UVB: susceptibility as a risk factor to the development of lepromatous leprosy *

UVB suscetibilidade como fator de risco para o desenvolvimento da hanseníase virchowiana

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Abstract: BACKGROUNDS - Ultraviolet radiation B (UVRB) is the most important environmental factor capable of altering the immune function of human skin.
OBJECTIVE: To evaluate the association of the phenotypes of susceptibility or resistance to ultraviolet radiation B (UVRB) and the polar forms of leprosy.
MATERIAL AND METHODS: We evaluated 38 patients with lepromatous leprosy (LL) and 87 patients with tuberculoid (TT) leprosy, according to the classification by Ridley and Jopling (1966). All the patients were submitted to a test to determine the phenotypes of susceptibility or resistance to UVRB through the application of a 2% dinitrochlorobenzene (DNCB) disc to a previously irradiated area with twice the minimal erythema dose (MED). After 21 days, a similar disc soaked in 0.05% DNCB was applied to the scapular area (unexposed to UVRB) to check for sensitiveness, with reading of the results after 48 hours. The patients that showed a positive reaction to DNCB were considered resistant (UVB-R) and those who did not show any reaction were considered susceptible (UVB-S).
RESULTS: The frequency of UVB-S individuals was 63.2% (24 patients) in the LL group and 34.4% (30 patients) in the TT group (OR=3.26; IC=1.36 – 7.87; x^2=7.73; p=0.005).
CONCLUSION: Our results suggest that UVB-susceptibility is a risk factor to the development of lepromatous leprosy (LL).
Keywords: Leprosy; Leprosy, lepromatous; Photobiology

Resumo: FUNDAMENTOS - A radiação ultravioleta B (RUVB) é o mais importante fator ambiental capaz de modificar a função imunológica da pele humana.
OBJETIVO: estudar a associação entre o fenótipo de suscetibilidade ou resistência à radiação RUVB e as formas polares da hanseníase.
MATERIAL E MÉTODOS: foram avaliados 38 pacientes com hanseníase virchowiana (MHV) e 87 pacientes com hanseníase tuberculoide (MHT) de acordo com a classificação de Ridley e Jopling (1966). Todos os pacientes foram submetidos ao teste para determinação do fenótipo de suscetibilidade ou resistência à RUVB por meio da aplicação de um disco de dinitroclorobenzeno (DNCB) a 2% em uma área de pele previamente irradiada com duas vezes a dose eritematosa mínima (DEM). Após 21 dias, outra aplicação de um disco similar de DNCB a 0,05% na região escapular (área não exposta à RUVB) foi realizada para avaliar se houve sensibilização, com leitura após 48 horas. Os pacientes que apresentaram reação positiva ao DNCB foram considerados UVB-resistentes e o oposto foi considerado para aqueles que não apresentaram resposta (UVB-suscetíveis).
RESULTADOS: A frequência de UVB-suscetíveis foi de 63,2% (24 pacientes) no grupo MHV e 34,4% (30 pacientes) no grupo MHT (OR = 3,26; IC = 1,36–7,87; x^2 = 7,73; p = 0,005).
CONCLUSÃO: Os resultados sugerem que a UVB-suscetibilidade é um fator de risco para o desenvolvimento da MHV.
Palavras-chave: Fotobiologia; Hanseníase; Hanseníase virchowiana

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INTRODUCTION

Ultraviolet radiation B (UVRB) is the most important environmental factor capable of modifying the structure and the function of human skin. [1, 2, 3, 4] Its likely depressing effect on cell-mediated immunity (CMI) and suppression of immune response, of genetic determination, have been the object of study in some infectious diseases, especially those whose CMI is closely related to the capacity of the organism to fight intracellular pathogens, such as *Micobacterium leprae*, the causing agent of leprosy. [5] Leprosy is a chronic infectious disease, predominantly neurocutaneous, characterized by a wide spectrum of clinical presentations, with tuberculoid pole (TT), stable and of strong immunologic resistance. The lepromatous or Virchowian form (LL), is characterized by the possibility of dissemination to other tissues due to complete absence of specific immunologic resistance. [6,7,8] In tropical countries with a high prevalence of this disease, environmental conditions, including exposure to UVRB, may be risk factors to the development of lepromatous leprosy in susceptible patients (UVB-S). [5,6]

MATERIAL AND METHODS

Patients and controls

Thirty-eight patients with LL (16 women and 22 men aged from 16 to 60 years) and 87 patients with TT (66 women and 21 men aged from 16 to 60 years) participated in the study, according to the Ridley-Jopling classification (1966). [6] The patients were chosen by the authors through an efficient active search in several communities in Recife and São Lourenço da Mata, which are both located in the Northeast of Brazil, during 2001 and 2002. Individuals who were ill and being treated at the time of the study or those with a past history of skin cancer, cutaneous herpes simplex infection, auto-immune diseases, complications due to leprosy reactions and/or nutritional deficiencies and those using immunosuppressive drugs were excluded from the study.

