EFFECTS OF TEAC AND HEXAMETHONIUM BROMIDE ON THE INTESTINAL MOVEMENTS OF DOG

By

K.N. GARG

From the Department of Pharmacology Medical College, Amritsar

(*Received November 5, 1961*)

It is well known that the action of a drug on the intestinal movements in a particular species of animal depends on its functional autonomic innervation. In the present studies TEAC and C_6 have been found to increase the rhythmic movements of the adult mongrel dog's intestine (in situ). The gut was subjected to vigourous circular contracractions but without the propulsive motility. These actions are indentical to those obtained in cats. It has been claimed that a functional similiarity exists in the autonomic innervation of stomach in cats and dogs. The above observations substantiate the earlier belief and it appears that a similiar autonomic arrangement also exists in the intestine of these two species of animals.

Bayliss and Starling (1901) showed that not only was the sympathatic innervation of the cat inhibitory in function but that vagal excitation might also have an inhibitory effect. Similar observations were made by Langley (1922); Brown, McSwiney and Wadge (1930), Feldberg (1950) on other species of animals. Ambache (1951), simplified the issue further by showing two kinds of functionally distinct ganglionic cells in the myenteric plexus ; stimulation of one causing contractions, of the other inhibition of the intestine. Obviously the action of a drug on the intestinal movements in a particular species will depend on its functional autonomic innervation.

It is well known that ganglionic blocking agents e.g. tetraethylammonium chloride (TEAC), hexamethonium bromide (C_6) on clinical use produce constipation and at times even paralytic ileus. Further TEAC has been found to decrease the peristaltic reflex in the dog (Stickney, Northup and Vanliere, 1951 ; Northup, Stickney and Vanliere, 1952) where as in the cat it augments the rhythmic movements of the gut. Similarly C_6 has been found very active in paralysing the peristaltic reflex in rabbits and guineapigs though the rhythmic activity of the gut in cats is increased considerably (Paton and Zaimis, 1951).

In view of the above interesting observations, the present studies were undertaken to find out the effects of these drugs on the rhythmic intestinal movements in dogs.

METHODS

Adult mongrel dogs of both sexes anaesthetised with ether and barbitone were used. To record intestinal activity, a piece of small intestine, about 6 cm long was selected and glass cannulae inserted at each end. The cannulae were held by ligatures in the submucosa only. After washing the intestine it was filled with 0.9 per cent saline. One of the cannulae was occluded and the other was connected to a sensitive bellow recorder (Paton and Zaimis, 1951). A mercury manometer was used for recording the blood pressure from the carotid artery. The drugs were injected in the cannulated femoral vein.

Tetraethylammonium and hexamethonium were used as chloride and bromide salts respectively in doses ranging from 1 to 8 mg/kg.

RESULTS

In all the eight experiments conducted, after injections of TEAC, the rhythmic activity of the intestine increased greatly in amplitude. During this period the gut was subjected to vigorous circular contractions. A notable feature was the absence of the propulsive motility of the gut. With the increased doses, the amplitude of the contractions was increased even more and there was tendency for the action to persist for a longer time (Fig. 1).

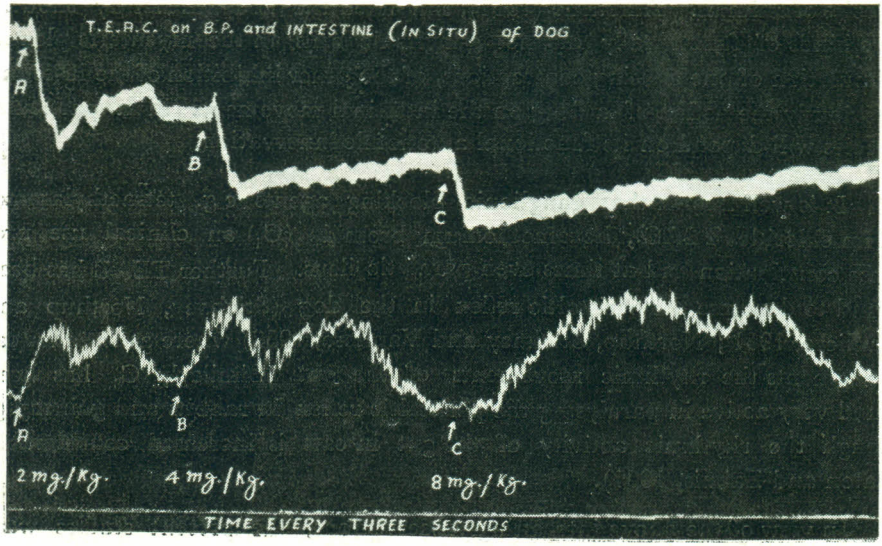

Fig. 1.

