Course ID: CMEC17

PET imaging of brain neurotransmission

Course director: Lars Farde

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Educational Objectives: To provide a basic insight in the methodology and clinical potentials of PET-imaging in psychiatry

Course description: The advent of brain imaging techniques that allow for non-invasive examination of the human brain has provided a corner stone in contemporary psychiatric research. Positron Emission Tomography (PET) trace radiolabelled molecules directly in the human brain. PET and allied techniques use molecules that are labelled with short-lived radioisotopes and injected intravenously. New molecules are now being developed for receptor subtypes, transmitter carriers, and enzymes of central interest in research on the pathophysiology and treatment of psychiatric disorders.

The course will consist of three lectures and time for discussion. The first lecture will introduce the attendant to technical principles for PET- and SPECT-imaging. A PET-camera system and acquisition of data will be described. Routines for image reconstruction and the ensuing image analysis procedure will be illustrated in a step-vise fashion. Limitations related to resolution and image statistics will be highlighted in relation to the anatomy of targeted anatomical structures in brain.

The second lecture will focus on the development of suitable molecules for imaging of target receptors and also on the faith of these molecules in the human body. Why are some molecules good and why do others not work as PET-ligands ? This question will be answered using examples on how strategies for rapid radiolabeling, binding selectivity, receptor affinity, lipophilicity and radioligand metabolism influence the suitability of a new molecule. The lecture will also show how radioligand characterisation in vitro and in animals provides a rationale step when selecting promising molecules for studies in humans.

The theme of the third lecture will be the use of PET-imaging in clinical research. Initially, ethical and practical considerations as to radiation exposure, number of studies in each individual, and laboratory conditions will be covered. Common strategies for PET-imaging in drug development will then be presented. Finally, a review of recent PET-strategies in psychiatric disorders.

Target audience: Psychiatrists, especially with an interest in psychopharmacology.

Course level: Basic.