Press Release

Circular RNA in the brain

Using deep-sequencing techniques, researchers in the Schuman Lab at the Max Planck Institute for Brain Research and the Chen Lab at the Max Delbruck Center for Molecular Medicine (Berlin) discovered that a mysterious class of RNA molecule, the so-called circular RNAs, are enriched in the brain and made from genes that normally code for proteins that inhabit brain synapses. Their findings were published online in Nature Neuroscience, February 25, 2015.

The central dogma of molecular biology posits that the information present in DNA (in the nucleus) is copied into RNA molecules that are then translated into protein. Of all the RNA present in cells, however, only about 5% are messenger RNA molecules that serve as a template for protein synthesis. The remaining 95% do not code for proteins and are called "non-coding RNAs". One special class of non-coding RNAs are circular RNAs. Distinct from most other RNAs that have a discrete beginning and ending point, circular RNAs result from the joining of the 5' end of one exon with the 3' end of another, a process termed "head-to-tail splicing". As a result, these RNAs have been assumed to form a circle, which makes them much more resistant to degradation by cellular enzymes. Recently, using deep sequencing techniques and computational tools, several research groups had identified thousands of new circular RNAs across a wide range of organisms

The RNA team from the Schuman and Chen labs analyzed the abundance of circRNAs in different tissues (e.g. lung, brain, heart, and liver) and found, surprisingly, that circular RNAs show the highest abundance in brain tissue. Moreover, they discovered that brain-expressed circRNAs are made from host genes that code for synaptic proteins. By analyzing synaptosomes and slices from the the hippocampus, a brain structure important for learning and memory, they found that circular RNAs are enriched and can be visualized in neuronal processes, indicating a possible role in synaptic plasticity. In support of this, the team also found that during neuronal development, these circular RNA molecules change their abundance when brain synapses are forming. Finally, that the team found that the circular RNAs exhibited different expression levels when neurons undergo plasticity. These data suggest an important function for this class of RNA molecule in regulating neuronal and synaptic function.

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Caption: The circular RNA group consists of researchers from the Schuman Lab in Frankfurt and Berlin-based Chen Lab.