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LIPID PEROXIDE AND ANTIOXIDANT LEVELS IN HEALTHY INDIAN AND HUNGARIAN SUBJECTS

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ABSTRACT

The present comparative and prospective study includes 400 normal subjects, out of which 200 were Indian and 200 were Hungarians. The latter population distinctly differed from Indian population in four respects. First is race wise, second living in relatively unpolluted environment, third liberal use of alcohol and fourth moderate to heavy smokers. The thiobarbituric acid reactive substances (TBARS) levels in Hungarians were 300% higher (males, 8.60 ± 2.70 nmol/ml, females, 7.10 ± 0.62 nmol/ml) than Indians (males, 2.55 ± 0.71 nmol/ml, females, 2.25 ± 0.56 nmol/ml).

Keywords: MDA(Malondialdehyde)/ TBARS, SOD(Superoxide dismutase), Catalase, GSH(Glutathione), GPX (glutathione peroxidase)

INTRODUCTION

Lipid Peroxidation, a primary reactive free radical formed by O_2^- and OH^-, which interacts with poly unsaturated fatty acid (PUFA), initiates a complex series of reactions that results in a variety of degradation products (1, 2). It is assumed that lipid peroxidation can be set into motion whenever prooxidant conditions occur in the cell. Lipid peroxidation can cause deleterious effects on cellular functions both directly by producing loss of membrane structure and indirectly by causing the evolution of toxicity produced metabolites, especially reactive aldehyde as alkenals, capable of reaching molecular target at a distance (3, 4, and 5).

Some of the aldehydes are highly reactive and are now designated as second toxic messengers which degenerate and augment initial free radical reactions. Among the many different aldehydes formed, the most intensively studied is MDA (malondialdehyde), which is new widely used as biochemical markers for the assessment of lipid peroxidation.

MDA is reactive towards sulphydryl and amino groups of proteins. It produces intra molecular and intermolecular linkage which can lead to inactivation and polymerisation of enzymes such as ribonuclease. Besides self inflicting damage on lipids its reactivity towards amino groups can result in interactions with the nitrogenous bases of DNA and inhibition of DNA, RNA and protein synthesis (6, 7, and 8).

Increased formation of free radicals and enhanced lipid peroxidation has been observed after active and chronic ethanol consumption (9, 10). Heavy smokers are also reported to face higher peroxidation level and lower antioxidant status (10). The Hungarian population in general is a liberal consumer of alcohol and fond of smoking. At the same time their nutritional status is better. This impelled us to evaluate their blood peroxide and antioxidant levels in healthy Indian and Hungarians to determine the differences, if any, in aforesaid parameters.

MATERIAL AND METHODS

Indian subjects:- Two hundred healthy subjects were selected for this part of the study. Detailed present and past history of subjects was recorded on a separate proforma regarding their general information i.e. Age, sex, height, weight, caste, religion, dietary habits and education. The normal Indian subjects were healthy medical students, staff members and attendant of patients, donors of blood bank of Maharana Bhupal Hospital/RNT Medical College Udaipur.

Hungarian subjects: - Two hundred healthy Hungarians comprised this group. All were healthy student and staff of JATE University in Szeged (Hungary). This Hungarian group had different dietary habits and culture. They were non-vegetarians and had liberal use of alcohol and smoking habit.

Biochemical parameters assayed:-Blood samples were collected in EDTA (2mg/ml) sodium salt as anticoagulant. Peroxidation was assayed by determining TBAR levels (a) in plasma. SOD (12), Catalase (13), GSH (14) and GPX (15) were assayed by standard procedures.

Statistical Analysis:-The biochemical parameters are expressed as mean ± SD(Standard deviation) for each group. A statistically significant deviations in the Hungarian compared with the Indian subjects were arrived at using analysis of variance.

RESULT AND DISCUSSION

We had opportunity to examine normal Hungarian subjects in addition to Indians. Therefore we though it germane to take up study in them for several reasons for example though Caucasoid is a common factor but Hungarians do have some genetic differences from Indians. The other features which make them different from Indians are (a) they are living under relatively less populated atmosphere. (b) Better nutrient intake (c) common use of tinned food. (d) Usually regular habits of drinking alcoholic beverages and (e) smoking habits.

