Marina RAJADURAI, PhD

Senior Research Scientist, Center for Innovation in Molecular and Pharmaceutical Sciences (CIMPS) Dr. Reddy's Institute of Life Sciences, University of Hyderabad Campus, Gachibowli, Hyderabad (AP), India. PIN 500046 **2**: Phone +91 40 6657 1500

Mob + 91 98 481 55591 Fax +91 40 6657 1581 e-mail: MarinaR@drils.org



RESEARCH INTERESTS:

Nanotechnology-Mediated Drug Delivery

Dr. Marina's primary research focus lies in the advancement of drug delivery systems, particularly those centered around innovative nanoparticles. Employing various methodologies, her focus extends to the creation of highly efficient and potent drug delivery mechanisms. These encompass cutting-edge technologies such as Microneedles, Lipid Nanoparticles, and Hydrogel Nano- and Microparticles. A key aspect of her work involves meticulous control over the morphology and dimensions of existing bioactive compounds at the nano- and sub-micro levels, enabling the manipulation of their biological activities. Within Dr. Marina's research group, a primary objective is the exploration of innovative solutions to address existing challenges in drug resistance and nutrient deficiencies. Their endeavors aim to contribute to advancements in overcoming these hurdles and improving the efficacy of pharmaceutical interventions.

PERSONAL DETAILS:

Date of birth: November 26, 1973.Citizenship: Russian FederationVisa Status: Overseas Citizen of India (OCI, a lifetime visa with Work Permit)

PROFESSIONAL EXPERIENCES:

- 2021 present Senior Research Scientist at Dr. Reddy's Institute of Life Sciences, Hyderabad.
- 2014 2021 Research Scientist at Dr. Reddy's Institute of Life Sciences, Hyderabad.
- 2013 2021 Co-Promotor and Head, Chemistry and Nanochemistry Department, Vegrandis Therapeutics Pvt. Ltd. (start-up biotech company)
- 2010 2013 Jr. Research Scientist at Dr. Reddy's Institute of Life Sciences, Hyderabad.
- 2008 2009 Post Doctoral Fellow at Institute of Life Sciences, Hyderabad.
- 2002 2007 Research Fellow at the A. N. Nesmeyanov Institute of Organoelement Compounds, Russian Academy of Sciences, Moscow, Russia.
- 2001 2003 Visiting Graduate Student, [in total six months] in the group of Prof. Dr. Klaus Müllen, at the *Max Planck Institute for Polymer Research*, Mainz, Germany.
- 1998 2002 Engineer, at the A. N. Nesmeyanov Institute of Organoelement Compounds, Russian Academy of Sciences, Moscow, Russia.

EDUCATIONAL RECORDS:

2006 - Ph.D. in Organic and Polymer Chemistry under the supervision of Prof. Dr. A. L. Rusanov and Dr. Z. B. Shifrina, at the *A. N. Nesmeyanov Institute of Organoelement Compounds, Russian Academy of Sciences*, Moscow, Russia.

Thesis topic: "Synthesis and Study of Novel Pyridine Containing Polyphenylene Dendrimers".

1998 - Diploma in Chemistry (equivalent to **M. Sc./ M.Tech)** from the Chemical-Technological Department, **D. I. Mendeleev Russian Chemical-Technological University**, Moscow, Russia.

HONORS/AWARDS:

- 2013 Incubator award (one of ten nominees out of 300 applicants, global competition) for an idea with promising potential and ingenuity, sponsored by "The Saving Lives at Birth" partners USAID, the Government of Norway, the Bill & Melinda Gates Foundation, Grand Challenges Canada, and DFID.
- 2004 Second Best PhD Student Award, INEOS RAS, Moscow, Russia.
- 2001 Visiting Graduate Student at MPIP (in the group of Prof. K. Müllen), Mainz, Germany.

