



## POSTER NO 7

### Two Studies Relating Melatonin, Sleep and Memory Processes

Baydas G, Nedzvetsky VS, Nerush PA, Kirichenko SV, Demchenko HM, Reiter RJ. *Neurosci Lett*, "A novel role for melatonin: regulation of the expression of cell adhesion molecules in the rat hippocampus and cortex", **Neuroscience Letters**, 326(2):109-12, June 28, 2002.

Neural cell adhesion molecules (NCAMs) are members of the immunoglobulin superfamily and are involved in synaptic rearrangements in the mature brain. There are three major NCAM forms: NCAM 180, NCAM 140 and NCAM 120. Several studies report that NCAMs play a central role in memory. In the present study we investigated the effects of melatonin on the expression of NCAMs in the hippocampus, cortex and cerebellum. The levels of NCAMs were determined by Western blotting. After administration of melatonin for 7 days, NCAM 180 expression increased both in the hippocampus and in the cortex as compared to controls. On the contrary, in rats exposed to the constant light for 7 days (which inhibits endogenous production of melatonin), NCAM 180 levels decreased in the hippocampus and became undetectable in cortex and cerebellum. NCAM 140 levels were also diminished in the hippocampus of constant light-exposed rats. There was no change in NCAM 120 expression in any brain regions. This is the first report indicating that melatonin has a modulatory effect on the expression of NCAM in brain areas concerned with cognitive function. Melatonin may be involved in structural remodeling of synaptic connections during memory and learning processes.

---

Smith C, "Sleep states and memory processes", **Behavioral Brain Research**, 1995 Jul-Aug;69(1-2):137-45 from the Department of Psychology, Trent University, Peterborough, Ontario, Canada.

Evidence for the involvement of rapid eye movement (REM) sleep or paradoxical sleep (PS) with memory processing continues to accumulate. In animals, there is continuing evidence of relatively small, vulnerable paradoxical sleep windows (PSWs) following successful acquisition. These PSWs, which manifest as increases in PS over normal levels, appear to exhibit shorter latencies to onset when the amount of material presented during acquisition is increased. Prevention of the PSW results in memory deficits. In humans, there is now evidence that different types of tasks are differentially sensitive to rapid eye movement sleep deprivation (REMD). Memory for declarative or explicit types of tasks, appears not to be affected by REM sleep loss, while memory for cognitive procedural or implicit types of material are impaired by REMD. Using post training auditory stimulation during REM sleep, memory enhancement of the procedural material is also possible. The memory for a fine motor task appears to be sensitive to post training stage 2 sleep loss. The important neural structures are generally not yet identifiable, although the hippocampus would appear to be important for place learning in the Morris water maze.

#### COMMENT

Rapid eye movement (REM) sleep is recognized as important for memory consolidation. Melatonin is emerging as critical for this vital physiology primarily for its modulatory effect on elaboration of neural cell adhesion molecules (NCAMs) during REM sleep. Melatonin appears to be involved in structural remodeling of synaptic connections during memory and learning processes via this mechanism.

Honey when consumed at bedtime will promote melatonin production via the HYMN cycle (see Poster No 14). Thus, honey may positively impact memory by two mechanisms: 1) by promoting melatonin which effects cognitive processes during REM sleep and 2) by reducing the production of the adrenal stress hormone, cortisol, which is known to attack short term memory in the hippocampus.