

Abstract

The aim of our work was to analyse the role of muscarinic M₂ receptors (M₂MRs) in the organism at rest and under stress. In the experiments, changes in animals with expressed M₂MRs are compared with M₂KO animals who lack these receptors.

The heart rate (HR) is determined by the level of the sympathetic and parasympathetic tones, the resulting HR is being the interaction of adrenergic and cholinergic receptors, which are among the receptors attached to G proteins. Their activity is influenced by structures of the autonomic nervous system with the highest centers with integrative function in the hypothalamus. The organism responds to the absence of M₂MRs by decreasing the number of adrenergic receptors; heart rate in resting conditions does not change significantly. However, in restraint stress, there are differences both during the stress response and in the post-stress period (more pronounced and prolonged tachycardia). The treatment with carbachol (MR agonist) in M₂KO animals induced tachycardia, strongly suggesting the presence of cardioexcitatory MRs. Ultradian heart rate rhythm is the superstructure of the circadian rhythm controlled by the suprachiasmatic nucleus. Autonomous regulation can affect other hypothalamic functions - circadian rhythms, endocrine regulation, thermoregulation, behavioural changes, memory. We therefore assumed that stress could affect these phenomena. In subjects with absence of corticotropin releasing hormone (CRH), we investigated the effect of restraint stress on behaviour and short-term memory. The lack of CRH affects escape behaviour but does not affect short-term memory. Finally, we discuss the possible clinical applications of our findings.

Key words: M₂ muscarinic receptors, stress, biological rhythms, CRH, hypothalamic integration