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The effect of purgative drugs on the intestinal absorption of glucose

SIR,—We have examined the effects of several purgatives on the *in vivo* absorption of glucose by the small intestine of the rat. In control experiments 20 ml of 0·9% saline containing 0·1% D-glucose and 5·0% ethanol was perfused through the lumen of the proximal 60 cm of the small intestine of an anaesthetized rat for 20 min. At the end of the experiment the rat was killed, the perfusate collected, its volume measured and the glucose concentration determined. The drugs were dissolved in the perfusion fluid, with ethanol as solvent.

The results (Table 1) show that inhibition of glucose absorption occurred with low concentration of all the purgatives except the anthraquinone derivatives. Oxyphenisatin produced the greatest inhibition and was more active than phloridzin which was included as a reference drug. Dioctyl was included because of the known inhibitory activity of other surface-active agents on the absorption of nutrients (Nissim, 1960).

TABLE 1. EFFECT OF PURGATIVES ON THE ABSORPTION OF GLUCOSE

Compound		Conc.	No. of rats	Absorption %	P value
Chemical name	Name			Mean ± s.e.	
Controls			10	87·28 ± 1·76	
	Sennoside "A"	10^{-4}	4	87·37 ± 1·43	<0·98
1,3,8-Trihydroxy-6-methylanthraquinone	Emodin	10^{-4}	4	83·72 ± 4·21	<0·4
1,8-Dihydroxyanthraquinone	Danthron	10^{-4}	4	90·92 ± 1·19	<0·3
2,3-Indolinedione	Isatin	10^{-4}	4	76·70 ± 1·41	<0·005
Dioxyphenylisatin	Oxyphenisatin	10^{-4}	6	20·50 ± 0·80	<0·001
Di-(4-acetoxyphenyl)-2-pyridylmethane	Bisacodyl	10^{-4}	4	49·38 ± 2·44	<0·001
2,2-Di(*p*-hydroxyphenyl)phthalide	Phenolphthalein	10^{-4}	4	61·45 ± 1·45	<0·001
Phloretin-2′-β-glucoside	Phloridzin	10^{-4}	4	40·24 ± 3·53	<0·001
Di-(2-ethylhexyl) sodium sulphosuccinate	Dioctyl sodium sulphosuccinate	$2 \cdot 10^{-3}$	4	62·42 ± 1·36	<0·001

The inhibition observed with phenolphthalein confirms the results of Hand, Sanford & Smyth (1966) who demonstrated inhibition of glucose transport in an *in vitro* preparation of rat small intestine. Bisacodyl has been reported to be without action in the small intestine (Macgregor, 1960) but the significant inhibition of glucose absorption obtained in the present study confirms the report by Forth, Baldauf & Rummel (1963) that this drug is capable of blocking nutrient absorption.

The observation that certain purgatives are capable of blocking glucose absorption in the small intestine raises two questions. Firstly, how do these drugs affect glucose absorption and will their study be of value in the elucidation of the transport mechanism? Secondly, of what significance is this activity in the normal purgative action of these drugs?

One experiment has been made which demonstrates that the mode of action of oxyphenisatin is not the same as that of phloridzin. When oxyphenisatin, at a concentration of 10^{-4}, was perfused in glucose-free 0·9% saline for 1 hr through the lumen of rat small intestine, glucose appeared in the perfusate. The mean concentration in two experiments was 13 mg % whereas with saline alone, or with saline containing phloridzin, 10^{-4}, no glucose was detected. The demonstration of glucose reversal with oxyphenisatin indicates that this drug is blocking the active transport stage of glucose absorption and not merely the entry of glucose into the mucosal cell, as occurs with phloridzin (Newey, Parsons & Smyth, 1959).

Bisacodyl and oxyphenisatin, the two most active drugs in the present study, are known to be capable of producing faecal evacuation within 1 hr when given as suppositories (Krebs, 1958; Sullivan, Dickinson & Wilson, 1963). This suggests that the purgatives have a direct action on the nerves or muscles of the rectum. However, these drugs may also act by inhibiting the absorption of nutrients from the lumen. The inhibition of glucose absorption, and associated retention of water, would increase the bulk within the lumen of the intestine and lead to increased peristalsis and more rapid passage of the contents.

The inactivity of the anthraquinone derivatives might be anticipated from the results of Straub & Triendl (1937) which indicated that these compounds are absorbed from the small intestine and secreted in the large intestine where they then stimulate peristalsis. The effect of these compounds on water absorption in the large intestine is under investigation.

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