# Curriculum vitae

**Marlène WIART**,47 y.o.

2 children born 2010 & 2013(carrier break of 2 years in 2010-2013)

[Ischemia-Reperfusion Injury Syndrom](http://carmen.univ-lyon1.fr/team-5-cardioprotection/?lang=en) (IRIS) team

[CarMeN lab](http://carmen.univ-lyon1.fr/?lang=en) (Cardiovascular, Metabolism, Diabetes and Nutrition)

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Research statistics: **Publications** 55; **h-number**: 25 (Google scholar, 07 March 2022)

**Education**

**1997-2000** **Ph.D. in Bioengineering** (University Claude Bernard Lyon 1: UCBL, Lyon, France)

“Quantification of cerebral perfusion using dynamic MRI”, under the supervision of Pr Atilla Baskurt.

Obtained with highest honors.

**1995-1997** **Master of Science in Physics**

I obtained the Master of Research diploma (DEA) of UCBL with a major in Bioengineering.

**1992-1995 Bachelor of Science in Physics**

I was admitted upon application at the **Ecole Normale Supérieure de Lyon** (ENS Lyon, France) in 1994 after obtaining my college degree in Physics at UCBL.

**Appointments**

**2015-today** Full-time **senior researcher** (directrice de recherche) at the [Center for National Scientific Research](https://www.cnrs.fr/en/cnrs) (CNRS) in the [IRIS team](http://carmen.univ-lyon1.fr/equipe-3-ischemia-reperfusion-syndromes/) of [CarMeN lab](http://carmen.univ-lyon1.fr/) (U1060 Inserm, UCBL)

Pilot, Axis 1: *Multimodal imaging of cellular death and inflammation*

**2002-2015** Full-time **research** **associate** (chargée de recherche) at the CNRS in the [Creatis](https://www.creatis.insa-lyon.fr/site7/en) lab(UMR CNRS 5220 U630 Inserm, Yves Berthezène & Norbert Nighoghossian group).

**2000-2002 Post-doc** at the Center for pharmaceutical and molecular imaging (Robert Brasch group), University of California San Francisco(UCSF, San Francisco, USA)

**Funding IDs (since 2015)**

**2019-2023 Coordinator** (PI: Marlène Wiart):ANR Breakthru. Collaborative project: *Bicolor imaging with x-Rays to Evaluate A repair Kit THRroUgh dedicated labelling of stem cells and hydrogel* <<https://anr.fr/Projet-ANR-18-CE19-0003>>

**2016-2021 Partner** (PIs Pr Ovize & Pr Nighoghossian): RHU MARVELOUS. *New MR imaging to prevent cerebral and myocardial reperfusion injury* <<http://www.rhu-marvelous.fr>>

**2015-2021 Partner** (PI: Pr Philippe Douek):European Union H2020:SPCCT. *In Vivo Spectral Photon Counting CT Molecular Imaging in Cardio- and Neuro-Vascular Diseases* <[www.spcct.eu](http://www.spcct.eu)>

**2015-2021 Project co-coordinator** (PI: Pr Berthezène):ANR NanoBrain. Collaborative project with public-private partnership: *Imaging inflammation in vivo in ischemic stroke - development of a multimodal NANOprobe & BRAIN imaging methods* <[www.nanobrain.fr](http://www.nanobrain.fr)>

**2015-2021 Partner** (PI: Pr Emmanuelle Canet-Soulas):ANR CYCLOPS. *CYCLOsporine A : Neuroprotecting effect in a non-human primate model of ischemic stroke with longitudinal PET/MRI <*[*https://anr.fr/Projet-ANR-15-CE17-0020*](https://anr.fr/Projet-ANR-15-CE17-0020)*>*

**Research record**

*Research topics:* My research thematic focuses on the development of **in-vivo molecular imaging** methods using innovative contrast agents and multimodal approaches for **translational ischemic stroke research**. I have made a **mobility** to CarMeN lab in 2015 to complement my imaging and therapies investigations with mechanistic studies and to foster the clinical transfer of my discoveries.

