

Audubon High School SMART Team

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NMDA Receptors

PDB: 4PE5

Primary Citation: Karakas, Erkan, and Hiro Furukawa. "Crystal structure of a heterotetrameric NMDA receptor ion channel." *Science* 344.6187 (2014): 992-997.

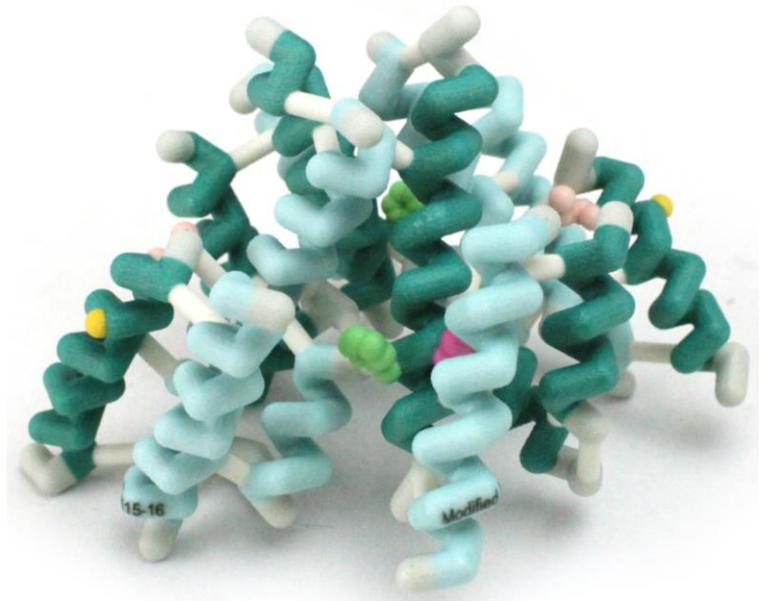
Format: Alpha carbon backbone

RP: Zcorp with plaster

Description:

According to the National Council on Alcoholism and Drug Dependence, 1 in every 12 adults suffers from alcohol abuse and alcoholism. Alcohol abuse is associated with impaired judgment and cognitive functions and can ultimately be lethal, killing almost 75,000 people a year. The N-methyl-D-aspartate receptor (NMDAR) protein is a major target of alcohol action in the brain.

The Audubon High School SMART (Students Modeling A Research Topic) Team has designed a model of NMDAR using 3D printing technology to investigate structure-function relationships. NMDARs, responsible for multiple cognitive functions, are composed of several domains including, the amino terminal domain, a ligand binding domain, a transmembrane domain, and an intracellular domain. NMDARs bind glutamate, a major excitatory transmitter, transporting signals from neuron to neuron through the synapse. Glutamate binds to NMDAR on the postsynaptic cell, the cell that receives a signal, which then opens the ion channel allowing sodium and calcium to enter and stimulate the cell. Alcohol passes through the blood brain barrier, a filtering mechanism of capillaries in the brain, and binds to specific amino acid side chains in the NMDAR. When alcohol is present, NMDAR's function is limited because the ion channel gate is restricted from opening. When alcohol binds to sites in the transmembrane domain, it blocks the entry of sodium and calcium into the neuron and hinders synaptic transmission via the NMDAR. Research has shown possibilities for multiple approaches to medically treat alcohol abuse and alcoholism. Understanding the structure-function relationship between NMDAR and alcohol, should help us learn how to better manage alcohol abuse and alcoholism.



Specific Model Information:

- Alpha helices in the GluN1 subunits are colored light blue.
- Alpha helices in the GluN2 subunits are colored teal.
- Alcohol sensitive amino acids displayed in spacefill.
 - Phenylalanine 637 is colored spring green
 - Phenylalanine 638 is colored purple
 - Methionine 824 is colored light pink
 - Glycine 826 is colored gold
- Structural supports are colored ivory.
- Non-motif sections of the backbone are colored light grey.

<http://cbm.msoe.edu/smartTeams/index.php>

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