synaptic volleys, together with recording of the bioelectric activity of the ganglia following antidromic stimulation). It was found that the ganglion-blocking agents do not increase postactivating inhibition and have no influence on the conduction of excitation during antidromic stimulation. In contrast to the ganglion-blocking agents, procaine considerably impairs conduction of excitation in the postsynaptic neurones.

From the above data it appears that the inhibition of transmission of excitation in autonomic ganglia which occurs under the influence of ganglion-blocking drugs is related not only to the selective depression of the cholinoreceptores, but may also be the result of the influence exerted by these substances on the function of the presynaptic endings.

58 Enhanced Postganglionic Responses of Sympathetic Ganglia to Stimulating Agents Following Repetitive Preganglionic Stimulation. R. L. VOLLE (U.S.A.).

Asynchronous postganglionic discharges of the feline superior cervical ganglion, *in situ*, evoked by acetylcholine (ACh), carbamylcholine, and tetramethylammonium (TMA) were monitored with conventional electrophysiological techniques. Following repetitive preganglionic stimulation with supramaximal volleys at rates ranging from 20 to 100 c/s for periods of 10 sec to 15 min, the amplitudes and time–courses of the ganglionic responses to these agents were enhanced markedly. The duration of stimulation required to produce these changes appeared to be related inversely to the frequency of stimulation. Following repetitive stimulation, carbamylcholine, administered in doses which elicited postganglionic responses lasting 20–30 sec in previously unstimulated ganglia, evoked responses which last 3–5 min. Doses of ACh and carbamylcholine which produced just detectable postganglionic firing were reduced 8- to 16-fold by this procedure of conditioning. The threshold doses of TMA, however, were not reduced; suprathreshold doses were potentiated. The enhanced responses, once induced, persisted for the duration of the experiment (up to 5 hr after conditioning stimulation). Antidromic stimulation of the postganglionic trunks of normal and chronically denervated ganglia did not result in any significant alteration of the responses of the ganglia to these agents. Furthermore, ganglionic blockade by hexamethonium, infused into the arterial supply of the ganglia before and during repetitive stimulation in amounts which blocked completely the postganglionic responses to single preganglionic volleys, did not prevent the occurrence of enhanced responses to injected stimulating agents. It is suggested from these findings that: (1) conditioning with repetitive preganglionic volleys results in alterations in the presynaptic nerve terminals as reported previously by Larrabee *et al.*[1]; and (2) the action of ACh and carbamylcholine on the ganglion is due in part to stimulation of the nerve terminals.[2]

1. LARRABEE and BRONK (1947), *J. Neurophysiol.*, **10,** 139.
2. VOLLE and KOELLE (1960), *The Pharmacologist*, **2,** 88.

59 Classification of Ganglionic blocking Agents. J. M. VAN ROSSUM (Holland).

Transmission of impulses through the ganglionic synapse is to some extent similar to transmission through the neuromuscular junction. In both cases acetylcholine (ACh) is involved, which implies that drugs may act by: (a) inhibiting the synthesis of ACh; (b) affecting the release of ACh; (c) occupying ACh-receptors whilst having intrinsic activity and thus action as an ACh-mimetic; (d) merely occupying ACh-receptors and thus acting as a competitive antagonist; (e) occupying other receptors and so acting as a non-competitive antagonist.

When studying ganglionic blocking agents on neuro-muscular preparations evidence accumulates that some may act as competitive antagonists and others as non-competitive antagonists.

Ganglionic-stimulants and -blocking agents have therefore been investigated upon the isolated guinea-pig intestine under conditions that only ganglionic effects are measured. Dose–response curves were made of the stimulants using nicotine as a standard, whereas the blockers were studied as how they affect dose–response curves of nicotine.

At least three classes of ganglionic drugs occur: Class I: the mimetics as nicotine, DMPP, pyridine-3-methyl-yl-trimethylammonium; Class II: the lytics or competitive antagonists as hexamethonium, pentapyrrollidinium and azamethonium; Class III: the non-competitive ganglionic blocking agents as pentacyne, chlorisondamine. There exists a number of intermediate compounds, e.g. mecamylamine and pempedine, which are both competitive and non-competitive.

There exists a characteristic relationship between chemical structure and the class of drug.

60 The Effect of Various Amines on Transmission through the Superior Cervical Ganglion of the Cat. S. B. GERTNER and A. ROMANO (U.S.A.).

We have recently reported that guanethidine and bretylium blocked transmission when perfused through the superior cervical ganglion. This block which could be antagonized by the perfusion of epinephrine and norepinephrine, prompted a more thorough investigation of the effects of amines on ganglionic transmission. The actions of epinephrine, norepinephrine, isoproterenol, ephedrine, phenylephrine, tyramine, dopamine, tryptamine, 5-hydroxytryptamine and various other derivatives were tested on transmission. The stability of the