# Denture stomatitis

## Occurrence and distribution of fungi

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Olsen, I. Denture stomatitis. Occurrence and distribution of fungi. *Acta Odont. Scand.* 32, 329—333, 1974.

Yeasts were isolated from all of 100 patients with generalized simple or granular denture stomatitis. Cultures on agar models of the upper denture and the palate and direct microscopic examination of denture and tissue smears demonstrated that the largest quantities of fungi reside on the fitting surface of the denture. Eight different yeasts species were identified, of which *Candida albicans* and *Torulopsis glabrata* were the most frequent.

*Key-words:* Stomatitis; mycoses

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Both cultures and smears have demonstrated a significantly higher occurrence of *Candida* in patients with denture stomatitis than in controls (*Budtz-Jörgensen*, 1974). *C. albicans* is the most common as well as the most pathogenic of *Candida* species, but it is now increasingly appreciated that also other yeasts may be pathogenic in man. In denture stomatitis the information on yeasts other than *Candida* is sparse.

Denture stomatitis, angular cheilitis and glossitis are sometimes present together as features of one single disease. However, previous mycological investigations in this field have been concerned largely with organisms on or in the palatal mucosa. The aim of the present study was to obtain further knowledge of the frequency and distribution of various fungi involved in this disorder. It was then necessary to include the denture as *Candida* has been demonstrated in large quantities on its fitting side (*Lyon & Chick*, 1957; *Cawson*, 1965; *Davenport*, 1970; *Budtz-Jörgensen*, 1972). *Davenport* (1970) actually suggested that denture stomatitis is associated with a proliferation of *Candida* on the denture rather than on the palate. The present work also introduces a sampling technique by which the mycological medium is brought into direct contact with fungi residing on the fitting surface of the denture.

Received for publication, May 5, 1974.

## MATERIAL AND METHODS

### *1. Patients*

One hundred patients (65 women, 35 men, mean age 64, range 34—91) were selected according to the following criteria:

a) wearing full upper denture, and

b) having generalized simple or granular inflammation in the palate (*Budtz-Jörgensen & Bertram*, 1970).

*2. Fungal cultures*

A modification of the culture technique developed by *Bahn, Quillman & Kendrick* (1962) and adopted by *Budtz-Jörgensen & Bertram* (1970) was used. The medium was a modified Sabouraud dextrose agar (*Cruickshank*, 1972). It consisted of dextrose 4 %, mycological peptone (Oxoid L 40) 1 % and agar (Kobe I) 2 % and »Davis» agar (Davis Gelatine Ltd., New Zealand) 1.5 %, pH 5.4. Penicillin, 20 IE/ml, and streptomycin, 40 μg/ml, were added to suppress growth of bacteria. An impression of the palate was taken in Coe alginate. The impression and the fitting surface of the upper denture were poured with agar after having been boxed in wax. The agar was then allowed to set *in situ* for 1 hour at 4°C. After incubation for 72 hours at 37°C the cultures on the models were quantitated according to the following scale: no colonies, 1—9 colonies, 10—24 colonies, 25—100 colonies, >100 colonies, and confluent growth. Identification of fungi was performed according to *Lodder* (1970) at the Mycology Unit, National Institute of Public Health, Oslo.

*3. Smears*

Metal spatulas were used to scrape palate, tongue, rhagades, and the fitting surface of the upper denture. The material obtained was distributed evenly on standard microscope slides, fixed immediately and stained with PAS-hematoxylin. The smears were evaluated for the presence of blastospores, single hyphae, scattered mycelium, and large accumulations of mycelium.

## RESULTS

*1. Fungal cultures*

Fungi were grown on all the denture and palatal models of the 100 patients (Fig. 1), the largest quantities being found on the denture models (Fig. 2). Eight different yeasts species were identified: 5 *Candida*, 2 *Torulopsis* and 1 *Kluyveromyces* (Fig. 3). Seventy patients carried only one species. Two species were isolated in 27 participants, while 3 had three species. *C. albicans* was found in mixed culture in 22 of the patients (29 %) in whom it was

