

MANJARI RAIN

PhD

Research Associate

ICMR RA fellow

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Nationality: Indian

Language known: Hindi and English.

Overview

Dr Manjari Rain did her masters in biotechnology from Indian Institute of Technology Roorkee, Uttarakhand, India. She graduated from **CSIR–Institute of Genomics and Integrative Biology (CSIR-IGIB), Delhi**, India, where she worked in the field of human functional genomics specifically on the association of genetic variants of the telomere-telomerase system with high altitude pulmonary edema, which is one of the various disorders of hypobaric hypoxia environment at high altitude. She also deciphered adaptive genetic variants in high altitude Ladakhi population of India. She also has work experience with cardiovascular diseases such as essential hypertension, acute coronary syndrome, coronary slow flow and myocardial infarction as she was associated with Cardiologists from Govind Ballabh Pant Hospital, New Delhi, India for many DM degree related studies.

After, completing her PhD she joined **Neuroscience Research Lab, Department of Neurology, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh**, India as a Research Associate. Here Dr Rain worked in three projects, one each

from ICMR, DBT and Ministry of AYUSH. She studied molecular mechanism of Amyotrophic Lateral Sclerosis (ALS) and retinal degeneration. Dr Rain grabbed ICMR RA fellowship for her proposal on biomarker discovery of age-related macular degeneration. During COVID pandemic, she was instrumental in successful commencement of a randomized control trial on COVID-patients and healthcare workers at PGIMER Chandigarh. She is well-trained for Good lab practice (GLP) at Neuroscience Research Lab, which is an established lab with awards in GLP compliance.

Dr Rain has **21 publications** and filed **one patent**. She has been a regular **reviewer** and is in the reviewing committee of the journal Annals of Neuroscience. She is a **member of Indian Academy of Neurology**. She is **co-editing** a special issue of the journal Diagnostics, presently.

Interests

Genetics, Population genetics, Biomarker discovery, Epidemiology, Integrative Health, Hypoxia, Oxidative stress, Autophagy, Telomeres, Pulmonology, Cardiology, Neurology, Degenerative diseases

Research Experience - 3 years and 4 months

1. **Research Associate (ICMR RA fellow)**, in ICMR RA fellowship entitled 'The role of macroautophagy in pathophysiology of dry and wet age-related macular degeneration' from March 2021 to present.
2. **Research Associate**, in DBT project entitled 'Investigating the molecular mechanism governing reversal of Amyloid β induced memory loss in mice by transplantation of human umbilical cord blood derived lineage negative stem cells.' from March 2020 to Feb 2021
3. **Research Associate**, in ICMR project entitled 'Biomarker analysis and statistical modeling of ALS risk alleles' from Nov 2019 to Feb 2020
4. **PhD**, entitled 'Relevance of telomere in adaptation and maladaptation at high-altitude', from Genomics and Molecular Medicine, CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB), Delhi & Academy of Scientific & Innovative Research, New Delhi, India, August 2011 to October 2018.
5. **Workshop**, on 'In vivo Oxygen Imaging workshop' at University of Chicago, Chicago, USA on July 15th - 16th, 2016.

6. **Workshop**, on "Laboratory Animal Welfare and Alternative Models" at CSIR–Institute of Genomics and Integrative Biology, Delhi, on July 6th, 2012.
7. **Dissertation**, entitled ‘Study of genetic polymorphism, among parents of breeding population of Guar using RAPD and EST-SSR markers’, at IIT Roorkee, Roorkee, Uttarakhand, India, January to April, 2011.

