Glucose induced germ tube formation in
Candida albicans

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Masters of Science degree in Microbiology

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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it was shown that, in serum, glucose is the primary inducer of germ tubes in C. albicans strain A72 (Hudson and Farley, unpublished).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

<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>BLAST</td>
<td>Basic Local Alignment Search Tool</td>
</tr>
<tr>
<td>kDa</td>
<td>kilodaltons</td>
</tr>
<tr>
<td>OD</td>
<td>Optical density</td>
</tr>
<tr>
<td>ORF</td>
<td>Open Reading Frame</td>
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<tr>
<td>PCR</td>
<td>Polymerase Chain Reaction</td>
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<tr>
<td>SOSUI</td>
<td>&quot;Japanese&quot; means &quot;Being Hydrophobic&quot; Transmembrane Prediction</td>
</tr>
<tr>
<td>TMHMM</td>
<td>Transmembrane Hidden Markov Model</td>
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<td>WT</td>
<td>Wild Type</td>
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