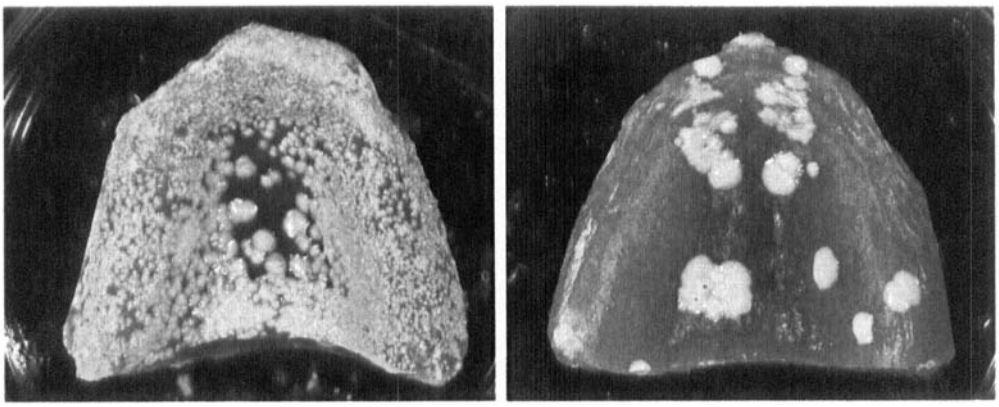

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Fig. 1. Yeasts grown at 37°C for 72 hours on agar models from a patient with denture stomatitis.
a) Denture model showing confluent growth.
b) Palatal model with a number of colonies in the range 25—100.

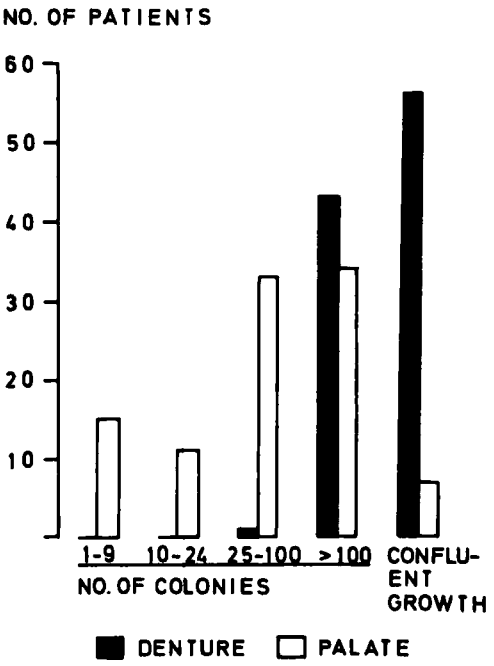


Fig. 2. Growth of fungi on agar models of the upper denture and palate in 100 patients with denture stomatitis.

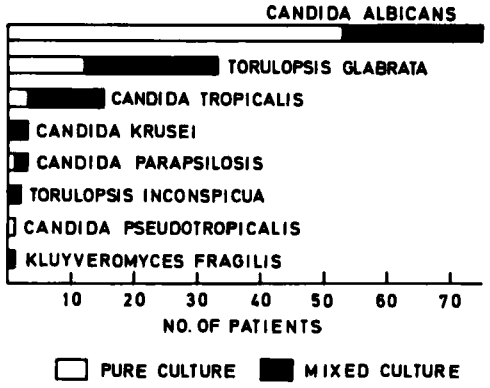


Fig. 3. Pure and mixed culture of yeasts species grown in 100 patients with denture stomatitis.

identified, *C. tropicalis* in 12 patients (80 %), and *T. glabrata* in 21 (64 %). Mixed cultures occurred more frequently on the denture models than on the palatal ones.

### *2. Smears*

Bastospores were observed in most scrapings. Hyphae in varying concentrations were present in all the denture smears, in 92 % of the palatal, and in 94 % of the tongue smears. The hyphal form was found in 90 % of the angular scrapings from the 30 patients with rhagades. The denture smears demonstrated the highest concentrations of yeast-like cells (Fig. 4). Whereas no palatal smear from any patient contained large accumulations of mycelium, these were seen in the denture scrapings from 72 patients (Fig. 5).