Research Skills

- Communication
- Scientific critical thinking
- Ability to maintain quality, safety and/or infection control standards
- Planning and scheduling to maintain work flow and output
- Data and Sample Collection
- Grant and manuscript writing
- Fund management
- GLP compliance
- Technical skills
 - DNA and RNA isolation from blood and DNA isolation from hypocotyls.
 - Single nucleotide polymorphism (SNP) genotyping – Fluidigm’s SNPtype genotyping, Illumina’s SNP genotyping Golden Gate Assay, SNaPshot SNP genotyping and restriction enzyme SNP genotyping.
 - Primer designing
 - PCR
 - Real-time PCR
 - ELISA and Calorimetric assays
 - Plasmid isolation
 - Native PAGE and SDS-PAGE
 - FACS
 - Heart rate variability
 - 6-min walk test
 - 1-min sit-stand test
 - Questionnaire-based psychological assessment
- Statistical and Graphical Analysis of Data

- Online tools and databases such as Ensembl genome browser, NCBI-dbSNP, NCBI-nBLAST, KEGG pathway, STRING, SISA online statistical tool and others.
- Data analysis using statistical tools such as Fluidigm's SNP genotyping analysis tool, IBM SPSS 12.0, 16.0 and 21.0, Graphpad, EpiInfo ver.6, Haploview, MDR and others.

Research Publications

1. Pasha Q, **Rain M**, Tasnim S, Kanipakam H, Thinlas T, Mohammad G. The Telomere-Telomerase System Is Detrimental to Health at High-Altitude. *Int J Environ Res Public Health*. 2023 Jan 20;20(3):1935. doi: 10.3390/ijerph20031935. PMID: 36767300; PMCID: PMC9915065.
2. **Rain M**, Puri GD, Bhalla A, Avti P, Subramaniam B, Kaushal V, Srivastava V, Mahajan P, Singh M, Pandey N, Malhotra P, Goel S, Kumar K, Sachdeva N, Maity K, Verma P, Dixit N, Gupta SJ, Mehra P, Nadholta P, Khosla R, Ahuja S, Anand A. Effect of breathing intervention in patients with COVID and healthcare workers. *Front Public Health*. 2022 Sep 30;10:945988. doi: 10.3389/fpubh.2022.945988.
3. Nagarathna R, Sharma MNK, Ilavarasu J, Kulkarni R, Anand A, Majumdar V, Singh A, Ram J, **Rain M**, Nagendra HR. Coping Strategy, Life Style and Health Status During Phase 3 of Indian National Lockdown for COVID-19 Pandemic-A Pan-India Survey. *Front Public Health*. 2022 May 18;10:814328. doi: 10.3389/fpubh.2022.814328. PMID: 35664115; PMCID: PMC9157816.
4. Maity K, Kaur N, **Rain M**, Malik R, Vinayak R, Ahuja S, Malik N. Biochemical and neuropsychological effect of diabetes yoga protocol on urban high-risk diabetes population: A pilot study. *The Journal of Oriental Research Madras*. 2022 Jan; XCIII-I:49-60. ISSN: 0022-3301.
5. Nagarathna R, Anand A, **Rain M**, Srivastava V, Sivapuram MS, Kulkarni R, Ilavarasu J, Sharma MNK, Singh A, Nagendra HR. Yoga Practice Is Beneficial for Maintaining Healthy Lifestyle and Endurance Under Restrictions and Stress Imposed by Lockdown During COVID-19 Pandemic. *Front Psychiatry*. 2021 Jun 22;12:613762. doi: 10.3389/fpsy.2021.613762. PMID: 34239456; PMCID: PMC8257944.

