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Pathogenic characteristics of candida albicans isolated from oral cavities denture wearers and cancer patients wearing oral prostheses

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2016-10-14
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PATHOGENIC CHARACTERISTICS OF *Candida albicans* ISOLATED FROM ORAL CAVITIES OF DENTURE WEARERS AND CANCER PATIENTS WEARING ORAL PROSTHESES

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A dissertation submitted to the Faculty of Health Sciences, University of Witwatersrand in Fulfillment of the requirements for the degree of

Master of Science in Medicine

Johannesburg, 2016

DECLARATION

I, Junior Vivian Mothibe, declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature ……

June 2016

DEDICATION

To my lovely daughter, Tebogo and my Mom, Johannah.
Not forgetting my sisters, Cynthia & Hlekane as well as my two brothers, Kenneth & Lucas.

"God Bless you!"

POSTER PRESENTATIONS

1. "Pathogenic characteristics of *Candida albicans* isolated from saliva of Denture wearers and Cancer patients wearing oral prostheses". Faculty Research Day and Postgraduate Expo, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa, 2012.

2. "Virulence of salivary *Candida albicans* in patients wearing oral prostheses". Postgraduate Cross Faculty Symposium, University of the Witwatersrand, Johannesburg, South Africa, 2012.

3. "Virulence of salivary *Candida albicans* in patients wearing oral prostheses". XLIV Scientific Meeting of the South African Division of the IADR (International Association for Dental Research), Emperor's Palace, Johannesburg, South Africa, 2012.

ABSTRACT

Candida albicans is a normal commensal carried by humans in the oral cavity, gut and vagina. It can cause superficial oral candidiasis to systemic infection both in immunocompromised patients, denture wearers, cancer patients and otherwise healthy individuals. The ability to cause infection is due to its pathogenic characteristics or virulence factors. In the susceptible patients, the number and the virulence of this organism may act as a marker for the onset of disease process. This study investigated the virulence properties of *C. albicans* isolated from the oral cavities of healthy subjects and two vulnerable groups, denture wearers and cancer patients wearing oral prostheses.

Oral rinse samples were collected from 49 normal healthy subjects (control group), 35 patients wearing full denture and 19 cancer patients with oral prostheses (study groups). They were cultured on CHROMagar for the quantitative and qualitative analysis of *Candida*. Yeasts were identified using API 20C Aux system. Twenty strains of *C. albicans* isolated from the healthy subjects and denture wearers and 14 strains isolated from the cancer patients were selected and their virulence properties ie. germ tube formation, adherence, proteinase and phospholipase production were measured. The results of the study groups were compared using a Scheffe test for pairwise comparison and a chi square test.

The *Candida* carriage rate in the normal subjects, denture wearer and cancer patients with prostheses was 42.86%, 74.29% and 84.21% respectively. In all three groups *C. albicans* was the predominant species. Denture wearer (45.72%) and cancer patients with prostheses (47.37%)

carried several *Candida species*. The most frequently isolated non-*C. albicans* species were *C. glabrata*, *C. tropicalis* and *C. krusei*. In addition, these two groups carried significantly higher number ($p<0.01$) of *Candida* in their oral cavity than the controls. Overall germ tube formation, adherence to epithelial cells, and production of phospholipase and proteinase was significantly higher in *C. albicans* isolated from the two patient groups ($p<0.05$) than the controls. In addition, when the virulence properties of strains isolated from normal individuals were compared to isolates from denture wearers, the adherence abilities as well as phospholipase and proteinase production were significantly higher in the strains from denture wearers ($p=0.01$, $p<0.01$ and $p=0.03$ respectively). Many strains isolated from the denture wearers produced phospholipase and proteinase (85% and 80% respectively) compared to the strains from normal subjects (25% and 60% respectively). In addition, germ tube formation and adherence ability were significantly higher in the strains isolated from the cancer patients with prostheses ($p=0.05$ and $p<0.01$ respectively) compared to the controls.

In conclusion, the high number of *C. albicans* isolated from the two study groups and their increased adherence ability suggests a compromised innate immunity that might be responsible for the frequent development of candidiasis. During the commensal state the increased expression of virulence factors in the denture wearers suggest the readiness of these strains to cause infection in this group. Further research is required to investigate the other host and environmental factors that may influence the virulence of *C. albicans* in these groups.

ACKNOWLEDGEMENTS

Firstly, I would like to **Thank God,** The Almighty, for making this work possible.

I would also like to pass my Sincere Gratitude to:

1. Prof MM Coogan for suggesting this topic and supervising.
2. Prof M Patel for being my Supervisor, Mentor and Teacher
3. Dr Foluso Owotade, Prudence Mashilo and Shilpa Ramla for their help in this study.
4. Mrs Zandiswa Gulube for ordering all the consumables required for the project.
5. Staff members of National Health Laboratory Service (NHLS), participants from Sandringham Retirement Age Home and patients attending Wits Oral and Dental hospital for their cooperation and participation in this study.
6. My family and friends for their love and support.
7. National Health Laboratories Service for the financial assistance

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
BECs	Buccal Epithelial Cells
$CaCl_2$	Calcium chloride
CC	*Candida* count
CMJAH	Charlotte Maxeke Johannesburg Academic Hospital
dH_2O	Distilled water
DRS	Denture-Related Stomatitis
GTT	Germ Tube Test
GTF	Germ Tube Formation
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
Min	Minutes
NHLS	National Health Laboratories Services
NaCl	Sodium chloride
NCAC	Non- *Candida albicans Candida*
OPC	Oropharyngeal *Candida*
Pz	Phospholipase production
PMMA	Polymethyl methacrylate
Pr	Proteinase production

Rpm	Rotations per minute
SAB	Sabouraud dextrose agar
SAPs	Secreted aspartyl proteinases

LIST OF SYMBOLS

^{o}C	Degree Celsius
cfu/ml	colony forming units per milliliter
g	gram
µl	Microliter
ml	Milliliter
%	Percentage
-ve	Negative
+ve	Positive