

Prevalence of *Candida* on the tongue and intertriginous areas of psoriatic and atopic dermatitis patients

Vera Leibovici,¹ Ronen Alkalay,¹ Klilah Hershko,² Arie Ingber,¹ Maria Westerman,¹ Nurith Leviatan-Strauss³ and Malka Hochberg¹

Departments of ¹Dermatology, ²Pathology, Hadassah University Hospital and ³Biostatistics Consultant, Hadassah University Hospital, Jerusalem, Israel

Summary

Data in the literature regarding the prevalence of *Candida* in psoriatic and atopic dermatitis patients are controversial. We conducted a prospective study to determine the prevalence of *Candida* on the tongue, axillae and groin of psoriatic patients when compared with atopic dermatitis patients and normal controls. During the period 2003–2005, data were collected from 100 psoriatic patients, 100 patients with atopic dermatitis and 100 normal controls. Fungal test specimens for *Candida* were collected from the axillae, groin and tongue of each patient. There was no increase in the prevalence of *Candida* in intertriginous area of either psoriatic or atopic dermatitis patients. However, the prevalence of *Candida* on the tongue was significantly higher in psoriatic patients (32%) compared with atopic dermatitis (18%) ($P = 0.024$) and higher, although not significantly, than in normal controls (21%) ($P = 0.08$). Our study did not reveal higher prevalence of *Candida* in the axillae and groin of either psoriatic or atopic dermatitis patients. There was a higher prevalence of *Candida* on the tongue of psoriatic patients. The *Candida* of the tongue was asymptomatic and did not correlate with age, gender, type of psoriasis or severity of the disease, therefore we conclude that this is clinically irrelevant.

Key words: psoriasis, atopic dermatitis, *Candida*, tongue, intertriginous areas.

Introduction

Infections have been long recognised as a trigger for the onset and exacerbation of psoriasis. Guttate psoriasis frequently follows streptococcal and viral infection. HIV virus type I represents another trigger for psoriasis. Regarding the prevalence of fungal infections in psoriasis, data are controversial. Flystrom found no *Candida* in the intertriginous areas of psoriatic patients.¹ Reborna reported the presence of *Candida* in the intertriginous areas of psoriatic patients.² Ganor found a prevalence of 9.3% of *Candida* on the affected skin of 407 psoriatic patients.³ *Candida* was found in the faeces of psoriatic patients in many previous studies.^{4–8}

The prevalence of *Candida* of the tongue was found to be increased in patients with psoriasis capitis or seborrheic capitis by Sneff *et al.* [7]. Waldman *et al.* [8] found that the quantity of *Candida* in saliva is higher in psoriatic patients compared with normal control. Skinner *et al.* [9] described 14 patients with palmo-plantar psoriasis in whom the disease was associated with oro-pharyngeal *Candida*.

Atopic dermatitis may be aggravated by various infections such as *Staphylococcus aureus*, herpes simplex or smallpox and dermatophytes, probably because of local defects in T-cell immunity. Regarding the prevalence of *Candida* in atopic dermatitis, data are limited and controversial. Henseler *et al.* [10] found that in atopic dermatitis the prevalence of oro-intestinal candidiasis was increased whereas *Candida* of the skin was decreased.

Buslau *et al.* [6] detected yeasts, mostly *Candida albicans* in 70% of the stools of patients with atopic dermatitis. *Candida* species are part of the normal mouth

Correspondence: Vera Leibovici, MD, PO Box 12018, Department of Dermatology, Hadassah University Hospital, Jerusalem 91120, Israel.
Tel.: +972 2 677 6368. Fax: +972 2 624 4801.
E-mail: doctor_ima@yahoo.com

Accepted for publication 11 July 2007

flora in 25–50% of healthy individuals and *C. albicans* is the most common type of the yeast group. Asymptomatic colonisation may become pathogenic following the use of local or inhaled steroids, oro-pharyngeal irradiation, traumatic denture, immunodeficiencies such as AIDS, malignancies, or systematic treatment with antibiotics, cytotoxic drugs, immunosuppressive therapy, and diseases such diabetes mellitus, adrenal dysfunction or hypothyroidism.

Patients and methods

During the period 2003–2005, data were collected from 100 psoriatic patients (51 females and 49 males), 100 patients with atopic dermatitis (70 females and 30 males) and 100 normal controls (60 females and 40 males). All patients were from the Dermatology department and outpatient clinic of the Hadassah University Hospital in Jerusalem, Israel. The study was approved by the Helsinki committee for clinical trials of the Hadassah Medical Centers and informed consent was obtained from all participants.

