

Editorial

Biomimetic and Functional Nanomaterials for Molecular Imaging

Pedro Ramos-Cabrer^{1,2,*}  and Jesús Ruiz-Cabello^{1,2,3,4,*} ¹ CIC biomaGUNE, Basque Research and Technology Alliance (BRTA), 20014 San Sebastian, Spain² Ikerbasque, Basque Foundation for Science, 48009 Bilbao, Spain³ Biomedical Research Networking Center in Respiratory Diseases (CIBERES), 28029 Madrid, Spain⁴ Department of Chemistry in Pharmaceutical Sciences, Pharmacy School, University Complutense Madrid, 28040 Madrid, Spain

* Correspondence: pramos@cicbiomagune.es (P.R.-C.); jruizcabello@cicbiomagune.es (J.R.-C.)

Welcome to this Special Issue of the journal *Pharmaceutics* entitled “Biomimetic and Functional Nanomaterials for Molecular Imaging,” which focuses on the exciting advancements in molecular imaging facilitated by biomaterials and nanotechnology. The development of non-invasive imaging technologies has revolutionized disease diagnosis, the study of the mechanisms of action, and the exploration of novel therapeutic approaches. In recent years, the convergence of biomaterials and nanotechnology has paved the way for innovative medical imaging techniques, propelling molecular imaging into a multidisciplinary discipline with tremendous potential.

Nanotechnology has played a pivotal role in transforming molecular imaging from a mere image acquisition process to a comprehensive field that combines sensitivity, selectivity, functional imaging, and the integration of therapeutic and diagnostic functions within molecular platforms (known as theranostics). By leveraging nanotechnology and existing imaging modalities such as magnetic resonance imaging (MRI), X-ray computerized tomography (CT), positron emission tomography (PET), and ultrasound imaging, the field of molecular imaging is becoming an essential technology in biomedicine.

Given the wide-ranging applications of biomaterials in biomedical research and, specifically, in the field of molecular imaging, this Special Issue aims to present noteworthy research and review articles that showcase the current state-of-the-art in biomaterial assessment, recent technological breakthroughs, and their functions and applications in molecular imaging.

We are thrilled to present a collection of insightful papers that exemplify the progress being made in the field. The articles selected for this Special Issue include:

1. “Synthetic Antiferromagnetic Gold Nanoparticles as Contrast Agents for MRI and CT” [1].
2. “Iron Oxide Conjugation for dual MRI and Fluorescent Imaging of Brain Tumors” [2].
3. “Divalent Manganese Ions for Cross-Linking and MRI Contrast in Intrathecal Injection of Hydrogel-Embedded Stem Cells” [3].
4. “Molecular Imaging for Myelin Quantification in Organotypic Cultures” [4].
5. “Iron Oxide-Bold Nanoparticles for In Vivo Imaging and Photothermal Therapy” [5].
6. “Quantification of Iron Oxide Nanoparticle Uptake in Mouse Brachiocephalic Artery Atherosclerotic Plaque using T2-Weighted MRI” [6].
7. “Review of New Approaches in Nanomedicine for Ischemic Stroke” [7].

These papers highlight the diverse applications and significant contributions that biomaterials and nanotechnology bring to molecular imaging. From enhancing imaging contrast and targeting specific tissues to enabling therapeutic and cell interventions and quantifying disease progression, these studies exemplify the transformative potential of this interdisciplinary field.

We extend our gratitude to the authors for their valuable contributions and the reviewers for their diligent efforts in ensuring the high quality of the published work. Their



Citation: Ramos-Cabrer, P.; Ruiz-Cabello, J. Biomimetic and Functional Nanomaterials for Molecular Imaging. *Pharmaceutics* **2023**, *15*, 1570. <https://doi.org/10.3390/pharmaceutics15061570>

Received: 17 May 2023

Accepted: 22 May 2023

Published: 23 May 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

collective efforts have made this Special Issue a comprehensive source of the latest advancements and insights in biomaterials and nanotechnology for molecular imaging.

We hope that this Special Issue serves as a valuable resource for researchers, clinicians, and stakeholders interested in the rapidly evolving field of molecular imaging. We anticipate that the findings presented here will inspire further exploration, collaboration, and innovative applications in the ever-expanding realm of biomaterials and nanotechnology for improved disease understanding, diagnosis, and treatment.

We hope that readers enjoy reading this Special Issue, and we hope that it will stimulate fruitful discussions and future breakthroughs in the fascinating field of molecular imaging.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. D'Hollander, A.; Van Roosbroeck, R.; Trekker, J.; Stakenborg, T.; Dresselaers, T.; Vande Velde, G.; Struys, T.; Lambrechts, I.; Lammertyn, J.; Lagae, L.; et al. Synthetic Antiferromagnetic Gold Nanoparticles as Bimodal Contrast Agents in MRI and CT—An Experimental In Vitro and In Vivo Study. *Pharmaceutics* **2021**, *13*, 1494. [[CrossRef](#)] [[PubMed](#)]
2. Arias-Ramos, N.; Ibarra, L.E.; Serrano-Torres, M.; Yagüe, B.; Caverzán, M.D.; Chesta, C.A.; Palacios, R.E.; López-Larrubia, P. Iron oxide incorporated conjugated polymer nanoparticles for simultaneous use in magnetic resonance and fluorescent imaging of brain tumors. *Pharmaceutics* **2021**, *13*, 1258. [[CrossRef](#)] [[PubMed](#)]
3. Kalkowski, L.; Golubczyk, D.; Kwiatkowska, J.; Holak, P.; Milewska, K.; Janowski, M.; Oliveira, J.M.; Walczak, P.; Malysz-Cymborska, I. Two in one: Use of divalent manganese ions as both cross-linking and MRI contrast agent for intrathecal injection of hydrogel-embedded stem cells. *Pharmaceutics* **2021**, *13*, 1076. [[CrossRef](#)] [[PubMed](#)]
4. Egimendia, A.; Carregal-Romero, S.; Osorio-Quejeta, I.; Padro, D.; Ruiz-Cabello, J.; Otaegui, D.; Ramos-Cabrera, P. Assessing the Potential of Molecular Imaging for Myelin Quantification in Organotypic Cultures. *Pharmaceutics* **2021**, *13*, 975. [[CrossRef](#)] [[PubMed](#)]
5. Caro, C.; Gámez, F.; Quaresma, P.; Páez-Muñoz, J.M.; Domínguez, A.; Pearson, J.R.; Pernía Leal, M.; Beltrán, A.M.; Fernandez-Afonso, Y.; De la Fuente, J.M.; et al. Fe₃O₄-Au core-shell nanoparticles as a multimodal platform for in vivo imaging and focused photothermal therapy. *Pharmaceutics* **2021**, *13*, 416. [[CrossRef](#)] [[PubMed](#)]
6. Moonen, R.P.; Coolen, B.F.; Sluimer, J.C.; Daemen, M.J.; Strijkers, G.J. Iron oxide nanoparticle uptake in mouse brachiocephalic artery atherosclerotic plaque quantified by T2-mapping MRI. *Pharmaceutics* **2021**, *13*, 279. [[CrossRef](#)] [[PubMed](#)]
7. Correa-Paz, C.; da Silva-Candal, A.; Polo, E.; Parcq, J.; Vivien, D.; Maysinger, D.; Pelaz, B.; Campos, F. New approaches in nanomedicine for ischemic stroke. *Pharmaceutics* **2021**, *13*, 757. [[CrossRef](#)] [[PubMed](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.