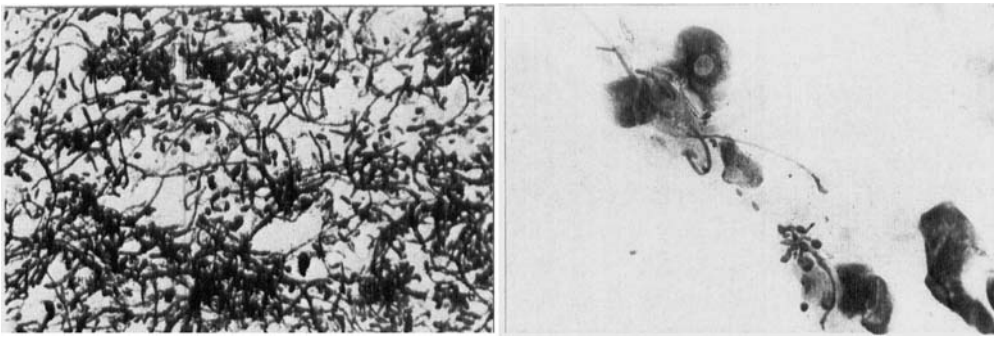

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Fig. 4. Smears from a patient with denture stomatitis. PAS-hematoxylin. ×235.
a) Denture smear showing blastospores and large accumulations of mycelium.
b) Palatal smear demonstrating blastospores and single hyphae.

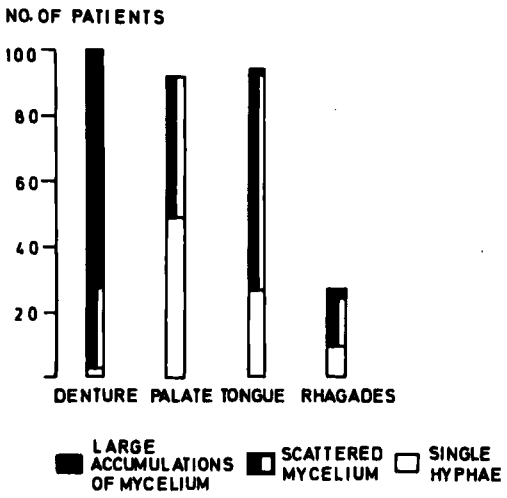


Fig. 5. Varying concentrations of hyphae in smears from different localizations in 100 patients with denture stomatitis.

## DISCUSSION

Positive yeast cultures were obtained from all the patients with generalized simple or granular denture stomatitis. These forms were chosen because they are claimed to be *Candida*-induced (*Budtz-Jörgensen & Bertram*, 1970). Hyphae, to which pathogenicity has been ascribed (*Kozinn & Taschdjian*, 1962; *Jepsen & Winther*, 1965), were found in most palatal and in all denture smears. These findings support the view of several workers that *Candida* is a significant etiologic factor in denture stomatitis (*Cahn*, 1936; *Lyon & Chick*, 1957; *Cawson*, 1963, 1965; *Lehner*, 1966; *Davenport*, 1970; *Budtz-Jörgensen*, 1974).

*C. albicians* was identified in most cases. Second to this in frequency was *T. glabrata*, which appeared as the only isolate in 12 patients. The genus *Torulopsis* is generally accepted as differing from the genus *Candida* in the absence of a well-formed pseudomycelium. It was therefore surprising to find that smears from patients in whom only *T. glabrata* had been isolated also contained hyphae. Although direct microscopic examination of smears is not as precise as cultural procedures (*Burnett & Scherp*, 1968), the most likely explanation is that *Candida* among the often innumerable colonies may occasionally have escaped identification. *Candida* was probably not erroneously diagnosed as *Torulopsis* as several methods had been used for classification, including fermentation and assimilation tests, spread of cultures on water, and examination of slide culture and of formation of sexual spores.

The agar models demonstrated that the largest quantities of fungi reside on the denture. It may be argued that the yield of yeasts on the denture and palatal models cannot be fairly compared as sampling by means of an impression implies a more indirect procedure. *Davenport* (1970), however, observed the same relationship using a replica culture technique with 2 layers of plastic foam sandwiched between denture and palate in 8 patients with denture stomatitis. Furthermore, the findings in denture and palatal smears confirmed the preponderance of yeast-like fungi on the prosthesis.

Cultures and smears further showed that the oral cavity may be a considerable yeast reservoir in patients with denture stomatitis. This disorder should therefore be given prompt and specific therapy, especially in debilitated patients risking spread of infection to adjacent tissues such as the pharynx, larynx and the lung. The treatment should then be directed against yeasts on the denture as well as against those on the oral mucosa.

*Acknowledgements.* I am indebted to Dr. Signy Reiersöl and M. S. Otto Solberg and their staffs for identification of fungi and for providing the mycological medium.

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