



Melatonin Elicits Stimulatory Action on the Adrenal Gland of Soay Ram: Morphometrical, Immunohistochemical, and Ultrastructural Study

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Abstract:

Endogenous melatonin is a hormone secreted by pineal gland; it has several roles in metabolism, reproduction, and remarkable antioxidant properties. Studies on the melatonin effect on the adrenal glands which are important endocrine organs, controlling essential physiological functions, are still deficient. In this study, we attempted to investigate the effect of exogenous melatonin treatment on the adrenal cortex and medulla using several approaches. Adrenal glands of 15 Soay ram were examined to detect the effect of melatonin treatment. Our results revealed that the cells of adrenal cortex of the treated animals were separated by wide and numerous blood sinusoids and showed signs of increase steroidogenic activity, which are evidenced by functional hypertrophy with increase profiles of mitochondria, smooth endoplasmic reticulum, and lipid droplets. The most striking ultrastructural features in the medulla of the treated group were the engorgement of chromaffin cells with enlarged secretory granules enclosed within a significantly increased diameter of these cells. The cytoplasm of these cells showed numerous mitochondria, rough endoplasmic reticulum (rER), Golgi apparatus, lysosomes, and glycogen granules. Exocytosis of secretory granules to the lumen of blood vessels was evident in the treated group. Piecemeal degranulation mode of secretion was recorded after melatonin treatment. Chromaffin cells in the control group expressed moderate immunoreactivity to Synaptophysin and tyrosine hydroxylase, compared with intensified expression after melatonin treatment. The ganglion cells of the melatonin-treated group showed a significant increase in diameter with numerous rER. The most interesting feature in this study is the presence of small granule chromaffin cells (SGC) and telocytes (TCs) for the first time in the adrenal glands of sheep. Moreover, these SGC cells, Schwann cells, fibroblasts, and progenitor stem cells showed a stimulatory response. The TCs were small branched cells scattered in the adrenal glands around cortical cells, chromaffin cells, nerve fibers, and blood vessels. These cells increased significantly in number, length of their telopodes, and secretory activity after melatonin treatment. In addition, multiple profiles of unmyelinated nerve fibers were demonstrated in all treated specimens. These results indicated that melatonin treatment caused a stimulatory action on all cellular and neuronal elements of the adrenal gland. This study may act as a new direction for treatment of adrenal insufficiency

Keywords:

adrenal cortex, chromaffin cells, telocytes, nerve fibers, Synaptophysin

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