6. Battu P, Sharma K, **Rain M**, Singh R, Anand A. Serum Levels of ARMS2, COL8A1, RAD51B, and VEGF and their Correlations in Age-related Macular Degeneration. *Curr Neurovasc Res.* 2021;18(2):181-188. doi: 10.2174/1567202618666210531130711. PMID: 34060991.
7. Khosla R, **Rain M**, Sharma S, Anand A. Amyotrophic Lateral Sclerosis (ALS) prediction model derived from plasma and CSF biomarkers. *PLoS One.* 2021 Feb 19;16(2):e0247025. doi: 10.1371/journal.pone.0247025. PMID: 33606761; PMCID: PMC7894922.
8. Miglani M, **Rain M**, Pasha Q, Raj VS, Thinlas T, Mohammad G, Gupta A, Pandey RP, Vibhuti A. Shorter telomere length, higher telomerase activity in association with tankyrase gene polymorphism contribute to high-altitude pulmonary edema. *Hum Mol Genet.* 2020 Nov 4;29(18):3094-3106. doi: 10.1093/hmg/ddaa205. PMID: 32916703.
9. Khosla R, **Rain M**, Chawathey S, Modgil S, Tyagi R, Thakur K, Pannu V, Sharma SK, Anand A. Identifying putative cerebrospinal fluid biomarkers of amyotrophic lateral sclerosis in a north Indian population. *Muscle & Nerve.* 2020 Oct;62(4):528-533. doi: 10.1002/mus.27026. Epub 2020 Aug 13. PMID: 32696574.
10. Gupta MD, Girish MP, Sarkar PG, Gupta A, Kategari A, Bansal A, Saijpaul R, Batra V, **Rain M**, Tyagi S, Pasha Q. Role of ApoE gene polymorphism and nonconventional biochemical risk factors among very young individuals (aged less than 35 years) presenting with acute myocardial infarction. *Indian Heart J.* 2018 Dec;70 Suppl 3(Suppl 3):S146-S156. doi: 10.1016/j.ihj.2018.08.013. Epub 2018 Sep 5. PMID: 30595248; PMCID: PMC6310748. ISSN: 0019-4832
11. **Rain M**, Chaudhary H, Kukreti R, Thinlas T, Mohammad G, Qadar Pasha MA. Elevated vasodilatory cyclases and shorter telomere length contribute to high-altitude pulmonary edema. *High Alt Med Biol.* 2018; 19: 60-68. doi: 10.1089/ham.2017.0136. ISSN: 1527-0297 Online ISSN: 1557-8682
12. Roach RC, Hackett PH, Oelz O, Bärtsch P, Luks AM, MacInnis MJ, Baillie JK; Lake Louise AMS Score Consensus Committee*. *Achatz E, Kohli S, **Rain M**, Qadar Pasha MA et al. The 2018 Lake Louise Acute Mountain Sickness Score. *High Alt Med Biol.* 2018; 19: 4-6. doi: 10.1089/ham.2017.0164. ISSN: 1527-0297 Online ISSN: 1557-8682
13. Gupta MD, Girish MP, Shah D, **Rain M**, Mehta V, Tyagi S, Trehan V, Qadar Pasha MA. Biochemical and genetic role of apelin in essential hypertension and acute

coronary syndrome. *Int J Cardiol* 2016; 223: 374-378. doi: 10.1016/j.ijcard.2016.07.242. ISSN: 0167-5273 (print); 1874-1754 (web)

14. Gupta MD, Girish MP, Sikdar S, Ahuja R, Shah D, Kumar R, **Rain M**, Nejatizadeh A, Tyagi S, Qadar Pasha MA. β -T594M epithelial sodium channel gene polymorphism and essential hypertension in individuals of Indo-Aryan ancestry in Northern India. *Indian Heart J* 2014; 66: 397-400. doi: 10.1016/j.ihj.2014.05.017. ISSN: 0019-4832
15. Gupta MD, Akkarappatty C, Girish MP, Kumar R, **Rain M**, Tyagi S, Qadar Pasha MA. Association between the Glu298Asp and 4b/4a polymorphisms of endothelial nitric oxide synthase and coronary slow flow in the North Indian population. *Coron Artery Dis.* 2014 May;25(3):192-7. doi: 10.1097/MCA.0000000000000093. PMID: 24525787. ISSN: 0954-6928. Online ISSN: 1473-5830

