SMART Teams 2013-2014
Research and Design Phase

Cedarburg High School SMART Team

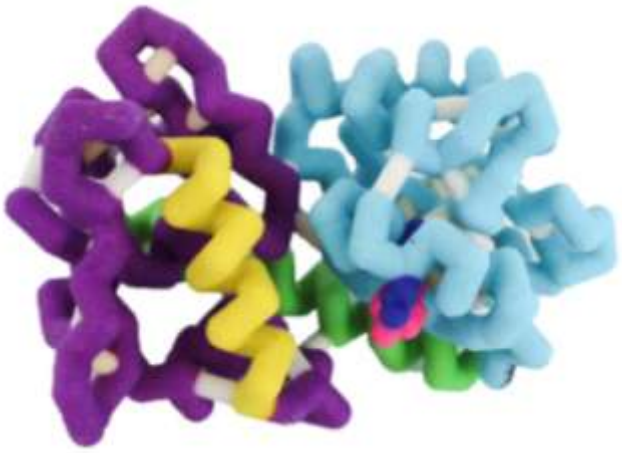
B. Allbee, N. Anderson, D. Blank, J. Bolgert, A. Bothe, N. Britt, A. Butt, S. Dyke, E. Geiser, T. Hammer, E. Janecek, I. Kalmer J. Lawniczak, M. Lesiecki, J. Levy, M. Marshall, N. Meaux, M. Ruzicka, J. Temmer, K. Tiffany, B. Vandenberg, J. Wankowski, E. Zeitlow

Teacher: Karen Tiffany
Mentor: Nicholas Silvaggi, Ph.D., University of Wisconsin-Milwaukee,
Chemistry and Biochemistry Department

Getting "Rit-R" Iron in the Cell:
The Role of RitR in Reducing Iron Transport into *Streptococcus pneumoniae*

PDB: Based on unpublished C128S

Primary Citation: Andrew F. Maule, Joshua J. Weiner, David P. Wright, Lanlan Han, Francis C. Peterson, Brian F. Volkman, Nicholas R. Silvaggi, and Andrew T. Ulijasz. Defining the Aspartate-Less Receiver (ALR) Domains: Structure and Activation of RitR from Streptococcus pneumoniae. 2014. Submitted to PNAS.



Format: Alpha carbon backbone

RP: Zcorp with plaster

Description:

According to the World Health Organization, pneumonia is the leading cause of death in children worldwide, and infection of lung tissue by *Streptococcus pneumonia* causes the bulk of bacterial pneumonia cases in children. The atypical response regulator, RitR (Repressor of iron transport Regulator), helps *S. pneumoniae* survive in the hostile oxidizing conditions in the lungs. RitR has two domains, a DNA-binding domain (DBD) and an aspartate-less receiver domain (REC). In its "inactive" form, these domains are docked (*i.e.*, close together) and the DBD is unable to bind DNA. In its "active" form, the domains are undocked; the DBD is freed from the REC. The "active" form dimerizes and can bind to DNA to turn off the iron transport genes. To study the changes that occur when RitR is activated, the Cedarburg High School SMART (Students Modeling A Research Topic) Team used 3D printing technology to model inactive RitR and a hypothetical active RitR dimer. RitR helps the bacterium survive in the oxygen-rich environment in lungs by stopping iron transport into the bacterial cell. If iron is transported into the cell, oxygen forms reactive oxygen species that damage and kill cells. *S. pneumonia* cells without RitR are unable to infect lung tissue, so RitR is a potential target for drug design.

Specific Model Information:

- The alpha carbon backbone of the receiver domain (1-106) is colored cyan.
- The alpha carbon backbone of the DNA binding domain (132-230) is colored purple.
- The linker helix (107-131) is highlighted in lime green.
- The interacting helix (194-208) is highlighted in yellow.
- Leu90 and Val93, displayed in ball and stick and colored blue, are the “gate” residues.
- Tyr100 is displayed in ball and stick and colored magenta.
- Cys128 (Ser) is displayed in ball and stick and colored orange.
- Structural supports and hydrogen bonds are colored white.

http://cbm.msoe.edu/smartTeams/

The SMART Team Program is supported by the National Center for Advancing Translational Sciences, National Institutes of Health, through Grant Number 8UL1TR000055. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.