

## Carbon-11. The Unique, yet Neglected Radionuclide for Drug Research

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**Compounds labelled with carbon-11** (radiopharmaceuticals / tracer) allow to “*trace*” biochemical processes within the organism without alterations, thus it is possible

- to evaluate new compounds in drug studies and
- to assay metabolic functions.

### **Short half-life of 20 min:**

→ No problem in radiosyntheses and biological / clinical evaluations by repeated studies.

### **Emission of Positrons:**

→ Registration by  $\gamma$ - $\gamma$ -coincidence, small animal PET, PET/CT or PET-MRT.

### **Technical improvements:**

Self-shielded cyclotrons → no need for special buildings to house the cyclotron,  
Automated synthesis modules → handling very high activities in closed systems.

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### Unique features of labelling with carbon-11:

- no alteration of physiological properties,
- mass of handled activities below  $10^{-6}$  g in a whole body dose.
- radiosynthesis of any compound can be realized in any radiochemical lab.

### Direct consequences:

**Assay of metabolic processes as they are directly on-going within the organism.**

### **Development of new drugs:**

1. Biodistribution and pharmacokinetics in small animals by PET.
  2. Translation to patients by PET measurement applying the European *Concept of **Microdosing*** ( $\leq 100\mu\text{g}$ ) by EMEA / CPMP, July 2003,  
*thus* no need for costly / lengthy toxicology evaluations.
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