Epidemiological data included gender, age, type of disease, its severity, as well as the body site from which the fungal test was collected. The psoriatic group included patients aged 18–84 (medium age 44.1), the atopic dermatitis group included age from 18 to 83 (medium 41.8) and the normal population included ages 18–80 (medium 46.3). Severity of disease was evaluated according to the psoriatic area and severity index in psoriasis and the scoring in atopic dermatitis scale in atopic dermatitis. Types of psoriasis included 60 cases of psoriasis vulgaris, 31 cases of inverse psoriasis and nine cases of psoriatic erythroderma. Fungal tests were collected from the axilla, groin and tongue of each patient. Psoriatic and atopic dermatitis patients who suffered from concomitant diabetes mellitus, or were on antibiotics or immunosuppressive treatment were excluded from the study.

Mycological examination

Scales and swabs were collected from axillae and groin of patients and normal population were dissolved in 30% KOH, then examined by direct microscopy. In parallel, scales and swabs were plated on two different types of Sabouraud glucose agar (SDA, HY-lbs Rehovot, Israel): one with cyclohexamide to select for dermatophytes and *C. albicans*, and one without cyclohexamide to isolate other yeasts and molds. Positive dermatophyte cultures were examined macroscopically and microscopically for the identification of fungal species. Positive

Candida species were recultured on Chromagar *Candida* plates (Hy-labs, Rehovot, Israel) to identify *Candida* strain.

Statistical examination

Descriptive statistics of fungi and fungal groups is given for each group of patients and site of disease. Basic descriptive statistics is given for gender and age. Association between fungus and subjects' group is tested¹ by using chi-squared models to compare psoriasis vs. atopic dermatitis and vs. normal population and² by using models of Logistic Regression with specific fungus of fungal group as the dependent variable, and subject group, age, gender, type of disease, and severity score, as explanatory variables. Subject group (normal population, psoriasis and atopic dermatitis), is used in the model as a categorical variable. Stepwise selection method is used with entry testing based on the significance of the score statistic, and removal testing based on the probability of the Wald statistic.

Results

The prevalence of fungal colonisation in the psoriatic patients was 37% yeasts and 2% dermatophytes. In comparison, in atopic dermatitis patients the prevalence of fungal colonisation was 19% yeasts and 2% dermatophytes and in the normal population 24% yeasts and 2% dermatophytes (Table 1). The percentage of yeasts in psoriatic patients was significantly higher compared with atopic dermatitis patients ($P = 0.0019$), and approached significance by comparison with the normal population ($P = 0.065$). Gender and age did not affect the prevalence of fungal infection in either psoriasis or atopic dermatitis (Table 2). Neither did the type of psoriasis or the severity of the disease affect the prevalence of *Candida* infection.

Regarding the prevalence of fungal infection according to body site, difference between the study groups

Table 1 Distribution of fungal colonisation in the group of diseases

	Normal	Psoriasis	Atopic dermatitis
<i>Candida albicans</i> (%)	21	32	19
<i>Candida parapsilosis</i>	3	4	0
<i>Candida</i> species	0	1	0
Total yeast	24	37	19
<i>Trichophyton rubrum</i>	1	1	2
<i>Trichophyton mentagrophytes</i>	1	1	0
Total dermatophytes	2	2	2
Total fungi	24	37	21

Table 2 Logistic regression models is used for yeasts with group of disease as a categorical explanatory variable, whereas eczema and normal population were each compared with psoriasis group. Age, gender, were also used as potential explanatory variables

	B	SE	Sig	Exp (B)	95.0% C.I. for Exp (B)	
					Lower	Upper
Eczema vs. psoriasis	−0.831	0.330	0.012	0.436	0.228	0.832
Normal vs. psoriasis	−0.589	0.317	0.063	0.555	0.298	1.032
Constant	−0.619	0.210	0.003	0.538		

B, estimated coecient in the logistic regression; SE, standard error of the coecient; Sig, significance of the coecient; Exp(B), exponent of estimated coecient (it equals the Odd Ratio);CI for Exp(B) is the confidence interval for the exponent of the estimated coecient.

Table 3 Distribution of yeasts by site of body

	Normal	Psoriasis	Atopic dermatitis
Yeast on axilla	3	2	0
Yeast on inguinal areas	0	3	1
Yeast on tongue	21	32	18

were significant: 32% of psoriatic patients had yeasts on the tongue, compared with 18% of atopic dermatitis patients and 21% of normal population. These results showed a significantly higher percentage of *Candida* on the tongue of psoriatic patients ($P = 0.024$), and a similar but not significant difference compared with the normal population ($P = 0.080$) (Table 3). There was no statistical difference between the study groups regarding the presence of yeasts in the axillae and groin.

