of the lower jaw by a mechanical contrivance to secure absolute uniformity in rate and amplitude; and on the flow aided by direct massage of the head and neck by kneading. Moreover a check was introduced by way of recording the lymph flow from both neck ducts, while the submaxillary gland on one side only was thrown into periodic activity by chorda stimulation. As our results are directly contrary to those of Asher and Bainbridge, the question should be reinvestigated by others.

4. In dogs under light ether anesthesia, perfectly quiescent and with all the salivary glands at rest, there is always a spontaneous flow of lymph from the neck lymphatics. If the anesthesia is pushed till the blood pressure falls considerably, this spontaneous flow ceases. The fact that Asher and Bainbridge worked on dogs under morphin may account for their failure to obtain lymph from the neck ducts in the absence of massage.

5. The osmotic pressure of the lymph from the active parotid of the horse is not the same in all animals. It may be either the same, higher or lower than that of the serum. In fact in three out of our five experiments it was lower. In four of the experi-

ments we failed to secure sufficient quantities of lymph from the gland for the freezing point determination. Since we have only five experiments on which to base our deductions, we do not consider the above statements final; but the fact that the lymph obtained from the active gland had in three cases considerably lower osmotic pressure than the serum, apparently eliminates osmosis as the factor effecting the transfer of water from the blood capillaries in the active gland. That leaves the secretory nerve theory and the "hormone" theory, as before stated, the only occupants of the field. The latter seems to us the most probable one, and our work is now directed towards proving or disproving it.

6. The osmotic pressure of the lymph from the neck lymphatics of the horse, collected with the animal under chloroform anesthesia, may be of slightly higher, of the same or of considerably lower osmotic pressure than the serum. Hamburger states that the osmotic pressure of the lymph collected from the neck lymphatic of the horse is thirteen per cent. higher than that of the serum. Hamburger collected the lymph from animals not under anesthesia.

We ourselves have had two cases which showed that the osmotic pressure of the neck lymph was more than one atmosphere lower than that of the serum. Here we are face to face with the old problem of secretion of urine, only here the relation is reversed. Even assuming that the capillary pressure in the head and neck region of the horse is 100 mm. Hg., this would not avail to overcome the difference in osmotic pressure of the lymph and the serum in these two cases, so that filtration could be the factor in the lymph production. Unless the lymph in these two cases was rendered dilute by the absorption by the tissue cells of the constituents making up the osmotic pressure, which although improbable is now being investigated, we have here a demonstration of a formation of lymph by a secretory activity of the capillary walls.

7. The osmotic pressure of the lymph from the neck lymphatics of the dog is usually lower than that of the serum. It is rarely greater. Leathes states that the thoracic lymph of the dog is always of higher osmotic pressure than the serum. In two of our experiments we collected lymph also from the thoracic duct, finding it in both cases of higher osmotic pressure than the neck

lymph. The thoracic lymph was in one case of the same, in the other case, of a higher osmotic pressure than the serum. It is therefore probable that the osmotic pressure of the thoracic lymph is usually greater than that of the neck lymph.

8. Under the conditions of our experiments — ether or chloroform anesthesia for from two to four hours — the osmotic pressure of the serum at the end of the experiment was in many cases greater than at the beginning of the experiment. The same difference is sometimes exhibited by the lymph collected from the same lymphatic but at different periods of the experiment. The mechanism of this change is being investigated.

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On the dissociation in solutions of the neutral caseinates of sodium and ammonium.

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From the dilution law, or from the equations for the equilibrium of an amphoteric electrolyte in the presence of non-amphoteric electrolytes, it can be shown that in the case of a protein in which the acid function considerably exceeds the basic function (as, for example, in the case of casein), an equation can be obtained connecting the observed conductivity of a neutral solution of the protein compound of a base with the dilution of the solution. This equation involves two constants, the one being the dissociation-constant of the protein salt of the base and the other the sum of the specific velocities of the anions and cations present.

If a solution of a hydroxide of an alkali or alkaline earth or ammonia be shaken up with casein until no more casein goes into solution, the solution (as I have previously shown) is, after filtration, neutral in reaction and is a solution of the neutral caseinate of the base, containing an amount of the base equivalent to 2.4 per cent. CaO.

Since these solutions are neutral, if no complex ions are formed, the conductivity will be entirely due to the cations of the base employed and to the casein anions. The sum of the ionic