

## **Pentapus like protein from plants packs bulk DNA in small space**

By Dr. Bilqeesa Bhat

Scientists have discovered a pentapus like protein called as FKBP53 histone chaperone from plants in a collaborative study headed by Dr Dileep Vasudevan from Department of Biotechnology's institution, the Institute of Life Sciences (ILS), Bhubaneswar. The FKBP53 histone chaperone helps in packing of DNA with histone proteins and folding of newly formed proteins in cell.

Chromatin is the compact form of our genetic material in which DNA gets wrapped around the structural proteins called histones. Histones assemble with DNA in a specific pattern. The wrapping of DNA around histone proteins is very essential for packing bulk DNA in small space by a spooling process.

The DNA coiled around histone proteins form a packing unit known as nucleosome assembly with help of histone chaperone. Histone chaperones is a special family of proteins which performs the function of histone deposition on DNA.

In the course of study, team was looking for a suitable and uncharacterized histone chaperone. They came across an interesting candidate called FKBP53 from the model plant *Arabidopsis thaliana*. Earlier such chaperones have been reported only from lower and higher eukaryotes, and not from plants.

For understanding, team prepared a detailed structure of FKBP53 histone chaperone. It was found that the first half of the protein called as N-terminus helps in histone deposition on DNA and the other side called as C-terminus aids in folding of newly synthesised proteins. N-terminus and C-terminus refers to amino group (-NH<sub>2</sub>) and the carboxyl group (-COOH) present on two sides of protein. The FKBP53 histone chaperone has long and flexible arms between its N- and C-terminus, giving it a shape of 'pentapus, a small five-legged invertebrate.

A three-dimensional structure of the two terminal domains of the FKBP53 protein surprisingly showed that N-terminal domain of protein was a pentameric form, which is often found in nucleoplasmin histone chaperones. This is the first study which has reported the presence of a nucleoplasmin protein from plants.

They also found out that N-terminal domain, like all other known nucleoplasmin chaperones, is highly stable and does not breakdown when treated with high temperature, high salt or high urea concentration. Study showed that the pentameric domain is capable of depositing histone proteins on to DNA and form chromatin-like structures. Interestingly, the C-terminus of the protein has been found to speed up the folding of newly formed proteins by ribosomal machinery of the cell.

The FK506 binding proteins are universally found in all life forms, ranging from small organisms to higher eukaryotes. The work was recently published in the high impact factor journal '*Nucleic Acids Research*'.

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