

should be investigated. For prognostic purposes, the condition should be regarded as benign, since no associations with internal malignancies have been described.

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Racial Differences in Experimental Skin Infection with *Candida albicans*

ALFREDO REBORA and MARCELLA GUARRERA

Department of Dermatology, University of Genoa, Genoa, Italy

Rebora A, Guarrera M. Racial differences in experimental skin infection with *Candida albicans*. *Acta Derm Venereol* (Stockh) 1988; 68: 165-168.

The forearm skin of 10 Caucasians and 10 American Negroes was inoculated with *Candida albicans* and the severity of the ensuing dermatitis as well as the population of *Candida* and other aerobes in the inoculum site have been assessed. Negroid skin proved to be less susceptible to irritation, even though it harboured a higher population of yeasts and aerobes other than *Candida*. (Received July 10, 1987.)

A. Rebora, Clinica Dermosifilopatica, Università di Genoa, Viale Benedetto XV, 7, 16132 Genova, Italy.

Racial differences in the skin physiology are poorly understood. The main fields of research have been morphology and biology of the melanocytes, while the popular belief that Negro skin is more resistant to irritants and infective agents, has been neglected (1).

In the present investigation we studied the response of negroid skin to the inoculation of *Candida albicans* (CA).

MATERIALS AND METHODS

Twenty healthy men, in the age range 21-59 years, 10 Caucasians and 10 American Negroes, were studied. All of them signed an informed consent to take part in the study.

CA was inoculated in the skin of their forearm according to a procedure detailed elsewhere (2). The main steps were the following: 1) CA was cultured on Sabouraud's dextrose agar and transplanted daily. 2) Freshly grown CA cells were suspended in 2 ml of saline solution and counted in a haemocytometer. 3) Appropriate scalar concentrations provided inocula containing 1 000, 10 000 and 100 000 cells per ml. 4) 10 μ l of each concentration was applied on the skin, immediately occluded by means of 2 cm² plastic film under Scotch tape and kept in place for 24 h. 5) After removal of the dressing, the skin appeared unaffected and was scrubbed with 2 ml Triton X-100 0.1% solution in 0.075 M phosphate buffer at pH 7.9, *ad modum* Williamson & Kligman (3). 6) The sample was diluted tenfold in Triton X-100 0.05% solution in 0.035 M phosphate buffer at pH 7.9. 7) Each dilution was plated onto the following media: Sabouraud's dextrose agar, Trypticase soy agar with and without lecithin and polysorbate 80, and Mycosel agar. 8) Colony counting was performed after aerobic incubation at 35°C for 2 days. Total aerobe counts were obtained from the difference between the number of all colonies and the number of *C. albicans* colonies. No identification of other aerobes was made. 9) 24 h after scrubbing, a pustular dermatitis occurred, strictly limited to the inoculation site. Pustules were counted and the severity of inflammation scored as follows: 1, 0-5 pustules; 2, 6-20 pustules; 3, more than 20 pustules; 4, confluent pustules; 5, erosion. 10) Non-parametric data were analysed by means of the Mann-Whitney U-test. Parametric data (logs of the numbers of colonies) were studied by factorial analysis of variance.

RESULTS

Clinical scores

Caucasians proved to react 27% more intensely than Negroes ($p < 0.01$). In both races, the severity of the reaction increased with the dose of CA inoculum ($p < 0.01$) (Table I).

CA population

Negroid skin appeared to harbour much more yeast than did caucasian skin (150%) ($p < 0.025 > 0.01$). In both races the yeast population was directly proportional to the dose of CA inoculum ($p < 0.025 > 0.01$) (Table I).

Other aerobes

Negroid skin harboured more aerobes than caucasian skin (650%) ($p < 0.025 > 0.01$). The population of aerobes did not vary significantly with the CA inoculum dose, even though in Negroes a gradually declining trend was observed (Table I).

No relationship was observed between the severity of the dermatitis and the number of CA recovered from the dermatitis site.

Table I. Severity of the dermatitis and Variation in number of *C. Albicans* and other aerobe colonies according to the size of inoculum

Results	Race	Candida inoculum size (cells/0.01 ml)			
		0	1 000	10 000	100 000
Clinical scores	White	0	1.40	2.40	3.15
	Negro	0.10	1.10	2.05	2.20
<i>C. albicans</i> cells \times 1 000	White	14	13	60	79
	Negro	1	114	133	171
Total aerobe cells \times 1 000	White	120	110	110	120
	Negro	740	1 380	730	630

DISCUSSION

Many years ago, it was demonstrated that CA could grow in large numbers on the outer layers of the stratum corneum when inoculated under occlusion. An acute pustular dermatitis resulted (2, 4).

