
C-1**Roles of Glutathione Reductase and γ -Glutamylcysteine Synthetase
in *Candida albicans***

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We have cloned the *CGR1* gene encoding glutathione reductase (GR) which catalyzes the reduction of oxidized glutathione (GSSG) to reduced glutathione (GSH) from *Candida albicans*. The *cgr1/cgr1* mutants were not viable when CaMAL2 promoter repressed the *CGR1* expression. The growth of the mutants could be partially overcome by thiol compounds such as GSH, dithiothreitol, cysteine, N-acetylcysteine and GSSG. Interestingly, *C. albicans* with *CGR1* overexpressed showed defective hyphal growth on solid medium and attenuated virulence. We have also cloned the *GCS1* gene encoding γ -glutamylcysteine synthetase which catalyzes the first step of glutathione biosynthesis. The *gcs1/gcs1* mutants were nonviable in minimal defined medium. The growth of the mutants could be resumed by supplementing with GSH, GSSG and γ -glutamylcysteine in the medium. The mutants had increased intracellular D-erythroascorbic acid level up to 2.25-fold when transferred to GSH-free medium. When the mutants were depleted of GSH, they showed typical markers of apoptosis. In conclusion, these results suggest that glutathione is an essential metabolite, and involved in hyphal growth, virulence and apoptosis in *C. albicans*.