Prof. Giuseppe Digilio

Curriculum Vitae

BIO AND EDUCATION

Prof. Giuseppe Digilio achieved his Master Degree in 1993 at the at the University of Turin (Italy) and received his PhD in 1998 (Protein Chemistry) at the same University with a research project entitled "Metal ions in the etiology and diagnosis of neurodegenerative diseases", under the supervision of Prof. S. Aime and Prof. B. Bergamasco. From 1999 to 2007, he held a permanent position as Head of the Chemistry Department at the "Bioindustry Park del Canavese SpA" (Colleretto Giacosa, TO, Italy), a Science Park focused on biotechnology and pharmaceutical research as a Contract Research Organization. In this period, his activities also included the technology transfer from public research institutions to private enterprises. In 2007 he was recruited as a chemistry Researcher (permanent staff) by the University of Eastern Piedmont "A. Avogadro", Department of Science and Technological Innovation (DiSIT; formerly DiSAV), located in Alessandria (AL, Italy). In 2022 he was appointed as Associate Professor in Chemistry by the same University. The main research activities include: *i)* Chemistry of molecular imaging probes (MRI, Spectral Photon Counting CT, Nuclear Medicine, Optical Imaging); *ii)* Microenvironment-responsive MRI probes based on lanthanide chelates; *iii)* Imaging labelled biomaterials for the follow-up of cell therapy; *iv)* Environmental metabolomics. From 2014 to 2020 he was an elected member of the Council of the European Society of Molecular Imaging (ESMI), the largest European scientific society dedicated to biomedical imaging science in preclinical research (www.e-smi.eu). He contributed to the construction of Euro-BioImaging ERIC, a pan-european research infrastructure whose mission is to provide open access to cutting-edge imaging technologies, both in the field of biomedical imaging and super-resolution microscopy (www.eurobioimaging.eu). He is currently a member of the MedHub, the section of the infrastructure dedicated to networking, training and open access to biomedical imaging technologies. He is a member of the Organizing Committee of the "National NMR School" promoted by GIDRM (Gruppo Italiano Discussione Risonanze Magnetiche; www.gidrm.org). He is author/co-author in over 60 international peer reviewed scientific publications and co-author in one patent.

UNIVERSITY CAREER

2022-	Associate Professor in Chemistry at the University of Eastern Piedmont "Amedeo Avogadro"
2007-2022	Researcher in Chemistry at the University of Eastern Piedmont "Amedeo Avogadro"

MAIN FIELDS OF INTEREST

1. Molecular and cellular imaging probe chemistry
2. Microenvironment-responsive MRI probes
3. Biomolecular NMR spectroscopy
4. Environmental metabolomics

