SLS users have obtained atomic structures of the eukaryotic ribosome

New insights into the cell's protein factory

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Eukaryotic ribosomes are among the most complex cellular machineries of the cell. These large macromolecular assemblies are responsible for the production of all proteins and are thus of pivotal importance to all forms of life. Two independent research groups at the ETH Zürich and the Institute of Genetics and Molecular and Cellular Biology in Strasbourg have obtained new insights into the atomic structure of the eukaryotic ribosome. The results have been published in the journal Science. All diffraction data were measured with synchrotron light at the Swiss Light Source macromolecular crystallography beamline X06SA at the Paul Scherrer Institute.

Protein synthesis is a central process that has been studied for decades. Ten years after the first structures of prokaryotic ribosomes were solved, the novel insights in their structure and function were awarded with the Nobel Prize in Chemistry in 2009. Eukaryotic ribosomes, which are substantially larger and contain many additional parts, could so far not be studied at an atomic level.

Researchers at both ETH Zürich and the Institute of Genetics and Molecular and Cellular Biology in Strasbourg have determined the structure of eukaryotic ribosome using data collected at the Swiss Light Source and resulting in two independent publications in the magazine "Science". The two research group headed by Prof. Nenad Ban in Zurich and by Dr. Marat Yusupov in Strasbourg, have been working on this difficult problem for a number of years.

The data obtained describe the atomic structure of the eukaryotic ribosome at high resolution and show the expanded architecture of this cellular machine. These structure is not only important for the understanding of the fundamental processes of life, but also for the development of new pharmaceutical drugs.

Eukaryotic ribosomes as drug targets ?

Besides the fundamental scientific interest in the function of this cellular machine with a key role in all forms of biological life, eukaryotic ribosomes are also considered a promising drug target. The data obtained by the group of Prof. Nenad Ban reveal the binding site of a small molecule protein synthesis inhibitor, which is specific to

eukaryotes. This compound inhibits the ribosome by binding to the same site as is the case for several natural products with potent antitumor activity. Further studies of eukaryotic-specific ribosomal inhibitors could thus result in novel drugs, such as fungicides, or drugs that specifically interfere with protein synthesis in higher eukaryotes.

Publications

Klinge S, Voigts-Hoffmann F, Leibundgut M, Arpagaus S, Ban N.
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Science 2011 Nov 3 Epub

Ben-Shem A, Garreau de Loubresse N, Melnikov S, Jenner L, Yusupova G, Yusupov M.
The Structure of the Eukaryotic Ribosome at 3.0 A Resolution.
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Further information

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Figure: Model of the eukaryotic ribosome (taken from Klinge *et al.*)