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NUTRITIONAL STATUS AND IMMUNE FUNCTION IN COCAINE AND HEROIN ABUSERS AND IN METHADONE TREATED SUBJECTS

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ABSTRACT

The plasma levels of some essential nutrients and the lymphocyte CD_4 to CD_8 ratio were measured in four groups of individuals that included: (a) cocaine and (b) heroin abusers, (c) methadone treated and (d) healthy subjects. Folate and B-carotene levels were lower in the three drug groups while vitamin C was lower in the methadone and heroin subjects. Vitamin E levels were borderline low in the methadone and cocaine groups. The methadone group also showed a significantly higher level of lipid peroxidation which correlated well with the low values observed for the antioxidant nutrients. Interestingly, the methadone group was the only one with a significantly reduced lymphocyte CD_4/CD_8 ratio.

INTRODUCTION

Drug users, particularly intravenous drug abusers, are at significant risk of contracting HIV, hepatitis B and other infections. Chandra, 1983 and numerous other authors have shown

that malnutrition and infection are mutually aggravating through their common association with immunity. Also, malnutrition has been linked to the reduction of lymphocyte T-helper (CD_4) to T-suppressor (CD_8) ratio (Casey et al., 1983). On the other hand, addictive drugs of abuse have been shown not only to produce significant nutritional aberrations (Mohs, Watson and Leonard-Green, 1990), but can also modulate immunocompetence (Donahoe and Falek, 1988).

Almost 25 years ago, methadone maintenance programs were started to prevent drug abusers from taking hard-core narcotic drugs. Methadone, however, is a psychoactive drug, which ranks 17th on the Drug Abuse Warning Network, albeit far below heroin. Immunological abnormalities have been reported to occur frequently in heroin addicts and in methadone treated subjects (Kreek, 1990) although Novick et al., 1989 have reported that subjects on methadone programs for more than 11 years have normal immune functions in terms of CD_4/CD_8 T-cell ratio. Recently, however, Herbert et al., 1990 reported nutritional abnormalities in terms of body mass index (BMI), hematocrit and hemoglobin concentration in patients on a methadone maintenance program.

Nutritional status in general and specific nutrient imbalances in particular have been shown to affect the immune response. It is plausible that nutritional deficits, common in drug abusers, may mediate or contribute to the deterioration of the immune function in these individuals. Since there is a lack of information in the literature, a preliminary study was designed in order to gain some insight into this problem.

METHODS

Twenty-four human subjects participated in this study to compare four groups of six subjects: group 1, healthy subjects as control; group 2, methadone treated for more than six months and less than five years; group 3, heroin addicts prior to entering into the methadone maintenance program; and group 4, cocaine abusers. None of the subjects were HIV positive and the human use protocol was approved by the Institutional Review Board of the University of Alabama at Birmingham (UAB). Blood samples were withdrawn from each subject for the analysis of some essential micronutrients and to estimate their immune status in terms of CD_4/CD_8 including lipid peroxidation (as MDA) and glutathione (GSH) levels.

Vitamin levels were determined using standard laboratory procedures in UAB's Nutrition Diagnostic Laboratory while the measurements of CD4 and CD8 cells were made by the fluorescence technique (Fahey, et al., 1984) using FITC conjugated OKT4 and OKT8, respectively. The GSH level was measured spectrophotometrically, (Beutler et al., 1963) and the lipid peroxidation level in terms of malondialdehyde (MDA) production was estimated by HPLC (Satoh, 1978). Statistical calculations were performed by using ANOVA analysis and the significant differences are reported in the table.

