Laboratory of RNA Biology

RNA splicing, spliceosome formation, alternative splicing, retinitis pigmentosa, nuclear structure

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Our long-term interest is to determine how cells decode information stored in the genome. Information in DNA is fragmented and we study processes and complexes that splice these fragments together and generate meaningful information that is further translated into amino acid sequence in a protein. We focus on molecules called RNAs that serve as a courier between DNA and proteins. However, it appears that RNA does not act as a simple "messenger" but undergoes various changes that significantly change information it carries. Our major aim is to analyse the process called RNA splicing and we mainly focus on variations in splicing among different cells and on assembly of the machinery that catalyses RNA splicing. We also aim to determine why mutations in the splicing machinery cause retinitis pigmentosa, a human genetic disease characterized by photoreceptor cell degeneration. As we study all these interesting processes directly in living cells, we widely employ advanced microscopy techniques (e.g. live cell imaging, FRET, FCS).

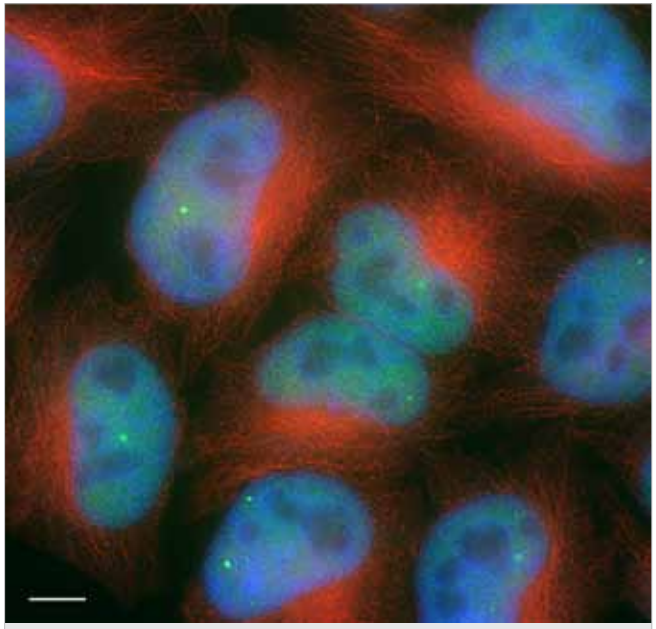

Fig. 1. Cancer cells expressing SART3-GFP protein (green). Cell nuclei stained blue and microtubules in the cytoplasm red.

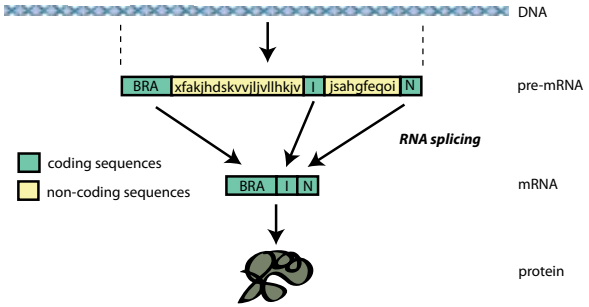

Fig. 2. Information flow from DNA via mRNA to protein.

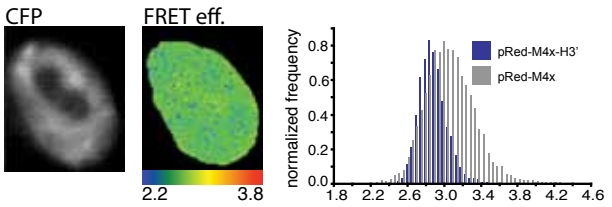

Fig. 3. Visualization of RNA-protein interaction directly in living cells by RB-FRET (Huranova *et al.*, 2009).

- GA CR, GA204/07/0133 – Self-organization principles of non-membrane-bound organelles in eukaryotic cells, 2007-2011, D. Staněk
- AS CR, KAN200520801 – Targeted expression and transport of bioactive molecules, 2008-2012, D. Staněk
- GA CR, GAP305/10/0424 – Regulation of alternative splicing via chromatin acetylation, 2010-2013, D. Staněk
- Max Planck Society – Pre-mRNA splicing and organization of the cell nucleus, 2006-2010, D. Staněk

1. Huranová M, Ivani I, Benda A, Poser I, Brody Y, Hof M, Shav-Tal Y, Neugebauer KM, Staněk D. The differential interaction of snRNPs with pre-mRNA reveals splicing kinetics in living cells. **J Cell Biol 2010** 191(1): 75-86.
2. Huranová M, Jablonski JA, Benda A, Hof M, Staněk D, Caputi M. *In vivo* detection of RNA-binding protein interactions with cognate RNA sequences by fluorescence resonance energy transfer. **RNA 2009** 15(11): 2063-2071.
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4. Cvačková Z, Mašata M, Staněk D, Fidlerová H, Raška I. Chromatin position in human HepG2 cells: although being non-random, significantly changed in daughter cells. **J Struct Biol 2009** 165(2): 107-117.
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