

ABOUT DR. ARCHANA RATH

Dr. Archana Rath, current Associate Professor at the Department of Biotechnology, University of Mumbai, is a doctorate in Reproductive Immunology and Molecular Biology from the prestigious National Institute of Immunology (Jawahar Lal Nehru University), New Delhi. She has experience of working in diverse reputed research organization like Quest Institute of Life Sciences, Nicholas Piramal Ltd and Advanced Centre for Treatment, Research and Education in Cancer (ACTREC). After joining the University, she was instrumental in establishing the Antimicrobial Research (AMR) Laboratory in the Department, and is the Principal Investigator of the AMR lab. Her lab is generously funded by several Major Research Project Grants from various government agencies like DST-SERB & DAE-BRNS. Dr. Rath holds Patent (Patent Number 45887), awarded by the Patent Office, Govt. of India for the process synthesis of Novel Silver Nanoparticles, synthesized by green technology, and showing promising antimicrobial activity. She also has a Copyright to her credit for the creation of one-of-its-kind database called FEAMR@ database, for surveillance of antimicrobial resistance in food and the environment. Another recent achievement is the publication of a video article in the prestigious international journal of repute called the Journal of Visualized Experiments (JoVE), which is the first of its kind video article under the University of Mumbai banner.

Dr. Rath has several international & national publications in reputed journals in the area of AMR. She has also written popular scientific articles for the general public. Her research findings have been televised under the Science Monitor series of Vigyan Prasar, Dept. of Science & Technology, Govt. of India. Her work has also been highlighted by various National Newspapers, e-portals etc.

Currently, she is working on analysing antimicrobial resistance associated with food and environment using conventional techniques as well as metagenomics, and ways to counteract the resistance using nanotechnology. Development of AMR based diagnostic kits is another area of research focus.

In the last few years, more than 50 post-graduate and Ph.D. students have successfully taken up this challenging area of research as their dissertation and PhD thesis topics. As part of their Social Outreach Activities, the AMR lab also organizes regular lab visits and events for the benefit of UG, PG & school students.

Academic & Administrative roles *(past and present, partial list)*

1. Former Head of the Department of Biotechnology, University of Mumbai (January 2017-January 2020).
2. Former Chairperson, Ad-hoc Board of Studies in Biotechnology, University of Mumbai.
3. Acted as Hon'ble Vice Chancellor's Nominee in the Purchase Committee, University of Mumbai.
4. Honourable Pro-Vice Chancellor's Nominee as Chairperson for Ph.D. viva.
5. Doctoral Committee Member for Ph.D. in Life Sciences at BARC, HBNI, Mumbai.
6. University appointed Chairperson for Ph.D. Viva Examinations.
7. External Expert for IBSC of Indian Council of Agricultural Research-CIFE

8. Ph.D. Thesis/ Dissertation Examiner/ Evaluator/ Moderator for IIT-Mumbai, MGM Institute of Health Sciences, St. Xavier's College, ICAR-CIFE Mumbai, etc.
9. Invited Judge & Resource Person for Avishkar Research Conventions.
10. Invited Judge at the Consortium 2025- PG Research Poster Competition at St. Xavier's College, Mumbai.
11. Chairperson, Syllabus Committee for Ph.D. Entrance Test (PET) (2019-2021) in Biotechnology, University of Mumbai.
12. Chairperson, Syllabus Committee for Ph.D. Coursework (2020-21) in Biotechnology, University of Mumbai.
13. Chairperson for revision of Syllabus of PG and UG in Biotechnology (2021-22), University of Mumbai.
14. University of Mumbai Nominee, Board of Studies in Biotechnology, Thakur College of Science & Commerce, Mumbai.
15. Member of the Syllabus Committee for development of semester and credit-based Syllabus of PG & UG programme of Life Sciences.
16. Internal and External Evaluator for various PG Examinations, University of Mumbai.
17. Convenor, Orientation workshop for PG teachers for the M.Sc. Biotechnology revised syllabus 2021-22
18. Convenor, Orientation workshop for UG teachers for the B.Sc. Biotechnology first year revised syllabus 2022-23
19. Life Member of Indian Science Congress Association (ISCA), Indian Society of Cell Biology (ISCB) and Indian Women Scientist Association (IWSA).

