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# Glucose induced germ tube formation in *Candida albicans*

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Miriama Sciascia

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## ABSTRACT

*Candida albicans*; is an opportunistic fungal pathogen that can cause a wide range of superficial and systemic infections. One of the many factors that have been implicated in *C. albicans* success as a pathogen is its ability to reversibly switch between a yeast form and a hyphal form (dimorphism). The dimorphic switch is triggered by a wide variety of stimuli which include temperature alone, pH alone, and serum. Serum is a potent inducer of germ tube formation and remains the medium of choice for rapid identification of *C. albicans* from other non-*albicans Candida* species. Recently it was shown that, in serum, glucose is the primary inducer of germ tubes in *C. albicans* strain A72 (Hudson and Farley, unpublished). In this study the ability of glucose, dialysed serum and serum filtrate to induce germ tube formation in a randomly chosen panel of clinical isolates of *C. albicans* was studied, and the role of two putative glucose receptors and a putative glucose transporter in the transduction of the glucose signal was investigated.

Dialysed serum (molecular weight, > 10 kDa) was less effective ( $P > 0.05$ , Students *t*-test) at inducing germ tube formation than serum. The addition of exogenous glucose alone to dialysed serum restored its ability to induce germ tube formation levels to those seen in serum in seven of the nine clinical isolates tested. Serum filtrate (molecular weight, < 10 kDa) induced germ tubes to levels indistinguishable from those seen in serum ( $P > 0.05$ , Students *t*-test) in all but one of the clinical isolates tested. Buffered glucose was also able to induce germ tubes in all the clinical isolates tested and the percentage germ tube formation was not statistically significantly different from that obtained with serum in ten out of sixteen clinical isolates tested. The addition of urea to these assays had no statistically significant effect on the induction of germ tube formation.

It was proposed that the induction of germ tube formation by glucose was mediated by a surface receptor and therefore the *C. albicans* genome was examined for genes encoding putative glucose receptors. Identified as possible receptors were orf19.1944 and orf19.5962. Orf19.3668, a putative glucose transporter, was also examined because its expression had been reported to increase during serum induced germ tube formation. Strains carrying homozygous deletions of each ORF were made and the

phenotypes of the mutants investigated. None of the ORFs were found to be involved in glucose or serum mediated germ tube formation. However, orf19.1944 was shown to play a role in germ tube formation under embedded conditions.

## ABBREVIATIONS

BLAST	Basic Local Alignment Search Tool
kDa	kilodaltons
OD	Optical density
ORF	Open Reading Frame
PCR	Polymerase Chain Reaction
SOSUI	“Japanese” means “Being Hydrophobic” Transmembrane Prediction
TMHMM	Transmembrane Hidden Markov Model
WT	Wild Type

# TABLE OF CONTENTS

ABSTRACT	i
ABBREVIATIONS	ii
TABLE OF CONTENTS	iv
LIST OF FIGURES	viii
LIST OF TABLES	ix
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
<b>1.1 Epidemiology of <i>Candida albicans</i></b>	<b>1</b>
<b>1.2 Pathogenicity Factors</b>	<b>1</b>
1.2.1 Adherence to host tissues	1
1.2.2 Secreted hydrolases	3
1.2.3 Morphological variation	4
<b>1.3 Molecular biology of germ tube formation</b>	<b>5</b>
1.3.1 Cell cycle regulation	5
1.3.2 Site selection	5
1.3.3 Physiological regulation	7
<b>1.4 Biochemistry of germ tube formation</b>	<b>8</b>
1.4.1 Activators of germ tube formation	9
1.4.1.1 The Cph1-mediated mitogen activated protein kinase (MAPK) pathway	9
1.4.1.2 Tec1-mediated pathways	13
1.4.1.3 The cAMP protein kinase (cAMP/PKA) pathway	13
1.4.1.4 The Rim101 pH response pathway	15
1.4.1.5 The Cph2 pathway	16
1.4.2 Repressors of germ tube formation	16
1.4.2.1 The Tup1-mediated pathway	16
1.4.2.2 The Rbf1-mediated pathway	17
<b>1.5 Inducers and repressors of germ tube formation</b>	<b>17</b>
<b>1.6 Aims of this study</b>	<b>18</b>

<b>CHAPTER TWO: MATERIALS AND METHODS</b>	<b>19</b>
<b>2.1 Yeast strains</b>	<b>19</b>
<b>2.2 Media and buffers</b>	<b>19</b>
2.2.1 Media	19
2.2.2 Buffers and solutions	24
<b>2.3 Bacteriological methods</b>	<b>25</b>
2.3.1 Culture conditions	25
2.3.2 Storage of strains	25
2.3.3 Determination of <i>C. albicans</i> cell numbers	25
<b>2.4 <i>C. albicans</i> germ tube induction assay</b>	<b>26</b>
2.4.1 Liquid assays	26
2.4.2 Solid assays	26
<b>2.5 DNA manipulation</b>	<b>27</b>
2.5.1 Purification of genomic DNA from yeast strains	27
2.5.2 Agarose gel electrophoresis of DNA	27
2.5.3 Quantitation of DNA	28
<b>2.6 PCR amplification of DNA</b>	<b>28</b>
2.6.1 Oligonucleotide primer design	28
2.6.2 PCR amplification of DNA targets	33
2.6.3 Purification of PCR products	33
2.6.4 Sequencing of PCR products	33
2.6.5 Preparation of PCR products for use in transformation	34
<b>2.7 Disruption of target ORFs</b>	<b>34</b>
2.7.1 Transformation of <i>C. albicans</i> strain BWP17	34
2.7.2 Screening of transformants	35
<b>2.8 Characterisation of target ORFs <i>in silico</i></b>	<b>35</b>
2.8.1 BLAST, sequence alignment and sequence conversion programs	35
2.8.2 Use of motif search engines	36
<b>CHAPTER THREE: RESULTS</b>	<b>37</b>
<b>3.1 Germ tube induction in clinical isolates of <i>C. albicans</i></b>	<b>37</b>
3.1.1 Germ tube formation in dialysed serum	37
3.1.2 Germ tube formation in serum filtrate	38
3.1.3 Inductions of germ tube formation by glucose	39

