Department of Biotechnology

Proforma for submission of Annual Progress Report (2021-22) supported under Star College Scheme

1. **Name of the College**: Ram Lal Anand College, University of Delhi.

2. **Name of Coordinator, designation, Address, Phone nos:**

Prof. Prerna Diwan

Department of Microbiology, Ram Lal Anand College, University of Delhi

5, Benito Juarez Road, New Delhi- 110021

Phone: 9871290711

Email: prernadiwan@rediffmail.com; prernadiwan.mic@rla.du.ac.in

Assessment duration: 1/4/2021 to 31/3/2022 (sanctioned on 29/02/2020)

Duration in years: 1 year

3. **Details of Departments Supported**

S.No	Name of Department	Courses (B.Sc./M.Sc./PG Diploma, certificate etc) offered	Regular Faculty members	
			Total =9	
			With Ph.D.	**Without Ph.D.**
1	Microbiology	B.Sc. (Hons) Microbiology	9	NIL

4. **Number & Date of Advisory committee meeting:** Advisory Committee was constituted in I year on 16th June 2020. Internal Meetings were held on 23 November 2021 and 14 February 2022.

Advisory committee meeting for evaluation of onsite progress could not be held as the college was running in online mode from March 2020 to 16th Feb 2022 due to COVID.

5. Qualitative improvements due to DBT support:

a. Minor research projects were done by students and faculty using Docking software SEESAR purchased under Non-Recurring grant of Star College scheme with a licence of 60 users. 57 students of B.Sc. (H) Microbiology, used this docking software for practical component of Discipline Specific Elective course "Fundamentals of Bioinformatics" offered in V semester of their curriculum and Skill enhancement course "Bioinformatics" offered in IV semester which could not be done earlier with sufficient hands on experience by students.

b. Trainings Conducted:

- A Hands on session on Fluorescence Microscopy was organised for students, faculty and laboratory staff on 29th March 2022 using Fluorescence microscope purchased through Non-Recurring grant of Star College scheme.
- Training session on Colony Counter on 22nd February 2022 for students, and faculty purchased through Non-Recurring grant of Star College scheme. The colony counter is being used by all students of BSc (Hons) Microbiology (134)
- Training Session on Anaerobic Gas Pak System for students, and faculty purchased through Non-Recurring grant of Star College scheme on 22nd February 2022.
- Training Session on PCR purchased through Non-Recurring grant of Star College scheme for students, and faculty on 16th February 2022. The PCR is being used by all students of BSc (Hons) Microbiology II and III (89).
- A Hands on session on Biosampler (Air Sampler for collection of Bioaerosols) was organised for students, faculty and Research Scholars on 22nd Feb 2022

c. Awards: Department of Microbiology, received **Best Department Award** at state level on 8.12.21 for session 2020-21 by Microbiologists Society, India. This was conferred based on overall college performance including academic, extracurricular, co-curricular and research activities. This was to some extent due to activities that could be conducted with support under star college scheme. Simran Preet Kaur got MSI "Best Student" of Department of Microbiology for the session 2020-2021 in 2021

d. **Research Promotion and Guidance:**

- **Joining of 2 PhD students** in Department of Microbiology: Ms Prerna Yadav under the supervision of Prof Prerna Diwan and Ms Mansi Podia under the supervision of Prof R.K.Gupta, Department of Microbiology.
- **New projects approved:** Two new ICMR projects have been sanctioned during session 2020-21 and one research proposal under consideration at DST
  - Resistome metagenomic profiling of bioaerosols in metro network in Delhi-NCR, (Principal Investigator: **Prof R K Gupta**, Co-investigators: **Dr Sunila, Prof Prerna Diwan, Department of Microbiology**), ICMR/2020/9584 Approved for **INR 56 Lacs,** 3 years by ICMR, Government of India.
  - Sanctioned and Received 19,55,118 as first year grant for project entitled "Assessment and Monitoring of Depth of Anesthesia using Explainable AI". ICMR/ 2021-13397 with **Co-investigator: Prof Rakesh Kumar Gupta, from Department of Microbiology** ; Principal Investigator: Dr Neeraj Kumar Sharma, Department of Computer science
  - A research proposal was submitted by **Prof Prerna Diwan and Prof R K Gupta, Department of Microbiology** under DST SEED grant and was short listed for Programme advisory Committee held on 2nd December 2021. The result is awaited
- **Minor summer research projects for students:**
  - Isolation and screening of plastic degrading bacteria from soils collected from different landfill sites of Delhi -Dr. Sunila Hooda, Poorvi Saini, Ananya Garewall , Neha Verma, Surbhi Singh
  - Activity of different kind of biosorbents and biodegraders for primary treatment of waste water produced from laboratories- Dr. Shalini Swami, Mohd. Fardeen Husain Shahanshah, Bhawana Sharma, Himanshu, Saloni Jain
  - Combating Methicillin resistant Staphylococcus aureus (MRSA): A drug repurposing approach- Dr. Vandana Gupta, Anurag Singh, Simran Preet Kaur, Himanshu
  - Screening of in vitro antimicrobial activity of Indian Plants against ESKAPE Pathogens-Dr. Nidhi S Chandra, Pragya, Priya Bhatia, Abhilash George, D. Anvitha
  - An epidemiological study of mental health of College students in Delhi- Dr. Salome John, Sahil Raina, Raajvi Khurana,