On-going/ Completed Research Projects:

Title of the Project	Funding Agency	Duration
A study on the prevalence and molecular profiling of virulence genes in multiple antibiotic resistant <i>Escherichia coli</i> isolated from retail food	SERB, DST *	May 2019- March 2023
Isolation and molecular characterization of antibiotic resistance in non-pathogenic organisms from food	BRNS, DAE	April 2013- December 2016
Isolation and Molecular Characterization of Antibiotic Resistant Microorganisms from Different Water Bodies	DST-PURSE Scheme, UoM	April 2017- March 2020

****Includes financial provision for SSR & Lab Visit (details provided below)***

Opportunities for Under-Graduate/ Post-Graduate Students:

1. **Dissertation Projects/Summer Projects/Internships at AMR Lab:** applications should be emailed to drarath@mu.ac.in
2. **Lab Visit for College/ School students** in the PI's institution –for College/School students to come for a one-day visit to see the research facility available in the lab.

3. **Antimicrobial Resistance Database (FEAMR)** – The AMR lab has developed a unique, one-of-its-kind database for surveillance of Antimicrobial Resistance in food and the environment (<http://feamrudbt-amrlab.mu.ac.in/>) (<https://doi.org/10.1007/s12539-022-00534-y>, Copyright L-99624/2020).

Students pursuing/completed B.Sc./ M.Sc. in Bioinformatics/Biotechnology/Life Sciences & allied fields wishing to be a part of the project can contact her via e-mail.

Ph. D. Students Guided/ Guiding:

Sr. No.	Name of Student	Fellowship availed	Title of Thesis	Status
1.	Onkar A. Naik	JRF & SRF (BRNS-DAE)	A study on prevalence of antibiotic resistant microorganisms in food and molecular characterization of their antibiotic resistant traits	Degree awarded (2019)
2.	Amruta A. Dhawale	UGC Non-Net	A study on Oxidative Stress Adaptations in <i>Escherichia coli</i>	Degree Awarded (2021)
3.	Maitri Mishra	JRF & SRF (DBT)	Elucidation of Size and Structural Dependence of Silver Nano and Microstructures on their Interaction with Antibiotics for Antimicrobial Activity	Thesis Synopsis submitted
4.	Harshali A. Shinde	JRF & SRF (DST-SERB)	A study on the correlation between Antibiotic Resistance Genes and Virulence Factors in Multiple Antibiotic Resistant <i>Escherichia coli</i> isolated from retail food	Work ongoing
5.	Devika M. Ghadigaonkar	PF (DST-PURSE) (till March 2020)	A Study on the Assessment of Anti-Microbial Resistant Bacteria from coastal waters of Mumbai, India and Molecular Characterization of their Antibiotic Resistance Genes	Work ongoing
6.	Ruchi Kadam	Joined January 2025	-	Work ongoing

Recent Publications:

Sr. No.	Paper Title	Authors	Journal
1.	Novel Silver Nanoparticle-Antibiotic Combinations as Promising Antibacterial and Anti-biofilm Candidates against Multiple-Antibiotic Resistant ESKAPE Microorganisms.	Mishra, M., Ballal, A., Rath, D. and Rath, A.	<i>Colloids and Surfaces B: Biointerfaces</i> (2024), p.113826. https://doi.org/10.