3.1.4	Induction of germ tube formation by urea	41
<b>3.2</b>	<b>Characterisation of orf19.1944</b>	<b>43</b>
3.2.1	<i>in silico</i> characterisation of orf19.1944	43
3.2.2	Preparation of DNA for targeted disruption of orf19.1944	46
3.2.3	Identification of orf19.1944 deletion strains	47
3.2.4	Identification of homozygous orf19.1944 deletions	47
3.2.5	Phenotypic characterisation of the orf19.1944 homozygous deletion strains Dgt1a and Dgt1b	50
<b>3.3</b>	<b>Characterisation of orf19.5962</b>	<b>55</b>
3.3.1	<i>in silico</i> characterisation of orf19.5962	55
3.3.2	Preparation of DNA for targeted disruption of orf19.5962	58
3.3.3	Identification of orf19.5962 deletion strains	58
3.3.4	Identification of homozygous orf19.5962 deletions	60
3.3.5	Phenotypic characterisation of the orf19.5962 homozygous deletion strains Dwa1a and Dwa1b	62
<b>3.4</b>	<b>Characterisation of orf19.3668</b>	<b>66</b>
3.4.1	<i>in silico</i> characterisation of orf19.3668	66
3.4.2	Preparation of DNA for targeted disruption of orf19.3668	69
3.4.3	Identification of orf19.3668 deletion strains	69
3.4.4	Identification of homozygous deletions derived from strain Bgr1a	71
3.4.5	Phenotypic characterisation of homozygous deletion strains Dgr1a and Dgr1b	73
 <b>CHAPTER FOUR: DISCUSSION</b>		 <b>76</b>
 <b>CHAPTER SIX: REFERENCES</b>		 <b>79</b>
 <b>APPENDIX</b>		 <b>87</b>
 <b>APPENDIX 1: DATA FOR PLOTTING STANDARD CURVES</b>		 <b>87</b>
 <b>APPENDIX 2: ORF <i>IN SILICO</i> CHARACTERISATION</b>		 <b>88</b>
 <b>APPENDIX 3: MAP OF PLASMID pBME101</b>		 <b>89</b>

<b>APPENDIX 4: PCR STRATEGIES</b>	<b>90</b>
<b>APPENDIX 5: DNA FOR TARGETED DISRUPTION OF ORFs</b>	<b>92</b>
<b>APPENDIX 6: GENETIC PROPERTIES OF THE <i>UAU</i> CASSETTE</b>	<b>93</b>

## LIST OF FIGURES

Figure 1	The cell cycle of <i>Candida albicans</i>	6
Figure 2	Biochemical pathways regulating germ tube formation in <i>Candida albicans</i>	10
Figure 3	Global alignment of orf19.1944 against Gpr1p	45
Figure 4	Screen for heterozygous deletions of orf19.1944	48
Figure 5	Sequence of the region flanking the 3'-end of the deleted orf19.1944 in the heterozygous deletion mutant Bgt1b	49
Figure 6	PCR detection homozygous deletion strains Dgt1c and Dgt1d	52
Figure 7	Homozygous orf19.1944 deletion strains can not form filaments on embedded agar	54
Figure 8	Global alignment of orf19.5962 against Snf3p	57
Figure 9	Screen for heterozygous deletions of orf19.5962	59
Figure 10	Sequence of the region flanking the 3'-end of the deleted orf19.5962 in the heterozygous deletion mutant Bwa1b	61
Figure 11	PCR detection homozygous deletion strains Dwa1a and Dwa1b	64
Figure 12	Global alignment of orf19.3668 against <i>HXT11</i>	68
Figure 13	Screen for heterozygous deletions of orf19.3668	70
Figure 14	Sequence of the region flanking the 3'-end of the deletion in the heterozygous deletion mutant Bgr1a	72
Figure 15	PCR detection homozygous deletion strains Dgr1a and Dgr1b	74

## LIST OF TABLES

Table 1	Yeast strains used for analysis of germ tube formation	20
Table 2	Yeast strains used for genetic analysis	21
Table 3	orf19.1944 oligonucleotide primers used in this study	29
Table 4	orf19.3668 oligonucleotide primers used in this study	30
Table 5	orf19.5962 oligonucleotide primers used in this study	31
Table 6	Common oligonucleotide primers used in this study	32
Table 7	Germ tube induction by dialysed serum	38
Table 8	Germ tube induction by serum filtrate	39
Table 9	Germ tube induction by glucose	40
Table 10	Germ tube induction by urea	41
Table 11	Disruption of orf19.1944 did not abolish germ tube formation in <i>C. albicans</i>	53
Table 12	Disruption of orf19.5962 did not abolish germ tube formation in <i>C. albicans</i>	65
Table 13	Disruption of orf19.3668 did not abolish germ tube formation in <i>C. albicans</i>	75