e. **Certificate course organised for Students**: 40 hours Online Certificate Course (40 hours),

titled 'Basic Statistics for Biological Sciences', from the 5th of July,2021 to the 16th of July, 2021, under the aegis of the DBT Star College Scheme. The objective of the course was to orient participants to basic statistics tools used in biological sciences

f. National level Innovative Idea competition: Presentation and discussion of students innovative idea was organised on 26th February 2022

g. **Outreach:** UDISHA: An HPV Vaccination Initiative by Dr. Vandana Gupta initiated a which aims to create awareness about Human Papillomavirus, which causes 6 types of cancers and the vaccines available. Microbiology students are the members of the core team.

h. **Collaboration/ MoU:** signed with the Sustainable India Trust (SIT) to promote sustainable development goals as envisaged by the UN. Nine students from Department of Microbiology enthusiastically enrolled as "Sustainable Champions" for Satva

i. **Seminar/Webinar/Talks organised:**

- Organized a talk on the 23rd of October, 2021 on start-ups and entrepreneurial skills with BioNEST, UDSC. Speaker Dr Vijay Kantharia, CEO, which helped students to gain hands on training and strengthen their understanding about a number of fundamental techniques used in the research field along with the facilities provided by the BioNEST to develop budding entrepreneurs. A total of 88 students and faculty attended the online talk.
- Talk on "Antibodies" – Ek Antibody, Anek Kaam on the 25th February 2022 by Prof. V.K. Chaudhary (NASI-Senior Scientist at Centre for Innovation in Infectious Disease Research, Education and Training (CIIDRET), UDSC) was attended by over 100 students and faculty from several colleges in hybrid mode.
- An online interaction with three outstanding departmental alumni of the Batch of 2014: Rahul Sanwlani (PhD student, Mathivanan Lab, La Trobe Institute for Molecular Sciences, La Trobe University, Melbourne, Australia, studying the role of bovine milk-derived extracellular vesicles in cancer progression), Aditya Bajaj and Manasvini Markandey (Senior Research Fellows, Department of Gastroenterology, AIIMS, working on the gut microbiome and organoids). The interaction was very motivating and inspiring for all current students. The alumni guided students about research options in India and abroad in the field

of Biotechnology.

- Webinar on "Copyright and Plagiarism issues for teaching and research" attended by 100 faculty members on 24 June, 2021 by Prof. Alka Chawla, Department of Law, University of Delhi
- Popular Lecture" Intellectual Property Rights (IPR) for students and faculty: covering Why, What and how of IPR and Patents on 3rd September 2021by Ms Latika Khanduja
- Popular Lecture for students and faculty entitled "Cyber Crimes in India: Modus Operandi, Prevention and Punishment" by Dr Megh Raj on 5th October .2021
- Popular Lecture By Dr Deepa Sinha "Challenges in SDG goals on health and nutrition in India "on 11th January 2022

j. Field Visit/Virtual Tour for students

Virtual tours	Date	Curriculum Enrichment of Courses	No. of students who attended
Virtual tour of a soy processing unit	18th October,2021	Students of BSc (H) Microbiology, Semester V as part of the course on Industrial Microbiology	32
Virtual tour of a factory producing Marmite (yeast extract for consumption)	18th October, 2021		
Virtual tour of a paper making unit to demonstrate the processing of wood-pulp and generation of sulphite waste liquor	6th October, 2021		

6. Any Novel aspect introduced or planning to introduce during the Scheme duration.

- Online Skill development certificate courses for students
- Hands on training in docking software SEESAR for use in research
- Hands on Metagenomic data Analysis of soil and air

- Research work presentations by students and faculty
- Article /review publication by students
- Air quality analysis through sampling for bioaerosols using Impactor and Impinger
- Fluorescence Microscopy

7. Lessons learnt / difficulties faced/suggestions if any, in implementation of the programme and utilization of DBT grant.
   - Due to Lockdown field visits could not be conducted. Visit to Institutions/Industries deferred due to Lockdown as per University guidelines
   - Closing of the college laboratories led to summer research projects only in the online mode
   - Delivery of equipment delayed due to COVID19
   - Offline FDP/seminar could not be conducted

8. **Key performance indicators**

S. no	Indicator	Pre-support		During /After Support (2020-21 & 2021-22)		Remarks
		Total = 36		Total = 63		
		M = 20	F = 13	M = 16	F = 47	
1	No. of students admitted	SC=1 ST=2 OBC =4 Gen= 13 (July 2019)	SC=3 ST=0 OBC= 3 Gen=10 (july 2019)	SC=2 ST=0 OBC= 5 Gen=9 (Admission: 2020)	SC=5 ST=2 OBC= 8 Gen=1 32 (Admission: 2020	The sanctioned intake strength is fixed to 40, there may be increase or decrease in students admitted due to cutoff merits and Key indicator is not applicable
				Total=45 in 2021		
				M=17	F=28	
				SC=2 ST=2	SC=2 ST=1	

