TIFR Centre for Interdisciplinary Sciences
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Colloquium

'Chiral proofreading' during translation of the genetic code

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The genetic code in the form of DNA is transcribed to RNA and then translated to proteins. During the process of translation, errors occur both during attachment of amino acids to transfer-RNA by aminoacyl-tRNA synthetases (aaRSs) and also in the ribosome during tRNA selection. Editing or proofreading modules of aaRSs remove wrong amino acids attached to the tRNA thereby maintaining a high fidelity during translation. We identified a proofreading domain that bears a striking structural resemblance to D-aminoacyl-tRNA deacylases (DTDs), which remove D-amino acids charged on tRNA, and it allowed us to propose a model for perpetuation of homochirality in proteins i.e. presence of only L-amino acids in proteins. In this talk, I will present some of our recent findings on a crucial 'chiral proofreading' mechanism by which D-amino acids are prevented by DTD from infiltrating the translational machinery of the cell. We show how the enzyme has been designed to be absolutely configuration-specific so that it does not cross-react and therefore deplete the abundant L-aa-tRNA pool in the cell. Therefore, the study highlights the importance of such fundamental enantioselection processes not only in the early evolution of translational apparatus but also in the neuronal context where some D-amino acids are present in high concentrations.

Wednesday, June 18th 2014

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TCIS