

Selected references - Nicole Praschak-Rieder

Praschak-Rieder, N. & Willeit, M. (2012). Imaging of seasonal affective disorder and seasonality effects on serotonin and dopamine function in the human brain. *Current Topics in Behavioral Neuroscience*, 11, 149-167.

Notes: According to current knowledge, disturbances in brain monoamine transmission play a major role in many psychiatric disorders, and many of the radioligands used for investigating these disorders bind to targets within the brain monoamine systems. However, a phylogenetically ancient and prevailing function of monoamines is to mediate the adaptation of organisms and cells to rhythmical changes in light conditions, and to other environmental rhythms, such as changes in temperature, or the availability of energy resources throughout the seasons. The physiological systems mediating these changes are highly conserved throughout species, including humans. Here we review the literature on seasonal changes in binding of monoaminergic ligands in the human brain. Moreover, we argue for the importance of considering possible effects of season when investigating brain monoamines in healthy subjects and subjects with psychiatric disorders

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Praschak-Rieder, N., Willeit, M., Wilson, A. A., Houle, S., & Meyer, J. H. (2008). Seasonal variation in human brain serotonin transporter binding. *Archives of General Psychiatry*, 65, 1072-1078.

Notes: CONTEXT: It is a common experience in temperate zones that individuals feel happier and more energetic on bright and sunny days and many experience a decline in mood and energy during the dark winter season. Brain serotonin is involved in the regulation of physiologic functions, such as mating, feeding, energy balance, and sleep. Although these behaviors and serotonin-related conditions show a clear seasonal pattern in humans, the molecular background of seasonal changes in serotonin function is entirely unknown. The serotonin transporter is a key element in regulating intensity and spread of the serotonin signal. OBJECTIVES: To detect seasonal variations in serotonin transporter binding in the living human brain and to detect correlations between serotonin transporter binding and duration of daily sunshine. DESIGN: Regional serotonin transporter binding potential values, an index of serotonin transporter density, were assessed from December 1, 1999, to December 9, 2003, in a consecutive sample of healthy volunteers. Binding potential values were related to meteorologic data. SETTING: Tertiary care psychiatric hospital. PARTICIPANTS: Volunteer sample of 88 drug-naive healthy individuals. INTERVENTION: Carbon 11-labeled 3-amino-4-(2-dimethylaminomethyl-phenylsulfanyl)-benzonitrile positron emission tomography. MAIN OUTCOME MEASURE: Regional serotonin transporter binding potential values. RESULTS: Serotonin transporter binding potential values were significantly higher in all investigated brain regions in individuals investigated in the fall and winter compared with those investigated in the spring and summer ($P = .01$ to $.001$). Moreover, binding potential values showed negative correlations with average duration of daily sunshine in all brain regions ($\rho = -0.21$ to -0.39 ; $P = .05$ to $<.001$), such that higher values occurred at times of lesser light. CONCLUSIONS: Serotonin transporter binding potential values vary throughout the year with the seasons. Since higher

serotonin transporter density is associated with lower synaptic serotonin levels, regulation of serotonin transporter density by season is a previously undescribed physiologic mechanism that has the potential to explain seasonal changes in normal and pathologic behaviors

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