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Estimation of the Period Covered by Vitamin B₁₂ Stores

As indicated in Chapter 9, it is possible to estimate the length of time body stores of vitamin B₁₂ held in reserve will maintain adequate nutrition when dietary intake is nonexistent as a result of adopting a vegan or similar diet very low in B₁₂ or when decreased absorption of vitamin B₁₂ occurs as a result of atrophic gastritis or pernicious anemia.

This estimate is based on being able to ascertain what the expected turnover rate will be (0.1, 0.15, and 0.2 percent have been found experimentally to occur). It has been estimated that in individuals with normal absorption and reabsorption rates for vitamin B₁₂, the daily turnover is 0.1 percent per day. For individuals with pernicious anemia, who cannot absorb or reabsorb vitamin B₁₂, the turnover rate is about 0.2 percent of the body pool or stores per day. As individuals develop various degrees of atrophic gastritis, it is possible that a turnover rate of 0.15 percent is appropriate.

To estimate how long body stores of vitamin B₁₂ can be depended on to maintain health, it is also necessary to know the lowest pool size of vitamin B₁₂ consistent with health, which could be considered to be the threshold before which signs of inadequate B₁₂ would begin to occur. As is indicated in Chapter 9, this has been estimated to be approximately 300 µg (Bozian et al., 1963).

By calculating the ratio of the total body stores of vitamin B₁₂ to this assumed threshold (or to a lower threshold if expected because of differences in individual requirements), it is possible to estimate how long body stores will meet the needs of the individual.

TABLE N-1 Table of Ratios^a Used to Estimate the Extent of Protection from Vitamin B₁₂ Stores

Vitamin B ₁₂ Threshold, µg	Initial Store, mg									
	1	2	3	4	5	6	7	8	9	10
350	3	6	9	11	14	17	20	23	26	29
300	3	7	10	13	17	20	23	27	30	33
250	4	8	12	16	20	24	28	32	36	40
200	5	10	15	20	25	30	35	40	45	50
150	7	13	20	27	33	40	47	53	60	67
100	10	20	30	40	50	60	70	80	90	100

^a This represents the initial vitamin B₁₂ stores divided by the level of stores at which signs of vitamin B₁₂ deficiency may become evident.

Table N-1 provides the ratio of the expected stores of an individual (in milligrams) to the threshold level of stores at which signs of vitamin B₁₂ deficiency may appear. Usually the threshold value is not known, but studies suggest that it may be approximately 300 µg of vitamin B₁₂ for adults (Bozian et al., 1963).

Tables N-2 and N-3 give the expected length in days (Table N-2) or years (Table N-3) for a given turnover rate and ratio from Table N-1 that body stores of vitamin B₁₂ will sustain health in the individual. For example, from Table N-1 the ratio for an initial store of 3 mg of vitamin B₁₂ and a threshold of 300 µg of vitamin B₁₂ is 10. If the turnover rate is 0.1, the store would be expected to last 2,303 days, or 6.3 years.

REFERENCE

Bozian RC, Ferguson JL, Heyssel RM, Meneely GR, Darby WJ. 1963. Evidence concerning the human requirement for vitamin B₁₂. Use of the whole body counter for determination of absorption of vitamin B₁₂. *Am J Clin Nutr* 12:117-129.

TABLE N-2 Time in Days until Vitamin B₁₂ Threshold Is Reached

Ratio of Initial Stores to Threshold, from Table N-1	Turnover Rate		
	0.1	0.15	0.2
70	4,248	2,832	2,124
60	4,094	2,730	2,047
50	3,912	2,608	1,956
40	3,689	2,459	1,844
30	3,401	2,267	1,701
20	2,996	1,997	1,498
17	2,833	1,889	1,417
16	2,773	1,848	1,386
15	2,708	1,805	1,354
14	2,639	1,759	1,320
13	2,565	1,710	1,282
12	2,485	1,657	1,242
11	2,398	1,599	1,199
10	2,303	1,535	1,151
9	2,197	1,465	1,099
8	2,079	1,386	1,040
7	1,946	1,297	973
6	1,792	1,195	896
5	1,609	1,073	805
4	1,386	924	693
3	1,099	732	549

TABLE N-3 Table of Time in Years until Vitamin B₁₂ Threshold Below Which Deficiency Signs May Occur Is Reached

Ratio of Initial Stores to Threshold, from Table N-1	Turnover Rate		
	0.1	0.15	0.2
70	11.6	7.8	5.8
60	11.2	7.5	5.6
50	10.7	7.1	5.4
40	10.1	6.7	5.0
30	9.3	6.2	4.7
20	8.2	5.5	4.1
17	7.8	5.2	3.9
16	7.6	5.1	3.8
15	7.4	4.9	3.7
14	7.2	4.8	3.6
13	7.0	4.7	3.5
12	6.8	4.5	3.4
11	6.6	4.4	3.3
10	6.3	4.2	3.2
9	6.0	4.0	3.0
8	5.7	3.8	2.8
7	5.3	3.6	2.7
6	4.9	3.3	2.5
5	4.4	2.9	2.2
4	3.8	2.5	1.9
3	3.0	2.0	1.5