

Long term effects of cigarette smoke extract and nicotine on Nerve Growth Factor and its receptors in bronchial epithelial cell line

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Long-term exposure to cigarette smoke induces severe injuries to respiratory system through several

mechanisms, some of them are well defined, but many others are not yet elucidated. Beside its classical role in nervous system, Nerve Growth Factor (NGF) and its receptors have a crucial role in airway inflammatory diseases [1]. To expand our knowledge about the relevance of NGF and its receptors in airway diseases induced by cigarette smoking, we exposed for 16 weeks the bronchial epithelial cell line BEAS-2B to sub-toxic concentrations of whole cigarette smoke extract or pure nicotine that maintain viable more than 80% of cells [2]. Viability, cell cycle gene expression, cell morphology and migration ability were tested and compared to NGF release and gene expression. Modulation of its receptors TrKA (high-affinity tropomyosin-related kinase A) and p75NTR (low-affinity neurotrophin p75 receptor) was also analyzed. The present study shows that long term exposure of BEAS-2B cells to cigarette smoke extract or nicotine induces: (A) differences: in cell viability, in the expression of cell cycle-related genes, in NGF release and in gene expression of NGF and its receptors; (B) similarities: in morphology and migration ability. Taken together, our data provide new insights about the biological role of NGF and its receptors in airway diseases induced by long-term cigarette smoking and, finally, our data evidence the opportunity not to use nicotine lozenges or e-cigarettes as anti-smoking replacement therapy in patients with a previous airway disease according to the ability of nicotine to increase the amount of the pro-inflammatory cytokine NGF into the bronchial environment.

References

- [1] Stabile A. et al. (2016) A role for NGF and its receptors TrKA and p75NTR in the progression of COPD. *Biol Chem* 397:157-163.
- [2] Marinucci, L. et al. (2014) Sub-Toxic nicotine concentrations affect extracellular matrix and growth factor signaling gene expressions in human osteoblasts. *J Cell Physiol* 229:2038-2048.

Key words

Human bronchial epithelial cells, NGF, p⁷⁵NTR, TrKA, nicotine, cigarette smoke extract.