PATENTS:

- 1. [Marina Rajadurai, Ergamreddy Ramanjaneya Reddy, Pushkar Kulkarni, Devyani Haldar, Kishore Venkata Laxmi Parsa. Fluorescent Organic Nanoparticles Useful for Biological Imaging. Indian Provisional Patent 3582/CHE/2013, August, 12th, 2013.]
- 2. [Marina Rajadurai, Pushkar Kulkarni, Aarti Sevilimedu, Uday Saxena. Magnetic nanoparticle formulations for targeted delivery of drugs to lungs for treatment of pulmonary diseases.Indian Full Patent Appl. No. 201741005560, February 16, 2017.]
- **3.** [PCT: Marina Rajadurai, Pushkar Kulkarni, Aarti Sevilimedu, Uday Saxena. "Magnetic Nanoparticle Formulations for Targeted Delivery of Drugs to Lungs for Treatment of Pulmonary Diseases", International Application Number: PCT/IB2018/050952]
- **4.** [M. Rajadurai. Sustained Release Compositions. Provisional Patent, Application Number 202041020828, filed in India on May 18, 2020]
- **5.** [*M.* Rajadurai, Bhavya Surekha, Sustained Release Compositions. Indian Patent Application No.: E-2/1663/2021/CHE, filed on May 18, 2021]
- **6.** [M. Rajadurai, Bhavya Surekha, Sustained Release Compositions. International PCT Application No. PCT/IN2021/050479, filed on May 18, 2021]
- 7. [Marina Rajadurai, Aarti Sevilimedu. Aptamer Directed Anti-Microbial Nanoparticles. Indian Patent Application No.: 202241043324, filed on July 28, 2022]

Selected Research Papers:

- Bhavya Surekha, Parimal Misra, Anitha C. Thippaiah, Bindiganavale R. Shamanna, Aiswarya Madathil, and Marina Rajadurai.* A Microneedle Transdermal Patch loaded with Iron(II) Nanoparticles for Non-invasive Sustained Delivery to Combat Anemia. *Mater. Adv.*, 2024, XX, XXXXX.
- 2. B. Thirupataiah, Gangireddy Sujeevan Reddy, Guntipally Mounika, Jetta Sandeep Kumar, Kazi Amirul Hossain, Jayesh Mudgal, Jessy E. Mathew, Gautham G. Shenoy, **Marina Rajadurai**, Kishore V. L.

Parsa and Manojit Pal. Pd-catalysed general access to 7-membered N/O-heterocyclic compounds as potential agents against inflammation. *Chem Commun*, **2021**, 57, 10091-10094; DOI: 10.1039/d1cc04140a.

