

# Conference Scene

## 2011 World Molecular Imaging Congress



### 4th Annual World Molecular Imaging Congress San Diego, CA, USA, 7–10 September 2011

The rapid growth and importance of the field of molecular imaging is reflected in the number of international societies that participate in the World Molecular Imaging Congress. The recent merger of the Academy of Molecular Imaging and the Society for Molecular Imaging to form the World Molecular Imaging Society (WMIS), and its support from the Molecular Imaging Societies of Europe (ESMI) and Asia (FASMI), attest to the enthusiasm with which scientists are embracing the use of multiple imaging modalities to investigate molecular mechanisms of disease progression *in vivo*. The Program Chair, P Foster, and co-Chair, B Pichler, put together an exciting program that reflected the cutting edge of the field.

Molecular imaging is defined as the visual representation, characterization and quantification of biological processes at the cellular and molecular levels within intact living organisms. It is the confluence of three disciplines: molecular, cell and developmental biology; radiochemistry and synthetic and medicinal chemistry; and diagnostic imaging. Exciting advances in the chemical and molecular design of imaging probes, clinical applications of fluorescence imaging, and designing multimodality scanners for small animal imaging are just a few examples of how molecular imaging is transforming our understanding of disease progression. The 4th Annual WMIC consisted of 4 full days of plenary sessions, educational workshops, industry workshops, an exhibit hall with vendors' booths and demonstrations as well as a mini-theater for vendor presentations, scientific (oral) sessions and poster sessions guided by a 30 min 'walk-through' by session chairs who evaluated the posters for awards. This article will highlight presentations that showed advances in cardiovascular molecular imaging.

#### Educational sessions

On the first day, there were 15 educational sessions encompassing five topics: chemistry of contrast media, biology, translational molecular imaging, image processing and validation, and imaging physics. The focus of each session was to provide up-to-date summaries of current findings, and in some sessions, standardized experimental protocols. In the session entitled 'Biology – imaging the developing organism', current developments in imaging

of isolated mouse embryos and embryos *in utero* were discussed. M Henkelman (Toronto, Canada) highlighted the use of high-throughput, high-resolution MRI to image embryonic lethality in knockout mice. D Turnbull (NY, USA) described the use of "ultrasound biomicroscopy" for analysis of cardiac blood flow and heart rate *in utero*, and 7 T MRI for the detection of embryonic cardiac motion and respiration. The most innovative ways of imaging the developing vasculature was in transgenic mice in which biotin expression was targeted to vascular endothelial cells. In this way, any imaging agent conjugated to avidin would bind to the biotin to detect the vasculature, such as fluorescein-avidin for fluorescence imaging, PFC-microbubble-avidin for ultrasound, and Gd-DTPA-avidin for MRI.

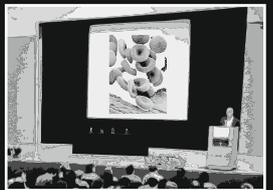
#### Scientific sessions

In the following 3 days of the conference, there were two blocks of five concurrent scientific sessions, in the morning and afternoon. Each session consisted of six oral presentations, selected from submitted abstracts. The sessions were organized to cover several themes, such as novel imaging modalities, probe design and nanomaterials, animal models, imaging biological processes and disease progression, and translational, clinical and 'close-to-clinical' imaging.

The session on 'Cardiovascular disease' (moderators: ZA Fayad, Charlottesville VA, USA, and M Schwaiger, Munich, Germany) covered aspects of imaging the molecular processes in the progression of atherosclerosis, myocardial infarct and ischemia/reperfusion injury, vascular

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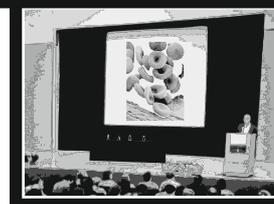
perfusion and leakage, and cardiomyopathy. SM Min (Seoul, Korea) used a near-infrared probe to image how matrix metalloprotease activity changed with diet or exercise in a mouse model of atherosclerosis. Y Tekabe (NY, USA) showed how dual-isotope SPECT/CT could detect changes in the receptor of the advanced glycation end products (RAGE) and perfusion in a mouse model of ischemia/reperfusion. They used a  $^{99m}\text{Tc}$ -anti-RAGE antibody for imaging RAGE and showed that there was a transient increase after injury. S Proulx (Zurich, Switzerland) used a fluorescent nanoparticle, IRDye800-PEG20000, to detect vascular leakage in mice overexpressing VEGFA, and found that it could detect very small changes in vascular permeability. K Vandoorne (Rehovot, Israel) was able to conduct Doppler ultrasound and micro-CT *in utero* to detect myocardial abnormalities in mice lacking a pro-survival gene, *Akt*. This was followed-up by cardiac MRI in the adults, thus achieving cardiac phenotyping from development to adulthood. A Broisat (Grenoble, France) developed nanobodies against VCAM-1 by phage display, and labeled them with  $^{99m}\text{Tc}$  for SPECT imaging of atherosclerotic plaques. Finally, our own work (S Dhanvantari, London, ON, Canada) showed the development of PET probes based on the structure of the peptide hormone ghrelin, and how they could monitor changes in expression of the ghrelin receptor, GHS-R, in the myocardium during the progression of diabetes in a mouse model.

