Tata Institute of Fundamental Research
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Seminar

Highly dilute uncharged polymers act as chemical RNA chaperones

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There is ample evidence that RNA played a central role in information storage and catalysis during early biology. However, all known ribozymes at dilution, far below their KM (Michaelis-Menten constant), are prone to adopt inactive conformations and require unrealistically high RNA and metal-salt concentration to overcome inactive conformations and achieve high levels of activity. Herein, we show that ppm-amounts of various noncharged water soluble polymers, such as, PEG (polyethylene glycol), PVA (polyvinyl alcohol) and others act as chemical chaperones that enable strong ribozyme activity even at nanomolar RNA and suboptimal salt concentrations. Specifically, we find that for diluted multi-component RNA ligases (R3C) and RNA cleaving ribozymes (HH), ppm amounts of PEG 10K boost ribozyme-substrate interactions by almost two orders of magnitude and extend the lifetime of the reactions resulting in up to 12-fold and 6-fold higher product yields, respectively. Furthermore, these findings imply that trace amounts of suitable polymers in a primitive environment may have been sufficient to boost early bio-catalysis by orders of magnitude.

Monday, Apr 22nd 2019

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

Auditorium, TIFR-H