



2016-2017 Research and Design Model

Divine Savior Holy Angels High School SMART Team

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The RNA Exosome: Gene Expression Terminator

PDB: 41FD

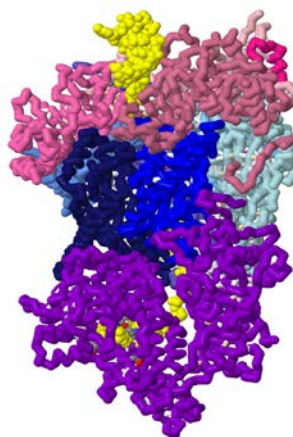
Primary Citation:

Makino, D.L., Baumgartner, M., Conti, E., Crystal structure of an RNA-bound 11-subunit eukaryotic exosome complex. (2013) *Nature* 495: 70-75

Format: Alpha carbon backbone

RP: Zcorp with plaster

Description: The RNA exosome is a multicomponent molecular machine with many functions, including the degradation of mRNA. RNA degradation is a natural process in prokaryotic and eukaryotic organisms and regulates protein abundance. In most organisms, RNA can be degraded in both directions (from 5' or 3' ends) and the exosome is an entity that degrades RNA from the 3' end. The minimal exosome is made up of eleven proteins that form three overall domains. The cap, or top of the structure, pulls in a single strand of RNA and feeds into a six-protein barrel shaped center portion, which directs the strand to the RNase domain at the bottom where the RNA is degraded from the 3'-to-5' direction. A cap protein, Rrp4, contains an active site consisting of Arg 110, Arg 123, Phe 177, and Asp 179 that unfolds RNA into single strands. The RNase active site on protein Rrp44 consists of Arg 847, Tyr 595, Asn 724, Gln 892, Gly 895, Glu 700 and Tyr 654 along with two magnesium ions and a water molecule which are needed to break down RNA into individual nucleotides. The Divine Savior Holy Angels SMART (Students Modeling A Research Topic) Team modeled the exosome using 3D printing technology. While the exosome is fundamentally important, exosome variants may also predispose people to cancers like multiple myeloma, as exosome mutations are recurrent in these patients. Thus, the understanding of how these mutations influence exosome function and may lead to treatments for these cancers.



Comment [BJ1]: Each word is capitalized.

Specific Model Information:

- Cap Proteins (4)
 - Protein G is hotpink.
 - Protein I is pink.
 - Protein H is palevioletred.
 - Protein K is fuchsia.
- Core Proteins (6)
 - Protein A is midnightblue.
 - Protein B is blue.
 - Protein C is slateblue.
 - Protein D is cornflowerblue.
 - Protein E is powderblue.
 - Protein F is lightskyblue.
- Nuclease Sight (1)
 - Protein J is darkviolet.
- RNA is yellow.
- Rrp4 highlighted amino acids in CPK
 - Arg 110, Arg 123, Phe 177, Asp 179
- Rrp44 highlighted amino acids in CPK
 - Arg 847, Tyr 595, Asn 724, Gln 892, Gly 895, Glu 700 and Tyr 654
- Hydrogen bonds are aliceblue.
- Struts are papayawhip

Comment [BJ2]: These two colors are still mixed up.

Comment [BJ3]: These two colors are still mixed up.

<http://cbm.msos.edu/smartTeams/smartTeamsLocal.php>