Review

1. Kumari S, Dahiya N, **Rain M**, Kumar R, Singh G. The role of Yoga Practice in Management of Coronary Artery Disease. *Integrative Medicine Case Reports*. 2022 Jul; 3(2):69-75. ISSN: 2582-6255
2. Anand A, Tyagi R, Khosla R, Bali P, **Rain M**, Maity K, Verma P, Gupta SJ, Nadholta P, Kaur N, Sharma K, Tripathi S, Avti P, Singh A. Integrative Approach to COVID-19: An Indian Facebook Recipe for Mental Health. *Ann Neurosci*. 2021 Jul; 28(3-4):183-190. doi: 10.1177/09727531211052971. 0972-7531
3. **Rain M**, Subramaniam B, Avti P, Mahajan P, Anand A. Can Yogic Breathing Techniques Like Simha Kriya and Isha Kriya Regulate COVID-19-Related Stress? *Front Psychol*. 2021 Apr 15;12:635816. doi: 10.3389/fpsyg.2021.635816. PMID: 33935886; PMCID: PMC8081973.

Editorial

1. **Rain M**, Anand A. A Policy Research Framework for Gender-Based Mapping of Research Scholars After Obtaining Fellowships. *Ann Neurosci*. 2020 Jan;27(1):5-6. doi: 10.1177/0972753120934591. Epub 2020 Jul 6. PMID: 32982092; PMCID: PMC7499826.

Book Chapter

1. Verma P, **Rain M**, Singh G. Tele-yoga and its implications for digital health-emerging trends in health and wellness. *Neuroscience of Yoga: Theory and Practice: Part 1*. 2024 Jul 31:219-41. Springer.
2. Nadholta P, Choudhary SK, **Rain M**. Yoga as a therapeutic intervention for the management of neurodegenerative disorders. In *Ayurvedic Herbal Preparations in Neurological Disorders* 2023 Jan 1 (pp. 587-610). Academic Press.
3. **Rain M**, Sivapuram MS, Mathur D, Pillai KS. Creating Data Recording Sheets (DRS) in Quality Management System. In *Quality Assurance Implementation in Research Labs* 2021 (pp. 63-77). Springer, Singapore.

Patent

1. Akshay Anand, Radhika Khosla, Shweta Modgil, **Manjari Rain**, Priya Mehra, Abha Tiwari, Kaushal Sharma, Himshikha Bhutani, Keshav Thakur, Pawan Kumar Gupta. Plasma bio-markers for diagnosis and prediction of ALS (Amyotrophic Lateral Sclerosis). Patent Application No. 202011015827

Papers In Conference Proceedings

1. Anand A, **Rain M**, Puri GD, Bhalla A, Avti P, Subramaniam B, Koushal V, Srivastava V, Mahajan P, Singh M, Pandey N. Efficacy of yoga-based breathing intervention in COVID-19 positive, post-covid and health care workers: a randomized clinical trial. *Psychosomatic Medicine*. 2022:A7-.
2. Bansal A, Gupta MD, Girish MP, **Rain M**, Tyagi S, Pasha Q. P5443 Association of G allele of CTLA 4 1661 A/G polymorphism with susceptibility and severity of rheumatic heart disease. *European Heart Journal*. 2018 Aug 1;39(suppl_1):ehy566-P5443.
3. Kumar S, Gupta MD, Girish MP, **Manjari R**, Qadar Pasha MA, Bansal AN, Sanjay TY. P5108 Demographic, clinical, coronary angiographic profile and telomere length in young patients of acute myocardial infarction among nondiabetics and nonsmokers. *European Heart Journal*. 2018 Aug 1;39(suppl_1):ehy566-P5108.

Publications under preparation/submission

1. Bali P, **Rain M**, Nehru B, Anand A. Therapeutic effects of brain-derived neurotrophic factor in ameliorating cognitive impairment in amyloid induced injury mediated by neurotrophic factors. (Original Article)