			1016/j.colsurfb.2024.113826
2.	Isolation and Identification of Waterborne Antibiotic-Resistant Bacteria and Molecular Characterization of their Antibiotic Resistance Genes.	Ghadigaonkar, D. and Rath, A.	<i>JoVE (Journal of Visualized Experiments)</i> (2023), (193), p.e63934 doi: 10.3791/63934
3.	FEAMR: A Database for Surveillance of Food and Environment-Associated Antimicrobial Resistance	Mishra M, Kadam P, Doshi B, Saravya J & Rath A	<i>Interdiscip Sci Comput Life Sci</i> (2022), 14(4), pp.833-840. https://doi.org/10.1007/s12539-022-00534-y
4.	DNA repair pathways important for the survival of Escherichia coli to hydrogen peroxide mediated killing.	Dhawale, A., Bindal, G., Rath, D., & Rath, A.	<i>Gene</i> (2021), 768, 145297. https://doi.org/10.1016/j.gene.2020.145297
5.	Characterization of multiple antibiotic resistance of culturable microorganisms and metagenomic analysis of total microbial diversity of marine fish sold in retail shops in Mumbai, India.	Naik O, Shashidhar R, Rath D, Bandekar JR, Rath A	<i>Environ. Sci. Pollut. Res.</i> , 2018 Mar 1;25(7):6228-39. https://doi.org/10.1007/s11356-017-0945-7
6.	Metagenomic analysis of total microbial diversity and antibiotic resistance of culturable microorganisms in raw chicken meat and mung sprouts (<i>Phaseolus aureus</i>) sold in retail markets of Mumbai, India.	Naik O, Shashidhar R, Rath D, Bandekar JR, Rath A	<i>Curr. Sci.</i> 113(1):71-79
7.	The CRISPR-Cas immune system: biology, mechanisms and applications.	Rath D, Amlinger L, Rath A , Lundgren M.	<i>Biochimie.</i> 2015 Oct; 117:119-28. https://doi.org/10.1016/j.biochi.2015.03.025
8.	Nucleotide excision repair is important for survival of hydrogen peroxide mediated killing in Escherichia coli	Amruta Dhawale, Archana Rath	<i>Int. J. Life Sci. Res</i> 7(2), 407-411

Details of Patents / Copyrights:

Title of work	Name of Author(s)	Registration details	Remarks
<u>Process Patent:</u> Biological Synthesis Process of Silver Nanoparticles and Application as Antimicrobial Agent against Multiple Antibiotic Resistant Bacteria	Dr. Archana Rath, Maitri Mishra	Patent No. 458867	Govt. of India
<u>Copyright:</u> FEAMR: Food and Environment associated Antimicrobial Resistance Database	Dr. Archana Rath, Maitri Mishra	L-99624/2020	Nature of work - Literary

Special Articles:

1. Popular article titled “जलप्रदूषण आणि जंतूंच्या रोधनक्षमतेचा विकास” in VANARAI’s Special Edition “Health and Environment” (ISSN 2250-1215, page no. 100) on December 2020
2. **DNA Repair Pathways: Elucidating the Role of Genes Involved in Oxidative Stress**, Amruta Dhawale, Archana Rath, Indian Society of Cell Biology Newsletter (2023), ISSN 2349-8307, Pgs. 46-48

Special Reviews on research publications from the lab:

1. The research work appeared as a short story in a televised show, “Science Monitor” on “Rajya Sabha TV”, Vigyan Prasar, an autonomous Institute of the Department of Science & Technology, aired on 5th August 2017.
<https://www.youtube.com/watch?v=SPnSDrVqACc>,
<https://sites.google.com/view/amrlabudbtuom/gallery/our-research-on-tv?authuser=0>
2. “Hindustan Times”<https://www.hindustantimes.com/cities/fish-bacteria-can-resist-drugs-used-to-treat-tb-malaria-reveals-mumbai-university-study/story-RKEezTi65fzchtZA2YQieN.html> published on 23rd April 2018.
3. “The Hindu” <http://www.thehindu.com/todays-paper/tp-national/tp-other-states/mumbai-study-shows-drug-resistant-bacteria-in-chicken-moong-beans/article19213505.ece> published on 5th July, 2017.
4. “Outlook”<https://www.outlookindia.com/website/story/scientists-discover-antibiotic-resistant-bugs-in-raw-chicken-sprouts/299659> published on 20th July, 2017.
5. “Biotech Times”<https://biotechtimes.org/2017/07/20/study-finds-antibiotics-bugs-chicken-sprouts/> published on 20th July, 2017.
6. “Indian Science Journal” <http://www.indiansciencejournal.in/health-news/raw-chicken-and-sprouted-beans-in-mumbai-unhealthy-206806> published on 20th July, 2017.
7. “India Science Wire” http://vigyanprasar.gov.in/isw/antibiotic_sea_fishes_story.html published on 20th December, 2017.
8. “India Water Portal” <http://hindi.indiawaterportal.org/node/66772> published on 20th December, 2017.

9. “Mongabay”<https://india.mongabay.com/2018/01/11/mumbai-fish-harbour-high-levels-of-antibiotic-resistant-bacteria/> published on 11th January, 2018.

