

injection of 1 c.c. of a 10 per cent. suspension of washed goat's corpuscles per kilo body weight. The control animal received intraperitoneally an emulsion of spleen from a normal dog (see curve).

Never does the serum of the control dog cause agglutination in greater dilution than 1:48. The agglutinating power is, on the whole, less than 1:24. The serum of the dog which received the immunized dog's spleen showed an increase in agglutinin from the start. Rising from a normal of 1:24 the serum agglutinates on the fifth and seventh day in a dilution of 1:384. From the eighth to the thirteenth day the serum agglutinates in a dilution of 1:96; and on the seventeenth day, the day of testing the fluids, the serum possesses an agglutinating value of only 1:48.

A future paper will give in greater detail this and other experiments which have yielded similar results with respect to antigen-fixation by the spleen. The mechanism of subsequent antibody formation in the recipient, whether by growth of the living cells or a second fixation of antigen liberated by the dead or dying splenic cells remains an open question. The results so far obtained warrant the conclusion that the spleen fixes antigen; and that this organ is, therefore, necessarily concerned with antibody formation.

The same method has been used with lymph glands and bone marrow with negative results. The work is being continued along this line with the hope of proving the point directly and conclusively by the successful transplantation of the spleen.

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The concentration of ammonia in the blood of dogs and cats necessary to produce ammonia tetany.

By **CLARA JACOBSON.** (By invitation.)

[*From the Hull Physiological Laboratory of the University of Chicago.*]

The importance of this subject rests in its relation to the markedly increased ammonia content of the blood of animals in parathyroid tetany. In a recent paper,¹ evidence was presented which indicates that this increased ammonia is apparently asso-

¹ Carlson and Jacobson : *American Jour. of Physiol.*, 1910, xxv, 403.

ciated with an impaired liver activity. That there is a marked similarity of the symptoms of ammonia poisoning and meat intoxication after Eck fistula to those of complete thyroidectomy was also pointed out and is further confirmed by the present work. These experiments were carried out at the suggestion of Dr. Carlson with the view of determining whether the ammonia concentration in the blood of animals in parathyroid tetany is sufficient by itself to cause tetany, assuming that no tolerance to the ammonia is developed.

Slow injections of ammonium carbonate in solution were made intravenously, the saphenous vein in dogs, and the jugular vein in cats being used. Blood samples were drawn for analysis when the symptoms became of the severity usually observed in parathyroid tetany or had returned to such after excessive injection. Some differences in ammonia content are inevitable and are due to the rapid diffusion of the ammonia into the tissues and the lymph, to elimination by the kidneys and to conversion into urea by the liver. The results obtained are as follows :

Ammonia Content of the Blood in Mgr. per 100 c.c.

Dog No. 1	2.8	Cat No. 1	3.44
" No. 2	2.1	" No. 2	3.64
" No. 3	3.7	" No. 3	1.88
" No. 4	1.75	" No. 4	2.40
" No. 5	2.4	" No. 5	2.34
		" No. 6	2.47
		" No. 7	3.18

Blood samples of six normal and three thyroidectomized dogs in tetany were analyzed for comparison and found to average : normal, 1.438, thyroidectomized 2.73 mgr. per 100 c.c. The ratio for cats is : normal (average for five animals), 1.57, and thyroidectomized (average for six animals), 2.53.

The symptoms observed after ammonia injection are very similar to those of complete thyroidectomy. There is a preliminary phase of dyspnœa and salivation usually accompanied by depression and more or less somnolence. Further injection results in twitching of muscles, which may be suddenly followed by opisthotonus and respiratory standstill (a condition observed in three or four parathyroidectomized cats under observation last fall).

In recovery, tremors, tetanic spasms, or both, and marked hyper-excitability are noted.

The results support the view that the increased ammonia in the blood of parathyroidectomized animals is directly responsible for the tetany and depression symptoms, as the concentration of the ammonia in the blood of parathyroidectomized cats and dogs is sufficient to cause tetany, tremors and depression in the normal animal.

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The daily curve of nitrogen elimination in the pregnant, as compared with the non-pregnant dog.

By **J. R. MURLIN.**

Comparison of the daily nitrogen output in periods of three hours in pregnant dogs as compared with the same dogs non-pregnant, on the same diet and living under identically the same conditions, shows that the form of curve is essentially the same in the two conditions. In the pregnant condition the total curve runs below that of the non-pregnant condition at a fairly uniform distance, showing that the retention for the embryos and auxiliary structures is fairly uniform from hour to hour.

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Contraction of muscle during voluntary innervation.

By **HORATIO B. WILLIAMS.** (By invitation.)

*[From the Department of Physiology, Cornell University
Medical College.]*

This communication is a preliminary report of studies on the frequency of contraction of voluntary muscle under voluntary innervation.

The muscles studied were the flexors of the forearm, and the problem has been approached from three directions :

1. The frequency of the action currents.
2. The frequency of the sound accompanying muscular contraction.
3. The frequency of the mechanical variations over the surface covering the contracting muscles.