CURRENT ISSUES OF RESEARCH

1. *Magnetic Resonance Imaging (MRI) molecular probes targeted to the Extracellular Matrix (ECM).*
   The ECM undergoes continuous remodelling, resulting from the balance between the degradation of its macromolecular components (*e.g.* collagens, elastin, fibrin, fibronectin) and *de novo* synthesis. The ECM remodelling is impaired in many pathobiological processes (including cardiovascular diseases and tumorigenesis). This research issue aims at developing new molecular imaging probes targeted to specific components of the ECM to study at the molecular level the role of ECM alterations in the progression and staging of the disease by non-invasive imaging techniques (*e.g.* MRI, Optical Imaging). The potential for clinical translations of early diagnostic imaging markers is also considered.
2. *Novel microenvironment-responsive contrast agents for Magnetic Resonance Imaging (MRI).*
   The assessment of the extracellular microenvironment in solid tumors is of utmost importance to stratify patients and to personalize therapy. This line of research deals with the synthesis, characterization and validation of MRI contrast agents responsive to either extracellular pH, or redox potential, or the activity of matrix enzymes. Probes being developed can be based on relaxation agents (for T_{1w}-MRI), or chemical exchange saturation transfer agents (for the CEST-MRI modality), or perfluorinated nanoparticles for the ^{19}F-MRI modality. Methods to obtain parametric images of the tissue microenvironment are also considered.
3. *Imaging labelled biomaterials for cell-therapy follow-up by Magnetic Resonance Imaging (MRI).*
   Cell therapy can be broadly defined as the transplantation of living cells for the treatment of a wide number of medical disorders. A critical issue to understand how therapy works is the lack of clinically compliant methods to follow-up the state of therapeutic cells on the long term after transplantation. This line of research aims at developing imaging labelled biomaterials to provide a shielding against immune rejection, and, at the same time, to enable longitudinal monitoring of cell survival by MRI.
4. *Structural characterization of functionalized peptides and recombinant proteins.*
   The conjugation of bioactive molecules such as peptides and proteins with chemical functionalities to enhance their pharmacokinetic profile or to add new functions is widely employed in the biotechnologic pharma industry. The research activities in this field aims at *i)* developing bioconjugation techniques and at *ii)* assessing the structure of biotechnologic drugs (for instance, by assessing the structural equivalence between PEGylated proteins and their native counterparts), with potential applications in drug design and in quality control.
5. *Environmental metabolomics*
   In environmental sciences, metabolomics has a great potential to reveal the response of sentinel organisms to environmental stressors when the level of stressors/toxicants are below those required to give clear answers in traditional end-point assays. This line of research is aimed at defining a link between metabolomic changes in suitable sentinel organisms and the level of ecotoxicological challenge, with potential applications for environmental surveillance.

CURRENT FUNDED PROJECTS

CALL	PROJECT TITLE
PRIN 2022 (PNRR M4C2)	"BiOmimetic fluorinated nanoProbes for multIscale Tumor detection by MRI and Advanced Raman techniques (OPTIMA)" – Project ID: 2022598YAX.
BHF RG/20/1/34802	"Detection Of High-Risk Plaque With Tropoelastin-Specific And Multicontrast Coronary MRI". Collaboration Agreement with King's College London

TOP FIVE PAPERS

1. F. Capuana, A. Phinikaridou, R. Stefania, S. Padovan, B. Lavin, S. Lacerda, E. Almouazen, Y. Chevalier, L. Heinrich-Balard, R. M. Botnar, S. Aime, G. Digilio* "Imaging of dysfunctional elastogenesis in atherosclerosis using an improved gadolinium-based tetrameric MRI probe targeted to tropoelastin" *J. Med. Chem.* **2021**, 64(20), 15250-15261.

2. V. Catanzaro, C. V. Gringeri, V. Menchise, S. Padovan, C. Boffa, W. Dastrù, L. Chaabane, G. Digilio*, S. Aime. A R_{2p}/R_{1p} ratiometric procedure to assess Matrix Metalloproteinase-2 activity by Magnetic Resonance Imaging. *Angew. Chem. Int. Ed.* **2013**, 52, 3926–3930.

3. V. Mugoni, R. Postel, V. Catanzaro, E. De Luca, E. Turco, G. Digilio, L. Silengo, M. P. Murphy, C. Medana, D.Y.R. Stainier, J. Bakkers, M. M. Santoro. Ubiad1 Is an Antioxidant Enzyme that Regulates eNOS Activity by CoQ10 Synthesis. *Cell* **2013**, 152, 504–518.

4. G. Digilio*, V. Menchise, E. Gianolio, V. Catanzaro, C. Carrera, R. Napolitano, F. Fedeli and S. Aime. Exofacial protein thiols as a route for the internalization of Gd(III)-based complexes for MRI cell labelling. *J. Med. Chem.* **2010**, 53, 4877–4890.

5. G. Digilio*, L. Barbero, C. Bracco, D. Corpillo, P. Esposito, G. Piquet, S. Traversa, S. Aime "NMR Structure of Two Novel Polyethylene Glycol Conjugates of the Human Growth Hormone-Releasing Factor, hGRF(1-29)-NH_2" *J. Am. Chem. Soc.* **2003**, 125, 3458-3470.

FURTHER INFORMATION

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