Accepted Abstracts in Conferences

1. **Manjari Rain**, Ramandeep Singh, Akshay Anand. Differential role of autophagy in dry and wet age-related macular degeneration. XL Annual Meeting of Indian Academy of Neurosciences, 2022.
2. **Manjari Rain**, Akshay Anand, Goverdhan Dutt Puri, Pramod Avti, Vipin Kaushal. Effect of controlled breathing intervention in COVID-19. NEURO, 2022.
3. **Manjari Rain**, Akshay Anand, Goverdhan Dutt Puri, Pramod Avti, Vipin Kaushal. COVID-19 health management by controlled breathing intervention. 6th International Leh Symposium, 2022.
4. **Manjari Rain**, Hema Kannipakam, Tashi Thinlas, Ghulam Mohammad, Qadar Pasha. Repressor activator protein 1 is a risk marker for high-altitude pulmonary edema. 6th International Leh Symposium, 2022.
5. **Manjari Rain**, Ritushree Kukreti, Tashi Thinlas, Ghulam Mohammad, Qadar Pasha. Telomere and telomerase play a substantial role in high-altitude pulmonary edema. 5th International Leh Symposium, 2018.
6. **Manjari Rain**, Ritushree Kukreti, Tashi Thinlas, Ghulam Mohammad, Qadar Pasha. Role of telomere and telomerase in high-altitude pulmonary edema. XII ISMM World Congress on Mountain Medicine, 2018.
7. **Manjari Rain**, Ghulam Mohammad, Ritushree Kukreti, M. A. Qadar Pasha. Relevance of telomere-telomerase system at high-altitude. 44th Annual Meeting of the International Society on Oxygen Transport to Tissue, 2016.
8. **Manjari Rain**, Ghulam Mohammad, Ritushree Kukreti, M. A. Qadar Pasha. Relevance of telomere-telomerase system at high-altitude. Keystone Symposia Conference, Understanding the Function of Human Genome Variation, 2016.
9. **Manjari Rain**, Ghulam Mohammad, Ritushree Kukreti, M. A. Qadar Pasha. Telomere-telomerase system shows relevance under hypobaric hypoxic environment of high altitude. Human Genome Meeting, 2016.
10. **Manjari Rain**, Ghulam Mohammad, Ritushree Kukreti, M. A. Qadar Pasha. Telomere under Hypobaric Hypoxia. 3rd International Leh Symposium, 2014.

11. M.A. Qadar Pasha, Rahul Kumar, **Manjari Rain**, Samantha Kohli. Telomeres emerge as potential candidate in high-altitude physiology. Human Genome Meeting, 2013.
12. Rahul Kumar, Samantha Kohli, **Manjari Rain**, Mohit Gupta, Sanjay Tyagi, S.K. Jain, M.A. Qadar Pasha. Interactions between genes of vasoactive pathways are apparent in essential hypertension. 2nd International Leh Symposium, 2012.

Poster/Oral presentations and conferences attended

1. Online poster presentation at NEURO, 2022, Okinawa, Japan from 30th June to 3rd July 2022. (2/07/2022)
2. Oral presentation at the 6th International Leh Symposium entitled “Lungs under normobaric and hypobaric hypoxia”, May 23rd – 27th, 2022, Leh, Ladakh, India. (24/05/2022)
3. Poster presentation at the 6th International Leh Symposium entitled “Lungs under normobaric and hypobaric hypoxia”, May 23rd – 27th, 2022, Leh, Ladakh, India. (24/05/2022)
4. Oral presentation at the 6th National Leh Symposium, Nov 15th, 2019, CSIR-IGIB, Delhi, India. (15/11/2019)
5. Oral presentation at the XII ISMM World Congress on Mountain Medicine entitled “Mountain Medicine in the Heart of the Himalayas”, November 21st - 24th, 2018, Kathmandu, Nepal. (23/11/2018)
6. Poster presentation at the 5th International Leh Symposium entitled “Respiration Under Hypobaric Hypoxia: Clinical and Molecular Portrayal”, November 15th – 18th, 2018, Gangtok, Sikkim, India.
7. Poster presentation at ‘44th Annual Meeting of International Society on Oxygen Transport to Tissue, 2016’, July 10th - 14th, 2016 at Chicago, Illinois, USA.
8. Poster presentation at the 3rd International Leh Symposium entitled “Ventilation and circulation in hypoxia: From mechanisms to patients and back”, September 19th - 23rd, 2014, Leh, Ladakh, India.
9. Attended 2nd International Leh Symposium entitled “The Lung at High Altitude: From Cellular Acclimatization to Clinical Disease”, August 3rd -7th, 2012, Leh, Ladakh, India.
10. Attended GENOMEET, 30th December 2011-1st January 2012, organized by CSIR-Institute of Genomics and Integrative Biology, Delhi, India.

