An Epidemiological Study on Candida Albicans in the Oral Cavity

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AN EPIDEMIOLOGICAL STUDY ON CANDIDA ALBICANS IN THE ORAL CAVITY

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Abstract. Candida albicans is found to occur in the oral cavity of individuals, whether or not they have oral disease. In our survey, 79 subjects were grouped according to oral rinse colony counts and clinical examinations as being noncarriers of C. albicans, non-diseased carriers of C. albicans, or diseased carriers of C. albicans. Answers to a number of questions on medical history, dietary practices and oral hygiene were recorded. Data obtained were tested by the Chi Square test, and 2 categories showed significant differences between noncarriers of C. albicans, non-diseased carriers of C. albicans, and diseased carriers of C. albicans. More individuals in the noncarrier and diseased carrier groups were regular alcoholic beverage drinkers; and more individuals in the non-diseased carrier of C. albicans and diseased carrier of C. albicans groups were hormone users.

There have been many epidemiological studies done on Candida albicans. This organism occurs in individuals with extensive caries and infected root canals, angular cheilosis (Schmitt 1971), denture stomatitis (Williamson 1972), poor denture cleanliness and those wearing dentures at night. Individuals with malignant diseases (Quie and Children 1971), endocrinopathies (Castells et al 1971) thyroid abnormalities, iron-deficiency anemia, and diabetes (Drake and Maibach 1973) have been shown to have frequent candidiasis. Humans or animals receiving steroid hormones (Hurley et al 1975, Mankowski 1954, Knight 1975, and Portnoy et al 1971, Apisarntharnax et al 1974), broad spectrum antibiotics (Portnoy 1971), and having nutritional deficiencies (Hurley 1967) have shown increased incidence of C. albicans.

Candida albicans is an opportunistic dimorphic fungus and occurs as a commensal or a parasite on the skin and mucous membranes of the human body. Host changes, rather than parasite changes, cause this alteration from commensalism to parasitism because C. albicans has been shown to occur in many unhealthy individuals (Drake and Maibach 1973). Therefore, the possibility of correlation of decrease in resistance, or other factors, with oral candidiasis was investigated.

MATERIALS AND METHODS

Oral Rinse Colony Counts. Each subject was given sterile distilled water with which to perform a deep gargle and oral rinse. The rinse was expectorated into a sterile container and plated on petri dishes containing Pagano-Levin Agar (Difco Labs). After 3 days incubation at room temperature, the number of colony forming units (CFUs) per ml of C. albicans was determined.

Epidemiological Study. Ninety-two subjects (aged 16-80; 45 males and 47 females; 10 Blacks, 1 Indian, and 81 Caucasians) were selected from the Ohio State University Dental Clinic and were classified as: noncarrier of C. albicans (NC), 33 subjects; non-diseased carrier of C. albicans (NDC), 29 subjects; diseased carrier of C. albicans (DC), 17 subjects; carrier of Candida sp. not albicans, 5 subjects; and diseased noncarrier (DNC), 8 subjects. Carrier is defined in this study as any individual harboring C. albicans whether showing oral disease or not. The noncarrier of C. albicans, non-diseased carrier of C. albicans, and diseased carrier of C. albicans groups were the largest groups obtained, and only these subjects were compared in the epidemiological survey. In addition to

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the standard medical-dental history form completed by all dental clinic patients, our subjects were asked to complete 2 additional questionnaires. The questionnaires used are on file at the Ohio State University, College of Dentistry, Division of Oral Diagnosis.

RESULTS AND DISCUSSION

Two out of 38 categories showed statistical significance between groups: hormone users and regular drinkers of alcoholic beverages (table 1). Percent of individuals using hormones (estrogens, birth control pills, or thyroid hormones) was significantly less in the noncarrier of \textit{C. albicans} group when compared with the diseased carrier group \((P<0.02)\) (fig. 1). Percent of individuals drinking alcoholic beverages regularly was significantly less in the non-diseased carrier of \textit{C. albicans} group when compared with the diseased carrier group \((P<0.01)\), and the non-carrier of \textit{C. albicans} group \((P<0.05)\) (fig. 2).

