strument except for the wave-length calibration. Buder's results do not agree very well with ours. Satisfactory agreement with most of the older authors (A. Mayer, Engelmann, Warming, and Ray Lankester) has been obtained.

The evidence obtained tends to show a close relation between the pigments of four classes of purple bacteria.

252 (2775)

The influence of acidity in the intestine upon the absorption of calcium salts by the blood.

By LAURENCE IRVING and JOHN FERGUSON. (Introduced by E. G. Martin).

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If calcium compounds are present in sufficient amounts in the diet, their solubility in the intestinal contents would be a limiting factor for absorption. Apparently calcium chloride and calcium lactate are quite easily absorbed. Salvesen[1] observed that calcium lactate could supply the entire calcium requirement of parathyroidectomized dogs even on a meat diet. Calcium lactate is quite soluble (about 10 per cent) compared with carbonates, phosphates, and most organic salts of calcium.

The solubility of organic calcium salts generally is favored by acidity. It has been suggested[2] that the acidity of the intestine is a factor in calcium absorption. Inouye[3] remarks that lactose feeding favors the maintenance of a sufficiently high blood calcium concentration to prevent tetany in parathyroidectomized dogs, and that this diet favors an acidophile flora. The diffusible calcium salts of milk are increased by acidification, as well as by tryptic digestion.[4]

In order to secure evidence on the absorption of calcium salts from the intestine these experiments were performed. Under

[1] Salvesen, *Acta Medica Scand.*, 1924, lx, suppl. 6, 5-159.

[2] Orr, Holt, Wilkins, Boone, *Am. J. Dis. Child.*, 1924, xxviii, 574-81.

[3] Inouye, *Am. J. Physiol.*, 1924, lxx, 524-37.

[4] György, *Biochem. Zeit.*, 1923, cxlii 1-10.

anesthesia the intestines of dogs and rabbits were injected with $CaCl_2$ solutions buffered at several hydrogen ion concentrations. Blood samples were removed at the start and at successive periods, and the serum Ca determined by the method of Kramer and Tisdall.[5] It has been shown[6] that serum calcium constitutes practically the entire blood calcium.

$CaCl_2$ solutions were selected as the most soluble of calcium salts, buffering of the acid solutions being accomplished by citrate mixtures. In general, alkaline buffers are objectionable because of the insolubility of their calcium compounds, but the glycocoll mixture was finally used. Possibly because of digestion, the pH of such a solution was not stable, and moved rapidly toward an acid condition in the intestine.

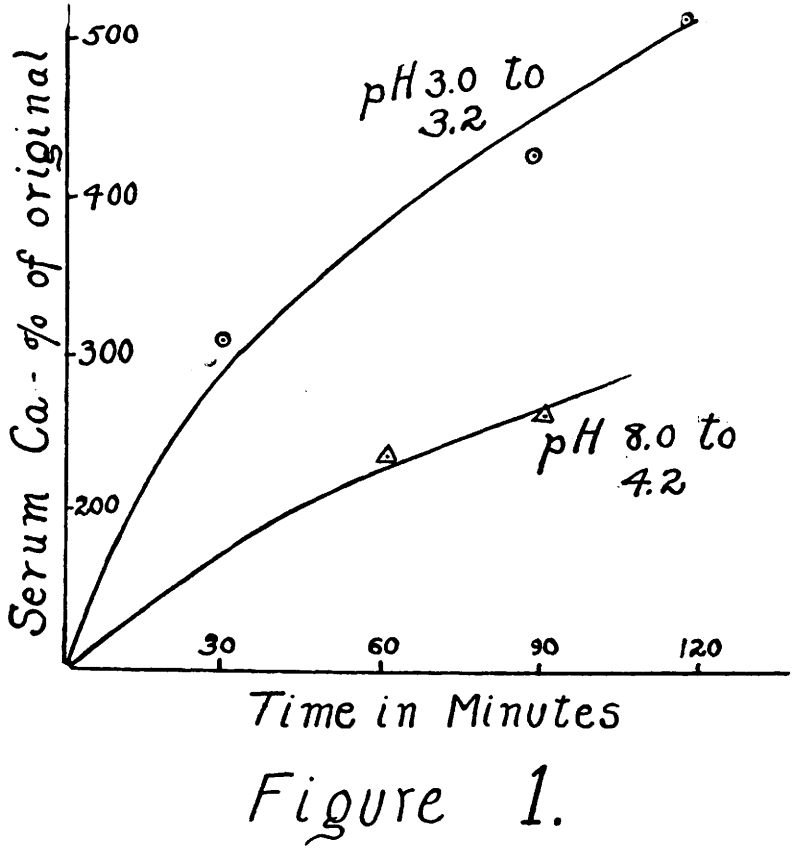

Figure 1.