				OBC= 4 Gen=9 (Admission: 2021)	OBC= 7 Gen=18 (Admission: 2021	
2	No. of students passing out (%) Students Admitted/passing out (pass %)	27/28 96.4% (passed in 2019)		20/21 (95.2%) (Passed in 2020) 32/32 (100%) (Passed in 2021)		
3	Drop-out rates	42-28= 14 (33.33%) (Batch 2016-19)		27-21= 6 (22.22%) (Batch 2017-20) 34-32=2 (5.8%) (Batch 2018-21)		
4	No. of students opting for MSc	24 (2019)		14 (2020) 20 (2021)		Admission delayed and semesters running in staggered mode due to COVID pandemic
5	Average marks	7.41 CGPA (74.1%) (Passed in 2019)		7.60 CGPA (76%) (Passed in 2020) 8.13 CGPA (81.3%) (Passed in 2021)		
6	No. of hands-on experiments being conducted	158 in prescribed CBCS Mode of Curriculum adopted by		148 as prescribed in revised LOCF Scheme of curriculum		The hands on exercises were supplemented for students

		University of Delhi	adopted by University of Delhi (Same in Year I (2020-21) and II (2021-22)	
7	No. of new experiments introduced	NA	3 in 2020-21 Additional 5 in 2021-22	
8	Publications (scopus indexed) /patents, if any.	3 Research Articles + 3 book chapters 2018-19	9 Research Articles + 4 book chapters 2020-21 7 Research Articles + 6 book chapters 2021-22	
9	Training received by faculty	6 trainings + 1online certificate courses completed from NPTEL	9 trainings +12 online certificate courses completed from Coursera, NPTEL and Open WHO (2020-21) 6+5 (in house) trainings in 2021-22	
10	Exhibitions /seminars /training courses conducted	3	9 (2020-21) 8 (2021-22) +1 certificate course	
11	Books/journals subscribed from grants	Nil	Nil (2020-21) 6 (2021-22)	

12	Outreach activities (Popular lectures)	nil	4 (2020-21) 4 (2020-21)	
13	Colleges mentored to apply for DBT Star College grants	Nil	Nil	
14	Invited lectures	11	36 (2020-21) 28 (2020-21)	

Proofs (S.No. 6-14) duly attested by Principal and Coordinator are attached as Annexure -3.

10. Self evaluation

Department	*Objective (as stated in proposal)	% achieved	Reasons for underachievement / If achieved, state in quantitative metrics
Microbiology	Under 5 broad objectives categories=13 action points were proposed	84.6% Visits could not be conducted (2020-21) 90 % Outstation visits could not be conducted (2021-22)	Most period after receiving grant was under Covid Pandemic during which college was closed for physical teaching.

Prerna Diwan

Prof. Prerna Diwan

DBT Star college Coordinator

Dr. Prerna Diwan
Professor & Coordinator,
DBT Star College Scheme
Department of Microbiology
Ram Lal Anand College, University of Delhi
5, Benito Juarez Road, New Delhi-110021
Phone : 91-11-24112557 (Office)
Email: prernadiwan.mic@rla.du.ac.in
Mobile : 91-9871290711

Rakesh K Gupta

Prof. Rakesh K Gupta

Principal

Principal
Ram Lal Anand College
(University of Delhi)
Benito Juarez Road,
New Delhi - 110021

Annexure 3:

Proofs 8-14

8. Publications (scopus indexed) /patents, if any:

i. Poorvi Saini, Ananya Grewall & Sunila Hooda 2022. In silico approach for identification of polyethylene terephthalate hydrolase (PETase)-like enzymes. Bioremediation Journal pp 1-13. https://doi.org/10.1080/10889868.2022.2054931

ii. Shahanshah MFH, Jain Saloni, Sharma Bhawana, Grewall Ananya, Swami Shalini 2022. Comparative analysis of B.1.617.2 (Delta) variant of SARS Cov-2. Journal of Microbiology and Infectious disease quarterly 12 (1):38-51. https://doi.org/10.5799/jmid.1086226

iii. Dwivedi V, Gupta RK, Gupta A, Chaudhary VK, Gupta S, Gupta V. 2022. Repurposing Novel Antagonists to p7 Viroporin of HCV Using in silico Approach. Letters in drug design and discovery . 19. https://dx.doi.org/10.2174/1570180819666220124112150

iv. Singh G, Soni H, Tandon S, Kumar V, Babu G, Gupta V, Chaudhuri (Chattopadhyay) P. 2022. Identification of natural DHFR inhibitors in MRSA strains: Structure-based drug design study.Letters in Chemistry. 4(1). https://doi.org/10.1016/j.rechem.2022.100292.

