

Phenotype analysis of lymphocytes of workers with chronic benzene poisoning

M.M. Brandão^{a,*}, M.A.V. Rêgo^b, L. Pugliese^a, J. Clarêncio^c, C.M. Bastos^b,
J. Ferreira^d, R. Meyer^e, M. Neves^d, S.M. Freire^f

^a PPGIm-ICS-UFBA/FDC, Fundacao Bahiana para o Desenvolvimento das Ciencias,
Rua Silveira Martins n.3386-Cabula, 41150100 Salvador, Brazil

^b Department of Preventive Medicine-School of Medicine-UFBA, Salvador, Brazil

^c CPqGM-Fiocruz-BA, Salvador, Brazil

^d Monte Tabor Foundation, Salvador, Brazil

^e Labimuno-UFBA, Salvador, Brazil

^f PPGIm-ICS-UFBA, Salvador, Brazil

Received 23 December 2004; received in revised form 8 April 2005; accepted 11 April 2005
Available online 26 April 2005

Abstract

Lifetime exposure to benzene is associated to a variety of blood disorders, and except for the risk of cancer, almost nothing is known concerning health impairment in individuals who are no longer exposed. In Brazil, this exposure is one of the serious problems in workplaces, and many workers have been laid off their jobs due to this intoxication, particularly in the State of Bahia, the largest producer of benzene in Latin America, which is the area of this study. From a larger study to describe health effects and genetic polymorphisms among workers with chronic benzene poisoning (CBP), this previous specific investigation analyzes the association between CBP and the pattern of sub-populations of lymphocytes. The study was performed with a CBP group ($n = 24$) and a control group with other occupational diseases ($n = 24$); both were selected at the Workers Health Study Center in the State of Bahia, Brazil. Clinical and epidemiologic variables were collected from medical records and from a detailed questionnaire. The average age was similar in the two groups (51.1 and 50.7, respectively). Analyzing the mean proportions of the sub-populations of lymphocytes, statistically significant differences were found for T cytotoxic cells (TCD8) (27.9; 19.4; $p = 0.002$) and T helper memory cell (CD4CD45RO) (31.2; 37.0; $p = 0.015$), respectively, for the CBP group and control group. These results should be viewed with caution because of the small sample size, but they strengthen a previous impression that workers exposed to benzene have their immune system impaired, even in the long term, which may contribute to some disorders and carcinogenesis process. These workers must be strictly followed up in a medical surveillance program. Although this problem has been known for a long time, this is the first attempt to study these specific effects in Brazil.

© 2005 Elsevier B.V. All rights reserved.

Keywords: Flow cytometry; Lymphocyte phenotype; CD antigens; Occupational exposure; Benzene; Immunotoxicity

1. Introduction

In Brazil, exposure to benzene has been seen as one of the serious problems noted in work places [1]. The largest

benzene production in Latin America, around 400,000 t/year, occurs in the State of Bahia, more precisely in the Petrochemical Complex of Camaçari. At the beginning of the 1990s, many workers were laid off work in this region due to the presence of hematological alterations, most notably the reduction in the number of leucocytes/neutrophils in peripheral blood.

Although there are many forms of benzene exposure, such as industrial emissions through gasoline vapors, motor

Abbreviations: CBP, chronic benzene poisoning; S.E., standard error; PBS, phosphate buffer saline

* Corresponding author. Tel.: +55 71 3581678; fax: +55 71 3581678.

E-mail address: marciaanjo@uol.com.br (M.M. Brandão).

