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# An Examination of the Flora and pH Changes in the External Auditory Canal in Patients with Seborrheic Dermatitis

*Seboreik Dermatitli Hastalarda Dış Kulak Yolu Florası ve pH Değişiminin İncelenmesi*

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## ABSTRACT

**Aim:** To investigate flora and pH changes in the external auditory canal (EAC) in patients with seborrheic dermatitis (SD).

**Material and Method:** Twenty-five patients with SD presenting to the Atatürk University Faculty of Medicine Ear, Nose and Throat and Dermatology Departments and 20 healthy controls were included in this prospective study. All individuals' EAC floras were collected using culture swabs, and EAC pH was measured using a surface pH meter.

**Results:** Coagulase-negative staphylococci and diphtheroid bacilli, representing normal flora elements, grew in 15 patients in the SD group and 10 in the healthy control group. pH values in the SD patient group ranged between 4.17 and 4.89, with a mean value of  $4.47 \pm 0.2$ . pH values among the healthy controls ranged between 4.33 and 4.94, with a mean value of  $4.63 \pm 0.2$ .

**Conclusion:** SD did not affect EAC flora or EAC pH values

**Key words:** external auditory canal flora; external auditory canal pH; seborrheic dermatitis

## ÖZET

**Amaç:** Bu çalışmada seboreik dermatit (SD)'li hastalarda dış kulak yolu (DKY) florası ve pH değişiminin araştırılması amaçlanmıştır.

**Materyal ve Metot:** Prospektif olarak planlanan çalışmaya Atatürk Üniversitesi Tıp Fakültesi Kulak Burun Boğaz ve Dermatoloji Anabilim Dalı polikliniğine başvuran 25 SD'li hasta ve 20 sağlıklı kontrol grubu dâhil edildi. Tüm bireylerin DKY florası kültür çubukları yardımıyla ve DKY pH'ı ise yüzey pH metre ile ölçülerek değerlendirildi.

**Bulgular:** SD'li hasta grubundaki 15 hastada ve sağlıklı kontrol grubundaki 10 hastada koagülaz negatif stafilokoklar ve difteroid basiller yani normal flora elemanları üredi. SD'li hasta grubunun pH değerleri 4,17 ve 4,89 arasında değişmekte olup pH değerleri ortalaması  $4,47 \pm 0,2$  olarak bulundu. Sağlıklı kontrol grubundaki bireylerin pH değerleri 4,33 ve 4,94 arasında değişmekte olup pH değerleri ortalaması  $4,63 \pm 0,2$  olarak bulundu.

**Sonuç:** Bu çalışmaya göre SD hastalığının DKY florası ve pH değeri üzerine etkisinin olmadığı tespit edilmiştir.

**Anahtar kelimeler:** dış kulak yolu florası; dış kulak yolu pH'ı; seboreik dermatit

## Introduction

Seborrheic dermatitis (SD) is a chronic inflammatory skin disease characterized by erythematous plaques or patches in areas containing sebaceous glands. The mild form of the disease is seen in 15–20% of the population, and it is more common in males. It may be associated with genetic and environmental factors<sup>1</sup>. The entity mostly affects parts of the body rich in sebaceous glands, such as hairy skin, the face, and the upper trunk<sup>2</sup>. The lesions are distributed symmetrically and typically worsen in winter. There is no specific treatment, the main aim being the control of symptoms<sup>1</sup>.

Although the etiology is uncertain, various factors can give rise to SD, such as androgens, fatigue, stress, depression, microangiopathic vascular diseases, atmospheric changes such as pressure variation, seasonal factors, clothing, diet and food allergies, autoimmunity, climacteric changes, *Pityrosporum ovale* (Malassezia furfur), medications, and riboflavin, pyridoxine, and biotin deficiencies<sup>2–4</sup>.

The cerumen consists of glandular secretions and epithelial wastes in the cartilaginous part of the external auditory canal (EAC). It is hydrophobic and slightly acidic and thus prevents bacterial growth<sup>5,6</sup>. The

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normal flora in the EAC and cerumen is gram (+), frequently consisting of *Staphylococcus aureus* and *Staphylococcus epidermidis*. Diphtheroids, streptococci, and enterococci are less common. *Pseudomonas aeruginosa* and fungal agents are rare in the normal EAC<sup>5</sup>.