v. Mohan L., Anand, S., Gupta, R. K. and Diwan, P. (2021). Frugal Science Innovations: Promising tools for education and healthcare. J of advanced Scientific Research 12(3); 20-28 (UGC care listed)

vi. Snigdha, S., Bajwa, T., Anand, S., Mohan L., Goyal, K., Mittal, M., Gupta, K.R., Wahlang, J. Gupta, R. K. and Diwan, P. (2021). A Cross-sectional Study on Prevalence of Betel nut Chewing Among the Youth of Meghalaya, North East Region of India: Development of Multifaceted Prevention Strategy: Prevalence of Betel Nut Chewing Among the Youth of Meghalaya" Accepted for Publication in Asian Pacific Journal of Health Sciences,ISSN 2350-0964; E-ISSN 2349-0659 (UGC care listed)

vii. Jain Rita, Das Deboshree, John M. Salome (2021). BMI as an Indicator of Depression and Stress-Induced Eating Disorders among College Students in Delhi. Asian Pacific Journal of Health Sciences. 9: 184-187 .

Book Chapters:

i. Malik, G., Chugh, S., Hooda, S., Chaturvedi, R.2022. Plant Growth Promoting Rhizobacteria (PGPR)-Assisted Phytoremediation of Contaminated Soils. In: Singh, A.K., Tripathi, V., Shukla, A.K., Kumar, P. (eds) Bacterial Endophytes for Sustainable Agriculture and Environmental Management. Springer, Singapore. Pp:71-93. https://doi.org/10.1007/978-981-16-4497-9_4

ii. Garima Malik, Sunila Hooda, Sahrish Majeed, Vimal Chandra Pandey. 2022. Understanding assisted phytoremediation: Potential tools to enhance plant performance. In: Pandey, V.C. (Edited Book), Assisted Phytoremediation. Elsevier, Amsterdam, PP. 1-24. pp 1-24. https://doi.org/10.1016/B978-0-12-822893-7.00015-X

iii. Role of Soil Microbes in Sustainable Development: Nutrient Transformation, Biremediation and Biodeterioration Anurag Singh, Shreya Kapoor, Priya Bhatia, Sanjay Gupta, Nidhi S Chandra, Vandana Gupta 2022 Industrial Application of soil Microbes 1 1 151-179.

iv. Shahanshah M F H, Sehrawat H, Wijewardana C, Pal S, Gupta A, Diwan P, Gupta S, Gupta V. 2021. In Phillip Galvan (Eds.) Recent Advances in Chikungunya Virus Therapeutics: An Overview. Chikungunya Virus: Epidemiology, Transmission and Therapeutics, Nova Science Publishers, Inc. USA pp:57-82. https://novapublishers.com/shop/chikungunya-epidemiology-transmission-and-therapeutics/

v. Sehrawat H, Shahanshah MFH, Wijewardana C, Pal S, Chaudhary VK, Gupta S, Gupta V 2021. In Phillip Galvan (Eds.) Recent Progress on Immunotherapy and Immunoprophylaxis of Chikungunya Virus. Chikungunya Virus: Epidemiology, Transmission and Therapeutics, Nova Science Publishers, Inc. USA, 83-1190. https://novapublishers.com/shop/chikungunya-epidemiology-transmission-and-therapeutics/

vi. Diwan P. Gupta, R. K. (2021). Substantial Thrust to Indian Rural Economy through Village Dairy Cooperatives as Envisaged by Gandhi. In Devendra Kumar (Eds.) Self-Reliant India: A Gandhian Perspective, pp. 80-96, Shivalik Prakashan, Delhi India, ISBN 978-93-87195-86-8.

9. Training received by faculty: (Include workshops & FDP)

i. Workshop 'Basic to Advanced Bioinformatics, Machine Learning, and Multiomics data analysis' organised by Nextgenhelper, New Delhi from March 12 -31, 2022 – Prof. Prerna Diwan

ii. Completed Internal Academic auditor training course conforming to requirements of ISO 9001; 2015 and ISO 19011;2018 from 2-13 August 2021 organised by IQAC Cluster and white code - Prof. Prerna Diwan

iii. SARS-CoV-2 proteases: exploring their suitability as targets for novel therapeutics, invited talk, International e-workshop on Exploring resources for COVID-19 Research Camarada (YouTube chanel) In association with GAUTAM SHIKSHA EVAM GRAMIN VIKAS SANSTHAN and Kalyani Welfare Associations, Jul 26th - 31, 2021 – Prof. Vandana Gupta

iv. Hands-on workshop on Fermentation Technology from 15th to 29th Dec. 2021 organised by BioNEST UDSC – Dr. M Salome John

v. Four weeks International Faculty Development Online Certificate Course on "BASIC TECHNIQUES IN MICROBIOLOGY (Phase IV)"" "Department Of Microbiology, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India, in association with Microbiologists Society, India & Western Rio Janerio State University (UEZO), Brazil" Online FDP 04 July 2021 - 08 August 2021 – Dr. Nidhi S Chandra

vi. Two Week (Online) Interdisciplinary Faculty Development Programme on 'MOOC's, E-Content Development, Research Methodology and Statistical Tools in Open Education World" Mahatma Hansraj Faculty Development Centre, (PMMMNMTT), Kalindi College, University of Delhi in collaboration with Mahatma