Precisely the same effects were obtained with C_6 but the effects were more pronounced even when comparatively smaller doses were used (Fig. 2).

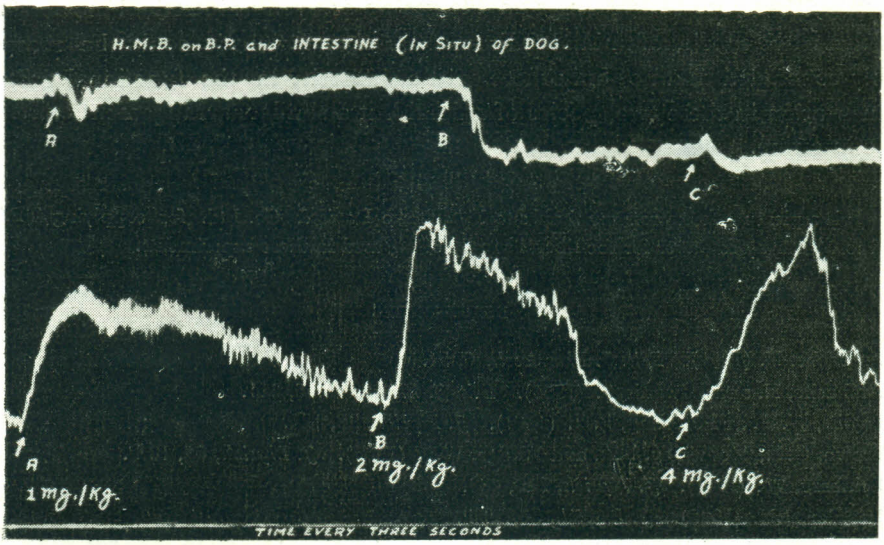

Fig. 2.

DISCUSSION

TEAC and C_6 increased the rhythmic movements of the dog intestine (*in situ*). The gut was subjected to vigorous circular contractions but without the propulsive motility. Precisely the same results were obtained by Paton and Zaimis (1951) with these drugs on the intestinal movements of cats. In their experiments also, there had been vigorous circular contractions of the gut but without the progressive quality of peristaltic waves. Stickney *et al.*, (1951) and Northup *et al.*, (1952) also observed a depression of the peristaltic reflex by TEAC in adult dogs. They, however, have not mentioned any increase in the rhythmic movements of intestine which has been observed by Paton and Zaimis (1951) and the present author. Wein and Mason (1951) recorded an increase in the contractions of stomach with C_6 in cats and inhibitory effect in rabbits. It may be that the variation in the results obtained in different species of animals depend on differences in the functional autonomic innervation of the gastro-intestinal tract. According to Brown *et al.*, (1930), the body of the stomach in the cat and dog receive both motor and inhibitory fibers from the sympathetic, contraction or relaxation being produced according to the type of stimulation.

Present observations and those of other workers referred to above provide good support to the views of Brown *et al.* (1930) that a functional similarity exists in the gastric innervation of dogs and cats as is well evident from the identical actions of these drugs on the gastric as well as intestinal movements of these two species of animal. From these observations it could be reasonably concluded that not only there exist a similarity in the functional gastric innervation in these two species of animal but a similar arrangement exists in the intestine.

It is a pleasure to express my thanks to M/S Parke Davis & Co. Ltd. for supplying TEAC and to M/S May & Baker for the liberal supply of C_6 used in these experiments.

REFERENCES

Ambache, N. (1951). *Brit. J. Pharmacol.*, **6**, 51.
Ambache, N. and Edwards, J. (1951). *Brit. J. Pharmacol.*, **6**, 311.
Bayliss, W.M. and Starling, E.H. (1901). *J. Physiol.*, **26**, 125.
Brown, G.L., McSwiney, B.A. and Wadge, W.J. (1936). *J. Physiol.*, **86**, 10 P.
Feldberg, W. (1951). *J. Physiol.*, **113**, 483.
Langley, J.N. (1922). *J. Physiol.*, **56**, 39 P.
Northup, D.W., Stickney, J.C., and Vanliere, E.J. (1952). *Amer. J. Physiol.*, **171**, 513.
Paton, W.D.M. and Zaimis, E.J. (1951). *Brit. J. Pharmacol.*, **6**, 155.
Paton, W.D.M. and Zaimis, E.J. (1952). *Pharm. Rev.*, **3**, 219.
Stickney, J.C., Northup, D.W. and Vanliere, E. J. (1951). *Amer. J. Physiol.*, **171**, 821.
Wein, R. and Mason, D.F. (1951). *Bit. J. Pharmacol.*, **6**, 611.