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in kemijsko tehnologijo

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*VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI*

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z naslovom:

**NMR in Cellular Structural Biology:
combining atomic resolution with the
cellular context**

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v predavalnici 1 v 1. nadstropju Fakultete
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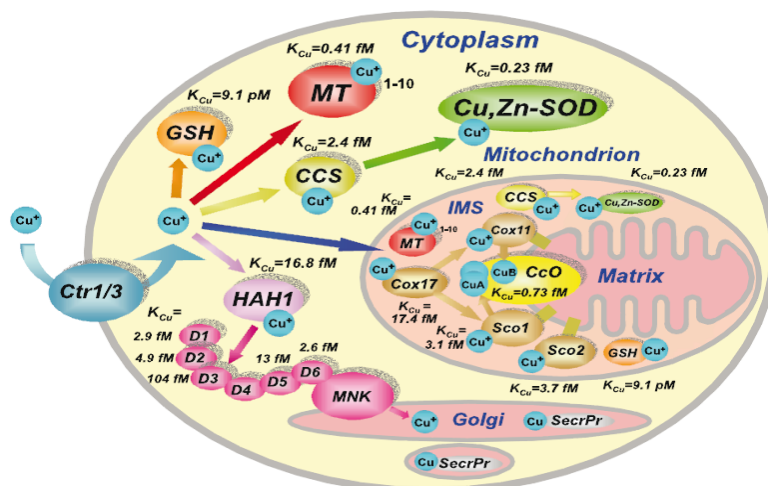
Vljudno vabljeni!

Povzetek

NMR spectroscopy constitutes a unique tool for describing functional biological processes at atomic level and in a cellular context. NMR is indeed suitable not only to characterize the structure and dynamics of biomolecules but, even more importantly, to describe transient interactions and functional events with atomic resolution, possibly in a cellular context. This approach requires the development of suitable methodologies capable of addressing multiple, specific, and sometimes non-conventional aspects and amenable to characterize functional processes in living cells, also integrating these data with those obtained *in vitro*.

Along a functional process, most interactions are transient in nature, suitably studied by NMR, which can also characterize processes in living cells with atomic resolution. Among processes involving transient interactions are the metal transfer processes, in which metal transfer, from metal transporters to the final recipient proteins, occurs through a series of protein-protein interactions¹. This transfer is determined by metal affinity gradients among the various proteins, with kinetic factors contributing to the selectivity of the processes². The presence of paramagnetic centers, such as iron-sulfur clusters, dramatically affects the NMR spectra, requiring tailored experiments also integrated with EPR spectra. In-cell NMR can provide the description of these processes within living cells.

The power of NMR in describing cellular pathways at atomic resolution in a cellular environment will be presented for a few pathways responsible for copper trafficking in the cell and for the biogenesis of iron-sulfur proteins. New major advancements in in-cell NMR^{3,4} and in the characterization of highly paramagnetic systems^{5,6} will be also discussed within an integrated approach where, from single structures to protein complexes, the processes are described in their cellular context within a molecular perspective.



¹ Banci L, Bertini I, Cantini F and Ciofi-Baffoni S. Cellular copper distribution: a mechanistic systems biology approach. *Cell Mol Life Sci*: 67, 2563-2589, 2010.

² Banci L, Bertini I, Ciofi-Baffoni S, Kozyreva T, Zovo K and Palumaa P. Affinity gradients drive copper to cellular destinations. *Nature* 465: 645-648, 2010

³ Banci, L., Barbieri, L., Bertini, I., Luchinat, E., Secci, E., Zhao, Y., and Aricescu, A. R. Atomic-resolution monitoring of protein maturation in live human cells. *Nat.Chem.Biol.* 9, 297-299, 2013.

⁴ Luchinat, E., Barbieri, L., Rubino, J. T., Kozyreva, T., Cantini, F., and Banci, L., In living cells folding and metal binding of SOD1 fALS mutants is impaired, *Nat.Commun.*, 5, 5502, 2014 .

⁵ Banci, L., Bertini, I., Calderone, V., Ciofi-Baffoni, S., Giachetti, A., Jaiswal, D., Mikolajczyk, M., Piccioli, M., and Winkelmann, J., A molecular view of an electron transfer pathway essential for iron-sulfur protein biogenesis, *Proc.Natl.Acad.Sci.USA*, 2013

⁶ Banci L, Ciofi-Baffoni S, Gajda K, Muzzioli R, Peruzzini R and Winkelmann J. N-terminal domains mediate (2Fe-2S) cluster transfer from glutaredoxin-3 to anamorsin. *Nat Chem Biol*, 10, 772-778, 2015