* **MRI of inflammation using iron oxide nanoparticles.** Mymain achievement is the development of an innovative MRI approach devoted to the analysis of neuroinflammation following ischemic stroke. This imaging method is based on the in-vivo magnetic labelling of phagocytic cells with magnetic nanoparticles such as ultrasmall superparamagnetic particles of iron oxide (USPIOs). This approach is attractive as it may be translated in clinical practice as demonstrated with Pr Nighoghossian in 2007. My current motivations are to improve the specificity of the approach and to further validate the MRI endpoints by designing novel nanoprobes and taking advantage of multimodality opportunities, such as intravital two-photon microscopy, synchrotron x-ray in-line phase-contrast microtomography and k-edge imaging with spectral photon-counting CT.
* **MRI monitoring of neuroprotection treatments of ischemic stroke.** I have developed a translational platform for investigating rodent models of ischemic stroke. The originality of my approach is to use MRI for animal inclusion and follow-up. I have implemented the same sequences as in clinical trials and I am currently working towards the identification of translational imaging endpoints to foster the clinical approval of new neuroprotection strategies.
* **Quantification of tissue perfusion and permeability with MRI and echography.** My main contribution to the fieldisthe development of methodological tools, based on black-box analysis or compartmental modelling, to extract quantitative hemodynamic parameters from the kinetics of an MR contrast agent. These developments have had broad applications both in the pre-clinical and in the clinical arenas in different organs: brain, heart, lungs, liver, breast, prostate...

**Current PhD supervision**

Elodie Ong. Evaluation of cyclosporine A neuroprotective effects in a mouse model of ischemic stroke using multimodal imaging, co-supervised by [M Paillard](http://carmen-intranet.univ-lyon1.fr/membres/melanie-paillard/) (CR Inserm, CarMeN). PhD defense: April 2023.

Clément Tavakoli. Monitoring gold-labelled therapeutic cells embedded in iodine-labelled hydrogel in animal models of osteoarthritis and ischemic stroke using high resolution k-edge subtraction CT, co-supervised by E Brun (CR Inserm, [STROBE team](https://strobe.univ-grenoble-alpes.fr/)). PhD defense: April 2023.

**Academic services**

Active member of the European Society for Molecular Imaging (ESMI), reviewer and neuroimaging category chair (2018-2019) at the EMIM (ESMI meeting), academic editor for *Plos One* and *Frontiers (Neurology & Cellular Neuroscience)*, reviewer for a number of international journals

**Industrial partnerships and contracts**

[Guerbet](https://www.guerbet.com/), [AMAG pharmaceuticals](https://www.amagpharma.com/), [MATHYM](https://www.mathym.com/), [Sanofi](https://www.sanofi.fr/), [Olea medical](https://www.olea-medical.com/fr), [VisualSonics](https://www.visualsonics.com/), [Philips Healthcare](https://www.philips.fr/healthcare)

# Publications 2018-2022 (citations are given from Web of Science in March 2022)

1. Dumot C, Po C, Capin L, Hubert V, Ong E, Chourrout M, Bolbos R, Amaz C, Auxenfans C, Canet-Soulas E, Rome C, Chauveau F, Wiart M. Neurofunctional and neuroimaging readouts for designing a preclinical stem-cell therapy trial in experimental stroke. Sci Rep, 2022, 12(1): 4700. <https://doi.org/10.21203/rs.3.rs-1019878/v1>

*With the aim of designing a preclinical study evaluating an intracerebral cell-based therapy for stroke, an observational study was performed in the rat suture model of ischemic stroke. Our results suggested that the most relevant endpoints were side bias (staircase test) and axial diffusivity (AD) (diffusion tensor imaging). After sample size calculation (18-147 rats per group according to the endpoint considered), we conclude that a therapeutic trial based on both readouts would be feasible only in the framework of a multicenter trial.*

1. Chourrout M, Rositi H, Ong E, Hubert V, Paccalet A, Foucault L, Autret A, Fayard B, Olivier C, Bolbos R, Peyrin F, Crola-da-Silva C, Meyronet D, Raineteau O, Elleaume H, Brun E, Chauveau F, Wiart M. Brain virtual histology with X-ray phase-contrast tomography Part I: whole-brain myelin mapping in white-matter injury models. Biomedical Optics Express 2022;13(3): pp: 1620-1639

<https://doi.org/10.1364/BOE.438832>

*We here demonstrate that X-ray phase-contrast tomography (XPCT) combined with ethanol-induced brain sample dehydration enables myelin mapping of the whole rodent brain and of human anatomo-pathological samples. XPCT detected and quantified white-matter injuries in a range of diseases, including ischemic stroke, and thus represents a powerful virtual histology tool.*

1. Chourrout M, Roux M, Boisvert C, Gislard C, Legland D, Arganda-Carreras I, Olivier C, Peyrin F, Boutin H, Rama N, Baron T, Meyronet D, Brun E, Rositi H, Wiart M, Chauveau F. Brain virtual histology with X-ray phase-contrast tomography. Part II: 3D morphologies of amyloid-β plaques in Alzheimer’s disease models. Biomedical Optics Express 2022;13(3): pp: 1640-1653 <https://doi.org/10.1364/BOE.438890>

*The present study shows how in-line (propagation-based) X-ray phase-contrast tomography (XPCT) combined with ethanol-induced brain sample dehydration enables hippocampus-wide detection and morphometric analysis of A plaques in Alzheimer’s disease models.*

1. Hubert V, Hristovska I, Karpati S, Benkeder S, Dey A, Dumot C, Amaz C, Chounlamountri N, Watrin C, Comte JC, Chauveau F, Brun E, Marche P, Lerouge F, Parola S, Berthezène Y, Vorup-Jensen T, Pascual O, and Wiart M. Multimodal imaging with NanoGd reveals spatiotemporal features of neuroinflammation after experimental stroke. Adv Science 2021, e2101433.

