

# AN EPIDEMIOLOGICAL STUDY ON *CANDIDA ALBICANS* IN THE ORAL CAVITY<sup>1</sup>

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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.

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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 Chilgren 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 non-carrier (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 *C. albicans* group when compared with the diseased carrier of *C. albicans* group

( $P < 0.02$ ) (fig. 1). Percent of individuals drinking alcoholic beverages regularly was significantly less in the non-diseased carrier of *C. albicans* group when compared with the diseased carrier group ( $P < 0.01$ ), and the non-carrier of *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 *C. albicans* due to alteration of flora of the respiratory and alimentary tracts. Another reason could be that

TABLE I  
*Epidemiological Investigation of Possible Causes of Increased Incidence of Candida albicans.*

Category	% NDC*	% NC**	% DC***	$\chi^2$
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† 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
Sleep 8 or more hours	47	30	25	ns
Education beyond HS	50	82	56	ns
Age > 35	67	52	31	ns
Married	71	83	78	ns
Caucasian	90	81	88	ns
Black	10	15	12	ns
Females	43	58	56	ns
Males	57	42	44	ns

\*NDC—Non-diseased carrier (29 subjects).

\*\*NC—Noncarrier (33 subjects).

\*\*\*DC—Diseased carrier (17 subjects).

†Hormones—any type (e.g., estrogen, thyroid hormones, birth control pills, etc.).

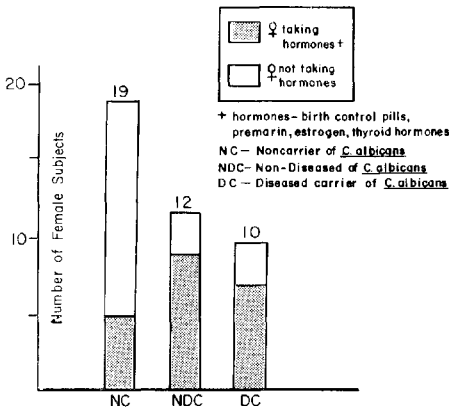


FIGURE 1. Frequency of Occurrence of Females Using Hormones vs Those Not Using Hormones.

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 altera-

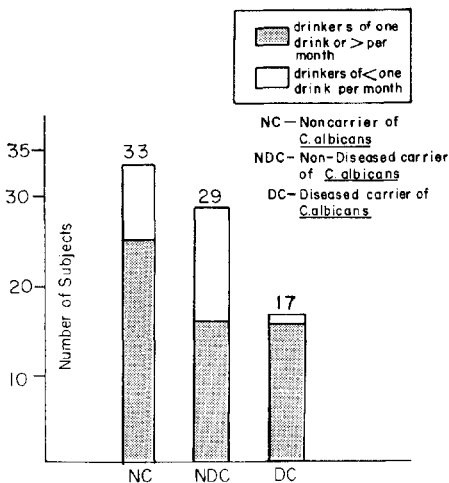


FIGURE 2. Frequency of Occurrence of Regular Alcohol Consumers vs Irregular Alcohol Consumers.

tions 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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