Hansraj Faculty Development Centre, Hansraj College, University of Delhi, Online FDP, 3rd August – 17th August 2021 – Dr. Nidhi S Chandra

10. Exhibitions/seminars/training courses conducted:

i. Hands on session on Fluorescence Microscopy was organised on 29th March 2022

ii. Training session on Colony Counter on 22nd Feb 2022

iii. Training Session on Anaerobic Gas Pak System on 22nd Feb 2022

iv. Training Session on PCR on 16th Feb 2022

v. A Hands on session on Biosampler (Air Sampler for collection of Bioaerosols) was organised for students, faculty and Research Scholars on 22nd Feb 2022

vi. Organized a talk on the 23rd of October, 2021 on start-ups and entrepreneurial skills with BioNEST, UDSC. Speaker Dr Vijay Kantharia, CEO

vii. Talk on "Antibodies" - एक नाम, अनेक काम on the 25th February 2022 by Prof. V.K. Chaudhary (NASI-Senior Scientist at Centre for Innovation in Infectious Disease Research, Education and Training (CIIDRET), UDSC)

viii. Alumni talk On the 2nd of October, Mikrobiologika hosted an online interaction with three outstanding departmental alumni of the Batch of 2014: Rahul Sanwlani (PhD student, Mathivanan Lab, La Trobe Institute for Molecular Sciences, La Trobe University, Melbourne, Australia, studying the role of bovine milk-derived extracellular vesicles in cancer progression), Aditya Bajaj and Manasvini Markandey (Senior Research Fellows, Department of Gastroenterology, AIIMS, working on the gut microbiome and organoids).

Certificate courses conducted for students:

- 40 hours Online Certificate Course (40 hours), titled 'Basic Statistics for Biological Sciences', from the 5th of July,2021 to the 16th of July, 2021

11. Books/journals subscribed from grants:

List of books ordered in the current session:

1. Biostatistics with scientific applications
2. Research and Publication ethics
3. Expression System: Methods Express
4. Whole Genome Amplification: Methods Express
5. DNA Microarrays: Methods Express
6. Genetic Analysis: An Integrated approach

12. Outreach activities (Popular lectures):

- Dr. Vandana Gupta initiated a social outreach campaign UDISHA: An HPV Vaccination Initiative in January 2021, which aims to create awareness about Human Papillomavirus, which causes 6 types of cancers and the vaccines available. Anurag Singh and Abhilash Jeas George are also the members of the core team.
- Webinar on "Copyright and Plagiarism issues for teaching and research" attended by 100 faculty members on 24 June, 2021
- Popular Lecture" Intellectual Property Rights (IPR) for students and faculty: covering Why, What and how of IPR and Patents on 3rd September 2021by Ms Latika Khanduja
- Popular Lecture for students and faculty entitled "Cyber Crimes in India: Modus Operandi, Prevention and Punishment" by Dr Megh Raj on 5th October 2021
- Popular Lecture By Dr Deepa Sinha "Challenges in SDG goals on health and nutrition in India "on 11th January 2022

13. Colleges mentored to apply for DBT Star College grants: NA

14. Invited lectures:

Proofs for the invited lectures are attached in the events

1. Advocate Latika Khanduja, Founder IPLOEA, Registered Indian Patent Agent
2. Dr Vijay Kantharia, CEO BIoNEST, UDSC
3. Prof. V.K. Chaudhary NASI-Senior Scientist at Centre for Innovation in Infectious Disease Research, Education and Training (CIIDRET), UDSC
4. Capt (Dr) Sunaina Singh, Motivational Speaker & Life Coach,
5. Rahul Sanwlani (PhD student, Mathivanan Lab, La Trobe Institute for Molecular Sciences, La Trobe University, Melbourne, Australia
6. Aditya Bajaj (Senior Research Fellow, Department of Gastroenterology, AIIMS.

7. Manasvini Markandey (Senior Research Fellow, Department of Gastroenterology, AIIMS)
8. Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI, Karnal
9. Ms Deboshree International Institute for Population Sciences
10. Dr Rita Jain, Assistant Professor, Dept. of Statistics, RLA College
11. Dr. Alka Chawla, Professor, Assistant Professor, Faculty of Law, University of Delhi
12. Dr. Megh Raj, Assistant Professor, Faculty of Law, University of Delhi
13. Dr. Dipa Sinha, Assistant Professor, School of Liberal Studies, Ambedkar University, Delhi
14. Mr. Arun Singh, Key Account Manager, HiMedia Laboratories Pvt.Ltd
15. Mr. Mohit Mahajan, Partner, CTO, Imagene Innolab, New Delhi

The following faculty gave invited talk under DBT Science Setu Program to our students:

