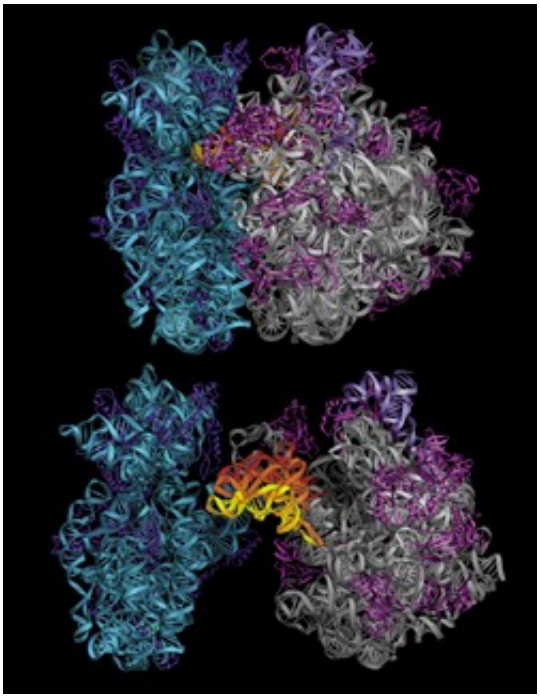
Scientists find gene sequences that stall protein synthesis

March 1 2013



(Phys.org)—Machines don't always run smoothly – phone calls drop, computers crash and cars stall.

A new Brigham Young University study shows the same kinds of problems happen to the molecular machinery within our cells.

Known as ribosomes, these machines crank out the proteins that do

nearly everything cells need to survive: Move things around, speed up chemical reactions to get energy from food, even make and copy DNA.

With all that ribosomes do right, it's only now coming to light how much can go wrong. As BYU biochemists report this month in the Proceedings of the National Academy of Sciences, these biological machines are just as prone to failure as man-made machines.

"Biologists tend to think of the ribosome as capable of making anything," said BYU professor and study author Allen Buskirk. "They think that ribosomes don't care what sequence you give them – that they just make whatever you tell them to make. And that's not true."

Even in a simple bacterial cell, there are thousands of different proteins, each made up of amino acids linked together end to end. Ribosomes have to build all these proteins accurately and quickly, using information copied off of DNA as messenger RNA to determine which amino acid goes where.

Buskirk and his students found a variety of amino acid sequences that cause ribosomes to move in fits and starts or completely stall. Some of it may be strategic – buying time for the protein to fold properly as it comes off the ribosome, or regulating the expression of nearby genes in response to changing conditions in the cell.

In other cases, however, it seems more like a bug in the system. Buskirk and his co-authors explain in the new study how cells recover from those setbacks with systems that alleviate stalling or rescue stalled ribosomes.

More information: www.pnas.org/content/early/201 … /1219536110.abstract

Provided by Brigham Young University