Identification of Metabolic Pathways Influenced by the G-protein Coupled Receptors gprB and gprD in Aspergillus nidulans

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Heterotrimeric G-protein-mediated signalling pathways play a pivotal role in transmembrane signalling in eukaryotes. Our main aim was to identify signalling pathways regulated by A. nidulans GprB and GprD G-protein coupled receptors. When these two null mutants were compared to the wild-type strain, the ΔgprB mutant shows an increased PKA activity in both glucose 1 % and during starvation. In contrast, the ΔgprD has a much lower PKA activity not only in in both glucose 1 % but also upon starvation. Transcriptomics and a metabolomics approach using 1H NMR of two single null mutants grown on glucose were performed. We have seen at least the expression of 11 of secondary metabolism gene clusters modulated when the ΔgprB and ΔgprD mutant strains are grown in 1 % glucose. Several members of the sterigmatocystin-aflatoxin gene cluster presented downregulation in both mutant strains. Interestingly, most of the genes of the NR-PKS monodictyphenone biosynthesis cluster have increased mRNA accumulation in ΔgprB, while in the ΔgprD they have decreased mRNA accumulation. The Principal Component Analysis in metabolomics demonstrated that there was a significant metabolite shift in the ΔgprD strain grown on glucose. A considerable number of amino acids were detected in our experimental conditions, and the amount of amino acids was higher in the ΔgprD, compared to the wild-type and ΔgprB strains. The results obtained revealed the differential expression of a variety of genes related mainly to secondary metabolism, sexual development, stress signaling and amino acid metabolism. It appears that the absence of these GPCRs triggers stress responses at genetic level. The data suggest an intimate relationship among different G-protein coupled receptors, fine-tune regulation of secondary and amino acid metabolisms, and fungal development.

Key words: Aspergillus nidulans, GprB and GprD

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