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SHORT COMMUNICATION

PERISTALTIC ACTIVITY OF ISOLATED STOMACH AND ITS MODIFICATION
BY DRUGS

M.L. SHARMA, C.L. JAYASWAL AND V.R. DESHPANDE
Department of Pharmacology, Medical College, Nagpur

Summary : Peristaltic activity of the stomach of guinea pig, rat and frog has been recorded. Hexamethonium, d-tubocurarine, cocaine, adrenaline and morphine inhibited peristaltic activity of stomach in all species. Acetylcholine, physostigmine and nicotine restored the activity.

Key Words : Stomach peristaltic activity effect of drugs on isolated stomach.

Peristaltic activity of isolated guineapig ileum, has been recorded by many workers (3-6, 8, 13, 16). In an attempt to analyse the mechanism of peristaltic activity, the action of steroid derivatives, sympathomimetic amines, parasympathomimetic drugs, antihistaminics and adrenergic neurone blocking agents on peristaltic reflex in guineapig ileum has been intensively studied (9-15). The present paper concerns itself with the record of peristaltic activity of isolated stomach and its modification by drugs.

MATERIALS AND METHODS

Peristaltic activity in isolated stomach of guineapig and rat : The method followed is that of Trendelenberg (16) with modification as described by Sharma and Grewal (13). Guinea pigs starved for 1 day were stunned by a blow on the head and bled to death by cutting the carotid arteries. The stomach was removed and its lumen was washed with Krebs's Henseleit solution. It was mounted for recording the peristaltic activity in an isolated organ bath of 500 ml capacity containing Krebs Henseleit solution bubbled with a mixture of 95% oxygen and 5% carbon dioxide and kept 37°C. Peristaltic activity was induced by raising the reservoir to a critical height and then lowering it by 4 cm so that the lumen of the stomach was no longer distended and peristaltic activity stopped.

Normal peristaltic activity was recorded for 2 min after which drug was administered to the bath and its effect was noted for 2 min. It was observed in control experiments that peristaltic activity could similarly be induced for 4 min. After this period the drug was washed out and peristaltic activity was recorded again after a rest period of 5 min. Longitudinal movements were isotonicly recorded by a frontal writing lever.

Peristaltic activity of isolated stomach of rat was similarly recorded using a bath of 100 ml capacity. The magnification of the lever system employed was 5 fold and the load on the lever was 7.5 g.

Peristaltic activity of isolated stomach of frog : The method followed was similar except that no fasting was necessary and frog ringer solution bubbled with oxygen and kept at 37°C was used. In each preparation the effects of each drug were observed at least 6 times.

RESULTS

A distinct difference in the peristaltic activity of stomach preparations of starved and fed guinea pigs and rats was observed. The peristaltic activity in preparations from fed animals was irregular and inconsistent, as compared to the starved ones, in whom, it was regular but weak. In the case of the latter fatigue occurred within $\frac{1}{2}$ to 1 hr. With frog preparations, such a difference was not observed. The peristaltic activity in frog preparations started immediately after raising the intraluminal pressure and was reproducible upto 4 hr without fatigue.

In six experiments each with rat, guinea pig and frog stomach, hexamethonium bromide (10 to 20 $\mu\text{g/ml}$), d-tubocurarine chloride (10 to 20 $\mu\text{g/ml}$), cocaine hydrochloride (2 to 5 $\mu\text{g/ml}$), morphine sulphate (0.2 to 0.5 $\mu\text{g/ml}$) and adrenaline hydrochloride (1 to 5 $\mu\text{g/ml}$) inhibited

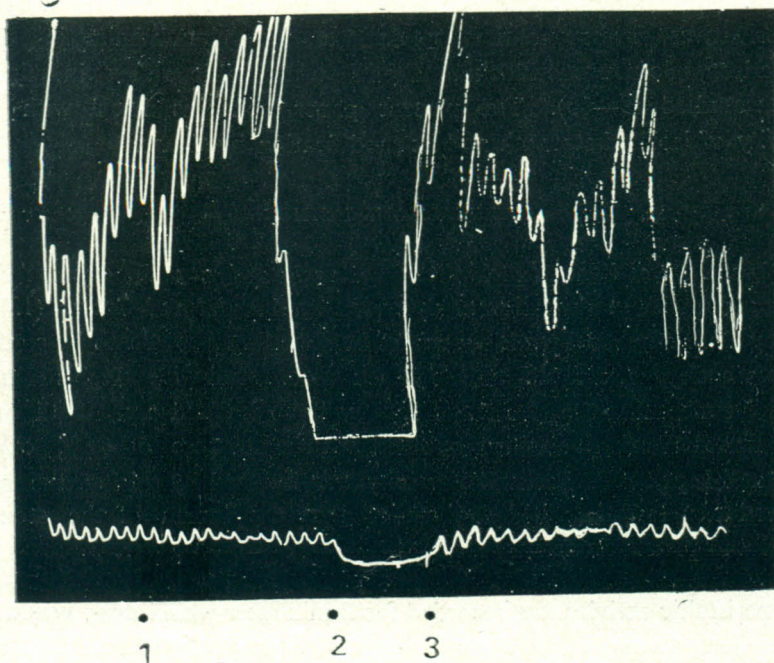


Fig. 1 : Influence of physostigmine on the inhibition of peristaltic activity of guinea pig stomach by hexamethonium. Upper tracing, peristaltic activity; lower tracing, longitudinal movements. Normal peristaltic activity (1), hexamethonium 20, $\mu\text{g/ml}$ was given at (2) and physostigmine 0.1 $\mu\text{g/ml}$ was given at (3).