Determination of Phenotypes: UVB-Susceptibility (UVB-S) or UVB-Resistance (UVB-R)

The phenotypes UVB-Susceptibility (UBV-S) or UVB-Resistance (UVB-R) were determined for all the patients through the application of a disc soaked in 2% dinitrochlorobenzene (DNCB) in an area previously irradiated (24 hours before) with twice the minimal erythema dose (MED). After 21 days, a similar disc soaked in 0.05% DNCB was applied to the scapular area (unexposed to solar radiation) to check for any sensitization. The results were read after 48 hours. The participants that showed a positive reaction to 0.05% DNCB were considered resistant (UVB-R) and those who did not have a reaction were considered susceptible (UVB-S). The MED was defined as the minimum amount of UVB that produces a discreet erythema, with well-demarcated borders, after exposure to UVRB through *Psora-Comb Dermalight (Dr. K. Honle Gmbh, Germany*), placed 2.5 cm away from an untanned skin area (dorsum) and expressed as energy by unit of area (Kj/m^2). Reaction to 0.05% DNCB was considered positive when there was development of erythema with or without edema, blisters and/or ulceration. All standardizations were done by the authors.

Ethics committee

The study was reviewed and approved by the Ethics Committee of the Faculty of Medicine of the Pernambuco Federal University. Data were obtained from the patients only after they signed the written informed consent.

Statistical analysis

Data were stored in Microsoft Office Excel 2003 software. Comparison between the cases, such as frequency of UVB-S, was done using the x? test. Results were considered significant for $p< 0.05$. The margin of error was calculated by *odds ratio* (OR).

RESULTS

A statistically significant association between susceptibility to UVRB and the lepromatous form of the disease ($p=0.005$) (Table 1) was observed. The risk of developing the lepromatous form of the disease was 3.26 times higher in UVB-Susceptible patients.

DISCUSSION

Nossos resultados sugerem que a suscetibilidade ao UVB é fator de risco para o desenvolvimento da forma virchowiana da hanseníase. Como conclusão são sugeridas medidas de prevenção de exposição à RUVB em portadores da hanseníase, evitando-se a indução de limitações na resposta imunológica, que supostamente possam ocorrer nestes pacientes.

Tabela 1: Associação entre a suscetibilidade à radiação UVB e as formas polares da hanseníase, hanseníase virchowiana (LL) e tuberculoide (TT)

UVB	LL n (%)	TT n (%)
Susceptibility	24 (63.2) *	30 (34.5) *
Resistance	14 (36.8)	57 (65.5)
Total	38 (100)	87 (100)

* p = 0,005

Within the electromagnetic spectrum of sunlight, UVRB (280 to 320 nm) has been classified as the main environmental agent that interferes with the immune components of the skin. [1] These changes occur especially in individuals genetically susceptible to the effects of UVRB exposure. [9,10-12] Leprosy shows great variation in its clinical presentation and it is known that an efficient immune cellular response is essential to fight *M. leprae* infection. [6, 13-14] An efficient immune cellular response in leprosy can be evaluated through a reaction caused by the lepromin antigen. In carriers of the lepromatous form of the disease, this response is slightly positive or negative. [5,6] There are few reports about the relationship between UVRB exposure and the clinical course of the disease in leprosy patients. Cestari et al. clearly showed alterations in the response provoked by the lepromin antigen in areas previously exposed to sun radiation, as compared to the response observed in non-exposed areas in the same person. [5] França verified a high frequency of the UVB-S phenotype in carriers of multibacillary forms of leprosy. [15] The present study also found a higher frequency of susceptibility to the immunologic effects of exposure to UVRB (UVB-S) in groups of patients with LL. Our results suggest that susceptibility to UVRB is a risk factor to the development of the lepromatous form of leprosy. In conclusion, the adoption of prevention measures regarding exposure to UVRB by carriers of the multibacillary forms of leprosy is suggested, thus preventing the induction of limitations to immune response that may occur in these patients. ❑

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