Co-supervision

1. Co-supervised two PhD students for their degree with PI during RAship.
2. Co-supervised four post-graduate students of Biotechnology for their M.Sc. dissertation with PI during PhD.
3. Co-supervised six post-graduate medical students for their degree of 'Doctorate of Medicine (Cardiology)' with PI during PhD.

Academics

1. M.Sc. Biotechnology from IIT Roorkee, Roorkee, Uttarakhand, India with a CGPA of 8.04.
2. B.Sc. Life Sciences (Botany, Chemistry, Zoology) from Deen Dayal Upadhyay University, Gorakhpur, Uttar Pradesh, India with 71%.
3. Intermediate (12th) from Little Flower School, Gorakhpur, Uttar Pradesh, India with 67% in ISC board.
4. High school (10th) from Little Flower School, Gorakhpur, Uttar Pradesh, India with 75% in ICSE board.

Other Achievements

1. Recently joined Integrative Medicine Case Reports as Co-editor, Nov 2024
2. Guest Editor in Diagnostics, 2022
3. Reviewer of Annals of Neuroscience, 2020-present
4. Won the Best Poster Award at 5th International Leh Symposium entitled "Respiration Under Hypobaric Hypoxia: Clinical and Molecular Portrayal", November 15th - 18th, 2018, Gangtok, Sikkim, India.
5. ISMM 2018 Scholarship for attending XII ISMM World Congress on Mountain Medicine, November 21st - 24th, 2018, Kathmandu, Nepal.
6. Co-chaired a session at 44th Annual Meeting of International Society on Oxygen Transport to Tissue, 2016, July 10th - 14th, 2016 at Chicago, Illinois, USA.
7. International travel grant award from Indian Council of Medical Research (ICMR), Govt. of India for attending the conference, '44th Annual Meeting of International Society on Oxygen Transport to Tissue, 2016', July 10th - 14th, 2016 at Chicago, Illinois, USA.

8. Won the Best Poster Award at 3rd International Leh Symposium entitled “Ventilation and circulation in hypoxia: From mechanisms to patients and back”, September 19th - 23rd, 2014, Leh, Ladakh, India.
9. Senior Research Fellowship (SRF) awarded through the nationwide exam conducted by Council of Scientific and Industrial Research (CSIR), Ministry of Science & Technology, Govt. of India, in July 2015.
10. Qualified national level entrance examination for the PhD program at CSIR–Institute of Genomics and Integrative Biology (CSIR-IGIB), Delhi, India; National Institute of Immunology (NII), New Delhi, India and National Center for Biological Sciences (NCBS), Bangalore, India in 2011.
11. Junior Research Fellowship (JRF) awarded through the nationwide exam conducted by Council of Scientific and Industrial Research (CSIR), Ministry of Science & Technology, Govt. of India, in December 2010.
12. Qualified the Graduate Aptitude Test in Engineering (GATE) 2010.
13. Awarded a two-year merit based scholarship, Department of Biotechnology, Ministry of Science & Technology, Govt. of India, India from March 2009 to March 2011.
14. Qualified Indian Institute of Technology Joint Admission Test (IIT JAM), 2009 for MSc Biotechnology course at IIT Roorkee, Uttarakhand, India.
15. Qualified Jawaharlal Nehru University (JNU) entrance exam, 2009 for MSc Biotechnology course at Devi Ahilya Vishwavidyalaya, Indore, India.
16. Qualified Banaras Hindu University (BHU) entrance exam, 2009 for M. Sc. Biochemistry course at BHU, Varanasi, India