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B₁₂ Absorption by Monkey Intestine.* (28130)

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Johnson and his collaborators(1), using an isolated loop of jejunum *in vivo*, showed that human gastric juice stimulates B₁₂ uptake in the monkey. Uptake in the absence of intrinsic factor (IF) was negligible. The present study extends the comparison of B₁₂ absorption in the monkey and the human by establishing the site of maximal intestinal uptake of the vitamin and by characterizing the species specificity of IF activity for the rhesus monkey.

Materials and methods. Sacs of intestine (about 1 g each) were prepared from the small intestine of the monkey according to the method of Wilson and Wiseman(2) and incubated in Erlenmeyer flasks containing 10 ml of Krebs-Henseleit bicarbonate-saline(3) with 200 mg% glucose. Co⁵⁷-labeled Vit. B₁₂ was added to the mucosal compartment at a concentration of 1 mμg/ml medium, with or without a preparation to be tested for IF activity. About 2 ml of bicarbonate-saline containing glucose but no B₁₂ were placed inside the sac (serosal side). The flasks were gassed with 95% O₂-5% CO₂ and incubated for 1 hr at 37°C with shaking. Sacs were then carefully washed with 0.15 M NaCl, drained of their serosal contents, blotted and weighed. The radioactivity of the tissue was counted in a well type scintillation counter. The B₁₂ taken up was expressed in mμg/g of tissue.

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Results and discussion. Intrinsic factor had no effect on B₁₂ uptake in the duodenum and upper jejunum, but produced increasing stimulation as the ileo-caecal valve was approached (Fig. 1). In the low ileum IF produced an average stimulation of 70-fold of B₁₂ uptake. In the absence of IF very little of the vitamin appeared in the tissue at any level of the small intestine. The site of maximal B₁₂ uptake in the monkey is similar to that observed in man(4-9).

The species specificities for IF activity in the monkey and man are also found to be identical. Intrinsic factor from human(10), hog(11,12), monkey(13) and rat(14,15)

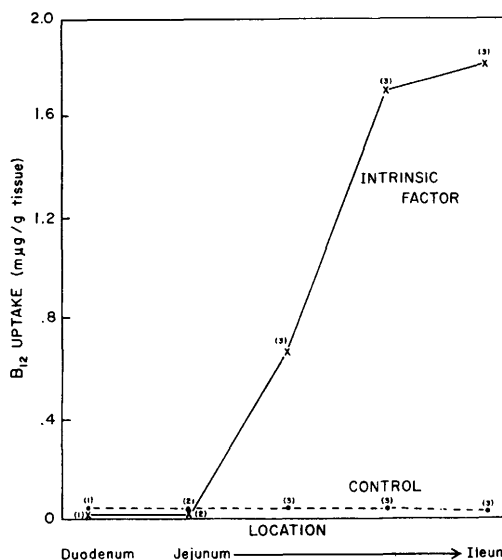


FIG. 1. Effect of location along monkey intestine on B₁₂ uptake with and without intrinsic factor. The source of intrinsic factor was a whole homogenate of rat gastric mucosa (2 mg/ml). Numbers in parentheses indicate number of animals used.

TABLE I. Effect of Intrinsic Factor from Different Species on B₁₂ Uptake by Sacs and Segments of Monkey Intestine.

	Source of intrinsic factor	Concentration in medium	B ₁₂ uptake, mμg/g*	Stimulation, %
Sacs	No IF	—	.032 (6)	—
	Monkey gastric mucosal homogenate	3.0 mg/ml	.44 (3)	1300
	Monkey gastric juice	.02 ml/ml	.26 (2)	700
	Human " "	.02 "	1.8 (3)	5500
	Hog IF	2.5 μg/ml	1.2 (4)	3700
	Rat gastric mucosal homogenate	2.0 mg/ml	1.8 (6)	5500
	Hamster " " "	1.9 "	.64 (2)	1900
	Guinea pig " " "	3.5 "	.038 (3)	0
	Dog gastric juice	.02 ml/ml	.020 (2)	0
Segments	Frog gastric mucosal homogenate	2.2 mg/ml	.018 (2)	0
	No IF	—	.56 (3)	—
	Rat gastric mucosal homogenate	2.0 mg/ml	2.2 (3)	300

* No. of determinations is given in parentheses.

stimulates B₁₂ absorption in man. Table I summarizes results obtained with sacs of monkey intestine. Gastric juice or gastric mucosal homogenate from monkey, human, hog, rat and hamster promoted B₁₂ absorption, while preparations from dog, guinea pig and frog did not. In one experiment the concentration of monkey gastric homogenate was varied from 1 to 6 mg tissue/ml of incubating medium and B₁₂ uptake was found to be proportional to IF concentration within this range.

When a number of small segments of monkey intestine were incubated with Vit. B₁₂, the stimulation of vitamin uptake produced by addition of IF was much less marked than with sacs. This is primarily due to the very high B₁₂ uptake by segments in absence of IF. While the assay with small segments of intestine has several advantages over sacs, it seems practicable for the monkey only if a potent IF preparation is used.

Summary. Maximal stimulation by intrinsic factor of B₁₂ uptake by the small intestine of the rhesus monkey occurred in the low ileum. IF from human, hog, monkey and rat stimulated B₁₂ absorption, while preparations from dog, guinea pig and frog did not.

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