16. Dr. Sabhyata Bhatia Scientist VI, NIPGR
17. Swarup Parida's, Scientist V, NIPGR
18. Dr. Shekhar C. Mande, Secretary, Department of Scientific & Industrial Research and Director General, Council of Scientific & Industrial Research, New Delhi
19. Dr. Vineet Gaur, DBT-Ramalingaswami Fellow, NIPGR
20. Dr. Amar Pal Singh, Scientist IV, NIPGR
21. Dr. Debasis Chattopadhyay, Scientist VII, NIPGR
22. Dr. Tarun is a Senior Research Scientist, Multidisciplinary Clinical & Translational Research group, at Translational Health Science and Technology Institute (THSTI)
23. Mr. Syed S Ahmed, Founder Director & CEO: TechInvention Lifecare Pvt Ltd.
24. Dr. Hasthi Ram, Scientist II, NIPGR
25. Dr. Senjuti Sinharoy, Scientist IV, NIPGR
26. Dr. Ashish Ranjan, Scientist IV, NIPGR
27. Dr. Alok K Sinha, Scientist VI, NIPGR
28. Dr. Manoj Prasad, Scientist VI, NIPGR

Taylor & Francis
Taylor & Francis Group

Bioremediation Journal

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/bbrm20

In silico approach for identification of polyethylene terephthalate hydrolase (PETase)-like enzymes

Poorvi Saini, Ananya Grewall & Sunila Hooda

To cite this article: Poorvi Saini, Ananya Grewall & Sunila Hooda (2022): *In silico* approach for identification of polyethylene terephthalate hydrolase (PETase)-like enzymes, Bioremediation Journal, DOI: 10.1080/10889868.2022.2054931

To link to this article: https://doi.org/10.1080/10889868.2022.2054931

Published online: 29 Mar 2022.

JMID/
Journal of Microbiology and Infectious Diseases

2022; 12 (1):38-51
doi: 10.5799/jmid.1086226

REVIEW ARTICLE

Comparative Analysis of B.1.617.2 (Delta) Variant of SARS-CoV-2

Mohd Fardeen Husain Shahanshah, Saloni Jain, Bhawna Sharma, Ananya Grewall, Shalini Swami

Ram Lal Anand College, University of Delhi, New Delhi, India

ABSTRACT

The emergence of numerous variants of SARS-CoV-2 has caused massive setbacks and prolonged the COVID-19 pandemic. Some of the variants are still under investigation, while some have become a reason of grave concern. One such variant is B.1.617.2, known as the Delta variant, which was first detected in India. A comprehensive analysis and comparison of this particular variant have been done to the original Wuhan strain, and the possible reasons behind rapid mutation have also been discussed.

A comprehensive literature search was done to summarize the information on the variants of SARS-CoV-2 and the reasons behind their mutation, with a significant focus on the B.1.617.2 variant. Data were collected from various online sources such as PubMed, Google Scholar, MEDLINE, Worldometer, WHO, CDC, and GISAID. In addition, 3D structures of spike proteins were obtained from Protein Data Bank (PDB).

The data shows that the spike protein of the B.1.617.2 strain is highly mutated and has accumulated eight amino acid changes. Besides spike protein, changes in non-structural proteins (nsP2, nsP3, nsP4, nsP12, and nsP15), other structural proteins (nucleocapsid and membrane protein), and accessory proteins (ns3, ns7a) have been observed as well. Furthermore, in almost all the variants of SARS-CoV-2, D614G mutation occurs, suggesting its role in increased infectivity and transmission.

New variants are continuously emerging on which we have no control. Spike mutations are more favored and essential in the evolution of new variants because it increases the transmissibility and infectivity of the virus. Therefore, to maximally protect public health, knowledge of different variants is essential. *J Microbiol Infect Dis 2022; 12(1):38-51.*

Keywords: *SARS-CoV-2, Spike, Mutation, Variants, B.1.617.2 variant*

INTRODUCTION

Since its first appearance in Wuhan, China, in late November 2019, the novel coronavirus, SARS-CoV-2, has transcended all borders and continues its rampage across the world by prolonging the ongoing COVID-19 pandemic [1, 2].

As of 30 November 2021, 1:47 am, 262,136,650 cases of coronavirus have been reported globally. Of these, 236,709,323 people have recovered, and 5,221,506 people have succumbed to the illness [3,4].

SARS-CoV-2 possesses a 30 kb long, positive sense, single-stranded RNA (ssRNA) molecule as its genome. Surrounding that RNA molecule is the Nucleocapsid (N) protein and the viral envelope, which is collectively made up of three other structural proteins, namely Spike (S), Envelope (E), and Membrane (M) [5, 6]. Its expansive genome consists of 14 open reading frames (ORFs) encoded for 27 different proteins. This betacoronavirus shares homology with other important zoonotic viruses such as SARS-CoV and MERS CoV, both of which have caused severe outbreaks in the past [1,2,7,8].