More individuals who were hormone users existed in the non-diseased carrier group and the diseased carrier group than in the noncarrier group. One possible reason for this may be that hormones may predispose to lowering of overall body resistance to \textit{C. albicans} due to alteration of flora of the respiratory and alimentary tracts. Another reason could be that

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|}
\hline
\textbf{Category} & \textbf{% NDC*} & \textbf{% NC**} & \textbf{% DC***} & \textbf{\(x^2\)} \\
\hline
Eat>2 meals/day & 43 & 33 & 56 & ns \\
Eat>2 servings protein/day & 93 & 85 & 81 & ns \\
Take>2 servings milk products/day & 67 & 48 & 44 & ns \\
Eat>4 servings vegetables & fruits/day & 50 & 48 & 31 & ns \\
Eat>4 servings bread & cereal/day & 57 & 45 & 38 & ns \\
Drink>4 cups coffee/day & 27 & 45 & 31 & ns \\
Drink>4 cups tea/day & 3 & 12 & 3 & ns \\
Drink>12 oz. carbonated beverages/day & 33 & 33 & 44 & ns \\
Drink>16 oz. beer/week & 50 & 27 & 31 & ns \\
Drink>1 glass wine/week & 17 & 36 & 19 & ns \\
Drink alcoholic beverages (1 or more/month) & 52 & 76 & 94 & s \\
Take vitamins daily & 23 & 12 & 12 & ns \\
Brush teeth daily & 77 & 94 & 75 & ns \\
Uses mouthwash regularly & 23 & 21 & 12 & ns \\
Wear dentures or partials & 13 & 6 & 12 & ns \\
Use Crest regularly & 53 & 58 & 12 & ns \\
Had blood transfusion & 10 & 8 & 25 & ns \\
Had tonsillectomy & 27 & 42 & 50 & ns \\
Had appendectomy & 6 & 12 & 12 & ns \\
Had hysterectomy & 8 & 5 & 33 & ns \\
Had thyroidectomy & 3 & 0 & 6 & ns \\
Had allergies & 53 & 33 & 31 & ns \\
Had sinus trouble & 27 & 15 & 19 & ns \\
Had thyroid problem & 3 & 6 & 12 & ns \\
Diabetic or diabetes in family & 40 & 33 & 25 & ns \\
Take tranquilizers regularly & 20 & 15 & 19 & ns \\
Take hormones\footnote{Hormones—any type (e.g., estrogen, thyroid hormones, birth control pills, etc.).} regularly & 30 & 15 & 44 & s \\
Chew tobacco daily & 3 & 3 & 12 & ns \\
Smokes pipe daily & 3 & 6 & 6 & ns \\
Smokes cigarettes daily & 37 & 39 & 56 & ns \\
Slept 8 or more hours & 47 & 30 & 25 & ns \\
Education beyond HS & 50 & 82 & 56 & ns \\
Age>35 & 67 & 52 & 31 & ns \\
Married & 71 & 53 & 78 & ns \\
Caucasian & 90 & 51 & 88 & ns \\
Black & 10 & 15 & 12 & ns \\
Females & 43 & 58 & 56 & ns \\
Males & 57 & 42 & 44 & ns \\
\hline
\end{tabular}
\caption{Epidemiological Investigation of Possible Causes of Increased Incidence of Candida albicans.}
\end{table}
immunologic IgA levels were increased in saliva when hormones were taken. This phenomenon has been shown to occur in vaginal secretions (Chipperfield and Evans 1975). Salivary IgA antibody to C. albicans has been found in raised titers in patients with oral candidiasis and is believed to limit the infection to the oral mucosa (Lehner et al. 1972).

More regular alcoholic beverage drinkers (consumers of one or more alcoholic beverages/month) existed in the diseased carrier group as opposed to the non-diseased carrier group of non carriers. Regular intake of alcohol could cause alterations in oral microbiota and decreased resistance of the gingival tissue. Ethanol has been shown to inhibit the normal inflammatory response by preventing leukocyte mobilization and chemotaxis (Wilson et al. 1964). This may in turn cause inhibition of phagocytosis of foreign antigens like C. albicans or allow for its overgrowth in the oral cavity. Alcohol may degrade gingival tissue permeability by increasing ionizing particles present in saliva, enhancing susceptibility of the gingival tissue to infection.

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LITERATURE CITED