The Role of Yeast Urea Amidolyase in Patients with Suppressed Immune Systems

PDB: 4ISS


Format: Alpha carbon backbone

RP: Zcorp with plaster

Description:
According to Rice University, 70% of people are affected by the infectious fungus Candida albicans. The immune system uses T and B cells to stop pathogens. People with suppressed immune systems, such as transplant patients, and AIDs or cancer patients, lack functional T and B cells, and rely on macrophages to destroy Candida. Candida can kill and exit macrophages due to an enzyme: urea amidolyase (UAL). While in the macrophage, an environmental change causes Candida to morphologically switch from a sphere to a structure with hyphae. UAL converts urea to ammonia (NH₃) and CO₂, creating an environment for hyphae to form, bursting the macrophage. The Greenfield SMART (Students Modeling A Research Topic) Team used 3D printing technology to model UAL. The biotin carboxylase (BC) domain uses energy from ATP cleavage to attach CO₂ to the swinging arm portion, or biotin carboxyl carrier protein (BCCP) domain. The BCCP domain swings across UAL, attaching CO₂ to urea forming allophanate in the carboxyl transferase (CT) domain. Allophanate moves to the allophanate hydrolase (AH) domain, hydrolyzing the allophanate into CO₂ and NH₃. Increases in CO₂ and NH₃ cause hyphae to form, destroying macrophages and allowing Candida to spread. Researchers could block UAL’s active sites to prevent Candida’s macrophage-killing shape change, preventing systemic candidiasis without damaging human cells.
Specific Model Information:

- The alpha carbon backbone of Chain A is highlighted in purple.
- The alpha carbon backbone of Chain B is highlighted in hot pink.
- Hydrogen bonds within the beta sheets are colored white.
- Structural supports to stabilize the molecule are colored beige.

[Link to SMART Team Program](http://cbm.msoe.edu/smartTeams/)

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