

## **Molecular Imaging: Dream or Reality?**

Juhani Knuuti, MD, PhD; Director, Turku PET Centre

Imaging has witnessed considerable advances during the last 20 years. Morphological imaging with CT and MR has benefited from the improvement of spatial and temporal resolution, which revitalized especially the role of CT in diagnostic imaging. Multi-slice (MSCT) CT imaging has become an important tool for staging and restaging of oncological diseases as well as a new diagnostic modality to detect coronary artery disease. At the same time, functional imaging has expanded its role in the clinical assessment of severity and extent of disease processes with documented prognostic value. Magnetic resonance imaging as well as tracer techniques using SPECT and PET has added an important new dimension to the functional characterization of pathophysiological processes by providing regional information on perfusion, metabolism and cell integrity. The current strong trend is to merge more than one imaging method into single device. PET/CT, SPECT/CT and most recently PET/MRI systems have become commercially available both small animals for research purposes and humans for clinical research and routine.

With the increasing knowledge in molecular biology new imaging targets have been identified. Specific receptor families as well as cell surface proteins have been proposed as targets for various imaging approaches using radiolabelled peptides, antibodies or MR contrast agents. The specific non-invasive visualisation of protein expression has become possible for diagnosis and therapy guidance. Using transgenic approaches, specific proteins can be expressed providing reporter gene imaging for the visualization of gene expression. These developments are believed to be the main players for the success of personalised medicine but also help in drug discovery and development.