<https://onlinelibrary.wiley.com/doi/10.1002/advs.202101433>

*We here propose an in vivo MRI tool to monitor neuroinflammation following ischemic stroke in mice, that we validate using two-photon intravital imaging back-to-back with MRI for the first time, using a novel gadolinium-based fluorophore-grafted nanoprobe specifically designed for internalization by phagocytic cells (ref Karpati et al below)*

1. Karpati S, Hubert V, Hristovska I, Lerouge F, Chaput F, Bretonnière Y, Andraud C, Banyasz A, Micouin G, Monteil M, Lecouvey M, Mercey M, Dey A, Marche P, Lindgren M, Pascual O, **Wiart M**, Parola S. Hybrid Multimodal Contrast Agent for Multiscale In Vivo Investigation of Neuroinflammation. Nanoscale, 2021, **13**, 3767-3781. <https://doi.org/10.1039/D0NR07026B>

*This paper from the NanoBrain consortium reports the synthesis and characterization of a hybrid multimodal nanoparticle specifically designed for the study of neuroinflammation. The follow-up paper that reports the validation of the approach in a mouse model of ischemic stroke is currently under revision in Advanced Science.*

1. Debatisse J, Eker O, Wateau O, Cho TH, **Wiart M**, Ramonet D, Costes N, Mérida I, Léon C, Dia M, Paillard M, Confais J, Rossetti F, Langlois JB, Troalen T, Iecker T, Le Bars D, Lancelot S, Bouchier B, Lukasziewic AC, Oudotte A, Nighoghossian N, Ovize M, Contamin H, Lux F, Tillement O, Canet-Soulas E. PET-MRI nanoparticles imaging of blood-brain barrier damage and modulation after stroke reperfusion. Brain Communications 2020, fcaa193, <https://doi.org/10.1093/braincomms/fcaa193>

*This paper from the CYCLOPS consortium presents a novel hybrid PET/MR method to assess blood-brain barrier permeability using a clinically-applicable nanoparticle and shows that this approach allows monitoring blood–brain barrier damage and cyclosporine A treatment effect in a non-human primate model of ischemic stroke.*

1. Basalay MV\*, **Wiart M**\*, Chauveau F, Dumot C, Leon C, Amaz C, Bolbos R, Cash D, Kim E, Mechtouff L, Cho TH, Nighoghossian N, Davidson SM, Ovize M, Yellon DM. Neuroprotection by remote ischemic conditioning in the setting of acute ischemic stroke: a preclinical two-centre study. Sci Rep 2020 Oct 9;10(1):16874. **\*co-first authors.** <https://doi.org/10.1038/s41598-020-74046-4>

*This collaborative paper (Hatter Cardiovascular Institute and Kings college London, London, United Kingdom) shows that remote ischemic conditioning in the setting of acute ischemic stroke in rats is safe, reduces infarct size and improves functional recovery through a two-centre, randomized, blinded international study, using translational imaging endpoints.*

1. Cuccione E, Chhour P, Si-Mohamed S, Dumot C, Kim J, Hubert V, Da Silva C, Vandamme M, Chereul E, Balegamire J, Chevalier Y, Berthezene Y, Boussel L, Douek P, Cormode D, **Wiart M**. Multicolor spectral photon counting CT monitors and quantifies therapeutic cells and their encapsulating scaffold in a model of brain damage. NanoTheranostics 2020;4(3):129-141.