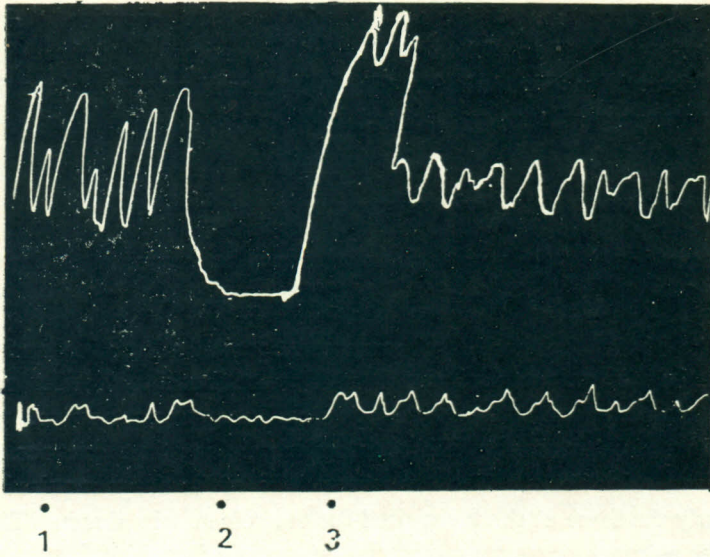


Fig. 2 : Influence of acetylcholine on the inhibition of peristaltic activity of rat stomach by cocaine. Upper tracing, peristaltic activity; lower tracing, longitudinal movements. Normal peristaltic activity (1) cocaine 5 $\mu\text{g/ml}$ was given at (2) and acetylcholine 200 $\mu\text{g/ml}$ was given at (3).

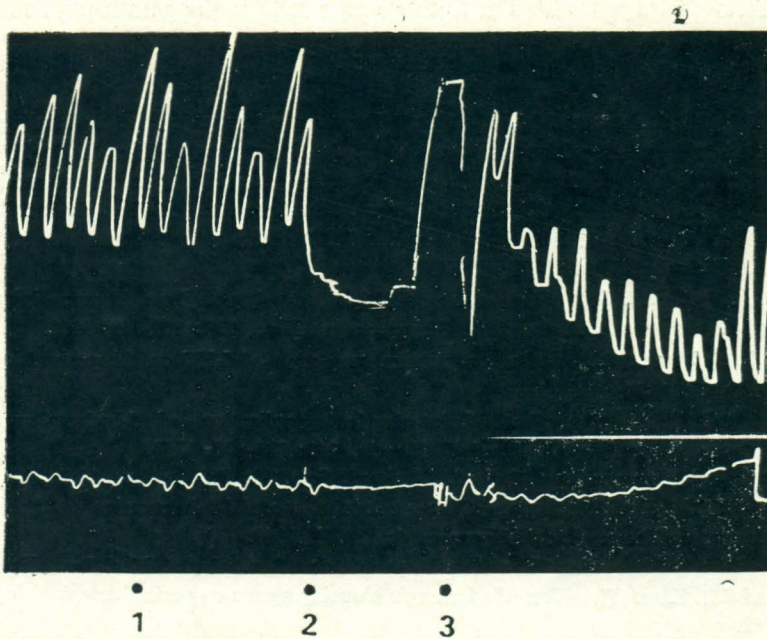


Fig. 3 : Influence of nicotine on the inhibition of peristaltic activity of frog stomach by d-tubocurarine. Upper tracing, peristaltic activity; lower tracing, longitudinal movements. Normal peristaltic activity (1), d-tubocurarine 10 $\mu\text{g/ml}$ was given at (2) and nicotine 0.5 $\mu\text{g/ml}$ was given at (3).

peristaltic activity. Acetylcholine chloride (100 to 200 $\mu\text{g/ml}$), nicotine (0.1 to 0.5 $\mu\text{g/ml}$), physostigmine salicylate (0.01 to 0.1 $\mu\text{g/ml}$) and neostigmine sulphate (0.01 to 0.1 $\mu\text{g/ml}$) restored the peristaltic activity (Fig. 1, 2, 3). The effect and concentrations of the drugs were nearly the same for guinea pig ileum as obtained by Burn (17) Beleslin *et al* (1, 2) and Sharma *et al* (11).

DISCUSSION

It is very interesting that the peristaltic activity can be recorded in isolated stomach of guinea pig, rat and frog.

The drugs like hexamethonium, d-tubocurarine, cocaine, adrenaline and morphine which inhibit peristaltic activity in guinea pig ileum (9 to 15) were found to inhibit peristaltic activity in the stomach of guinea pig, rat and frog. Acetylcholine, physostigmine, neostigmine and nicotine restored the peristaltic activity, inhibited by above drugs in a manner identical to that described for guinea pig ileum. The concentrations of the drugs required to produce their effects are also nearly the same as those required for the guinea pig ileum. This indicates that the sensitivity of the stomach preparation and the guinea pig ileum is of the same order.

It is suggested that the frog stomach method is an addition to the screening methods for peristaltic activity. It has a distinct advantage, since the peristaltic activity can be recorded for 4 hr without fatigue. Besides, the method is economical and no starvation is necessary. The sensitivity and effects of drugs are similar to those reported for the guinea pig ileum.

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