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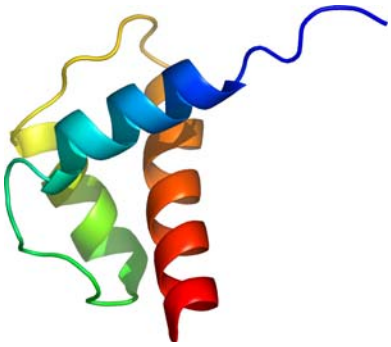
EMSL In Brief
Environmental Molecular Sciences Laboratory

Protein Research Goes to Extremes

Scientists uncover structure of extremophilic ribosomal protein with EMSL's NMRs

Like chocolate chips in a cookie, dozens of small proteins are scattered throughout the RNA of a ribosome, the protein factory essential to all forms of life; unlike the chocolate chips, the functions of many ribosomal proteins are not well understood. Recently, an international research team shed light on the ribosomal protein S17E from the archaeal thermophilic anaerobe *Methanobacterium thermoautotrophicum* by determining the protein's structure. This protein adopts a small three-helix bundle structure with a positively charged surface that may act as a robust scaffold for molecular recognition in the ribosome. The newly determined structure provides a template for modeling the homologous human ribosomal protein. Also, the proteins in this and other extremophilic microorganisms have potential applications as enzymatic catalysts in bioenergy production and bioremediation. The scientists conducted this research using data acquired on EMSL's nuclear magnetic resonance spectrometers.



Three-helix bundle of the S17E protein in M. thermoautotrophicum

Scientific impact: Understanding the relationship between the sequence and structure of S17E broadens our understanding of the function and evolution of ribosomes. Surprisingly, the protein in this archaeon is strikingly similar to a novel human phophopeptide-binding fold protein that lacks sequence similarity. This and other discoveries made with EMSL's state-of-the-art instruments contribute to the success of predicting biological functions from molecular and chemical data.

Societal impact: Elucidating the basis of the thermostability of proteins from *M. thermoautotrophicum* and other thermophiles may someday enable the design of enzymes for bioenergy and bioremediation. Because *M. thermoautotrophicum* and other microbial ribosomes are similar to the human ribosome, understanding the structures of their protein components provides insights into the workings of the human ribosome.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

Citation: Wu B, A Yee, Y Huang, TA Ramelot, JR Cort, A Semesi, JW Jung, W Lee, MA Kennedy, G Montelione, AM Edwards, and CH Arrowsmith. 2008. "The Solution Structure of Ribosomal Protein S17E from *Methanobacterium thermoautotrophicum*." *Protein Science* **17**(3):583-588.

Acknowledgments: The researchers are from the Ontario Cancer Institute, University of Toronto, Rutgers University, Pacific Northwest National Laboratory, Miami University, Washington State University, and Yonsei University, Korea. The authors are participants in the Northeast Structural Genomics Consortium. This research was supported by the National Institutes of Health Protein Structure Initiative, the Ontario Research and Development Challenge Fund, Genome Canada, the Canadian Institute of Health Research through the Canada Research Chairs program, the Korea Science and Engineering Foundation grant funded by the Ministry of Science and Technology, and Brain Korea 21 Program.