

## ORIGINAL ARTICLE

**Identification of immunogenic proteins of *Candida parapsilosis* by serological proteome analysis**P.Y. Lee<sup>1</sup>, L.H. Gam<sup>2</sup>, V.C. Yong<sup>3</sup>, R. Rosli<sup>4</sup>, K.P. Ng<sup>5</sup> and P.P. Chong<sup>1,6</sup>

1 Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

2 School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia

3 School of Biosciences, Taylor's University (Lakeside Campus), Subang Jaya, Selangor, Malaysia

4 Department of Obstetrics and Gynaecology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

5 Department of Medical Microbiology, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia

6 Department of Microbiology, Translational Infectious Diseases Program, Centre for Translational Medicine, National University of Singapore, Singapore

**Keywords**

antigen, *Candida parapsilosis*, cell wall proteins, immunoproteomic.

**Correspondence**

Pei Pei Chong, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.  
E-mail: cpp@upm.edu.my

2013/2230: received 7 November 2013, revised 24 November 2013 and accepted 27 November 2013

doi:10.1111/jam.12408

**Abstract**

**Aims:** Systemic candidiasis is the leading fungal bloodstream infection, and its incidence has been on the rise. Recently, *Candida parapsilosis* has emerged as an increasingly prevalent fungal pathogen, but little is known about its antigenic profile. Hence, the current work was performed to discover immunogenic proteins of *C. parapsilosis* using serological proteome analysis.

**Methods and Results:** Cell wall proteins extracted from *C. parapsilosis* were resolved by two-dimensional electrophoresis followed by immunoblotting using antisera from experimentally infected mice. Mass spectrometry analysis of the 32 immunoreactive protein spots resulted in the identification of 12 distinct proteins. Among them, 11 proteins were known antigens of *Candida albicans*, whereas Idh2p was identified for the first time as an immunogenic protein of *Candida* species. Recombinant Idh2p was expressed in *Escherichia coli*, and its antigenicity was verified by immunoblot analysis.

**Conclusions:** An immunoproteomic approach was successfully applied to identify immunogenic proteins of *C. parapsilosis*, with Idh2p as a novel candidate antigen. The identified antigens may serve as potential biomarkers for development of diagnostic assay and/or vaccine for *C. parapsilosis*.

**Significance and Impact of the Study:** This work represents the first immunoproteomic analysis of *C. parapsilosis*, which provides new insights into host–pathogen interactions and pathogenesis of *C. parapsilosis*. The immunogenic proteins could be studied as biomarker candidates for *C. parapsilosis*.

**Introduction**

*Candida* species is a member of normal human microflora that exists in healthy individuals without causing any disease. However, it is also an opportunistic fungal pathogen that can cause candidiasis, affecting mainly people with debilitated immune system. *Candida* spp. is the major human fungal pathogen and was ranked as the fourth organism causing nosocomial bloodstream infections in the United States (Wisplinghoff *et al.* 2004). Among all types of candidiasis, the systemic form is of foremost clinical importance as it is associated with high

mortality and morbidity rate (Ortega *et al.* 2011). The incidence of systemic candidiasis has increased markedly over the years with *Candida albicans* as the predominant species isolated. However, in recent years, there is a changing trend in the epidemiology of *Candida* infections worldwide (Pfaller and Diekema 2007). Of important note is the significant increase in the prevalence of *Candida parapsilosis* in several geographical locations across the globe (Forrest *et al.* 2008; Miceli *et al.* 2011). Likewise, the shift towards *C. parapsilosis* was also observed in Malaysia (Ng *et al.* 2001; Rahman *et al.* 2008; Siti Umairah *et al.* 2012).