Recent Invited/ Oral Talks (partial list)

1. Invited talk “**Anti-microbial Resistance (AMR) and One Health Perspective**” on 10th December 2024, as part of World Antimicrobial Awareness Week celebration at St. Xaviers College, Mumbai.
2. Invited talk “**Tackling Anti-microbial Resistance (AMR) from One Health Perspective**” delivered on 4th-5th March 2024, during the Two-day International Conclave on Antimicrobial Resistance, organised by the DBT-CTEP, sponsored and organized by the Centre of Excellence in Life Sciences, PSGR Krishnammal College for Women, Coimbatore, India.
3. Invited talk “**Seafood Safety from One Health Perspective**” during ICAR-CIFE organized and DST-SERB sponsored two-day National Seminar "Seafood Safety and Public Health" on 4th & 5th January, 2024.
4. **Understanding AMR through Metagenomic Approaches** - ICAR Sponsored Winter School (9-29th January 2023) on Antimicrobial resistance in food fish: Challenges and Mitigation, conducted by CIFE, Mumbai – 25th January 2023
5. **Antimicrobial efficacy of green synthesized Silver Nanoparticles against Multiple Antibiotic Resistant *Acinetobacter baumannii*** – 3rd World Congress on Infectious Diseases and Antibiotics 2022 (online) – 30th January, 2022
6. **FEAMR Database© for surveillance of Antimicrobial Resistance in food and environment** – The World Environment Summit (online) – 2nd October, 2021
7. Received **First prize** for Oral presentation at **National Conference on Climate Change (NCCC)** organized by Utkal University, Bhubaneswar, on March 2020.
8. **Metagenomics in Clinical Microbiology** - PG Assembly (Western Region) of IAMM at Seth G.S. Medical College & K.E.M. Hospital, Mumbai – 29th July 2019.
9. **A study on antibiotic resistant *Escherichia coli* isolated from retail food in Mumbai, India** – World Congress on Infectious Diseases and Antibiotics, Bangalore – 28th November 2018.
10. **Food Associated Antibiotic Resistance and Its Implications to Human Health** - International Conference (IAETS- 2018), Chhatrapati Shivaji Maharaj University, Panvel, Mumbai (India) – 17th November 2018.

Conferences/ Events organized: (partial list)

1. National Seminar-cum-Event on Biotechnology Entrepreneurship (**NSBTE**) in India: Recent Trends and Challenges held on 26th March 2018.
2. **BIOINNOVA** National Conference in collaboration with Thakur College, Kandivali held on 10th February 2018.
3. **National Science Day** held on 28th February 2017 & 2018.
4. **World Antimicrobial Awareness Week** held under the aegis of the World Health Organization (WHO) from 18th-24th November 2021 and 2022.

Gene Bank Submissions:

There are a total of **214** submissions from our lab till date.

The NCBI BioProject Accession no: PRJNA639905 contains all submissions done by the AMR Lab to NCBI (<https://www.ncbi.nlm.nih.gov/>) till date, which can be accessed at <https://www.ncbi.nlm.nih.gov/bioproject/PRJNA639905>

1. Gene sequences of Antibiotic Resistant microorganism isolated from food samples:

Sr. No.	Food source	No. of isolates	Accession Numbers	Publication date on NCBI
1	Chicken	50	KX355642 – KX355691	26-JUNE-2016
2	Mung sprout	50	KX355692 – KX355741	26-JUNE-2016
3	Marine fish	50	KX300038 – KX300086 KY432753	26-JUNE-2016 14-JULY-2017

2. Antibiotic Resistant gene sequences amplified from metagenomic DNA:

No. of genes	Accession Numbers	Publication date on NCBI
13	KY798891-KY798897 KU573047-KU573052	09-MAY-2017 09-FEB-2017

3. Antibiotic Resistant gene sequences amplified from transconjugants:

No. of genes	Accession Numbers	Publication date on NCBI
3	KY924468-KY924470	12-JUN-2017

4. Antibiotic Resistant gene sequences amplified from isolates:

No. of genes	Accession Numbers	Publication date on NCBI
11	KY867437-KY867447	19-APR-2017

For any queries, please contact Dr. Archana Rath via email:

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Useful Links:

AMR Lab Website: <https://sites.google.com/view/amrlabudbtuom>

FEAMR DB: <https://feamrudbt-amrlab.mu.ac.in/home.aspx>