Analysis of molecular mechanisms responsible for the subcellular localisation of nuclear DNA helicase II (NDH II)

NDH II belongs to the family of nuclear RNA helicases. Besides nucleoplasmic localisation, presence of NDH II in specific nuclear compartments such as PML nuclear bodies and nucleolus was reported. Its function in these domains is still unknown. To investigate the molecular determinants responsible for nuclear compartmentalization of NDH II, we analyzed in vitro behaviour of NDHII and its deletion mutants fused with green fluorescent protein.

In addition to nucleoplasmic staining identical to localisation of endogenous NDHII, EGFP-NDH II localised into distinct nuclear bodies adjacent to nucleoli, which we termed NDH II perinucleolar bodies. Intriguingly, these bodies were not identical with any of the nuclear bodies or compartments tested (i.e PML nuclear bodies, polymerase II transcription sites, snRNP and non-snRNP splicing speckles and DNA damage foci). Notably, they were resistant to RNase treatment but disassembled upon inhibition of RNA polymerase I transcription. Moreover, inhibition of transcription by all three RNA polymerases led to the translocation of NDHII into the segregating nucleoli, namely into dense nucleolar caps marked by TLS protein. The examination of the behaviour of NDH II-truncated molecules lacking either one or both of the terminal domains revealed that N-terminal domain is indispensable for the targeting of NDHII into perinucleolar bodies and for its translocation to segregated nucleoli.

In conclusions, our work has shown that NDH II forms a novel perinucleolar compartment in which it does not colocalise with its previously described interacting partners. This might suggest a further role of NDH II in RNA metabolism apart from transcription. Identification of the components of these bodies may contribute to the completion of our view on nuclear compartmentalization and its impact on performing nuclear functions.