

# Cut, file, shred – a type of multi-tool pocketknife processes ribosomal RNA

December 4 2015

---

Researchers from the Heidelberg University Biochemistry Center (BZH) have discovered a complex of four proteins that, much like a multi-tool pocketknife, serves as a knife, a file and a pair of scissors in the manufacture of ribosomes. The complex helps eliminate the residual ribonucleic acid (RNA) that are produced during the manufacturing of the ribosome and must be removed to complete the process. The results of the research were published in the journal *Molecular Cell*.

Ribosomes are the cell's protein factories and must be continuously replenished for cell growth and division. "During biogenesis, the components are assembled, modified and reworked; their position accuracy is checked as well," explains Prof. Dr. Ed Hurt of the BZH, whose research team discovered the [protein complex](#). In addition to ribosomal protein components, ribosomes also consist of ribosomal RNA in which ribonucleotides are linked together similar to a chain. Three of the four chains found in the mature ribosome are initially created as a large continuous RNA molecule, from which the three mature RNA chains are excised. However, there are RNA pieces in between the mature RNA chains that need to be removed to obtain functional ribosomes. "The process is much like the formation of fingers in the embryo. To create a functional hand, the cells that make up the initially present 'webbing' between the fingers have to die," explains Prof. Hurt.

The four-protein complex discovered by the BZH researchers combines multiple functions. Lisa Gasse at Ed Hurt's laboratory found that a

subunit of the enzyme complex first slices into one of the excess areas like a fine knife, a molecular scalpel in a way. Next, one of the resulting RNA ends is activated so it can be gradually shredded until all the excess RNA is gone. According to the researchers, the complex has a separate protein for each function; shredding even requires two. "This protein complex is similar to a pocketknife with three tools – a knife for slicing, a file to render the remnant compatible with the shredder, and the shredder itself," explains Lisa Gasse.

The discovery by the Heidelberg researchers could shed new light on the origin and causes of a rare motor neuron disease that causes fatal respiratory failure in newborns, wherein a mutation in the protein complex was identified, specifically in the subunit with the scalpel function. This subunit was the focus of the Heidelberg team's investigations.

**More information:** Lisa Gasse et al. Coordinated Ribosomal ITS2 RNA Processing by the Las1 Complex Integrating Endonuclease, Polynucleotide Kinase, and Exonuclease Activities, *Molecular Cell* (2015). [DOI: 10.1016/j.molcel.2015.10.021](https://doi.org/10.1016/j.molcel.2015.10.021)

Provided by Heidelberg University

Citation: Cut, file, shred – a type of multi-tool pocketknife processes ribosomal RNA (2015, December 4) retrieved 25 April 2024 from <https://phys.org/news/2015-12-shred-multi-tool-pocketknife-ribosomal-rna.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.