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The effect of thyro-parathyroidectomy on the blood coagulation time in the dog.

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It has long been held that the parathyroid glands are in some way concerned with the metabolism of calcium in the body. In dogs killed during parathyroid tetany MacCallum and Voegtlin[1] found a decrease in the amount of calcium contained in the blood and brain tissue, and recently MacCallum, Lambert and Vogel[2] have shown that when blood, from which the calcium has, in large part been removed by dialysis, is perfused through an isolated limb, the nerves of this limb show extreme hyperexcitability similar to that observed in tetany.

It is also believed by Wright and others that a diminution of ionic calcium in the blood leads to a prolongation of the coagulation time, and an increase to a shortening of the time.

Our experiments were undertaken with the object of determining whether removal of the parathyroids (and thyroids) in the dog will produce any effect on the speed with which the blood coagulates, and so presumably, point to a change in its calcium content.

We adopted the graphic method of Cannon and Mendenhall[3] of estimating the coagulation time, with one or two slight modifications, and found it to work satisfactorily.

The dog was anesthetized with ether, the left saphenous artery clamped close to the femoral from which it arises, ligatured on the distal side and then opened between the clamp and the ligature. The coagulation tube or canula was made so that it fitted tightly into the central end of the incision, and on relaxing the clamp a sample of circulating blood was obtained. The canula was then plugged with plasticine, quickly removed to a waterbath kept at

[1] MacCallum and Voegtlin, *Jour. Exper. Med.*, 1909, XI, p. 118.

[2] MacCallum, Lambert and Vogel, *Jour. Exper. Med.*, 1914, XX, p. 168.

[3] Cannon and Mendenhall, *Amer. Jour. Physiol.*, 1914, XXXIII, p. 225.

a constant temperature of 25° C. and the time recorded. After each sample of blood had been secured the artery was thoroughly washed out with Ringer's solution.

When ten or more observations had been made, the wound, after being cleansed with corrosive, was closed, and then both lobes of the thyroid (including the parathyroids) were removed. When the symptoms of tetany developed the animal was again anaesthetized and the same procedure adopted on the right limb. At the end of this last experiment it was killed by an overdose of chloroform.

In our later experiments we made three sets of observations on each animal; in the first set the blood was taken from the left saphenous artery, and a few days later, when this wound had healed, the corresponding vessel on the right side was used. At the end of this second experiment the thyroid (including the parathyroids), was removed, and when symptoms developed a third set of observations was made on blood withdrawn from the right lateral circumflex artery, a branch of the femoral arising at a higher level than the saphenous. The object of this procedure was to find out whether, under normal conditions, the coagulation time showed any variation from day to day in the same individual.

Without going into detail, the results of our experiments, so far as they have gone, seem to point to the conclusion that when the symptoms of parathyroid tetany are pronounced (rapid breathing, excessive tonic and clonic muscular contractions, etc.) the coagulation time is prolonged, which may possibly indicate a low calcium content for the blood. On the other hand, where the symptoms are only slight (fine muscular tremors and no rise in body temperature) or just beginning, the coagulation time either remains unchanged or is somewhat shortened.

The following are three examples taken from the thirteen experiments which we have performed:

EXPERIMENT I. DOG ♂, WEIGHT 16.9 KILOS, AGE 13 MONTHS.

1st set of observations (average of 10 readings)—Coag. time 3½ min., normal.
2d " " " " " " " — " " 4½ " "
3d " " " " " " " — " " 6 " during tetany.

In this case the symptoms, which appeared four days after removal of the glands, were very severe: respiration 120, rectal

temp. 104.2° F., marked tonic and clonic muscular contractions.

EXPERIMENT II. DOG ♀. WEIGHT 15.9 KILOS. AGE 12 MONTHS.

1st set of obs. (average of 10 readings)—Coag. time 3½ min., normal.
2d " " " " " " " — " " 4 " "
3d " " " " " 8 " — " " 3 " during slight tetany.

No symptoms appeared until nine days after operation and then only slight muscular tremors were observed with no rise of temperature (100.6° F.).

EXPERIMENT III. DOG ♀. WEIGHT 14.0 KILOS. AGE 12 MONTHS.

1st set of obs. (average of 10 readings)—Coag. time 5 min., normal.
2d " " " " " " " — " " 5 " "
3d " " " " " " " — " " 4½ " after operation.

This dog showed slight symptoms three days after operation. These passed off and did not return and fifteen days later the third set of observations was made after which the animal was killed.

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The relative efficiency of the biological action of the Roentgen rays emitted by the Coolidge and the old type tubes.

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In accordance with the modern conception in physics the Roentgen rays present pulsations in the ether analogous to the rays of light. The waves of ether forming the Roentgen rays are considerably shorter than the shortest ultra-violet waves of light. The waves of the so-called soft Roentgen rays are about 1,000 times shorter than those of ultra-violet light, and the waves of the hard Roentgen rays are still shorter.

Any substance, solid, liquid, or gaseous, absorbs a part of the Roentgen rays which pass through it. The fraction of the rays thus absorbed depends upon the density and thickness of the substance. The remaining rays penetrate beyond the interposed substance. The relation between the quantity absorbed by the substance and that penetrating beyond it is of fundamental im-