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Nicotinic Acetylcholine Receptors: Universal Role and Medical Significance

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Tobacco-related morbidity is the public health problem of critical importance for Ukraine that has one of the world's highest percentage of smokers (35.3% cf. 23.6% in USA). Both first and second hand smoking present a major risk factor for various respiratory pathologies, including lung cancer, which is the most common form of cancer in Ukraine. The main active substance of tobacco smoke is nicotine. Multiple effects of nicotine in the human organism are mediated through nicotinic acetylcholine receptors, ligand-gated ion channels permitting the intracellular entry of mono- and bi-valent cations in response to acetylcholine. Nicotinic receptors are expressed in many tissues and cells to mediate fast synaptic transmission in skeletal muscle and autonomic ganglia, release of dopamine in the brain, metabolism of respiratory epithelium and vascular endothelium, skin formation, inflammatory and immune reactions. Consequently, nicotine damages mucus, ion and cytokine release in respiratory pathways, promotes epithelial cell proliferation and angiogenesis, prevents normal skin cell differentiation, causes aberrant immune reactions like immunodeficiency, allergy and autoimmunity. On the other hand, nicotine is beneficial upon inflammatory diseases like ulcerative colitis. The ability of nicotine to increase dopamine level in the brain is the main reason for smoking addiction; however, it is beneficial for disorders like Parkinson's and Alzheimer diseases, schizophrenia, states of anxiety and depression. In conclusion, nicotinic receptors play an important role in many pathological states and are attractive targets for designing new drugs to modulate their functions without establishing addiction and providing negative effects.