Other scientific sessions, while not devoted entirely to imaging cardiovascular disease, had presentations on novel imaging probes or modalities designed to detect areas of cardiac inflammation, tracking stem cells and imaging apoptosis in models of myocardial infarct. The session entitled 'Imaging probes for novel molecular imaging techniques' (moderator: S Aime, Torino, Italy) covered the use of such experimental imaging modalities and probes as Cerenkov luminescence, photoacoustic nanodroplets, fluorescence lifetime imaging and chemical exchange saturation transfer MRI contrast agents. Y Xu (Stanford, CA, USA) described the use of Cerenkov luminescence imaging, which detects photons emitted by positron-emitting radionuclides, to detect the effects

of cancer therapy. K Wilson (Austin, TX, USA) discussed photoacoustic nanodroplets, which consist of perfluorocarbon nanobubbles containing gold nanorods, to image the pancreas using ultrasound. C Goergen (Boston, MA, USA) showed how fluorescence lifetime contrast could detect protease activity in regions of myocardial infarct. Fluorescence lifetime imaging is based on the exponential decay rate of the fluorophore, thus enabling more efficient separation of signal from background. Using a cathepsin-activatable near-infrared probe in a mouse coronary artery ligation model of myocardial infarction, they were able to show elevation of fluorescent signal specifically in the area of infarct. LQ Chen (Tucson, AZ, USA) and E Terreno (Torino, Italy) used chemical exchange saturation transfer MRI contrast agents, which depends on the chemical exchange of labeled protons in the contrast agent with bulk water to measure changes in extracellular pH in tumors following anticancer therapy.

There were three presentations in the session 'Imaging the fate and function of stem cells' (moderators: P Foster, London, ON, Canada, and J Bulte, Baltimore, MD, USA) that described stem cell tracking in models of cardiovascular disease. Z Zhang (Xian, China) used bioluminescence imaging to show enhanced survival of adipose-derived stem cells upon treatment with statins in a mouse model of myocardial infarction. Enhanced survival correlated with improvements in cardiac function and a decrease in fibrosis and inflammation. K Narshnh (Stanford, CA, USA) described a method by which cardiac progenitor cells could be genetically engineered for multimodality imaging. Engraftment of the engineered stem cells into a mouse model of ischemic myocardium could be visualized over time with PET and bioluminescence, and correlated with improvements in cardiac function. J Lu (Xian, China) used mesenchymal stem cells engineered for bioluminescence imaging in conjunction with micro-CT to track angiogenesis in a mouse model of vascular ischemia.

In the session 'Imaging apoptosis', H Chen (Charlestown, MA, USA) showed that the apoptosis-sensing nanoparticle, AnxCLIO-Cy5.5, had a protective effect on apoptosis in a mouse model of cardiac



ischemia/reperfusion injury. The nanoparticle targets phosphatidylserine on apoptotic cell membranes and can be imaged through MRI or fluorescence by means of the iron oxide nanoparticle CLIO or the fluorescent dye Cy5.5. J Johnson (St Louis, MO, USA) described the use of caspase-activatable cell-penetrating peptides conjugated to fluorescent dyes to report apoptosis in a rat model of retinal degeneration. E Ribot (London, ON, Canada) showed that a balanced steady-state free precession MRI pulse sequence could distinguish live and dead cells labeled with iron oxide nanoparticles. K Jung (Seoul, Korea) showed that radiation therapy of cancer cells engineered to express the sodium iodide symporter could be imaged with SPECT using an  $^{131}\text{I}$ -labeled peptide. N Sato (Bethesda, MD, USA) demonstrated the use of PSVue794, a near-infrared probe targeting phosphatidylserine, in visualizing tumor cell death induced by cytotoxic T cells in a mouse model of immune cell therapy.

### Poster sessions

There were 832 poster presentations divided into four sessions that covered a wide range of topics, such as recent advances in imaging instrumentation, probe design, imaging of chronic disease, animal models, imaging cellular metabolism, gene expression and epigenetics, and translational and clinical studies. Each session was allotted 90 min, which allowed for extensive discussions with the poster presenters. Thirty two presenters received awards for their presentations.

### Plenary sessions

The keynote address was given by RS Kerbel (Toronto, ON, Canada) on imaging the effects of therapy in advanced metastatic cancer. Five plenary sessions at WMIC covered the latest advances in clinical fluorescence imaging (V Ntziachristos, Munich, Germany, and GM van Dam, Groningen, The Netherlands), PET imaging of the endocrine pancreas (P Harris, New York, NY, USA), metabolic imaging of cancer (SJ Nelson, San Francisco, CA, USA) fast MRI (M Garwood, Minneapolis, MN, USA) and immuno-PET of cancer (A Wu, Los Angeles, CA, USA).

The Young Investigator Award winners were: 1st place – K Wilson (Austin, TX, USA); 2nd place – L Crane (Groningen, The Netherlands); 3rd place – P Wang (Charlestown, MA, USA).

The next World Molecular Imaging Congress will be held 5–8 September 2012 in Dublin, Ireland. The congress will provide an exciting opportunity for researchers to share the latest developments in the multidisciplinary and ever-expanding field of molecular imaging.

### Financial & competing interests disclosure

*The author has no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript.*

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