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Laboratory of Biology of the Cell Nucleus

Regulation of gene transcription, nucleoskeleton, nuclear actin, myosin

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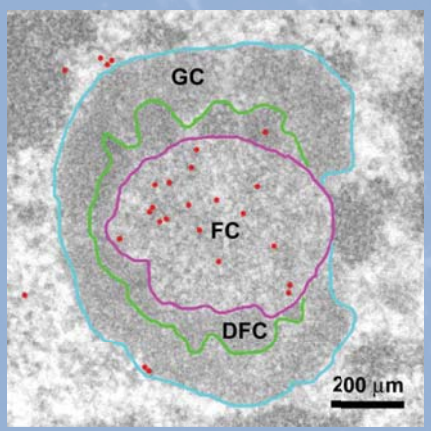

Ultrastructural detection of actin molecules (red dots) in the nucleolus of resting human lymphocyte

Research topics

In diploid mammalian cells, some $6x10^9$ base pairs of DNA fold as a nucleoprotein complex (i.e. chromatin) into higher-order arrays so as to fit in a nucleus measuring only 10 µm. The nucleus also contains machineries for transcription of genes and processing of RNA products, and for precise DNA replication, repair and recombination. Nuclear interior is therefore functionally highly compartmentalized, and the recent evidence points strongly to structure-related regulation of nuclear functions – however, the mechanisms forming the 3D-structure of the nucleus are still mostly obscure. We therefore employ a multi-disciplinary approach in order to study nuclear functions in relation to the higher-order nuclear structures, e.g. nuclear bodies, the nucleolus, and the nucleoskeleton. Our research concentrates on: (1) the relationship between nuclear compartmentalization and regulation of gene expression, (2) structure, dynamics, and function of the nucleoskeleton which might direct nuclear compartmentalization, (3) functions of nuclear myosin I and actin in transcription and gene expression, (4) development of new microscopy methods for ultrastructural studies.

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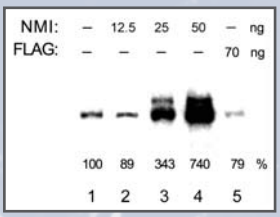
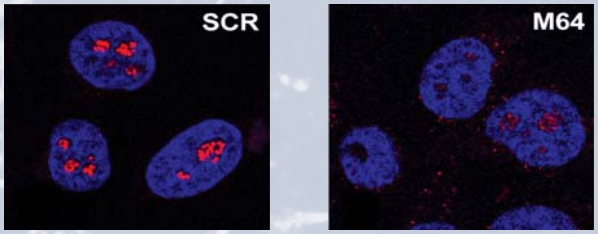
Selected recent papers

1. Philimonenko AA, Hodny Z, Jackson DA, Hozak P. The microarchitecture of DNA replication domains. **Histochem Cell Biol.** 2006;125:103-17.
2. Janderova-Rossmeislova L, Novakova Z, Vlasakova J, Philimonenko V, Hozak P, Hodny Z. PML protein association with specific nucleolar structures differs in normal, tumor and senescent human cells. **J Struct Biol.** 2007;159:56-70.
3. Vlasakova J, Novakova Z, Rossmeislova L, Kahle M, Hozak P, Hodny Z. Histone deacetylase inhibitors suppress IFNalpha-induced up-regulation of promyelocytic leukemia protein. **Blood.** 2007;109:1373-80.
4. Kahle M, Pridalova J, Spacek M, Dzijak R, Hozak P. Nuclear myosin is ubiquitously expressed and evolutionary conserved In vertebrates. **Histochem Cell Biol.** 2007;127:139-48.



Addition of nuclear myosin I accelerates transcription of ribosomal genes in vitro (Northern blot, visualization of rRNA transcripts)



Depletion of NMI by siRNAs reduces rDNA transcription (red – transcripts, blue – DNA)