Angela Llamazares, Unispital Zürich

Aluminium-(^{18}F)-fluoride Tracers: current situation and future challenges from a GMP-perspective

Aluminium-(^{18}F)-fluoride (^{18}F-AlF) radiolabelling of biomolecules opens the door to combining the favourable properties of cyclotron produced (^{18}F)-fluoride for PET Imaging, with the relative simplicity of metal-chelation chemistry. Currently, great interest has been aroused by very promising tracers developed using the aluminium-(^{18}F)-fluoride approach. Among the most outstanding, those targeting the fibroblast activation protein, the somatostatin receptor or the prostate specific membrane antigen can be highlighted.
Aluminium-(^{18}F)-fluoride radiolabelling is amenable to automation, kit-formulation and, with sensible design, can be made GMP-compatible. These are key aspects to upscale production capability and in order to achieve the regulatory compliance required to make the tracers widely available for clinical use. This radiolabelling approach however, is also associated with new challenges, which have to be overcome before those goals can be realised.

Zeynep Talip, Center for Radiopharmaceutical Sciences PSI

Production of Medical Radionuclides from Bench-to-Bedside

The use of radionuclides in the field of nuclear medicine for monitoring and treating different types of cancers has dramatically increased over the last two decades. However, the number of radionuclides for routine clinical therapeutic or imaging applications is still limited due to their scarce accessibility.
Radiolanthanides are of particular interest in the field of nuclear medicine, offering attractive decay properties for both diagnosis and therapy. In recent years, great interest has also been directed in their theragnostic (use of two radioisotopes of the same element, with imaging and therapeutic properties) potential due to their similar chemical characteristics.
In this talk, the current state of the novel medical radionuclide production at the Paul Scherrer Institute will be summarized with an emphasis on radiolanthanides. Different projects for the investigation of the different production routes of promising radiolanthanides (terbium-161, erbium-165, erbium-169, thulium-167, ytterbium-167 and terbium-155) will be outlined. Appraisal of the future directions and needs for the production of novel radionuclides associated with irradiation facilities and separation (radiochemical separation, online and offline mass separation) will be underlined.

Axel Rominger, Inselspital Bern

Clinical and Research Aspects of Total-body PET

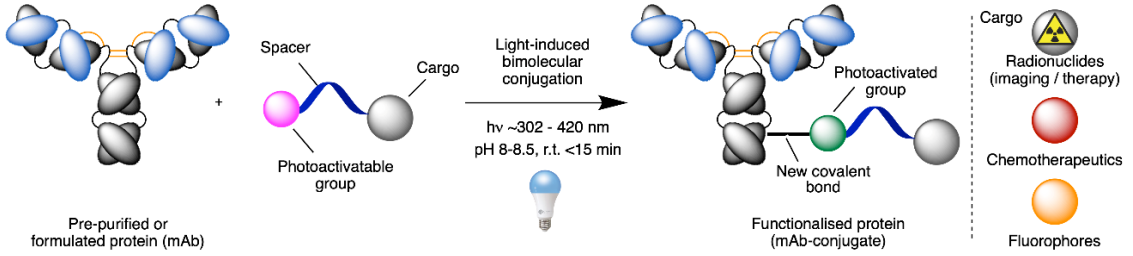
Recently, long axial field-of-view (LAFOV) scanners (>1m) with SiPM detection systems have been developed and are now commercially available. The sensitivities and axial body coverage of such a LAFOV system open up new horizons both in the scientific context and in clinical routine.

It allows for reductions in acquisition times while maintaining diagnostic quality or on the other hand reductions in the administered radioactivity without significant impact on image noise.
Delayed imaging might result in higher detectability of tumor lesions. Low count statistics PET such as Y-90 PET is possible within time slot lengths comparable to clinical routine of diagnostic tracers. Last but not least dynamic imaging protocols covering all major organs simultaneously are another major advantage compared to previous scanner generations. This allows for kinetic modeling and generation of multiparametric images, adding potentially relevant data information.
Therefore both opportunities and also challenges coming along with such a system will be presented, in light of clinical and research aspects.

Jason P. Holland, University of Zurich

Radiochemistry in a Flash

Photochemistry harbours many fascinating reactions and reactive intermediates that hold potential for applications in the synthesis of bioactive compounds. In recent years, my group has been exploring the use of compounds that undergo light-induced activation for the synthesis of protein-conjugates like monoclonal antibodies functionalised with radioactive metal complexes, fluorophores, and drugs. Photolysis typically produces extremely reactive, short-lived intermediates (with lifetimes in the micro-to-nanosecond range) and controlling the experimental conditions to allow productive bioconjugation chemistry is the major challenge in harnessing light-induced chemistry. This presentation will cover some of our recent synthetic, spectroscopic, computational, radiochemical, and biological studies using photoradiosynthesis to make viable radiotracers in a flash.



Judith Delage, CHUV Lausanne

Radiolabeling and preclinical theranostic study of anti TEM-1 scFv-Fc fusion proteins in a mouse neuroblastoma model

Antibodies recognizing specific tumor targets can be used to deliver therapeutic payloads with high degree of specificity. The simultaneous use of the same antibody, combined with different radionuclides for imaging and for therapy, an approach named “theranostics”, offers unique opportunities for personalizing therapy and rapidly assessing therapeutic response at a molecular level.

In our project, we decided to target the tumor endothelial marker 1 (TEM-1), described as an excellent therapeutic antigen, since it is tumor-specific and expressed in the neo-vasculature.
We studied preclinically one fusion protein antibody, targeting murine and human TEM-1, named 1C1m-Fc. After radiolabelling either with 64Cu or 177Lu, in vitro and in vivo characterization in xenograft models were performed to assess the immunoreactivity, the pharmacokinetic behavior and the dosimetry profile of our radiolabeled compound and to determine if this new radiolabeled probe is suitable for a theranostic application.
Our experimental results have shed some light on the role of the conjugation on the in vivo behavior of a radiolabeled compound. This finding is an opportunity to further improve the biodistribution and imaging contrast of radiopharmaceuticals. Furthermore, our study highlights the interest of a theranostic targeting of TEM-1 with a new radiolabeled antibody. The promising results appear as a prelude to a future translation in patients.

Andrea Grotzky, HUG Gènève

Routine GMP production of [13N]ammonia : from cyclotron to PET image

The nuclear medicine service of Geneva university hospital has a strong focus on cardiac molecular imaging with approximately 1300 cardiac investigations per year. One of the most frequently used PET radiopharmaceuticals is [13N]ammonia, which allows high-quality images in both rest and stress studies. Its short half-life of 9.96 min, however, requires reliable production using an on-site cyclotron and rigorous organisation for timely administration. This presentation will focus on these aspects.