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4097

Calcium Excretion by the Alimentary Tract.

E. L. WALSH AND A. C. IVY.

From the Department of Physiology, Northwestern University Medical School.

It is generally accepted that calcium is absorbed in the upper and excreted in the lower intestine. Since, so far as we have been able to ascertain, none of the experiments used by the various investigators has involved the use of pouches or fistulas of the various portions of the intestine in unanesthetized animals, we decided to study calcium excretion by using such a method. We believe this method has the definite advantage that every possible factor can be quite accurately controlled.

Stewart and Percival,¹ in acute experiments on cats, showed by washing of the colon that apparently there was a constant excretion of calcium by the colon, averaging about 0.8 mg., for the 3 hours.

Pouches (Thiry-Vella) of the upper jejunum and the lower ileum about 18 inches long were made; and pouches of the entire colon were made. Only dogs were used. These pouches were washed out at various intervals with distilled water, 0.1% HCl and 0.1% NaHCO₃, the amount of calcium in the washings being determined by the permanganate method.

It was found that daily washings with distilled water of the loop, or pouch, of the upper jejunum, yielded from 0.32 to 1.2 mg. of calcium; that daily washings of the pouch of the lower ileum yielded from 2.0 to 8.5 mg.; and that daily washings of the entire colon yielded from 1.8 to 15.0 mg. of calcium. Daily washings with the weak acid and alkaline solutions did not increase the yield. Washing out the lower ileum or colon at one hour intervals in succession for 6 or 8 hours markedly increased the yield, the yield of the lower ileum being from 24.0 to 30.0 mg., and of the colon from

¹ Stewart, C. P., and Percival, G. H., *Biochem. J.*, 1927, **xxi**, 301.

17.6 to 55.4 mg., for 8 hours. Experiments are under way to determine the effect of bile, feces and mechanical distension on calcium elimination by the intestine.

It is evident from our experiments that calcium is eliminated to a much greater extent by the lower intestinal mucosa than the upper. However, it must be pointed out that the concentration of calcium in the gastric juice is from 5.0 to 6.5 mg. per 100 cc.² of pancreatic juice (our own determination) is from 5.0 to 9.0 mg. per 100 mg., and of gall-bladder bile from 6.0 to 17.0 mg. per 100 cc. It is also evident from our experiments that increased activity of the lower ileum and colon caused by hourly washings markedly increases the output of calcium.

4098

Emptying of Human Gall Bladder After Saline Cathartics.

E. A. BOYDEN AND C. L. BIRCH.

*From the Departments of Anatomy and Medicine, College of Medicine,
University of Illinois.*

In a recent number of the PROCEEDINGS¹ it was shown that magnesium sulphate, when injected directly into the duodenum, produced relatively as great an expulsion of bile from the gall bladder as usually resulted from the first phase of contraction following a meal of egg-yolk. Secondly, the striking change in shape of the cholecystograms made it certain that not merely emptying but also contraction of the gall bladder was induced by the injection of this salt.

Since then, a large number of other salts have been tried, employing the same quantitative method of measuring the response that has been used in our other investigations, namely, computation of successive gall bladder volumes and the plotting of a contraction curve. Up to the present time, this work has revealed the existence of 2 other salts which in strong solutions are as effective as magnesium sulphate, viz., magnesium chloride and sodium sulphate. Furthermore, each of the 2 sulphates when diluted and given by mouth, induce nearly as pronounced an emptying as when given by

¹ Boyden, E. A., and Saunders, A. M., *PROC. SOC. EXP. BIOL. AND MED.*, 1928, xxv, 458.

² Austin, W. C., and Matthew, S. A., *Am. J. Phys.*, 1927, lxxxii, 552.