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NUCLEOPHOSMIN, COILIN, AND ARGENTOPHILIC (AgNOR) PROTEINS OF THE NEURONS OF THE HUMAN SUBSTANTIA NIGRA

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The aim of the study was to investigate the intranucleolar distribution of nucleophosmin (B23), coilin (p80), AgNOR proteins, and non-heme iron in the human substantia nigra neurons. The study was carried out using fragments of the human midbrain ($n = 10$) from persons with the verified absence of neurodegeneration signs. Material was fixed in the zinc-ethanol-formaldehyde, a fixative providing high preservation of antigenic determinants. The study presents new data on the molecular and structural organization of the nucleolus of neurons of the human substantia nigra. It has been found that the nucleus of the nigral has only one large (from 4.2 ± 0.4 to $6.2 \pm 0.6 \mu\text{m}$ in diameter) nucleolus. Nucleophosmin is concentrated in the nucleolus and distributed unevenly. Cajal bodies found in the nucleus of the majority of neurons of the substantia nigra represent coilin-containing structures which are characterized by a round or oval shape and size around $1 \mu\text{m}$. Accumulation of coilin is found also in numerous intranuclear microstructures looking significantly different from the typical Cajal bodies according to their localization and morphological characteristics. AgNOR proteins were demonstrated in the nucleolus of the nigral neurons, distribution of which is characterized by strong variability. Non-heme iron was revealed in the nucleolus of some neurons of the substantia nigra, which in some cases has been concentrated within the GFC. The obtained data will contribute to a clearer understanding of the role of nucleolar proteins in the functioning of the human brain's dopaminergic neurons and in definition of molecular sensors of nucleolar stress which is observed in neurodegeneration.

Keywords: nucleolus, brain, substantia nigra, human, nucleolar stress, nucleophosmin, coilin, AgNOR proteins, non-heme iron, immunohistochemistry