Systematics of the genus *Candida*; implications for understanding clinical presentation, mixed infection and antifungal treatment and the influence on strain maintenance and replacement during oral candidiasis in HIV-infected individuals

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Abstract

Oropharyngeal candidiasis is an opportunistic infection associated with immunocompromisation. Despite recent reports of a decline in the prevalence of this oral infection with HAART (highly-active antiretroviral therapy) treatment of HIV infection, it continues to be a significant cause of morbidity in this patient group. There have been numerous studies investigating the epidemiology of *Candida* infection and the taxonomic structure of the genus. This study assesses the systematics (ie., taxonomy, phylogeny and epidemiology) of thirteen *Candida* species of medical importance using type and reference strains plus isolates obtained from 101 HIV-positive individuals and 20 HIV-negative asymptomatic carriers. The techniques used were allozyme electrophoresis at 15-20 independent enzyme loci and sequence comparisons within the 16S, ITS1, ITS2 and 5.8S rRNA regions. The results of this study have confirmed the existence of a number of distinct species but, as previous studies have also reported, questions the validity of the genus *Candida*. This conclusion is made on the basis of the extent of genetic variation observed between *Candida* species and the close relationships between some *Candida* species and species of other fungal genera. Of epidemiological significance, the study supports the theory that oropharyngeal candidiasis is opportunistic with isolates from HIV-positive patients being genetically interspersed with isolates from asymptomatic carriers. Additionally, the strain infecting a patient changes as frequently as weekly, many patients are co-colonised by multiple strains and different strains can be isolated from multiple concurrent lesions. Whilst the results of this study have not resolved many of the epidemiological and taxonomic issues still under debate, they have provided a comprehensive framework that can be used to build our understanding of the complex interactions between strains of *Candida*, antifungal therapy, HIV treatment, the immune response and the oral cavity.