[5] Kramer and Tisdall, *Bull. Johns Hopkins Hosp.*, 1921, xxxii, 44-50.

[6] Howland and Kramer, *Am. J. Dis. Child.*, 1921, xxii, 105-119.

Rabbits did not prove such suitable subjects for the experiments because of the variability found in their normal serum. It is also likely that urethane is not an ideal anesthetic for use in such experiments because of its possible hydrolysis and increase of the alkalinity. All of the experiments, however, were performed on pairs of animals, the treatment differing only in the acidity of the calcium chloride solution. The experiments with dogs, which appear most suggestive, were controlled by blood counts which indicated that no dilution or concentration had occurred sufficient to reverse the order of the findings.

Figure 1 shows the results of experiments with two dogs receiving $CaCl_2$ solutions buffered at pH 3.0 and 8.0 respectively. There was no question of the rapid absorption of calcium by the serum, and of the fact that absorption from the acid medium was more pronounced.

Figure 2 shows results with another pair, one receiving $CaCl_2$ solution buffered at pH 3, the other unbuffered neutral $CaCl_2$. Here the difference in absorption is not so great, but still favors the more acid solution. These figures represent results typical

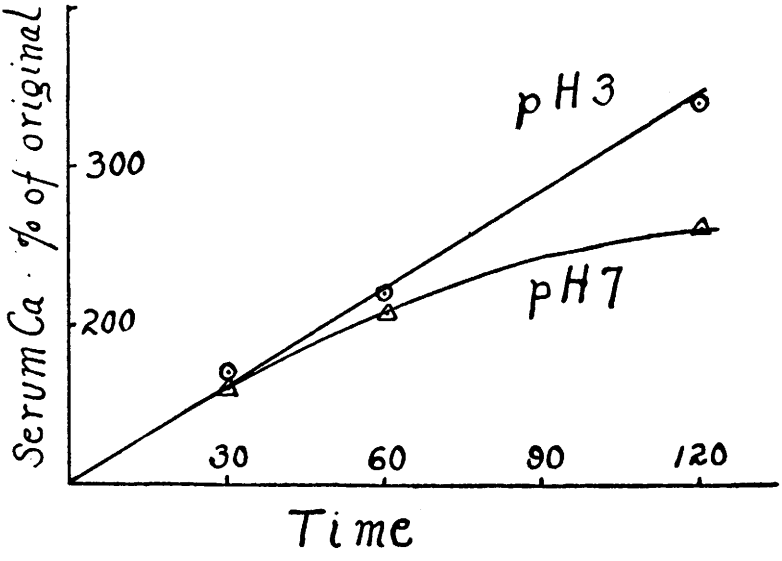

Figure 2.

of those obtained with other dogs and with rabbits, although the rabbits were not so regular.

It is not shown why calcium from $CaCl_2$ solution should be more readily absorbed from acid than from neutral solutions, as its ionization would be nearly total in either case and its solubility complete. The injected salt, however, would gradually receive contributions from the several sources of intestinal fluids, producing a quite different solution. Calcium salts would be limited in solubility to that of their least soluble combination, and under such conditions an acid buffer would preserve them in solution. The general separation of the curves with increasing time agrees with this idea, for absorption from neutral or alkaline solutions gradually decreases, while from buffered acid solutions it remains about constant.

253 (2776)

The action of strophanthus on the chloralized heart.

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In a recent paper[1] I was trying to show—for the cold blooded heart—that in chloral hydrate, if applied in appropriate concentrations, we possess a substance which paralyzes the nervous elements of the heart in precedence to the muscular ones. It was suggested there that we might take advantage of this functional interval (elapsing between the elimination of the nervous elements and the paralysis of the sinus: the end stage of chloral action) in order to analyze the point of attack of certain pharmacological agents. The reactions of the digitalis group were tested first, for, although it is generally known that digitalis action is primarily myotropic, there remains a possibility of neurotropic action, particularly concerning chronotropic and dromotropic activities. The experiments have been carried out on the perfused heart of terrapin (Engelmann's method.) The chloral

[1] d'Irsay, S., and Priest, W. S., *Am. J. Physiol.*, 1925, lxxi, 563.