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## BIOAVAILABILITY OF VITAMIN B12

### Introduction

Vitamin B12 is required by both animals and man. In animals, it is synthesised by intestinal bacteria, but a deficiency can still be produced by a diet low in Vitamin B12. The daily requirement for adult humans is 3 µg. Over 30% of ingested B12 is excreted. This vitamin is principally (30-60%) stored in the liver.

B12 is necessary at the cellular level for DNA and RNA synthesis and also for synthesis of porphyrins and lipids. It also promotes carbohydrate metabolism and is responsible for maintaining the structural integrity of membranes, especially the myelin sheath of the spinal chord. At the organismal level it maintains the epithelial and mucosal cells, bone marrow and gastrointestinal tract.

### Bioavailability Study

Rats were used in this study because their diet can be controlled and large numbers may be easily studied for long periods of time. More valid statistical conclusions are possible with large numbers of subjects.

In this study six groups of five male Sprague-Dawley rats each were used. All rats were fed a B12 deficient food from Bioserve Inc. After 2 weeks on this diet, they were determined to be deficient as evidenced by 2 consecutive days of weight loss. Groups were continued on this diet and were also given orally twice a week an aqueous solution of either USP B12 or Re-natured B12 at one of three levels, 0.3, 0.6, or 1.2 µg of B12. After 6 weeks the rats were sacrificed and their livers and serum analysed for B12 using a commercial radioimmunoassay technique. Statistics were done using a two tailed t-test. The results are listed in Table 1.

**Table 1:**

<u>Form of B12</u>	<u>Dose (µg)</u>	<u>Serum B12 (ng/ml)</u>	<u>Liver B12 (ng/ml)</u>
USP	0.3	0.196 ± 0.116	14.3 ± 3.1
USP	0.6	0.293 ± 0.140	15.5 ± 1.7
USP	1.2	0.367 ± 0.151	15.8 ± 1.9
Re-natured	0.3	0.102 ± 0.051	14.7 ± 2.6
Re-natured	0.6	0.329 ± 0.197	16.0 ± 2.9
Re-natured	1.2	1.66 ± 1.99	17.5 ± 0.2

From this data the relative bioavailability can be calculated. The slope of the plot of the logarithm of the dose (x-axis) vs. the concentration in serum or liver (y-axis) represents the bioavailability. For comparison purposes, the synthetic is said to be 100% bioavailable.

**Table 2:**

<b>Blood</b>		
<u>Form of B12</u>	<u>Slope of Plot</u>	<u>Relative Bioavailability</u>
USP	0.284 (Serum)	100%
Re-natured	2.58 (Serum)	908%
<b>Liver</b>		
USP	1.50	100%
Re-natured	3.01	908%

**Discussion**

Statistics were done on the relative bioavailability by comparing the slopes of the USP and Re-natured B12 plots for both serum and liver using a two-tailed t test for regression differences. In serum, the re-natured had a significantly greater slope than USP B12 and thus a significantly greater bioavailability at the 99.9% confidence level. In liver, there was no significant difference bioavailability. However, the Re-natured B12 had a two fold larger slope than the USP B12.