Discussion

Our findings show a significantly higher prevalence of *Candida* on the tongue in psoriatic patients compared with atopic dermatitis patients, and no significant difference compared with normal control. These results are consistent with those of Sneff *et al.* [7] and Waldman *et al.* [8]. Boehncke *et al.* [11] showed that T-cell receptor repertoire in chronic psoriasis is restricted and lacks enrichment of superantigen-associated V beta regions. Thus, superantigens seem not to play a pathogenetically relevant role in chronic plaque-stage psoriasis.

Candida on the tongue is present in 25–50% of healthy individuals and is referred to as asymptomatic colonisation. It is influenced by many non-pathogenic factors, such as salivary flow, salivary pH, use of dentures and iatrogenic or disease related causes. The

presence of candidiasis is significant only when it is symptomatic. In our study, the affected psoriatic patients had asymptomatic *Candida* on their tongues. There was also no correlation between age, gender, type of psoriasis or severity of the disease and prevalence of *Candida* on the tongue, therefore we conclude that this is clinically irrelevant.

At the outset of this study, we were biased by our prior uncontrolled personal experience, in which Ketoconazole appeared to be helpful in the treatment of some inverse psoriasis patients. We expected and increased prevalence of *Candida* at least in the intertriginous areas of inverse psoriasis patients, but the results proved to be different. It is quite likely that, as suggested by Van Cutsem *et al.* [12], ketconazole has an anti-inflammatory effect, which may explain some of its beneficial effects irrespective of *Candida* infection. It is also possible that, as suggested by Rebora, *Candida* present in the intertriginous areas of psoriatic patients disappears when replaced by Gram negative bacteria, but leaves a kobnerising effect.²

In this study, neither oral nor intertriginous *Candida* were detected in atopic dermatitis patients. These patients however had an increased prevalence of *Tricophyton rubrum*, when compared with non-atopic controls. In our study, atopic dermatitis patients were employed as controls for psoriasis patients, explaining the fact that only 100 patients were investigated. To elucidate the role of *Candida* in the intertriginous area and the tongue in atopic dermatitis, further studies involving large numbers of patients will be required.

Acknowledgment

The authors would like to thank Prof. Chaim Hershko for critical review of the paper.

References

- 1 Flystrom I, Bergbrant I-M, Brared J, Brandberg LL. Microorganisms in intertriginous psoriasis: no evidence of *Candida*. *Acta Derm Venereol* 2003; **83**: 121–3.
- 2 Rebora A. *Candida* and psoriasis. Letter to the editor. *Acta Derm Venereol* 2003; **84**: 175.
- 3 Ganor S. Disease sometimes associated with psoriasis. I. Candidosis. *Dermatologica* 1977; **154**: 268–72.
- 4 Menzel I, Holzman H. Yeast flora in feces from patients with seborrheic dermatitis of scalp or psoriasis capilliti. *Z Hautkr* 1986; **61**: 451–5.
- 5 Hanel H, Menzel I, Holzman H. High phospholipase-A activity of *Candida albicans* isolated from the intestine of psoriatic patients. *Mycoses* 1988; **131**: 451–3.

- 6 Buslau M, Menzel I, Holzman H. Fungal flora of human faeces in psoriasis and atopic dermatitis. *Mycoses* 1990; **33**: 90–94.
- 7 Sneff H, Bothe C, Busacker J. Studies on the yeast flora in patients suffering from psoriasis capilliti or seborrheic dermatitis of the scalp. *Mycoses* 1990; **33**: 29–32.
- 8 Waldman A, Gilhar A, Duek L, Berdicevski I. Incidence of *Candida* in psoriasis. A study of the fungal flora of psoriatic patients. *Mycoses* 2001; **44**: 77–81.
- 9 Skinner RB, Rosenberg EW, Noah PW. Psoriasis of the palms and soles is frequently associated with oropharyngeal *Candida albicans*. *Acta Derm Venereol (suppl.)* 1994; **186**: 149–50.
- 10 Henseler T, Tausch I. Mycoses in patients with psoriasis and atopic dermatitis. *Mycoses* 1997; **40**(suppl. 1): 22–28.
- 11 Boehncke WH, Dressel D, Manfras B *et al.* T-cell receptor repertoire in chronic plaque stage psoriasis is restricted and lacks enrichment of superantigen-associated V beta regions. *J Invest Dermatol* 1995; **104**: 725–8.
- 12 Van Cutsem J, Van Gerven F, Cauwenbergh G, Odds F, Jansen PAJ. A comparative study with hydrocortisone acetate in a model using living and killed *Staphylococcus aureus* on the skin of guinea-pigs. *J Am Acad Dermatol* 1991; **25**: 257–61.