- **3.** Marina Rajadurai* and E. Ramanjaneya Reddy. Tuning the sensitivity towards mercury via cooperative binding to D-fructose: dual fluorescent chemosensor based on 1,8-naphthyridine-boronic acid derivative. *RSC Advances*, **2021**, 11, 14862 14870.
- **4.** Basaveni S., Kuchkina N.V., Shifrina Z.B., Pal M.* and **Rajadurai M***. Ni nanoparticles on polyaromatic hyperbranched polymer support as a mild, tunable and sustainable catalyst for catalytic transfer hydrogenation. *J Nanopart Res.*, **2019**, 21: 91, https://doi.org/10.1007/s11051-019-4533-2.
- Uday Saxena*, Marina Rajadurai*, Surendar Basaveni, Swapna Yellanki, Raghavender Medishetti, Aarti Sevilimedu, and Pushkar Kulkarni. "Double PEGylation significantly improves pharmacokinetic properties of irinotecan containing nanoparticles in a zebrafish model". *Current Nanomedicine*, 2019, 9, 173-181. DOI: 10.2174/2468187308666180925143701.
- 6. Pushkar Kulkarni, **Marina Rajadurai**, Aarti Sevilimedu, Surendar Basaveni, Swapna Yellanki, Raghavender Medishetti, and Uday Saxena. "Magnetic nanoparticle formulation for targeted delivery of chemotherapeutic irinotecan to lungs", *Drug Delivery and Translational Research*, **2018**, Oct; 8 (5): 1450-1459. doi: 10.1007/s13346-018-0527-3.
- Kuchkina N.V., Rajadurai M., Pal M., Basaveni S., Shifrina Z.B. "Catalysts based on hyperbranched pyridylphenylene polymers and palladium nanoparticles for Suzuki-Miyaura cross-coupling reaction". *Russian Chemical Bulletin*, 2018, v. 67, Issue 6, pp 1035-1040. <u>https://doi.org/10.1007 /s11172-018-2176-6</u> (First Online: 27 September 2018)
- 8. E. Ramanjaneya Reddy, Abdul M Yaseen, Arshad Rizvi, Girdhar S. Deora, Sharmistha Banerjee, Aarti Sevilimedu, and Marina Rajadurai, "Antibacterial Nanoparticles Based on Fluorescent 3-Substituted Uridine Analogue". ChemistrySelect, 2017, 2, 557-561, doi: 10.1002/slct.201601708
- E. Ramanjaneya Reddy, Swapna Yellanki, Raghavendra Medishetty, Lahiri Konada, Neeraja P. Alamuru, Devyani Haldar, Kishore V.L. Parsa, Pushkar Kulkarni, and Marina Rajadurai,* "Red Fluorescent Organic Nanoparticle Bioprobes: A Photostable Cytoplasmic Stain for Long Term In Vitro and In Vivo Visualization" ChemNanoMat. 2015, (Inside Front Cover) Volume 1, Issue 8, pages 567–576 doi: 10.1002/cnma.201500201
- Balakrishna Dulla, E. Ramanjaneya Reddy, Keerthana S. Chennubhotla, Pushkar Kulkarni, Rajadurai Chandrasekar and Marina S. Rajadurai, "Organic Nano-Vesicular Cargoes for Sustained Drug Delivery: Synthesis, Vesicle Formation, Controlling "Pearling" States and Terfenadine Loading/Release Studies", *Journal of Nanotechnology*, vol. Article ID 369139, 13 pages, 2014.
- **11.** Naisa Chandrasekhar, Ramanjanya Reddy, Muvva D. Prasad, **Marina S. Rajadurai*** *and* Rajadurai Chandrasekar,* "Passive optical wave guiding tubular pharmaceutical solids and Raman spectroscopy/mapping of nano/micro scale defects", *CrystEngComm*, **2014**, 16, 4696-4700.
- E. Ramanjaneya Reddy, Rakesh Kumar Banote, Kiranam Chatti, Pushkar Kulkarni and Marina S. Rajadurai,* "Selective Multicolour Imaging of Zebrafish Muscle Fibres Using Fluorescent Organic Nanoparticles" ChemBioChem, 2012, 13, 1889-1894.
- **13. M. S. Rajadurai**, Z. B. Shifrina, N. V. Kuchkina, A. L. Rusanov and K. Müllen, "Rigid aromatic dendrimers", *Russ. Chem. Rev*, **2007**, *76*, 821-838.

- N.V. Tsvetkov, S.K. Filippov, T.M. Kudriavtseva, V.O. Ivanova, Z. Shifrina, <u>M. Averina</u>, N. Firsova, A. Rusanov. "Hydrodynamic properties of rigid pyridine-containing polyphenylene dendrimers in solutions", *Polymer Science Series A*, 48(4), 692-698, **2006**.
- Z. B. Shifrina, M. S. Rajadurai, N. V. Firsova, L. M. Bronstein, Xinlei Huang, A. L. Rusanov and K. Muellen "Poly(phenylene-pyridyl) Dendrimers: Synthesis and Templating of Metal Nanoparticles", *Macromolecules*, 2005, 38, 9920-9932.
- **16.** A. L. Rusanov, E. G. Bulycheva, Z. B. Shifrina, **M. S. Averina**, Y. I. Fogel, E. I. Mal'tsev, A. V. Vannikov, D. A. Lybenko and S. V. Kirillov, "New highly phenylated bis(naphthalic anhydrides) and the related polyheteroarylenes", *Polymer Science Series A*, **2003**, *45*, 826-832.
- M. L. Keshtov, A. L. Rusanov, I. A. Ronova, N. M. Belomoina, P. V. Petrovsky, A. N. Schegolihina, Z. B. Shifrina, V. M. Menshov and M. S. Averina, "New fluorine-containing polyphenylquinoxalines", *Polymer Science Series B*, 2001, 43, 1595-1599.
- **18.** Z. B. Shifrina, **M. S. Averina**, A. L. Rusanov, M. Wagner, K. Mullen, "Branched polyphenylenes by repetitive Diels-Alder cycloaddition", *Macromolecules*, **2000**, *33*, 3525-3529.

