Poster Presentation

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SOD5 is the Prototype of a New Class of Cu-only Superoxide Dismutases

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Superoxide dismutases (SODs) are antioxidant enzymes that catalyze the dismutation of superoxide into molecular oxygen and hydrogen peroxide. Candida albicans is a polymorphic fungus that causes the majority of fungal infections in humans. In the immunocompetent population, colonization of C. albicans can result in acute infections of the mucosal surfaces both in the oral and genital cavities, however, immunocompromised individuals encounter life-threatening systemic infections. Several factors contribute to the pathogenesis of C. albicans including the expression of SOD5; a postulated copper-zinc SOD. SOD5 enables C. albicans to evade the immune response of the host, namely the oxidative burst. In the absence of SOD5, reactive oxygen species (ROS) accumulate and C. albicans exhibit a severe loss in viability. Our studies sought to examine the crystal structure of SOD5. The protein was overexpressed in E. coli and due to its insolubility; it was denatured, refolded, and further purified. Following protein purification, a sedimentation velocity experiment was performed and the data revealed that SOD5 is a monomeric protein in solution. The structure was then determined using single crystal X-ray diffraction. The structure of SOD5 confirms that it is a prototype of monomeric SODs possessing a copper-only active site and lacking a zinc binding site. In addition, this protein was devoid of the electrostatic loop that typically characterizes all SOD1s. The SOD5 copper site is solvent accessible, cupped in an electrostatic architecture that could serve in superoxide guidance. SOD5-like proteins are widespread among fungal pathogens and appear adapted for the metal and oxidative challenges at the host-pathogen interface.

Keywords: Candida albicans, SOD5, Superoxide dismutase