Università di Roma
Tor Vergata

Università degli Studi di Roma "Tor Vergata"

Dipartimento di Scienze e Tecnologie Chimiche
Via della Ricerca Scientifica, 1 - 00133 Roma (IT) - Tel +39 06 72594337 Fax +39 06 72594328

AVVISO DI SEMINARIO

La **Prof.ssa Barbara Saccà**
Center of Medical Biotechnology (ZMB)
Faculty of Biology
University of Duisburg-Essen

il giorno 14/04/2023 alle ore 14:30
Nell' Aula seminari del Dipartimento di Scienze e Tecnologie Chimiche

Terrà un seminario dal titolo:

Coupling biochemical processes in space and time

Proponente: Prof. Francesco Ricci

Università di Roma
Tor Vergata

Università degli Studi di Roma "Tor Vergata"

Dipartimento di Scienze e Tecnologie Chimiche

Via della Ricerca Scientifica, 1 - 00133 Roma (IT) - Tel +39 06 72594337 Fax +39 06 72594328

Coupling biochemical processes in space and time

J. Huang, A. Jaekel, J. van der Boom, D. Podlesainski, M. Elnagar, A. Heuer-Jungemann, M. Kaiser, H. Meyer, B. Saccà

In the cell, control of complex biochemical cascades often relies on coupled spatio-temporal order. Accordingly, individual reactions take place within specialized compartments, with transfer of matter into and among compartments being regulated by various types of gating mechanisms. The goal of this work is to emulate this control strategy in an artificial and programmable way. As a proof of principle, we realize a system that couples the segregation/unfolding function of the p97 ATPase with the proteolytic activity of a serine protease, thus mimicking the putative coupling of the p97/proteasome machinery, which is supposed to be critical for protein homeostasis in the cell. The two events are confined within distinct DNA origami compartments, A and B, and linked in a defined spatio-temporal order, such that AB performs differently from BA. We show that the physical separation of the two reactions enables their otherwise incompatible coexistence in solution, while compartmentalization alone enhances the rates of the individual steps. Finally, we present strategies for controlling the flow of the reaction from one chamber to the other by favoring accessibility at one side of the compartment and limiting molecular diffusion through the lateral DNA walls. We envision that this construction principle may be employed to create specialized reaction units that can be combined in a modular fashion not only to mimic naturally occurring cascades but also to perform operations not existing in nature.