phonate† 1:150,000 to 1:75,000, ephedrine-HCl 1:20,000 to 1:10,000, cocaine-HCl 1:75,000, nicotine 1:1,000, atropine 1:1,000 and a mixture of nicotine and atropine, 1:1,000 each, markedly diminished or entirely abolished the inhibitory effect on intestinal movements of electrical stimulation of the mesenteric nerves.

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An Analysis of the Actions of Cocaine on Excised Smooth Muscles.*

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In a previous report[1] there was presented evidence that cocaine is not a general sympathomimetic drug. Since most of the studies of the action of this drug on the iris (Gold, Miller, Koppanyi, Yonkmann[2]) indicate an action on the terminal mechanism of the sympathetic nerves to this organ, a further analysis of the action of cocaine on other organs was carried out. All studies were on excised tissues bathed in Tyrode solution or modified Locke solution. The tissues were taken from animals killed by a blow, or under urethane and chloretone or amytal anesthesia. Only experiments on small intestine, colon and uterus of the rabbit are described in this report.

Small intestine. Five segments of small intestine of the rabbit were shown to respond to 1:10,000 cocaine HCl by contraction. This action was not prevented by previous treatment of the tissue with nicotine and atropine, 1:50,000 each. Of 15 segments which were depressed by cocaine 1:10,000, 5 were depressed by cocaine after nicotine and atropine 1:20,000 each, 5 were depressed by cocaine, but not by epinephrine, after ephedrine 1:10,000, and 5 were depressed by cocaine, but not by epinephrine, after ergotamine, 1:75,000. These concentrations of ephedrine and ergotamine were shown to prevent the inhibitory effect of electrical stimulation

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[1] Thienes, C. H., *J. Pharm. Exp. Therap.*, 1928, **33**, 21.

[2] Gold, H., *J. Pharm. Exp. Therap.*, 1924, **23**, 365; Miller, G. H., *Ibid.*, 1926, **28**, 219; Koppanyi, T., *Ibid.*, 1930, **38**, 113; Yonkman, F. F., *Ibid.*, 1930, **40**, 195.

of the mesenteric nerve, yet cocaine depressed several such poisoned muscles.

Colon. Five segments of rabbit colon were contracted by cocaine, 1:10,000. This action of cocaine was in no way influenced by nicotine or atropine, 1:20,000.

Uterus. Four segments of excised uterus of the rabbit were contracted by cocaine, 1:10,000 both before and after ergotamine reversal of epinephrine action.†

Conclusions. Since the drugs which are known to paralyze ganglia and nerve terminations of the autonomic nervous system failed to prevent either the augmentor or depressant effects of cocaine on the small intestine, colon and uterus of the rabbit, it seems reasonable to conclude that this alkaloid acts on the muscle, rather than the nerves of the organs studied.

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Studies on Cyanide-Stable Respiration.

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The opinion has long been held that the respiration of animal tissues is completely inhibited by cyanides.[1] However, Dixon and Elliott[2] have shown that in most tissues there is an appreciable oxygen consumption in the presence of the cyanide radical.

We have found that the cyanide-stable fraction of the respiration of the liver of the frog, *Rana pipiens,* is quite appreciable. The frogs were pithed and the liver promptly removed. The tissue was then minced with a razor moistened with Ringer's solution into slices 0.5 mm. or less in thickness, under which conditions Warburg[3] has shown that oxygen and cyanide have free access to the several cells. The minced liver, suspended in phosphate Ringer's,[4] was placed in the respiration chamber of a Warburg manometer. A cup containing 7% KOH removed the CO_2 produced. All the mano-

† The authors are indebted to the Sandoz Chemical Works, Inc., for a generous supply of ergotamine tartrate and ergotamine methane sulphonate.

[1] Macleod, J. J. R., "Physiology and Biochemistry in Modern Medicine." 1930, 622.

[2] Dixon, M., and Elliott, K. A. C., *Biochem. J.,* 1929, **23**, 872.

[3] Warburg, O., *Biochem. Z.,* 1923, **142**, 317.

[4] Dickens, F., and Simer, F., *Biochem. J.,* 1930, **24**, 1301.