exhaust fumes, cigarette smoke and water source contamination, occupational exposures are considered to be of a higher level [2]. Evidence of the noxious effect of benzene dates back to the end of the 20th century [3,4] and its carcinogenesis on bone marrow is known [5–13]. In addition, this substance is involved in a variety of blood abnormalities of which there are many reports [14–17]. Accidentally, some studies with the object of analyzing the relation between exposure to benzene and leukemia have also shown an increase in the risk of lymphoid neoplasias among workers exposed to benzene [18]. In a review of 18 epidemiological studies about the association between exposure to solvents and non-Hodgkin's lymphoma (NHL) found that out of the nine studies that characterized exposure more precisely, only one was categorical in demonstrating the non-existence of an association [19], which may mean an important indication of the existence of this association. It was concluded that considering the limitations of each study and the leucemogenic action of benzene, it is reasonable to classify it as one of the probable agents involved in the etiology of NHL [20]. However, in spite of this recognized carcinogenic action on the lympho-hematopoietic system (classification in Group 1 of the *International Agency for Research on Cancer* IARC, the patterns of exposed populations (workers and the community in general) becoming ill is still being discussed, and except for the risk of cancer, little is known with regard to immunotoxicity [21].

The effects of immunotoxicity induced by benzene are probably a reflection of the toxicity to the bone marrow [22], inducing depression and altering both the immune system mediated by cells and the humoral with decrease in the lympho-proliferative response of T and B cells and inhibition of the activity of T cytotoxic cells [23]. The increase in the susceptibility to infections as a result of a depression of the bone marrow may be the main cause of death related to chronic exposure to benzene [24].

The majority of data available in literature about CBP and immunotoxicity was obtained from studies in animals [15,25–35]. Data in humans are scarce and involves groups of workers during the exposure [36–39]. Except for the risk of cancer, little is known with respect to immunotoxicity [21] and the alterations to health among individuals in whom occupational exposure has ceased.

The purpose of this study is to describe and analyze the phenotypical profile of lymphocytes, comparing the leucogram values of two groups (individuals with and without CBP). This study is a part of a broader research, in progress, about laboratory assessment of immunocompetence, of genotoxic alterations and genetic polymorphism.

In spite of the various forms of toxicological assessment, the evaluation of the immunological response is an important parameter that could provide information about the immunotoxic mechanisms that may be responsible for a series of reactions leading to pathogenesis. The findings in this study will help to describe later events in individuals with a history of CBP.

2. Material and method

2.1. Population and the study area

Within the scope of a wider project “Hematological, Genotoxic, Immunological Alterations, Genetic Susceptibility and Occupational Exposure to Benzene” in workers registered in the Work Disease Outpatients (“Ambulatório de Doenças do Trabalho (ADT)”) of the Worker Health Study Center (“Centro de Estudos da Saúde do Trabalhador (CESAT)”) in the period from 1988 to 1999, a hematologist selected 24 patients with a most probable diagnosis of chronic intoxication by benzene based on the following criteria: (1) occupational exposure to benzene; (2) number of leucocytes lower than 4000 and neutrophils lower than 2000; (3) decreasing trend in the number of these cells, as from the beginning of exposure. The controls were selected from the same file and from where cases came from (CESAT) diagnosed with other occupational diseases, at the same time as the cases. The patients mainly originate from the Metropolitan Region of Salvador, and work or worked for companies, generally in the industrial sector of this region.

2.2. Study design

This study is a part of a larger case control study. From the definition of the two groups, those who have and those who do not have CBP, a phenotype analysis was carried out of the lymphocytes and comparisons were established between the groups.

2.3. Data collection

2.3.1. Questionnaire

The individuals were asked to answer a questionnaire, structured specifically for the assessment of exposure, personal data, determination of life-style factors like smoking and alcohol and use of medications, among others.

2.3.2. Obtainment of peripheral blood samples

Blood was collected at fasting by venous puncture in the antecubital region in a vacuum collection tube (Vacutainer®) with tri-potassium EDTA.

2.3.3. Leucogram

For analyzing the blood sample, a hematological self-analyzer Adivia 120-Bayer was used. Complete leucograms were made and the total numbers of leucocytes, lymphocytes and segmented neutrophils were analyzed. For all the reagents used to acquire and analyze the samples, the manufacturer's recommendations and guidance were followed.

Morphological study of the samples in blood smears was assessed by a hematologist of the group.

Download English Version:

<https://daneshyari.com/en/article/9266179>

Download Persian Version:

<https://daneshyari.com/article/9266179>

[Daneshyari.com](https://daneshyari.com)