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Stimulation of Peristalsis in the Potassium Deficient Rat by Acetyl-β-Methylcholine.* (19902)

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Potassium deficiency in the rat is accompanied by a decrease in intestinal tone and motility(1-3). This may be due either to a lack of stimulation or to an inability of the smooth muscle of the small intestine to respond to stimuli. Acetyl-β-methylcholine (ABM) has been observed to increase the tone and peristaltic activity of the stomach and small intestine of the dog and of man (4,5), but observations on the *in vivo* effect of ABM on intestinal tone and motility in rats have not been reported.

The experiments reported herein show that ABM increases the propulsive motility of the small intestine of the potassium-deficient rat, but does not affect the peristaltic activity of the intestine of rats receiving a complete diet.

Experimental procedure. The potassium-deficient rats and their controls were fed a purified sucrose-casein diet similar to that of Grunert and Phillips(6). The potassium-deficient diet was analyzed for potassium by means of the Perkin-Elmer model 52A flame-photometer after wet ashing and was found to contain 0.01% potassium. Groups of 10 male and 10 female albino rats of the Sprague-Dawley strain which weighed 100-120 g were placed on the deficient or the control diet. The diets and distilled water were fed *ad libitum*. After 10 weeks on the diet, the intestinal motility of each of the rats was determined by means of a modification(3) of the technic of Macht(7). The *ABM* was given in the form of a freshly prepared distilled water solution containing 1 mg of U.S.P. acetyl-β-methylcholine chloride per ml. The ABM-chloride was stored in a calcium chloride desiccator and weighings were made as rapidly as possible to avoid errors due to its hygroscopicity. A study was conducted to determine the dosage of ABM necessary to produce the effects of parasympathetic stimulation in male rats weighing from 200-250 g and maintained on a "stock-diet."†

Results and discussion. Although ABM stimulated lacrimation and salivation(4,5), it did not cause any increase in the propulsive motility of the intestine as determined by this technic when rats receiving the stock diet were used as the test animals (Table I). It appears that the peristaltic activity of the intestine of the rats fed the stock diet was already adequate and could not be further increased by ABM.

ABM was found to increase the intestinal motility of the potassium deficient rats as shown in Table II. This indicates that the factor limiting peristaltic activity in the potassium deficient rat is a lack of stimuli rather than an inability of the smooth muscle of the

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† Stock diet: 28% ground wheat; 24% ground yellow corn; 10% soy bean oil meal; 12% skim milk powder; 8% alfalfa leaf meal; 5% butter; 2% Wilson's 1:20 liver powder; 1% calcium carbonate; 1% iodized NaCl.

TABLE I. Response of Stock Diet Rats to Various Doses of Acetyl-β-Methylcholine.

mg ABM–Cl/ 100 g body wt	Bolus travel (% of total length)	Effect on lacrimation and salivation
0	65 ± 7*(3)†	0
.02	68 ± 13 (3)	0
.05	67 ± 13 (3)	0
.1	69 ± 19 (3)	L‡
.2	56 ± 16 (3)	L and S
.4	68 ± 14 (3)	Copious L and S

* Stand. dev.
† No. of determinations.
‡ L = lacrimation; S = salivation.

TABLE II. Effect of Acetyl-β-Methylcholine on Intestinal Motility of Potassium Deficient and Control Rats.

	Bolus travel (% of total length)	
Dietary K	Non-treated	.2 mg ABM–Cl /100 g body wt
.01%	26 ± 12*(8)†	66 ± 19 (7)
.5 %	70 ± 18 (9)	72 ± 16 (10)

* and † as in Table I.

intestine to respond. This may indicate neuropathology, a decrease in muscle tone under vagal control, impaired neuromuscular transmission, or a decreased sensitivity of the intestinal musculature to parasympathetic stimulation. *In vitro* studies have shown that potassium stimulates glycolysis which is catalyzed by an extract of rat brain(8), that the addition of KCl to brain slices increases aerobic glycolysis(9), and that increasing the potassium content of Locke's solution results in increased synthesis of acetylcholine by brain slices(10). It has also been observed that the exclusion of KCl from Kreb's solution increases the threshold stimulus for mammalian A nerve fibers(11). These data indicate that potassium has an important role in the physiology of nervous tissue. There is also evidence which indicates that potassium is important in the transfer of nerve impulses across the neuromuscular junction(12) and that potassium sensitizes muscles to acetylcholine(13).

Summary. Acetyl-β-methylcholine was observed to stimulate intestinal motility in potassium deficient rats but did not affect the intestinal motility of rats receiving complete diets.

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Estrogenic Action of Some DDT Analogues.* (19903)

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Burlington and Lindeman(1) found chronic 2,2'-bis-(p-chlorophenyl)-1,1,1-trichloroethane (DDT) administration to effect inhibition of

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