

Serum Adenosine Deaminase Estimation in Petrol Filling Station Workers

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INTRODUCTION

Petrol, Diesel and their products have become inevitable in all areas of human activity and have become an inseparable element of life. Petrol and diesel particles contain aliphatic hydrocarbons, polycyclic aromatic hydrocarbons, heterocyclic and polar organic compounds and are thought to be mutagenic and/or carcinogenic as well as cytotoxic to bacteria and mammals (Pederson, 1981; Kotin et al., 1995).

Petrol filling station workers have great risk as the workers are exposed chronically to various petroleum derivatives directly related to their work areas. Chronic occupational exposure to such derivatives is considered to possess genotoxic risk (Pitarque et al., 1997).

Adenosine deaminase (ADA) participates in the degradation of purines by converting adenosine to inosine and deoxyadenosine to deoxyinosine (Pettersson et al., 1984). ADA is essential for the differentiation of lymphoid cells particularly T-cells and plays a role in the maturation of monocytes to macrophages (Fischer et al., 1976). The ADA activity increases during antigenic and mitogenic responses of lymphocytes and it is considered as an important immunoenzyme marker for assessing cell mediated immunity (Mishra et al., 1997).

Recently, Uma Devi et al, 2001 pioneered the study on the role of serum ADA activity in tobacco factory workers occupationally exposed to tobacco dust and reported increase in the ADA activity in factory workers compared to controls. Keeping this study in view, the present study was undertaken with an aim to determine the serum ADA activity to assess immunological disturbance in petrol filling station workers as they are chronically exposed to petrol and its derivatives in their work areas.

MATERIALS AND METHODS

A total of 89 male workers in the age group of

20-45 years who employed in the petrol filling stations in Hyderabad and Secunderabad, Andhra Pradesh for a period of 2-18 years were selected for the study. The study was carried out over a period of 2 years (July 1999- July 2001). The workers were clinically examined and information pertaining to the duration of service, health status, medication, exposure to chemicals, smoking and drinking habits, type of marriage and reproductive history was collected using a standard questionnaire. All the subjects underwent lung function tests and tests to rule out low grade infections. Due care was taken during the selection of the subjects for serum ADA estimation because past or present infections is well able to give elevated serum ADA activity.

Among 89 males, 65 were included in the study because they had no previous illness and were clinically normal during sample collection. The majorities among the study group 41 were non-smokers and 24 were smokers. 65 individuals with the same age group and socio-economic status were matched as controls.

For ADA estimation 2ml of blood sample was collected into the serum separation tubes from both control and exposed subjects. The blood samples were centrifuged at 3000 rpm for 10 minutes and the serum was assayed immediately for ADA activity as described by Guisti and Galanti (1984).

50 μ l of serum was incubated for 1 hour at 37°C in 1 ml of adenosine solution (20 mmol/l) buffered with phosphate (50 mmol/l), pH 6.5. For determination of ammonia 3 ml of phenol nitroprusside and 3 ml of alkaline hypochlorite were added. Ammonium sulphate solution served as standard. The absorbance was measured at 630 nm in a Shimadzu UV-240 spectrophotometer. The activity of ADA is expressed in units/liter. Serum albumin and total protein concentration were analysed by kit method supplied by Reddy laboratories, Hyderabad. Statistical analysis was carried out by Student *t* test.

RESULTS

Serum albumin and total protein concentration were also measured in petrol filling station workers and control groups. The mean $\pm$ SD serum albumin levels in the station workers and control groups were found to be 4.29 ± 0.46 g/100 ml and 4.31 ± 0.42 g/100 ml respectively. The serum total protein concentration was estimated as 6.68 ± 0.51 g/100 ml in station workers and 6.72 ± 0.53 g/100 ml in controls. There was no difference in the serum albumin and total protein concentrations between the two groups.

The observation of serum ADA levels in the petrol filling station workers and control groups are presented in table 1. The mean $\pm$ SD serum ADA levels were 18.48 ± 3.82 units/liter in petrol filling station workers which was slightly higher when compared to controls with a mean $\pm$ SD of 17.89 ± 3.76 units/liter. The increase in the mean activity in the petrol filling station workers compared to controls was found to be statistically insignificant ($P > 0.05$).

Table 1: Serum ADA levels (μ /l) in petrol filling station workers compared with healthy control subjects

Groups	Number of cases	Serum ADA (μ /l) Mean $\pm$ SD	Serum ADA (μ /l)
Petrol filling station workers	65	18.48 ± 3.82	8.68 - 32.32
Healthy controls	65	17.89 ± 3.76	8.90 - 29.91

$P > 0.05$, not significant

DISCUSSION

The enzymatic deamination of adenosine to inosine was first reported in homogenates of rabbit skeletal muscle almost 7 decades ago (Weisman et al., 1988). Later, Conway and Cooke (1937) reported the presence of ADA activity in human blood. ADA is widely distributed in human tissues and its physiological role is especially important in lymphocytes particularly T-cells with variation according to cellular differentiation (Hirschhorn et al., 1978). ADA activity in T cells have been reported 5- 20 folds higher than B cells (Sullivan et al., 1977).

A hereditary deficiency of ADA has been reported in children suffering from severe combined immunodeficiency (SCID) associated with

defective cellular and humoral immunity has been reported in various diseases where cell mediated immunity is stimulated. Earlier studies have shown elevated levels of serum ADA in typhoid fever (Ungerer et al., 1996), tuberculosis (Sharma et al., 2001), acute nephrotic syndrome (Mishra et al., 1997) and different types of cancers (Eroglu et al., 2000).

This is probably the first study on estimation of ADA levels in petrol filling station workers and no data is available in this field for comparison. Earlier, Uma Devi et al. (2001) showed elevated levels of serum ADA activity in tobacco industry workers occupationally exposed to tobacco dust compared to controls. In our study though there is a marginal increase in the ADA activity in the study group compared to controls, it could not reach statistical significance. This suggests that serum ADA activity in petrol filling station workers remains unaltered and further studies are required in this area to substantiate our findings.

KEY WORDS Adenosine Deaminase. Cell Mediated Immunity. Petrol Filling Station Workers.

ABSTRACT The activity of adenosine deaminase (ADA), a measure of cell mediated immune response was determined in serum of 65 male workers employed in different petrol filling stations in Hyderabad and Secunderabad, Andhra Pradesh, over a period of 2 years (July 1999- July 2001). The mean ADA activity in the study group was found to be 18.48 units/liter compared to 17.89 units/liter among controls. There was only a marginal increase in the ADA activity in the study group compared to controls. The increase in the ADA activity in the workers was found to be statistically insignificant. The results indicate that serum ADA activity in petrol filling station workers remains unaltered.

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