

citrate per kilo given intravenously stimulated the contractions of the small as well as of the large intestine, the effect lasting several minutes. Tonus and the rhythmic contractions were increased, but in dogs the effect on tonus predominated. Repetition of dose usually produced greater effects in cats and dogs, but in the rabbit it caused relaxation of the intestine and abolition of the rhythmic movements. This depression was followed, however, by gradual recovery. After intramuscular injections of very large doses of sodium citrate marked and prolonged stimulation occurred; both tonus and rhythmic movements were greatly augmented.

The action of citrate was also tested after the division of both vagi. The effect was usually the same as when the salt was given to animals with both vagi intact. Sodium citrate injected after atropine failed to stimulate the intestine, but when pilocarpine was injected after atropine, the subsequent administration of citrate produced temporary inhibition of the intestinal movements and marked decrease of tonus. If more pilocarpine is given and a sufficient interval of time allowed to elapse after the atropine, the usual effect upon the intestine may occur after the injection of citrate.

152 (1899)

The action of sodium citrate on the central nervous system.

By WILLIAM SALANT and NATHANIEL KLEITMAN.

*[From the Department of Physiology and Pharmacology,
University of Georgia, Augusta, Georgia.]*

Maxwell¹ reported experiments in which sodium citrate applied to the cortex of the cerebrum in rabbits was without any effect, but when injected into the white matter underneath produced some of the symptoms of citrate poisoning. These observations were extended later by Robertson and Burnett² who made similar studies on the cerebellum. They likewise found that a reaction was obtained only when the solution of sodium citrate

¹ Maxwell, *Jour. Biol. Chem.*, 1906, ii, 183.

² Robertson, *Journ. Pharm. Exp. Therap.*, 1911-12, iii, 635.

was injected into the white matter. The symptoms were with few exceptions the same as those following toxic doses of citrate when given subcutaneously or by mouth. This led them to conclude that they were mainly of cerebellar origin.

We made a study of citrate in a series of experiments on cats in which sodium citrate was given after removal of the cerebrum. The subcutaneous injection of toxic doses failed to cause the symptoms usually produced by citrate. Tonic and clonic convulsions, muscular twitching and other symptoms produced by the same doses of citrate in our controls were absent in all of our decerebrated animals.

Tests made on frogs have shown, however, that convulsions and muscular effects may be produced in these animals in the absence of the cerebrum and of the rest of the brain. But when the spinal cord was destroyed no convulsions were observed. Toxic doses of citrate given after division of one sciatic failed to produce spasms of the corresponding leg, and the symptoms produced by citrate disappeared after section of the sciatic.

153 (1900)

Alkaloid actions as test for synapse-function in insects.

By **W. J. CROZIER.**

[*From the Zoölogical Laboratory, Rutgers College, New Brunswick, N. J.*]

Injection of strychnine solution, even at saturated concentration (0.5 c.c.), in a series of sphingid caterpillars (genera *Samia*, *Automeris*, *Ceratonia*), fails to induce "reversal of inhibition"; and save in the case of those species normally the most excitable it fails to induce any opisthotonic symptoms. Opisthotonic curvature (spasmodic) can be induced, however, by tetraethylammonium chloride. General excitation is produced by a variety of neurophil substances (but not by creatin). Only with atropine is one able to bring about reversal of inhibition in the use of antagonistic muscle groups; it is in this case very clearly shown in the behavior of the prolegs, which no longer react to embrace an ob-