Seborrheic dermatitis has been reported to be capable of affecting the EAC<sup>7</sup>. However, to the best of our knowledge, the effect of SD on the EAC flora and pH values has not previously been investigated. This study aimed to explore the EAC flora and whether any changes in EAC pH levels occur in patients with SD.

## Material and Method

Approval for this prospective study was granted by the Ataturk University Faculty of Medicine Clinical Research Ethical Committee (decision no. 1 dated 02.09.2013). Twenty-five patients (16 female and nine male) presenting to the Ataturk University Faculty of Medicine Ear, Nose and Throat and Dermatology Departments and diagnosed with SD and 20 healthy controls (10 female and 10 male) were included in the study. Written informed consent was obtained from all patients who participated in this study.

Individuals who had not used antibiotics for at least one month and had not experienced upper respiratory tract infection, with no chronic disease such as diabetes mellitus (DM), and without chronic or acute otitis or external otitis were enrolled. Patients with any chronic skin infection other than SD were excluded.

Cultures were taken using culture swabs from the patient, and control groups were sent to the microbiology laboratory. Culture collection was based on the swab remaining in contact with the patient's EAC for at least 10 sec. Specimens sent to the microbiology laboratory were immediately inoculated onto blood broth and eosin methylene-blue (EMB) agar media. Daily growth of specimens inoculated onto growth was checked for a minimum of three and a maximum of five days. External auditory canal pH was measured in all individuals with a surface pH meter with an appropriate probe. After measurement, the probe was

placed in a neutral solution supplied with the pH meter to avoid false results.

## Statistical Analysis

Data analysis was performed on IBM Statistical Package for Social Sciences program version 20.0 (IBM Corporation, New York, NY, USA). Data were expressed as number, percentage, and mean plus standard deviation. The Kolmogorov-Smirnov test was applied to determine whether the data for variables included in the analysis were normally distributed. The Mann-Whitney U test was used to compare age and pH values between the patient and control groups and the sexes, while the chi-square test was used to determine growth status between the patient and control groups. The growth status between the sexes between the patient and control groups was analyzed using Fisher's exact test. *p* values <0.05 were regarded as significant for all analyses.

## Results

Ages in the patient group ranged from 18 to 57, with a mean age of  $37.6 \pm 13.6$ . Ages in the healthy control group ranged from 18 to 54, with a mean age of  $30.2 \pm 11.4$ . No statistically significant difference was observed in terms of age between the patient and control groups (*p*=0.1; Mann-Whitney U value=179).

No growth occurred in 10 (40%) patients in the SD patient group and in 10 (50%) healthy control group members. Coagulase-negative staphylococci and diphtheroid bacilli, representing normal flora elements, grew in 15 patients in the SD group and 10 (50%) healthy control group members (Table 1). The difference between the two groups was not significant (*p*=0.5; chi-square value=0.45).

Patient group pH values ranged between 4.17 and 4.89, with a mean value of  $4.47 \pm 0.2$ . pH values in the healthy control group ranged between 4.33 and 4.94, with a mean pH of  $4.63 \pm 0.2$ . The difference between the two groups was statistically significant (*p*=0.01; Mann-Whitney U value=145) (Table 2).

**Table 1.** Isolated microorganisms

	Patients	Control group	<i>p</i> value	Chi-square value
Microbiological evaluation (isolated microorganisms)	Coagulase (-) staphylococci Diphtheroid bacilli	Coagulase (-) staphylococci Diphtheroid bacilli	0.5	0.45

**Table 2.** pH value of patients and control group

	Patients	Control group	p value	Mann-Whitney U value
pH	4.17-4.89 mean 4.47 ± 0.2	4.33-4.94 mean 4.63±0.2	0.01	145

**Table 3.** pH value of the patient and control group with growth

	Patients	Control group	Reproductive ones p value	Mann-Whitney U value
pH	4.17-4.89 mean 4.43±0.2	4.33- 4.74 mean 4.51±0.1	0.14	49
Total			25 patients	

pH values in the patient group with normal floral bacteria growth in culture ranged between 4.17 and 4.89, with a mean value of  $4.43 \pm 0.2$ . The pH values of the healthy control group with normal flora bacteria ranged between 4.33 and 4.74, with a mean value of  $4.51 \pm 0.1$ . The difference between the two groups was not statistically significant ( $p=0.14$ ; Mann-Whitney U value=49) (Table 3).

