6526

Experimental Hypocalcemia.

A. B. HASTINGS AND C. B. HUGGINS.

From the Departments of Medicine and Surgery, and the Lasker Foundation for Medical Research, the University of Chicago.

Approximately 90% of the calcium may be adsorbed from the serum of normal dogs by shaking with solid $Pb_3(PO_4)_2$.[1] Using this method of decalcifying blood the following experiments have been carried out.

Small dogs were alternately bled maximally (about 50% of their blood volume) and immediately transfused with an equal volume of decalcified blood. This procedure was repeated as many as 28 times in the course of an afternoon. Each sample of blood removed was analyzed for calcium, phosphorus, and occasionally for CO_2 and pH. When the transfusions were repeated every 20 minutes the serum calcium did not decrease below 2.1 millimols per liter and no symptoms occurred.

When only 10 minutes were allowed to elapse between transfusions the serum calcium decreased to 1.6 millimols per liter after 12 or 13 transfusions. Mild symptoms of tetany appeared when the serum calcium reached 1.75 millimols per liter (7 mg. per 100 cc.). These persisted as long as the serum calcium was kept below this level. If an interval of 20 minutes or longer was allowed to elapse between transfusions the serum calcium rose promptly, even though the calcium removed had far exceeded that calculated as being initially present in solution in the body. This is interpreted as evidence that the bone salts are freely soluble in serum which has been rendered undersaturated with respect to them. Experiments of this nature were performed on 6 normal dogs. The cerebrospinal fluid was analyzed for its calcium content at the end of the experiment in one dog and was found to be 1.6 millimols per liter, a normal value.

The symptoms observed may be characterized as those of a mild tetany. At no time did a well-defined convulsion occur. Specifically the symptoms noted were localized but persistent tremors of groups of muscles of the extremities, chest, shoulders, and head. Sometimes involuntary movements of the fore legs occurred.

When the parathyroid glands were removed prior to the experi-

[1] Roseberry, H. H., and Hastings, A. B., unpublished results.

ment, the following differences were noted. If the parathyroidectomy was performed 6 hours before the experiment, the initial serum calcium was normal. Transfusing with decalcified blood brought the serum calcium below the tetany level more rapidly than in the series of experiments on normal dogs, *i. e.*, within one hour instead of between 1¾ or 2 hours. The symptoms in these animals were mild, however, and the cerebro-spinal fluid calcium was not reduced appreciably below normal at the end of the experiment. Furthermore, in spite of 18 transfusions, extending over 3 hours, the blood was still able to take up calcium *in vivo* if the transfusions were interrupted.

When the parathyroidectomy was performed 24 to 30 hours prior to the experiment, marked symptoms of tetany were brought on shortly after transfusions with decalcified blood were begun. The serum calcium could be kept at a lower level in such animals (1.3 millimols per liter). At the same time, the cerebro-spinal fluid calcium was found to be 1.4 millimols per liter.

6527

Effect of Calcium and Citrate Injections into Cerebrospinal Fluid.

C. B. HUGGINS AND A. B. HASTINGS.

From the Departments of Medicine and Surgery, and the Lasker Foundation for Medical Research, the University of Chicago.

Sabbatini observed that the direct application of isotonic solutions of oxalate or of citrate to the exposed brain of dogs increased their excitability and at times resulted in a generalized convulsion.[1] This effect was antagonized by calcium. We have repeated and extended these experiments. Small amounts (0.1-0.3 cc.) of isotonic solutions of either sodium citrate (0.077 M), calcium chloride (0.107 M), calcium citrate (0.06 M), or magnesium chloride (0.107 M) were injected into the cisterna magna of dogs, using a fine needle (26 gauge).

A typical syndrome occurred following injections of sodium citrate, consisting of immediate contraction of the voluntary muscles of the neck, trunk, extremities and tail. The motor phenomena included an extensor rigidity of the legs, slightly greater in the fore legs than in the hind, and a marked opisthotonos, pleurothotonos,

[1] Sabbatini, L., *Revista sperimentale di freniatria*, 1901, **27**, 946.