



**UNIVERSITI PUTRA MALAYSIA**

**FUNCTIONAL CHARACTERIZATION OF YIRO10W (DSN1) AND  
YOR228C GENES IN SACCHAROMYCES CEREVISIAE**

**YIAP BEOW CHIN.**

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GENES IN *Saccharomyces cerevisiae*.

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By

YIAP BEOW CHIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra  
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Philosophy.

December 2004



To my parents, wife, son and daughter.



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in  
fulfilment of the requirement for the degree of Doctor of Philosophy

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AND *YOR228C* GENES IN *Saccharomyces cerevisiae*.**

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**December 2004**

**Chairman: Associate Professor Raha Abdul Rahim, Ph.D.**

**Faculty: Food Science and Biotechnology**

The aim of this project was to functionally decipher two novel genes of *Saccharomyces cerevisiae* (*YOR228C* and *YIR010W*). Four levels of study were undertaken to achieve the aims of this study including bioinformatics data mining and prediction, gene deletion study, phenotypic analysis and protein profiling. Sequence analysis of *YOR228C* predicted the expression of a 34 kDa transmembrane protein of low abundance with the potential of forming a homodimer. It could be a stress-responsive gene that also regulates cell growth in yeast but it was not an essential component of the cell. On the other hand, *Yir010wp* has a size of 66 kDa and would be a heterodimer in a complex. This low abundant protein may be related to cell division cycle as it was found to be incorporated within the yeast spindle pole body. The necessity for its exact stoichiometry was a sign of gene dosage sensitivity as demonstrated by the reduction in heterologous fitness. Deletion of a single copy of *YIR010W* caused chromosomal segregation error leading to aneuploidy. Furthermore, double knockout of the gene from the genome was

lethal, implying its essentiality to the yeast cell. As a whole, this study has successfully elucidated the general functions of the two genes under investigation, namely the relationship between *YOR228C* to growth/stress-response and the link between *YIR010W* to the cell division cycle.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PENCIRIAN FUNGSI GEN-GEN *YIR010W (DSN1)* DAN *YOR228C* DALAM  
*Saccharomyces cerevisiae*.**

Oleh

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**DISEMBER 2004**

**Pengerusi: Profesor Madya Raha Abdul Rahim, Ph.D.**

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Tujuan projek ini adalah untuk mengetahui fungsi dua gen yis *Saccharomyces cerevisiae* yang baru iaitu *YOR228C* dan *YIR010W*. Empat tahap penyelidikan telah dijalankan untuk mencapai matlamat projek ini, termasuk pencarian data dan ramalan menggunakan bioinformatik, penyelidikan pemadaman gen, analisis fenotip dan pemprofilan protein. Analisis jujukan *YOR228C* diramalkan untuk menghasilkan satu protein transmembran bersaiz 34 kDa dan mempunyai jumlah yang sedikit serta berpotensi menjadi homodimer. Ia berkemungkinan adalah suatu gen yang bertindakbalas terhadap tekanan dan juga regulasi pertumbuhan sel yis, tetapi ia adalah komponen yang tidak penting untuk sel. Sebaliknya, *Yir010wp* mempunyai saiz 66 kDa dan boleh menjadi heterodimer dalam suatu kompleks. Protein berjumlah kecil ini sememangnya berkaitan dengan proses penduaan sel apabila ia didapati melekat kepada badan kutub spindal (spindle pole body) yis. Keperluannya dalam stoikiometri yang betul merupakan suatu tanda kepekaan terhadap dos gen sebagaimana ditunjukkan oleh kekurangan

kecergasan heterologus. Permadaman satu gen *YIR010W* menyebabkan kesilapan dalam pembahagian kromosom dan seterusnya menghasilkan aneuploidi. Tambahan pula, pemadaman kedua-dua gen tersebut boleh membinasakan sel yis; menunjukkan kepentingannya terhadap sel tersebut. Secara keseluruhannya, projek ini telah berjaya menerangkan secara ringkas fungsi kedua-dua gen yang dikaji, di mana *YOR228C* merupakan gen yang berkaitan dengan tindakbalas terhadap tekanan dan pertumbuhan manakala *YIR010W* berhubungan dengan proses penduaan sel.

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