#	Years	Title	Pls, Co-Pls	Funding, (Agency)	Status
1	2010 - 2014 3 years	Rational Design and Synthesis of Novel Antibiotics Against Drug Resistant Bacteria	M. Rajadurai	11.74 lakhs (DST)	Completed
2	2011 - 2014 3 years	Synthesis of Fluorescent Saccharide Sensors as Potential Tool for the Diagnosis of Carbohydrate Metabolism Disorders	M. Rajadurai	20.40 lakhs (CSIR)	Completed
3	2012 - 2013 1.5 years	Nanoparticles and Nanostructure Catalysts (<u>DRILS - IPDO - Chirotech joint program</u> , DRILS Program Head: Prof. Javed Iqbal, IPDO Program Head: Dr. Vilas Dahanukar; DRILS Project Co-ordinators: Dr. Srinivas Oruganti (CPRI, DRILS), IPDO Project Co- ordinator: Dr. Graham Meek (Chirotech))	M. Rajadurai	10.80 lakhs IPDO, DRL	Chemistry Transferred to IPDO, Project terminated
4	2014 - 2016 2 years	Delivery and retention of Irinotecan loaded magnetic nanoparticles for treatment of brain tumors	U. Saxsena, M. Rajadurai and P. Kulkarni	49.85 lakhs (BIG BIRAC)	Completed
5	2016 – 2018 6 month	Trans-Dermal Patch as a Treatment for Nutritional Deficiency <u>- 6-month feasibility</u> study	M. Rajadurai	2.50 lakhs (in- house project)	Completed, submitted to DBT

RESEARCH SUPPORT

6	2016 - 2018 3 years	Metal Nanoparticles Embedded into Hyperbranched Polymer Matrix as Efficient and Reusable Catalysts for Organic Transformations (joint with RFBR-Russia)	M. Pal, M. Rajadurai , Z. Shifrina, N. Kuchkina (Russia)	24.09 lakhs+ 20,000 USD (DST)	Completed
7	2020 - 2023 3 years	A Microneedle Transdermal Patch for Supplementing Critical Micronutrients for Prevention and Control of Anemia	M. Rajadurai , P. Misra, B.R. Shamanna, Anitha C. T. (UoH)	71.99 lakhs (DBT)	<i>In vivo</i> studies ongoing
8	2021 - 2022 6 month	Synthesis of Lipid Solid Nanoparticles for RNA delivery (setting up in-house platform technology)	M. Rajadurai, R. Pallavi, M. Shinde, K. Veeramani	1.00 lakh (in- house project)	Completed, <i>in vivo</i> studies ongoing
9	2023 – 2026 3 years	Developing a Wearable, Light-Concentrating, Photonic Micro-Sphere Patch for On-the-Go Outdoor/Indoor Photodynamic Therapy	R. Chandrasekar (UoH), M. Rajadurai	53.33 Lakhs (HEFA)	Ongoing
10	2023 – 2025 2 years	Antibiotic-Free Nanoparticles for Treatment of Mastitis Associated Staphylococcus Aureus and Escherichia Coli	M. Rajadurai, A. Sevilimedu, P. Suman (NIAB)	49.17 lakhs (BIRAC)	Under review

COURSES TAUGHT AT THE INSTITUTE FOR PHD STUDENTS:

- Chemical Kinetics and Thermodynamics (ICB);
- Spectroscopy and Spectrometry
- Bio-physical organic chemistry
- Catalysis in organic synthesis
- Nanoscience and Nanotechnology

TRAINING OF HIGHLY QUALIFIED PERSONNEL :

- No. of Ph.D students: 1 (Registered at UoH, Degree awarded)
- No. of Master Students Trained: 12
- No. of Summer Students Trained: 10