<https://www.ntno.org/v04p0129.htm>

*This paper from the SPCCT consortium demonstrates for the first time internationally that multicolor spectral photon counting CT (SPCCT) allows the monitoring and quantification of therapeutic cells and their encapsulating scaffold transplanted in the damaged rat brain.*

1. Hubert V, Dumot C, Ong E, Amaz C, Canet-Soulas E, Chauveau F, **Wiart M**. MRI coupled with clinically-applicable iron oxide nanoparticles reveals choroid plexus involvement in a murine model of neuroinflammation. Sci Rep. 2019 Jul 11;9(1):10046. <https://doi.org/10.1038/s41598-019-46566-1>

*This paper brings the proof-of-concept that MR imaging of ultrasmall particles of iron oxide (USPIO) accumulation within the choroid plexus may serve as a translational imaging biomarker to study choroid plexus involvement in neuroinflammatory disorders. 6 citations* [*(1st percentile of the 261,802 tracked articles of a similar age in all journals*](https://www.nature.com/articles/s41598-019-46566-1/metrics)*).*

1. Hubert V, Chauveau F, Dumot C, Ong E, Berner LP, Canet-Soulas E, Ghersi-Egea JF, **Wiart M**. Clinical Imaging of Choroid Plexus in Health and in Brain Disorders: A Mini-Review. Front Mol Neurosci. 2019 Feb 12;12:34. <https://doi.org/10.3389/fnmol.2019.00034>

*This review summarizes the knowledge that has been gathered from the clinical imaging of choroid plexus* *(ChPs) in health and brain disorders. Imaging of immune cell trafficking at the ChPs has remained limited to pre-clinical studies so far but has the potential to be translated in patients for example using MRI coupled with the injection of clinically-applicable iron oxide nanoparticles. 9 citations (69% citation rank:* [*more than 69% of all Frontiers articles*](http://loop-impact.frontiersin.org/impact/article/436311#citations)*).*

1. Davidson SM, Arjun S, Basalay MV, Bell RM, Bromage DI, Botker HE, Carr RD, Cunningham J, Ghosh AK, Heusch G, Ibanez B, Kleinbongard P, Lecour S, Maddock H, Ovize M, Walker M, **Wiart M**, Yellon DM. The 10th Biennial Hatter Cardiovascular Institute workshop: cellular protection−evaluating new directions in the setting of myocardial infarction, ischaemic stroke, and cardio−oncology. Basic Res Cardiol 2018, 113:43. <https://doi.org/10.1007/s00395-018-0704-z>

*The investigators meeting at the 10th Hatter Cardiovascular Institute workshop examined the parallels between ST-segment elevation myocardial infarction (STEMI) and ischemic stroke. It was agreed that the way forward must include measures to improve experimental methodologies, such as longitudinal MRI and to judiciously select therapies targeting specific pathways of cellular death and injury such as remote ischemic conditioning.* ***56 citations (***[***Highly cited paper****:* ***top 1% of the academic field of Clinical Medicine based on a highly cited threshold for the field and publication year***](http://apps.webofknowledge.com.proxy.insermbiblio.inist.fr/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=F55oAVUy5hNHPNb981v&page=1&doc=5)***)***

1. Albers J, Pacile S, Markus MA, **Wiart M**, Vande Velde G, Tromba G, Dullin C. X-ray-Based 3D Virtual Histology—Adding the Next Dimension to Histological Analysis. Mol Imaging Biol 2018, 20:732−741. <https://doi.org/10.1007/s11307-018-1246-3>

*This collaborative review from the x-ray study group of the European Society for Molecular imaging -* [*ESMI*](https://www.e-smi.eu/) *summarizes the most recent examples of virtual histology using synchrotron x-rays and provides currently known possibilities of improving contrast and resolution of μCT. The current evidence suggests that virtual histology may present a valuable addition to the workflow of histological analysis, potentially reducing the workload in pathology, refining tissue classification, and supporting the detection of malignancies, including in neurology, the field that I covered in this review. 13 citations.*

1. Brisset JC, Gazeau F, Corot C, Nighoghossian N, Berthezène Y, Canet-Soulas E, **Wiart M**. INFLAM – INFLAMmation in Brain and Vessels with Iron Nanoparticles and Cell Trafficking: A Multiscale Approach of Tissue Microenvironment, Iron Nanostructure and Iron Biotransformation. IRBM, Elsevier Masson, 2018, 39 (2), pp.93−102. <https://doi.org/10.1016/j.irbm.2018.02.002>

*This review from the INFLAM consortium presents the contribution of our collaborative research project under the "TecSan" grant from the French Research Agency (ANR) as well as pre-clinical and clinical perspectives of USPIO's inflammation MRI in atherosclerosis and stroke. 2 citations.*

