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SEASON, SUNLIGHT, AND BRAIN SEROTONIN FUNCTION

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Introduction: Many experience low mood and energy during winter. Brain serotonin is involved in the regulation of many physiologic and pathologic functions that vary with season. Seasonal variations in peripheral serotonergic markers have been described in clinical and nonclinical populations, and a postmortem study shows seasonal differences in hypothalamic serotonin concentration.

Aim: We investigated the molecular background of seasonal changes in serotonin function by conducting a series of studies on serotonin transporter (5-HTT) density and function in depression and health.

Methods: In a large study in drug-free patients with seasonal affective disorder (SAD) we aimed at detecting state-related alterations in 5-HTT-mediated inward and outward transport in platelets. Another study in healthy subjects aimed at detecting seasonal variations in 5-HTT binding in the living human brain using [¹¹C]DASB positron emission tomography. Regional 5-HTT binding, an index of 5-HTT density, was assessed in a large sample of drug-naïve healthy volunteers, and was related to meteorological and astronomical data.

Results: In patients with SAD we showed that the 5-HTT is in a hyperfunctional state during winter depression, and normalizes after light therapy and in natural summer remission. In healthy subjects, 5-HTT binding was higher in autumn/winter as compared to spring/summer. Regional 5-HTT binding correlated negatively with daily sunshine, such that higher values occurred at times of lesser light.

Conclusions: Since high 5-HTT density is associated with low synaptic serotonin levels, regulation of 5-HTT density and 5-HTT function by light is a mechanism that may explain seasonal changes in normal and pathologic behaviours.