Vitamin B_{12} Excretion as Index of Hepatic Disorder

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DURING A STUDY concerning the role of vitamin B_{12} in diabetes (1), it was noted that a number of cases in this study failed to excrete more than 10 μg. of a 50-μg. intramuscular load dose of the vitamin. All of these patients had a history of liver disease or some form of hepatic insufficiency.

The storage of vitamin B_{12} by the liver has been studied extensively by Meyer *et al.* (2) and by Glass *et al.* (3) using radioactive Co^{60} as tracer for the vitamin. They demonstrated that the radioactive material accumulates in the liver and can be measured with a directional scintillation counter over this organ. This was especially prominent in patients with pernicious anemia when a potent source of intrinsic factor was given at the same time.

Rachmilewitz *et al.* (4) studied cases of acute hepatitis and cirrhosis of the liver and found that in these cases, the vitamin B_{12} content of the serum was very high; with subsidence of jaundice, the B_{12} concentration decreased to normal levels. This study points to the additional binding of B_{12} in liver disease and indicates the importance of a healthy liver for B_{12} storage. In liver disease the liver B_{12} stores are apparently depleted; hence the increased bound B_{12} in the serum.

This paper reports the decreased excretion of intramuscular B_{12} in cases of liver involvement and the gradual increase to normal levels during the period of convalescence.

MATERIAL AND METHODS

The assay of vitamin B_{12} was carried out using three different organisms; *Lactobacillus leichmannii*, *Euglena gracilis*, and *Ochromonas malhamensis*. These organisms were used in order to compare the B_{12} excretion values, using independent systems. The materials and methods have been outlined by Baker *et al.* (5).

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RESULTS AND COMMENTS

Table 1 shows the clinical diagnosis and comparative assay results of this study. The B_{12} values with *L. leichmannii* are higher than with the other two organisms. This is due to the increased utilization of desoxyribosides present in the urine, a point which has been treated by Baker *et al.* (5). These results point to the increased absorption of vitamin B_{12}, after administration of a 50-μg. intramuscular dose, by patients with clinical diagnosis of liver involvement.

In some cases, the results do not agree with the clinical diagnosis of convalescence, and it is this point which makes the excretion of B_{12} a valuable aid in the clinical evaluation of convalescence in liver disease. It can be noted that some patients who were considered clinically convalescent, still did not excrete normal amounts of the vitamin.

Table 1. VITAMIN B_{12} EXCRETION EIGHT HOURS AFTER A 50 μg. INTRAMUSCULAR LOAD DOSE

Patient	*Age*	*Sex*	*Diagnosis*	*B_{12} excreted (μg.)*		
				Ochromonas malhamensis	Euglena gracilis	Lactobacillus leichmannii
H.Z.	30	M	Normal control	39.8	36.2	50.2
H.D.	45	M	Normal control	33.5	26.0	55.6
R.S.	33	M	Normal control	23.8	24.5	48.7
A.W.	46	M	Obstructive jaundice, convalescent	0.6	0.5	1.2
G.G.	28	M	Pneumonia and hepatitis	1.0	2.4	3.0
L.P.	65	F	Jaundice	1.9	0.7	3.8
H.J.	48	M	Lobar pneumonia, recovered	2.5	4.2	8.3
R.V.	48	M	Pneumonia	3.6	5.6	9.9
A.V.	26	M	Portal cirrhosis	4.1	6.9	8.5
H.P.	37	M	Cirrhosis	4.9	9.2	23.4
S.S.	21	F	Bronchopneumonia	5.6	2.4	6.8
L.L.	45	F	Liver disease	6.3	11.6	16.8
A.D.	58	F	Biliary tract disease	8.1	8.1	14.4
P.R.	68	F	Bronchopneumonia	8.6	4.8	13.2
A.R.	32	M	Schistosomiasis	9.3	9.5	12.5
A.K.	21	M	Infectious hepatitis, convalescent	10.0	16.1	19.5
C.C.	54	M	Ketosis	1.0	2.9	10.6
V.W.	53	F	Pancreatitis	1.5	1.7	5.0
N.R.	35	M	Diabetic retinopathy	3.6	4.8	6.6
T.K.	46	M	Angina pectoris	4.1	7.8	10.8
K.H.	70	M	Pulmonary emphysema	5.2	3.6	8.9
W.W.	18	M	Heart disease	8.1	10.2	20.4
A.A.	30	F	Neurologic disease	9.2	5.5	11.5

Vitamin B_{12}, being a normal metabolite, would not make for undue metabolic derangement, such as can be caused by the various methods used for chemical evaluation of liver function, and can be the indicator system of choice in judging whether a patient is considered clinically cured. A high excretion of B_{12} after a load test indicates that the liver has again become capable of storing B_{12} and that the increased amounts of B_{12} from injection are no longer required for normal metabolic activity of the organ.

Four cases included in this study were convalescing from attacks of pneumonia. The role of the liver in pneumonia infections is well known, and as this study shows, these patients have a decreased excretion of B_{12}, possibly due to the effect of the infection upon the liver. None of the patients with liver disease, except some convalescing, excreted more than 10 μg. of the 50 μg. load dose, as measured by the *Euglena* and *Ochromonas* assay methods. From 23 cases reported, 20 cases excreted below 10 μg. of vitamin B_{12}. Thirteen of these had history of liver involvement. Seven cases without liver involvement excreted below 10 μg.; the 3 normal controls all excreted between 24–40 μg. of the load dose.

This study is being extended and the various types of liver involvement are being categorized to determine the extent to which B_{12} excretion is correlated with liver involvement. The technic offers an aid in detecting how extensive is the liver damage and to what point convalescence has progressed.

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