TABLE

	Group 1 Control	Group 2 Methadone	Group 3 Opiate	Group 4 Cocaine
Plasma Folate (ng/ml)	13.98 ± 6.85	6.73 ± 3.79*	4.48 ± 1.87**	6.16 ± 6.53
RBC Folate (ng/ml)	653.17 ± 218.46	378.83 ± 88.07*	336.33 ± 53.34**	217.17 ± 111.23**
Vitamin B12 (pg/ml)	385 ± 108.9	930.67 ± 577.86	447.67 ± 45.74	577.5 ± 289.60
Vitamin B6 (A/C)	1.46 ± 0.18	1.70 ± 0.20	1.76 ± 0.26*	1.76 ± 0.34
Riboflavin (A/C)	1.22 ± 0.11	1.19 ± 0.07	1.37 ± 0.21	1.56 ± 0.29*
Thiamine (A/C)	1.08 ± 0.06	1.13 ± 0.04	1.13 ± 0.03	1.11 ± 0.05
Vitamin C (mg/dl)	0.76 ± 0.26	0.20 ± 0.14**	0.05 ± 0.07**	0.44 ± 0.44
Vitamin A (ug/dl)	51.5 ± 13.4	42.58 ± 13.79	53.67 ± 17.34	51.33 ± 19.77
Carotenes (ug/dl)	170.17 ± 53.18	68 ± 45**	75.67 ± 34.74**	58.17 ± 12.97**
Vitamin E (mg/dl)	1.09 ± 0.48	0.63 ± 0.37	1.15 ± 0.57	0.69 ± 0.10
GSH (mg/dl)	80.4 ± 9.4	78.3 ± 4.1	81.40 ± 12.1	74.2 ± 14.8
MDA (nm/ml)	3.7 ± 1.0	7.5 ± 1.4*	5.4 ± 1.0	5.5 ± 1.6
CD_4/CD_8	2.28 ± 1.10	1.30 ± 0.52*	2.24 ± 0.63	1.91 ± 0.83

**p<0.01 *p<0.05

RESULTS AND DISCUSSION

The values in the Table show that the drug abusers in general have considerable lower folate and beta carotene levels. The vitamin C status in both methadone and opiate groups were significantly lower than the control while the cocaine group showed a value that falls in the lower side of the normal range. Although

the vitamin E status was not statistically different, the values in the methadone and cocaine groups were borderline normal.

In summary, the methadone group has more nutrient shortages than either the heroin or cocaine abusers, showing low values for folate, and the antioxidant nutrients B-Carotene, vitamin C and vitamin E. Interestingly, the methadone group is the only one that showed significantly elevated levels of MDA indicating an abnormally high level of lipid peroxidation. This supports the notion that methadone treatment may be associated with an increased utilization of the body's antioxidant systems.

The finding that only the methadone-treated subjects have a lower lymphocyte CD_4/CD_8 ratio (see Table) may suggest a relationship, direct or indirect, between their level of free radical production (i.e., as evidenced by a high lipid peroxidation and low levels of antioxidant nutrients) and their immune function. It is not clear whether the methadone treatment is the cause of the depletion of the antioxidant nutrients and immunodepression or whether the latter may result from the life-style and poor diet of these subjects.

Although the sample size in this preliminary study is small, the results presented here provide some significant information on the nutritional status of drug abusers. Since intravenous drug abusers have a higher risk for contracting HIV infection and since free radicals may be involved in the pathogenesis of viral infections, particularly AIDS (Papadopoulos-Eleopulos, 1988), the potential interaction between nutritional status and

immunodepression in these subject becomes even more important. Cellular oxidative injury, measured as an increased production of malondialdehyde (Sonnerborg, et al., 1988) may play a role in the progression of HIV infection. A double-blind, placebo-controlled study with sodium diethyldithiocarbonate, a potent antioxidant, in patients with AIDS or AIDS-related complex have shown significant reduction in primary opportunistic infections (Lang, et al., 1988). Based on this information, a pertinent question may be asked: Will the nutritional and immunological status of HIV-infected drug abusers who enter into methadone maintenance programs deteriorate faster, thus leading to an earlier onset of full-blown AIDS disease? A larger, more thorough investigation of this relationship is, therefore, warranted.

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