All this factors are known to influence oxidant status. Smoking (10) and alcohol (9, 16) increases peroxidative stress. The TBARS level in normal Hungarian males and females were 8.60 ± 2.70 nmol/ml and 7.10 ± 0.62 nmol/ml and 2.25 ± 0.56 nmol/ml. Thus TBARS levels in Hungarians were about 3 times higher than Indians. This is very significant observation as much as it explicitly points out higher oxidant burden in Hungarians (17).

Table: - 1 Antioxidant and peroxide levels in Indians and Hungarian population.

Parameters	Indian Males (n=140)	Indian Females (n=60)	Hungarian Males (n=120)	Hungarian Females (n=80)
MDA(nmol/ml)	2.55±0.71	2.25±0.56	8.60±2.70	7.10±0.62
SOD(units/ml Haemosylate)	3.86±0.69	3.26±0.85	1.32±0.40	1.91±0.36
Catalase(µmolH2O2/min/mg protein)	87.98±15.36	88.26±14.65	94.80±27.6	80.00±27.80
GSH (mg/dl)	36.46±5.43	35.00±5.43	67.10±7.30	69.10±7.31
GSH-PX(mg GSH/minat37°C)	2.36±1.02	2.02±1.21	9.10±0.65	8.91±0.62

Since MDA is direct adduct of PUFA this are essential constituents of cellular membrane lipids and many other cellular components, three deductions can be made. (a) Membrane lipids may be more damaged in Hungarians than Indians (b) PUFA located in other cellular or extra cellular compartment are more damaged and (c) else both are partly damaged. We would like to emphasize that damage need not to be necessarily expressed in form of pathology because tissues are always in state of dynamic equilibrium and possess an effective repair system. The data however assumes greater significance if viewed in context to antioxidant

status which is better in them. We measured four antioxidants namely GSH, SOD, Catalase, GSH-PX. Interestingly, SOD and GSH levels were significantly higher and other tended to be higher in them than Indians. Obviously the reason could be need for better defence battery. It is now well know that all the three enzymes are inducible enzymes. Their activity in Hungarians innately implies that their induction should be to meet enhanced generation of superoxide anion and free hydroxyl radical. Similarly the increased level of GSH should meet increased demand of GSH-PX.

It has repeatedly been pointed out in literature that reduced GSH is a major endogenous antioxidant (18). In the western population the reported normal range is 47-80 mg/100ml. in Hungarians males and females its level was 67.10 ± 7.30 and 69.00 ± 7.31 respectively. These levels clearly indicate an adequate status. In Indian subjects its level is reported to very widely. Our study found values comparable (21) but in others it was found to be lower (19, 20). Green and Paller (18) showed that potent exogenous sources of free radicals include oxidized drugs, smoke, radiations and other substances and that endogenous antioxidation GSH is preferentially oxidized to save tissues from disasters of oxidant injury. It is also known that free radicals are by products of metabolic processes and originate from environmental pollutant (22). Here again GSH comes to rescue along with other antioxidants. Lower level of GSH in Indians, therefore, represents a discouraging picture about antioxidant status which is usually weak due to weaker nutrient antioxidant status. (23, 24)

Strikingly SOD (superoxide dismutase) levels are higher in both Hungarian males (1.32 ± 0.40 units/ml haemolysate) and females (1.91 ± 0.36 units/ml haemolysate). This is 3.4 and 5.82 times higher than corresponding subjects. This higher level may be a genetic consequences or an adaptive mechanism to meet increased flux of superoxide anion. The latter one appears are more plausible.

CONCLUSION

Comparative prospective study was undertaken between Indian and Hungarian subjects with respect to lipid peroxidation and antioxidant level.

MDA (malondialdehyde) levels (8.60±2.70) in males and 7.10±0.62 in females were 3-4 times higher than Indians.

SOD (superoxide dismutase) levels were lower than Indians and were higher in females as compared to males.

Hungarian males had higher Catalase levels than Indian males while females had lower levels than Indian females.

GSH (glutathione) and GSH-px (Glutathione peroxidase) levels were higher than Indians.

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