
A Racial Difference in Serum Vitamin B₁₂ Levels

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Measurements of the serum Vitamin B₁₂ concentrations of 49 black and 49 white healthy adults demonstrate a significantly higher mean serum Vitamin B₁₂ level in blacks when compared to whites ($p < 0.001$). The reason for this difference appears to be genetic, although environmental factors may also be involved. It is suggested that clinical laboratories should establish their own separate reference values of serum Vitamin B₁₂ for blacks and whites in order to prevent misinterpretation of test results.

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Reports from South Africa (1-3), Nigeria (4), and the United Kingdom (5,6) indicate that blacks have higher serum Vitamin B₁₂ levels than whites. To our knowledge, the only study in the United States indicating a racial influence on serum Vitamin B₁₂ is that of Drum and Jankowski (7) which concludes that American black patients have higher median serum Vitamin B₁₂ levels compared to white patients. In their study, the prevalences of conditions which potentially could alter the serum Vitamin B₁₂ level were not examined. In some of the above reports the assay methods used to measure Vitamin B₁₂ were not truly specific for Vitamin B₁₂, since they also measure cobalamin analogs. As a result of this nonspecificity, the serum Vitamin B₁₂ levels could have been erroneously higher than actual values (8).

Therefore, this present study has been designed to compare the serum Vitamin B₁₂ levels in healthy black and white adults utilizing a serum Vitamin B₁₂ assay that does not significantly measure spurious cobalamin analogs.

SUBJECTS AND METHODS

Forty-nine adult black and 49 adult white blood donors were selected at random to participate in this study. The age and sex distributions of the two racial groups are shown in Table 1. All subjects had unremarkable clinical histories and physical examinations. All had normal hematologic values, serum alanine aminotransferase, and negative hepatitis B

surface antigens. None were taking Vitamin B₁₂ medication. None of the female subjects were pregnant at the time of the study. Blood samples were obtained by venipuncture and were allowed to clot at room temperature. The serum was separated by centrifugation and stored at -20°C until assayed.

The Vitamin B₁₂ concentrations were measured in serum after denaturation of endogenous binding proteins by heating at pH 9.2, using a competitive protein binding radioassay kit method* (9). Purified hog intrinsic factor is the Vitamin B₁₂ binding protein utilized in this assay. The cross-reactivity of cobinamide in the assay is 0.023%. Intra-assay variability was less than 10% for various levels of serum Vitamin B₁₂ and all samples were measured in duplicate. The manufacturer's assay protocol was followed without modification.

The serum Vitamin B₁₂ levels in each racially selected group were analyzed statistically using the Kolmogorov-Smirnov test (10) to verify their Gaussian distributions. Differences in the arithmetic means of the serum Vitamin B₁₂ concentrations of the two groups were examined by calculating the standard error of the difference of the means.

RESULTS

The age and sex distributions of the two racial groups were not significantly different ($p > 0.05$). The arithmetic means, standard deviations, and observed ranges of the serum Vitamin B₁₂ levels in the two groups are shown in Table 2. The Kolmogorov-Smirnov test indicates that the distributions of the serum Vitamin B₁₂ levels in both groups were Gaussian ($p < 0.01$). The black subjects have a significantly higher mean serum Vitamin B₁₂ level than the white subjects ($p < 0.001$).

DISCUSSION

Although there is an overlap in the ranges of serum Vitamin B₁₂ levels in the two racial groups, this study

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TABLE 1
Age and Sex Distributions of Black and White Subjects Studied

Age group (yr)	Black M	White M	Black F	White F
18-19	1	—	1	—
20-29	7	5	9	10
30-39	13	13	10	10
40-49	2	2	2	3
50-59	2	4	—	2
60-65	1	—	1	—
Total	26	24	23	25

indicates that healthy black adults have a significantly higher mean serum Vitamin B₁₂ level when compared to healthy white adults of similar age and sex. Although we were not able to properly compare and evaluate the socioeconomic differences between the two groups used in this study, a survey by Bailey et al. (11) did not demonstrate significantly different serum Vitamin B₁₂ concentrations in members of low-income households. Therefore, we feel that socioeconomic conditions may not have contributed significantly to the difference in serum Vitamin B₁₂ concentrations observed in this study.

Fernandes-Costa and Metz attribute high serum Vitamin B₁₂ levels in blacks to the elevation of serum transcobalamins (TC) (3). They found higher unsaturated cobalamin binding capacities and higher TC I, TC II, and TC III in blacks compared to whites in South Africa. Higher cobalamin binding capacities have also been reported in Uganda Africans (12) and in Nigerians (4,13). The reason for the higher transcobalamin levels in blacks is thought to be genetic (3). Porck et al. (14) reported that blacks have a very high incidence of the transcobalamin-II2 allele which binds more cobalamin than the transcobalamin-II alleles common in whites. There is also data suggesting that environmental factors may play a role. Fleming et al. (4) reported that whites living in Nigeria have significantly higher serum cobalamin levels than whites living in the United States. Brandt et al. (2) found that blacks working as miners in South Africa had higher serum Vitamin B₁₂ levels compared to urban blacks.

TABLE 2
Serum Vitamin B₁₂ Levels in Black and White Healthy Adults (in pg/ml)

Item	Blacks	Whites
Number (N)	49	49
Mean (X̄)	546	382
Standard deviation (s.d.)	197.53	131.34
Observed range	195-943	127-832

It is interesting to note that classical pernicious anemia is much less common in blacks compared to whites (7), and that perhaps the higher serum Vitamin B₁₂ level in blacks could delay the clinical onset of pernicious anemia.

Since there appears to be a significant difference between the mean serum Vitamin B₁₂ levels of blacks and whites, we suggest that each clinical laboratory establish separate reference values for each group. Reference values obtained from a racially mixed group or from a single racial group may lead to misinterpretation of serum Vitamin B₁₂ levels. Such misinterpretation could result in the failure to properly diagnose clinical disorders with Vitamin B₁₂ deficiency or with elevations of the serum Vitamin B₁₂ level and could also result in the performance of unnecessary tests.

FOOTNOTE

* Corning's Immo Phase® combined ⁵⁷Co Vitamin B₁₂/¹²⁵I Folate Radioassay, Corning Medical, Corning Glass Works, Medfield, MA 02052.

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