The present data emphasize the importance of NANA in the drug-induced calcium transfer in isolated rat stomach, and raise the question of whether amphetamine acts on the same receptor of 5-HT.

TABLE 1. *Total radioactivity after incubation for 8 min with ^{45}Ca. Effects of (+)-amphetamine (D-A), serotonin (5-HT) and furtrethonium (HFUR)*

Drugs	*n*	Radioactivity (d.p.m./mg of fresh tissue)	Significance tests* Source of variation	*F*	*P*
Controls (C)	6	5,325·5±902·5	C vs D-A C vs 5-HT C vs HFUR	6·30	<0·025
D-A 10^{-1} mM	5	4,750·8±1,049·2	C vs D-A	2·62	n.s.
5-HT 10^{-4} mM	6	9,282·8±1,395·6	C vs 5-HT	10·15	<0·025
			C vs HFUR	16·63	<0·001
HFUR 10^{-3} mM	6	10,110·2±2,725·3	D-A vs 5-HT	21·67	<0·001
			D-A vs HFUR	30·31	<0·001
			5-HT vs HFUR	<1	n.s.

The controls were taken from strips incubated with ^{45}Ca only. The mean values are reported with 95% confidence limits. *n*=Total number of experiments. * Fischer's *F*-test. Doses are expressed as base.

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The action of Tris(3,5,6,8-tetramethyl-1,10-phenanthroline) ruthenium (II) chloride (RTMP) on the cholinergic receptor of the rat intestine and guinea-pig ileum

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Fully co-ordinated metal chelates of ruthenium (II) and 1,10-phenanthroline bases have widespread biological effects including (+)-tubocurare-like action (Schulman & Dwyer, 1964). Such compounds are highly stable and inert and contain no specifically active groups. The charge is diffusely spread over the components of the cation, which generally has considerable lipophilia and a redox potential outside that commonly found in biological tissues. The biological actions of such chelates are a function of the cation as a whole and probably result from functional derangement of responsive biological surfaces by weak Coulombic and shorter range forces.

The action of RTMP has been investigated on the isolated rat intestine and guinea-pig ileum by the techniques described by van Rossum and van den Brink (1963); van Rossum (1963) and Henderson, Ariëns and Simonis (1968). RTMP ($1–3 \times 10^{-4}$M) occasionally produces a small contraction of the rat intestine but

usually effects a sustained contraction of the guinea-pig ileum which may reach 70–100% of the maximal height produced by the agonist furtrethonium. The contraction of the guinea-pig ileum produced by RTMP is generally unaffected by hexamethonium (3×10^{-4}M), Neobenodine (3×10^{-6}M) or the serotonin antagonist xylamidine tosylate (3×10^{-6}M). However, it may be partly or completely eliminated by lachesine (10^{-4}M), procaine (3×10^{-3}M), morphine (1.25×10^{-3}M), magnesium chloride ($1–3 \times 10^{-2}$M), aging at room temperature or the absence of calcium ion in the Tyrode solution. Hemicholinium (1.75×10^{-3}M) generally has no effect on the initial RTMP contraction but accelerates the onset of tachyphylaxis following repeated doses. During RTMP tachyphylaxis, sensitivity of the guinea-pig ileum to the indirect cholinomimetic phenyl acetate (Takagi, Takayanagi, Ishida and Moritoki, 1965) ($1–3 \times 10^{-3}$M) is markedly reduced while that due to furtrethonium or pentyl trimethylammonium iodide (3×10^{-5}M) is relatively little decreased. Antagonism by RTMP to furtrethonium, methylfurtrethonium and pentyl trimethylammonium iodide has been demonstrated on rat intestine and guinea-pig ileum which were negligibly responsive to the spasmogenic action of the chelate, and similar pA_2 values have been obtained against each agonist in both preparations. Combined competitive and non-competitive antagonism is produced by still higher doses of RTMP.

It is tentatively concluded that: (1) RTMP releases ACh from the postganglionic cholinergic nerve terminals of the guinea-pig ileum and probably rat intestine; (2) RTMP inhibits acetylcholine esterase and is also a competitive and non-competitive antagonist of typical cholinomimetic drugs, the cholinergic receptors of both rat intestine and guinea-pig ileum responding to RTMP in a similar manner; (3) RTMP lacks a region of high charge density and other characteristics usually present in more potent cholinergic drugs and its multiple actions must all be mediated by the simple physical forces inherent in the cation.

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Some derivatives of tropine and *pseudo*tropine

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The benzilic esters of tropine and *pseudo*tropine were described by Forster, Goodford & Ing (1957), who reported that benzilyltropine methiodide and ethiodide and benzilyl-*pseudo*tropine methiodide were all as active as atropine in antagonizing acetylcholine on the isolated guinea-pig ileum. In the test, however, the compounds