The main factor promoting establishment of the yeast on the skin appeared to be humidity, in that it not only prevents the yeast from drying, but also provides abundant nutrients by bringing in lipids, proteins and carbohydrates from the horny layer, either in suspension or in solution.

CA provokes the pustular dermatitis through its potent endotoxins. Allergic responses are unlikely. The susceptibility of the skin to such 'infection' is almost universal and there is a direct relationship between the size of the inoculum and the severity of the resulting dermatitis (2). Such a relationship has been confirmed in the present study too.

The overgrowth under occlusion also involves the other resident aerobes that increase with the increase in the size of *C. albicans* inoculum. However, from the inoculum size of 10000 cells/0.01 ml of *C. albicans*, a decrease in the total number of aerobes is seen in Negroes—but not in Caucasians.

Interestingly, no relationship can be found between severity of the dermatitis and number of yeasts recoverable from the infected area (2). Hence other factors must therefore be involved in determining skin susceptibility. One of these could be race.

Our findings show that negroid skin is particularly less reactive or irritable, especially in view of the huge population of yeasts and other aerobes it may harbour under conditions of high humidity. Even normal non-inoculated negroid skin under occlusion was able to cause *C. albicans* to grow in excess without inducing any inflammation (Table I). This finding agrees closely with earlier studies by Weigand (5) and by Frosch & Kligman (6, 7), who demonstrated an increased resistance of black skin to chemical irritation.

Since stripping provided evidence (2) that the severity of the pustular dermatitis in our model is a function of the thickness of the stratum corneum, it would seem that the latter must be the main factor in providing an efficient barrier against CA endotoxins (5).

However, this does not appear to be completely true. The thickness of the stratum corneum of black skin is no different from that of caucasian skin (8), even though a greater compactness has been suggested (9); the 'stripped' curve in our model (2) differs from the curve of the 'stripping modified permeability' (10, 11) and no racial differences in percutaneous absorption of steroids could be shown in vivo (12). Other, possibly immunological, factors must be involved.

ACKNOWLEDGEMENTS

This investigation was performed at Ivy Research Laboratories, Philadelphia, Pa., and was supported in part by research contract DA-17-71-C-1009 from the U.S. Army Medical Research and Development Command Department of the Army.

K. R. McGinley, W. Flowers, Rebecca Stewart and Sandra Goldberg provided technical assistance.

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Phytophotodermatitis Mimicking Jellyfish Envenomation

J. W. BURNETT,¹ T. D. HORN,¹ F. MERCADO¹ and P. H. NIEBYL²

¹Division of Dermatology, Department of Medicine, University of Maryland School of Medicine, Baltimore, Maryland, and ²Private Practice of Dermatology, Easton, Maryland, U.S.A.

Burnett JW, Horn TD, Mercado F, Niebyl PH. Phytophotodermatitis mimicking jellyfish envenomation. Acta Derm Venereol (Stockh) 1988; 68: 168-171.

Two cases of citrus juice phytophotodermatoses with long hyperpigmented macular lesions are reported. These lesions simulated those resulting from jellyfish envenomation. The diagnosis can be established by the lack of local pain or signs of envenomation, and the absence of a serological response to jellyfish venom. (Received September 29, 1987.)

J.W. Burnett, Division of Dermatology, Department of Medicine, University of Maryland School of Medicine, 22 South Greene Street, Baltimore, MD 21201, U.S.A.

Phytophotodermatoses are infrequent summertime eruptions. The cutaneous lesions of those disorders appear as macular hyperpigmentation on photo-exposed areas having been in contact with both radiation and photoactive compounds. The eruption may be severe and hemorrhagic if the dose of the inciting chemical agent is significant. Photodermatoses have occurred after the application of perfumes containing oil of Bergamot which is contained in various cosmetics and perfumes. The active ingredients in this oil, which is prepared from an Italian citrus fruit, are furocoumarins whose action spectrum falls in the UVA range (1). The Bergamot plant is botanically related to lemons and limes which also contain juices capable of producing similar lesions (2).

Citrus fruit phytophotodermatitis usually affects the hands and exposed upper extremities of bartenders, artists or waitresses. A recent outbreak of 106 cases of phototoxic dermatitis from limes used in the preparation of pomanders at an art class in a day camp in Maryland was reported (3). We described below 2 additional cases of citrus phytophoto-