The virus particle gets transmitted via respiratory aerosols, fomites, and human contact and manifests a range of nonspecific

Correspondence: Dr. Shalini Swami, Department of Microbiology, Ram Lal Anand College, University of Delhi, Benito Jaurez Marg, South Campus, New Delhi, India
E-mail: dr.shaliniswami@gmail.com
Received: 28 July 2021 Accepted: 24 January 2022

Letters in Drug Design & Discovery

Editor-in-Chief

ISSN (Print): 1570-1808
ISSN (Online): 1875-628X

Rank | Journal | Subscribe

Research Article

Repurposing Novel Antagonists for Targeting p7 Viroporin of HCV Using In silico Approach

(E-pub Ahead of Print)

Published on: 19 April, 2022

Author(s): Varsha Dwivedi, Rakesh Kumar Gupta, Amita Gupta, Vijay K Chaudhary, Sanjay Gupta and Vandana Gupta*

DOI: 10.2174/1570180819666220124112150

Price: $95

Purchase PDF

Abstract

Background: P7 viroporin in HCV is a cation-selective ion channel-forming protein, functional in the oligomeric form. It is considered to be a potential target for anti-HCV compounds due to its crucial role in viral entry, assembly, and release.

Methods: Conserved crucial residues present in HCV p7 protein were delineated from the available literature with a specific focus on the genotypes 3a and 1b prevalent in India. Using the Flex-X docking tool, a library of FDA-approved drugs was docked on the receptor sites prepared around crucial residues. In the present study, we proposed drug repurposing to target viroporin p7, which may help in the rapid development of effective anti-HCV therapies.

Results: With our approach of poly-pharmacology, a variety of drugs currently identified as antibiotics, antiparasitic, anti-emetic, anti-retroviral, and anti-neoplastic were found to dock successfully on the p7 viroporin. Noteworthy among these are general-purpose cephalosporin antibiotics, leucal, phthalylsulfathiazole, and granisetron, which may be useful in acute HCV infection, and anti-neoplastic sorafenib and nilotinib, which may be valuable in advanced HCV-HCC cases.

Conclusion: This study could pave the way for quick repurposing of these compounds as anti-HCV therapeutics.

Keywords: Hepatitis C virus, viroporin, p7, drug-repurposing, in-silico screening, polypharmacology

Results in Chemistry 4 (2022) 100292

Contents lists available at ScienceDirect

Results in Chemistry

journal homepage: www.sciencedirect.com/journal/results-in-chemistry

Identification of natural DHFR inhibitors in MRSA strains: Structure-based drug design study

Gagandeep Singh [a,b,*], Hemant Soni [a], Smriti Tandon [a], Vijay Kumar [a], Gajji Babu [a], Vandana Gupta [c], Pratima Chaudhuri (Chattopadhyay) [d]

[a] Section of Microbiology and Chemistry, Central Ayurveda Research Institute, Jhansi, Uttar Pradesh 284003, India
[b] Kusuma School of Biological Sciences, Indian Institute of Technology Delhi, New Delhi 110016, India
[c] Department of Microbiology, Ram Lal Anand College, University of Delhi, 110021, India
[d] Molecular Biophysics Lab, Amity Institute of Biotechnology, Amity University, Sector 125, Noida, Uttar Pradesh 201313, India

ARTICLE INFO

Keywords:
MRSA
DHFR
Streptomyces

ABSTRACT

Methicillin-resistant *Staphylococcus aureus* (MRSA) is also known as a superbug because of its resistance against multiple antibiotics. It is an opportunistic pathogen that targets immune-compromised people with higher fatality rate and is difficult to treat. This study targets DHFR protein of *Staphylococcus aureus* (saDHFR), which is a crucial enzyme for its survival and is involved in the synthesis of 5,6,7,8-tetrahydrofolate, an essential cofactor involved in multiple metabolic pathways. In this study, a library of compounds with antimicrobial activity produced by *Streptomyces sp.* was screened for inhibitory activity towards saDHFR. Through structure-based drug design approach, the compounds showing higher affinity towards saDHFR active site and lower affinity towards human DHFR (huDHFR) were selected, which were further screened down based on their ADMET properties. Two compounds, BRN-1354521 and CHEMBL487191 were identified as the lead molecules exhibiting higher affinity towards saDHFR validated by MD simulations and binding energy calculations using MMGBSA method. This study could lay the foundation for the discovery of novel inhibitors of saDHFR with high therapeutic index to tackle the emerging resistance in *Staphylococcus aureus*.

1. Introduction

Emergence of multiple drug resistance in pathogenic bacteria against the known antibiotics has become one of the most challenging problem in the 21st century. One of them is *Staphylococcus aureus*, a gram-positive coccus which resides in one third of the human population mostly asymptomatically. Occasionally it causes opportunistic infections of skin and soft tissue causing a variety of diseases. *S. aureus* lands in high priority list for research and development of new antibiotics according to WHO [1]. Discovery of antibiotics, and their availability on commercial scale for use in almost all kinds of bacterial infections have undeniably proved to be savior for human beings. However, the prolonged and indiscriminate use of antibiotics led to parallel appearance of resistance to multiple antibiotics used routinely called first line drugs leading to multi drug resistance or MDR [2]. In the last two decades several bacterial pathogens including *S. aureus* evolved with resistance to second and third line of drugs and are called extreme (XDR) and total drug resistant (TDR) pathogens respectively and are together given the name "superbugs". With the emergence of MDR, XDR and TDR strains, bacterial pathogens become impossible to treat and need for newer antimicrobials ever prevails.