# Main publications before 2018

1. Nighoghossian N, **Wiart M**, S. Cakmak, Berthezene Y, Derex L, Cho TH, Nemoz C, Chappuis F, Tisserand JL, Pialat JB, Trouillas P, Froment JC, Hermier M. [Inflammatory response after ischemic stroke: a USPIO-enhanced MRI study in patients.](https://doi.org/10.1161/01.str.0000254548.30258.f2) *Stroke*, 2007;38(2):303-307. 95 citations.
2. **Wiart M**, Davoust N, Pialat JB, Desestret V, Moucharrafie S, Cho TH, Mutin M, Langlois JB, Beuf O, Honnorat J, Nighoghossian N, Berthezene Y. [MRI monitoring of neuro-inflammation in mouse focal ischemia](https://www.ahajournals.org/doi/10.1161/01.STR.0000252159.05702.00). Stroke, 2007,38(1) :131-137. 86 citations.
3. Desestret V, Brisset JC, Devillard E, Moucharrafie S, Nataf S, Honnorat J, Nighoghossian N, Berthezène Y, and **Wiart M**.[Early stage investigations of USPIO-induced signal changes after focal cerebral ischemia in mice](https://doi.org/10.1161/STROKEAHA.108.531269). Stroke, 40:1834-1841, 2009. 48 citations.
4. Brisset JC, Desestret V, Devillard E, Marcellino S, Chauveau F, Lagarde F, Nataf S, Honnorat J, Nighoghossian N, Berthezène Y, and **Wiart M**. [Quantitative effects of cell internalization of two types of ultrasmall superparamagnetic iron oxide nanoparticles at 4.7T and 7T](https://link.springer.com/article/10.1007%2Fs00330-009-1572-6). *European Radiology*, 2010; 20(2):275-285. 22 citations.
5. Chauveau F, Cho TH, Perez M, Guichardant M, Riou A, Aguettaz P, Picq M, Lagarde M, Berthezène Y, Nighoghossian N, **Wiart M**. [Brain-targeting form of docosahexaenoic acid for experimental stroke treatment: MRI evaluation](https://doi.org/10.2174/156720211795495349). *Curr Neurovasc Res*, 8(2):95-102, 2011. 28 citations.
6. Desestret V, Riou A, Chauveau F, Cho TH, Devillard E, Marinescu M, Ferrera R, Rey C, Chanal M, Angoulvant D, Honnorat J, Nighoghossian N, Berthezene Y, Nataf S, **Wiart M**. [In vitro and in vivo models of cerebral ischemia show discrepancy in therapeutic effects of M2 macrophages](https://doi.org/10.1371/journal.pone.0067063). *PLoS One* 2013, 8:e67063. 32 citations.
7. Durand A, Chauveau F, Cho TH, Kallus C, Wagner M, Boutitie F, Maucort-Boulch D, Berthezene Y, **Wiart M**, Nighoghossian N: [Effects of a TAFI-Inhibitor Combined with a Suboptimal Dose of rtPA in a Murine Thromboembolic Model of Stroke](file:///D:\Marlene\CNRS\Avancement-au-choix\10.1159\000366266). *Cerebrovasc Dis* 2014, 38:268-275. 10 citations.
8. Marinescu M, Chauveau F, Durand A, Riou A, Cho TH, Dencausse A, Ballet S, Nighoghossian N, Berthezene Y, **Wiart M**. [Monitoring therapeutic effects in experimental stroke by serial USPIO-enhanced MRI](https://link.springer.com/article/10.1007%2Fs00330-012-2567-2). *European Radiology* 2013, 23:37-47. 14 citations.
9. Frindel C, Rouanet A, Giacalone M, Cho TH, Ostergaard L, Fiehler J, Pedraza S, Baron JC, Wiart M, Berthezene Y, Nighoghossian N, Rousseau D: [Validity of shape as a predictive biomarker of final infarct volume in acute ischemic stroke](file:///D:\Marlene\CNRS\Avancement-au-choix\10.1161\STROKEAHA.114.008046). *Stroke* 2015, 46:976-981. 10 citations.
10. Tamion A, Hillenkamp M, Hillion A, Maraloiu VA, Vlaicu ID, Stefan M, Ghica D, Rositi H, Chauveau F, Blanchin MG, Wiart M, Dupuis V: [Ferritin surplus in mouse spleen 14 months after intravenous injection of iron oxide nanoparticles at clinical dose](https://doi.org/10.1007/s12274-016-1126-6), Nano Research 2016, 9:2398-2410. 7 citations.
11. Cuccione E, Versace A, Cho TH, Carone D, Berner LP, Ong E, Rousseau D, Cai R, Monza L, Ferrarese C, Sganzerla EP, Berthezene Y, Nighoghossian N, Wiart M, Beretta S, Chauveau F: [Multi-site laser Doppler flowmetry for assessing collateral flow in experimental ischemic stroke: Validation of outcome prediction with acute MRI](https://doi.org/10.1177/0271678X16661567). *J Cereb Blood Flow Metab* 2017;37(6):2159-2170. 10 citations.