Media Release: European College of Neuropsychopharmacology

Researchers confirm the biochemical cause of seasonal depression (SAD)

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Berlin, 21 October 2014 New research confirms why some people suffer from the winter blues while others get through the winter without any problems. A longitudinal study from a group of researchers from the University of Copenhagen has found that that people with Seasonal Affective Disorder (SAD) show significant seasonal differences in the way they regulate the neurotransmitter serotonin in comparison to the majority of the population. This work is being presented at the ECNP congress in Berlin.

SAD affects a significant amount of people as daylight levels drop in autumn. At Northern European latitudes (for example all of Scandinavia, Glasgow and Moscow) around 1 person in 6 suffers from SAD.

The researchers scanned 11 SAD patients and 23 healthy individuals using Positron Emission Tomography; they were able to show significant summer to winter differences in the levels of the serotonin transporter (SERT) protein; SAD patients showed higher levels of SERT in the winter months, corresponding to a greater removal of serotonin in winter.

Serotonin (also known as 5-HT) is a neurotransmitter which affects mood, in fact many anti-depressant drugs, such as SSRIs (Selective Serotonin Reuptake Inhibitors, such as Prozac) work by allowing serotonin to be retained in the synapse where it exerts its effects.

Lead researcher, Brenda Mc Mahon said:

"We believe that we have found the dial the brain turns when it has to adjust serotonin to the changing seasons. The serotonin transporter (SERT) carries serotonin back into the nerve cells where it is not active, so the higher the SERT activity the lower the activity of serotonin. Sunlight keeps this setting naturally low, but when the nights grow longer during the autumn, the SERT levels increase, resulting in diminishing active serotonin levels. Many individuals are not really affected by SAD, and we have found that these people don't have this increase in SERT activity, so their active serotonin levels remain high throughout the winter".

The SAD patients had an average 5% higher SERT level in the winter compared to the summer, whereas the healthy participants on average showed no significant change.

Commenting for the ECNP, Professor Siegfried Kasper (Vienna) said

"SERT fluctuations associated with SAD have been seen in previous studies, but this is the first study to follow patients through summer and winter comparisons. It seems to offer confirmation that SERT is associated with SAD"

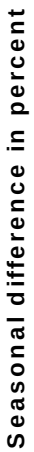

Figure showing SERT differences between patients and healthy participants (summer and winter)

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Notes for editors

Please mention the European College of Neuropsychopharmacology Congress

in any stories which result from this press release.

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The ECNP is an independent scientific association dedicated to the science and treatment of disorders of the brain. It is the largest non-institutional supporter of applied and translational neuroscience research and education in Europe.

ECNP organises a wide range of scientific and educational activities, programmes and events across Europe, promoting the exchange of high-quality experimental and clinical research and fostering young scientists and clinicians.

The annual ECNP Congress takes place from 18-21 October. It is Europe's premier scientific meeting for disease-oriented brain research, annually attracting between 5,000 and 8,000 neuroscientists, psychiatrists, neurologists and psychologists from around the world. Website: www.ecnp.eu

Abstract This work will be presented on Tuesday 21st October at 11.45 (CEST)

Patients with seasonal affective disorder show seasonal fluctuations in their cerebral serotonin transporter binding

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Objectives: Lack of daylight is a prominent environmental stressor at high latitudes. It is estimated that more than 15% of the Copenhagen inhabitants suffer from Seasonal Affective Disorder (SAD) or sub-syndromal SAD [1]. Cross-sectional neuroimaging studies have demonstrated that in healthy individuals, striatal serotonin transporter (SERT) binding is high at winter solstice and low at summer solstice. These fluctuations are particularly evident in carriers of the short 5-HTTLPR polymorphism (S-carriers). The aim of the present study is to do the first longitudinal investigation of seasonal SERT fluctuations in healthy S-carriers and in S-carriers suffering from SAD.

Methods: All participants completed the Seasonal Pattern Assessment Questionnaire (SPAQ) to evaluate seasonal variations in sleep, social activity, mood, weight, appetite and energy. The score on each item was summed to obtain a Global Seasonality Score (GSS), which indexes the degree of SAD (range: 0−24, GSS>10 indicates SAD). Subjects without any seasonality and GSS ≤ 10 entered the study as healthy participants while subject with a GSS ≥11 were interviewed by specialized psychiatrists both in their asymptomatic and their symptomatic (winter) phase to establish the SAD diagnosis. Twenty-three (13 females) healthy S-carriers (mean±SD: GSS: 4.8±2 and age: 25±7 years) and 11 (six females) S-carrying SAD patients (mean±SD: GSS:13.7±2 and age: 2*6*±8 years) were investigated with a dynamic [11C]DASB HRRT PET scan and a MRI brain scan both summer and winter, in randomized order. Non-displaceable binding potential (BP_{ND}) was quantified using MRTM2. Summer BP_{ND}s were plotted as a function of winter BP_{ND}s for 17 different brain regions [2]. The slope of the regression line (β) was used as a measure of individual change in global brain SERT changes across seasons. The β values were compared between healthy controls and SAD patient using a Mann–Whitney unpaired t-test. A one sample paired t-test was used within groups to investigate significant seasonal SERT changes.

Results: We found a significant difference between healthy controls and SAD patients in seasonal SERT changes: median β healthy controls: 1.033, median β SAD: 0.93, U= 59, p = 0.01. Furthermore we observed a tendency for a winter-summer change in the SAD group ($\beta \neq 1$): t(10) = 2.136, meanbSD: 0.96±0.07, p = 0.058 but not in the healthy control group: t (22) = 1.759, mean β±SD: 1.024±0.07, p = 0.092.

Conclusions: We find that SAD patients experience a significantly larger seasonal SERT fluctuation compared to their healthy counterparts. We were not able to reproduce previous findings of a similar up-regulation during winter in healthy subjects and we speculate that this is due to a careful selection of individuals completely void of season related symptoms. Our data suggests that seasonally provoked depression is linked to seasonal SERT changes.