The mouse (balb-c) suprachiasmatic nucleus of the hypothalamus: retinal projections and immunohistochemical characterization

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The circadian timing system can be defined as a set of neural related structures whose function is the generation and regulation of circadian rhythms. This system comprises a central pacemaker, the hypothalamic suprachiasmatic nucleus (SCN) and the intergeniculate leaflet (IGL) of the thalamus. These centers receive direct photic information from the retina. The mammalian SCN is considered to be the major component of a biological clock. The SCN has a complex neurochemical organization, as already described for other mammals, especially the rat. The present study was performed to characterize the mouse suprachiasmatic nucleus as anatomical entities based in the cytoarchitecture by Nissl staining, the pattern of the distribution of the retinal projections by anterograde transport of intraocularly injected cholera toxin subunit B (CTB), and the pattern of distribution of neuroactive substances presented in neuronal or glial cells. Twenty-three mouse (Mus musculus) (30-50 g) of both sexes were used in these experiments. The subjects were deeply anesthetized with chloral hydrate (400 $mg.kg^{-1}$, i.p.) and received an intraocular injection of 7 µL 0f a 0.5% solution of CTB in 0.1 M phosphate bufferef saline (PBS). After 5-7 days of survival time, the animals were deeply anesthetized and perfused transcardially with phosphate-buffered saline and 4% paraformaldehyde in PBS. The brains were removed from the skulls. A sliding microtome was used to obtain coronal sections (30 µm) of a frozen tissue block. All immunohistochemical reactions were done using free-floating sections. The reactions were done using the avidin-biotin-peroxidase (ABC) technique. Brain sections were evaluated with a microscope (Zeiss) using bright-field. The results allow to identify the mouse suprachiasmatic nucleus as a circled-shaped small cells cluster located at both sides of the third ventricle, which receives a dense bilateral terminal plexus from the retina, with vasopressin (VP), neurophysin (NPH), vasoactive intestinal polypeptide (VIP), gamma-aminobutyric acid (GABA), nitric oxide synthase and calbindin (CB) and calretinin containing-perikarya and neuropeptide Y (NPY), substance P (SP), enkephalin (ENK) and parvalbumin containing-terminals, besides a large number of astrocytes as indicated by dense immunoreactivity to glial fibrillary acidic protein (GFAP). The nervous system components governing circadian rhythmicity constitute a specialized subdivision of the mouse visual system. These results constitute an important contribution addressed to understanding of the circadian timing system organization and are discussed by comparing the cumulated knowledge about data in this species and in others and in terms of their participation in the mechanisms of regulation of the circadian rhythmicity.