## Discussion

Since SD is a frequently seen chronic skin disease that may be refractory to treatment and that has a damaging psychosocial impact on patients, it has been the subject of considerable research. The EAC can also be affected in diseases with widespread skin involvement, such as SD, allergic dermatitis, atopic dermatitis, and psoriasis<sup>8</sup>. Seborrheic dermatitis frequently causes pruritus when it affects the EAC, and pruritic ears were present in approximately 90% of the patients in the present study.

Malassezia species are part of the normal skin flora in humans. These species can cause pityriasis versicolor, Malassezia folliculitis, SD, and atopic dermatitis<sup>9,10</sup>. No growth of Malassezia species was observed in the present study.

The EAC is normally slightly acidic, with a pH value of approximately 4–6. Micro-organisms are, therefore not easily able to colonize this region. However, infection may occur under conditions such as sterile equipment not being employed during ear cleaning or pH increasing due to frequent contact with water. Dampness prepares the ground for infection by numerous micro-organisms, particularly fungi<sup>11,12</sup>. External auditory canal pH was acidic in both the patient and control groups

in the present study. External auditory canal pH values were also acidic among individuals with normal floral bacteria growing in EAC culture in both groups. On the basis of these findings, it may be concluded that SD has no effect on EAC pH.

The two micro-organisms most frequently isolated from the EAC are the normal flora elements coagulase-negative staphylococci and diphtheroid bacilli (Corynebacteria spp.)<sup>11,13</sup>. Coagulase-negative staphylococci and diphtheroid bacilli (Corynebacteria spp.) also grew in patients with SD and members of the healthy control group in the present study. *P. aeruginosa* is a micro-organism with high mortality and morbidity that spreads rapidly and causes malignant (invasive) otitis externa, particularly in individuals with immune suppression, such as malignancy, in DM patients, and the elderly<sup>14,15</sup>. *P. aeruginosa* was not isolated in the present study since cases from this patient group were not included.

Stroman et al.<sup>5</sup> reported gram-positive growth at a rate of 92% in EAC and cerumen cultures from normal healthy individuals, gram-negative growth at 1%, fungus growth at 7%, and gram-positive growth at 93% in EAC isolates, gram-negative micro-organism growth at a rate of 4.5%, and fungal growth at 2.5%. The most commonly detected strain in both groups was coagulase-negative *S. auricularis*, and detailed examination of both cerumen and EAC isolates revealed that similar micro-organisms exhibited very close growth rates<sup>5</sup>. The present study also detected predominant coagulase-negative staphylococci and diphtheroid growth in SD patients and the healthy control group.

In addition to structural, environmental, and traumatic factors leading to inflammatory changes, infectious

(bacterial, fungal, and viral) and reactive (eczema, SD, neurodermatitis, etc.) factors are also involved in otitis externa<sup>16</sup>. This common disease affects 10% of the population, particularly in summer. The most commonly isolated bacterial agents are *P. aeruginosa* and *S. aureus*, while the most frequent fungal agents are *Aspergillus* and *Candida albicans*<sup>17,18</sup>. Patients with chronic or acute otitis externa were excluded from the present study.

The principal limitation of the present study is the low number of patients. Further extensive studies investigating the effect of SD on the pH and microbiology of the EAC are now needed.

## Conclusion

Seborrheic dermatitis is a chronic skin disease whose etiology is not yet fully understood. External auditory canal involvement is common in patients diagnosed with SD, and these patients present to ENT and dermatology clinics due to pruritus. Seborrheic dermatitis was found to cause no change in EAC microbiology or EAC pH in the present study.

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