Video Article

Long-term microdialysis of rodent pineal gland

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Abstract

The pineal gland plays a crucial role in the regulation of circadian rhythms, seasonal behaviors, sexual development, and metabolism. Its best-known function is the production of melatonin. Melatonin is synthesized from tryptophan via four enzymatic steps1 (Fig. 1A) and is regulated by the suprachiasmatic nuclei (SCN) via a multi-synaptic neuronal pathway2 (Fig. 1B). The SCN is known to be the central pacemaker that controls circadian rhythms of mammals. Thus, through measurement of pineal secretions, it is possible to directly investigate mammalian pacemaker properties. Here we provide a method for long-term in vivo measurement of pineal secretions in freely acting animals3. The secretion products are collected via pineal microdialysis, and analyzed by high performance liquid chromatography (HPLC) instruments. Concentrations of melatonin and its precursors serotonin and N-acetylserotonin are obtained from each sample. Samples are collected every ten minutes via automated processes for up to one month for each individual. Among the common circadian markers used in rhythm studies such as sleep-wake, activity-rest, body temperature, and cortisol secretion rhythms, melatonin is consistently recognized as the best marker of the circadian pacemaker 4,5,6,7. Previously, melatonin results from microdialysis studies were averaged between a group of animals, in experiments that lasted for only 1-4 days 8,9,10,11. Through the method presented here, inter-individual variations of pineal secretions can be verified, allowing for the differentiation of chronotypes in laboratory animals 12. Furthermore, minute changes in individual animals can be identified and followed for prolonged periods under various experimental conditions 13.

Disclosures

No conflicts of interest declared.