

2nd International Conference on **Alzheimer's Disease and Dementia** September 23-25, 2014 Valencia Convention Centre, Spain

Neurochemical dementia diagnostics for the early diagnosis of Alzheimer's disease: State-of-the-art and the perspectives

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Neurochemical Dementia Diagnostics (NDD) is a routine diagnostic tool in the evaluation of the patients with cognitive impairments, such as those with Alzheimer's disease (AD). Currently, two groups of biomarkers analyzed in the cerebrospinal fluid (CSF) are taken into consideration: amyloid β ($A\beta$) peptides and Tau proteins, along with the hyperphosphorylated forms of the latter (pTau). The analyses of these two groups of biomarkers can reveal pathologic alterations as early as twenty years before the onset of the clinical symptoms. In mild cognitive impairment (MCI), NDD can reliably predict which persons are at risk to convert to AD. The role of biomarkers of amyloid β deposition in the brain tissue (including the CSF concentrations of $A\beta_{42}$), as well as the biomarkers of neurodegeneration (including the CSF concentrations of Tau/pTau proteins), is reflected in the currently proposed diagnostic criteria for AD and MCI. Current further directions in the development of NDD include: (a) search for novel biomarkers with improved analytical or diagnostic performance, (b) optimization of the analysis of the biomarkers already available (for example, by improved quality control and inter-laboratory comparison of results), (c) applications of novel technologies enabling better management of patients samples, for example application of multiplexing technologies, and (d) search for biomarkers in the blood.

Biography

Piotr Lewczuk leads the Laboratory for Clinical Neurochemistry and Neurochemical Dementia Diagnostics at the Department of Psychiatry and Psychotherapy, Universitätsklinikum Erlangen. This lab is one of the mostly internationally-recognized, European leading centers for neurochemical diagnosis of dementia. The Laboratory is one of the five world-wide reference centers, together with the laboratories in Goteborg (S), Amsterdam (NL), Ghent (B), and Philadelphia (USA), in the Alzheimer & acutes Association supported project on CSF biomarkers international quality control. He is a member of the Steering Committee of this project. For more than ten years he has been working on diagnostic and research aspects of the CSF, including a large panel of neurologic and psychiatric disorders with a particular scope on neurodegenerating conditions, like Alzheimer & acutes disease. In 2004, he obtained the Certificate of Expertise from the German Society of Clinical Neurochemistry to become one of seventy certified clinical neurochemists in Germany, and currently he is a member of the Extended Board of the German Society of Clinical Neurochemistry.

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