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## Pheromone-independent sexual reproduction in a ubiquitous human fungal pathogen

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Bacterial quorum sensing (QS) is a well-characterized communication system that governs a large variety of collective behaviors. By comparison, QS regulation in eukaryotic microbes remains poorly understood, especially its functional role in eukaryote-specific behaviors, such as sexual reproduction. *Cryptococcus neoformans* is a prevalent fungal pathogen that has two defined sexual cycles (bisexual and unisexual) and is a model organism for studying sexual reproduction. Here, we show that the QS peptide Qsp1 serves as an important signaling molecule for both forms of sexual reproduction. Qsp1 orchestrates various differentiation and molecular processes, including meiosis, the hallmark of sexual reproduction. It activates bisexual mating, at least in part through the control of pheromone, a signal necessary for bisexual activation. Notably, Qsp1 also plays a major role in the intercellular regulation of unisexual initiation and coordination, in which pheromone is not strictly required. We identified the atypical zinc finger regulator Cqs2 as an important component of the Qsp1 signaling during both bisexual and unisexual reproduction. The absence of Cqs2 eliminates the Qsp1-stimulated mating response. Unveiling the regulon of Cqs2 through ChIP-seq identified the regulatory network responsible for QS-coordinated sexual development. We found that Cqs2 can directly orchestrate the expression of the regulators dominating the various stages during sexual reproduction, including meiosis and sexual structure (basidium) maturation that represent two concomitant pre-sporulation events. Cqs2 governs the regulatory coordination of meiosis and basidium maturation through the direct control of Pumilio-family regulator Pum1. We further demonstrated that the coordination of these two events is required for the formation of infectious spores likely as a key commitment mechanism. Together, these findings extend the range of behaviors governed by QS to sexual development and meiosis.