This opportunistic human pathogenic, *S. aureus*, has acquired resistance towards virtually all the available antibiotics resulting in the emergence of Methicillin Resistant *Staphylococcus aureus* or MRSA, thereby resulting in devastating morbidity and mortality worldwide [1,3]. MRSA strains have further gained resistance to vancomycin which is indicated for the treatment of MRSA making it an XDR. MRSA causes a wide range of severe diseases in humans including endocarditis, bacteremia, pneumonia, osteomyelitis and blood infections, in addition to minor skin and soft tissue infections including sore throat, otitis

Abbreviations: CADD, Computer Aided Drug Discovery; DHFR, Dihydrofolate Reductase; MRSA, Methicillin Resistant *Staphylococcus aureus*; MD, Molecular Dynamics; MM PB/GBSA, Molecular Mechanics with Poisson Boltzmann or Generalized Born and Surface Area; TDR, Total Drug Resistant; TMP, Trimethoprim; XDR, Extreme Drug Resistant; PBP, Penicillin Binding Protein.

* Corresponding author at: Section of Microbiology, Central Ayurveda Research Institute, Jhansi, Uttar Pradesh, 284003, India.
E-mail address: gagandeep.singh.khurana@bioschool.iitd.ac.in (G. Singh).

https://doi.org/10.1016/j.rechem.2022.100292
Received 10 December 2021; Accepted 21 January 2022
Available online 26 January 2022

ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN 0976-9595

Review Article

FRUGAL SCIENCE INNOVATIONS: PROMISING TOOLS FOR EDUCATION AND HEALTHCARE

Lalit Mohan[1], Shaubhik Anand[1], Rakesh Kumar Gupta[2], Prerna Diwan*[2]

[1]*Department of Biotechnology, Delhi Technological University, Bawana Rd, Shahbad Daulatpur Village, Rohini, Delhi, India*

[2]*Department of Microbiology, Ram Lal Anand College, University of Delhi, South Campus, 5, Benito Juarez Road, Dhaula Kuan, New Delhi, India*

**Corresponding author: prernadiwan.mic@rla.du.ac.in*

ABSTRACT

In recent years, emphasis is being given to frugal affordable and sustainable innovations. This article advocates the potential of frugal products characterised with robust product functionality especially in low resource settings in the healthcare and education sectors so that benefits of science can reach the masses. Frugal innovation does not mean compromising the quality, but it is to be able to apply science to get the desirable result in the given conditions. The article discusses some recent innovative frugal products and their comparisons to conventionally used technologies. It elaborates on two innovations, Foldscope and Paperfuge which are frugal alternatives to microscope and centrifuge respectively with potential applications in diagnostics, research, and education especially in developing economies.

Keywords: Frugal, Paperfuge, Foldscope, Education, Healthcare.

1. INTRODUCTION

Over the past few years, with the advancement in science and especially in the field of biomedical research, scientists have shifted their focus to frugal products, as most of the devices or equipment used in the diagnosis or analysis are highly expensive and bulky. The cost is mainly attributed to the raw material used in manufacturing of these devices. The skilled manpower needed for its operation further shoots up the costs. This enormously high cost of equipment constrains its use due to limitation of materialistic support to the students, researchers, and organisations. There is only about 1% of the population in the world that can afford quality diagnostics and rest cannot afford due to the high costs. Lack of infrastructure, trained personal, low capacity and less capable distribution channel also renders the use of highly sophisticated medical and research devices limited [1]. Considering the examples of Magnetic Resonance Imaging (MRI) and electron microscope, both the devices though extremely useful for medical imaging and research are extremely costly with additional load of high one-time operational cost and recurring maintenance cost, limiting its use [2]. The expensive nature of such devices renders it inaccessible to a major section of the society. This has led to a strong income-based segregation of health care and research facility received by an individual. Most devices require a constant supply of electricity due to which these facilities are mostly concentrated in the urban settings, thus depriving the rural settings from availing its benefits which is the base for the health care [3]. These so called power-hungry devices have been manufactured only to work in high resource settings of developed countries with electrical power grids. Recently during the pandemic crisis, countries especially the developing economies have felt the need and identified their potential to innovate through frugal products to manage the severity of the COVID-19 virus transmission [4].

Frugal science is a concept by which the complexity of product and the associated cost of the product is reduced using simple design strategies such that they can even be made available in resource-limited environments [2]. The term "frugal science" can also be referred to the usage of economical equipment to study and explore the scientific world. Frugal science makes it easy for the researcher/explorer to discover more using limited resources even at very distinct places which are not technologically advanced as compared to the rest of the world. The frugal devices help to make science very handy and reduce the cost to study science. The word "frugal" is also an adjective used for things/products which are economical to use, such products are therefore valued by the consumer for its low cost, sustainability, and quality [5]. On the same lines, frugal innovation

ORIGINAL ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

Cross-sectional Study on Prevalence of Betel Nut Chewing among the Youth of Meghalaya, North East Region of India: Development of Multifaceted Prevention Strategy

Shrabani Snigdha[1], Tavleen Bajwa[1], Shaubhik Anand[1], Lalit Mohan[1], Keshav Goyal[1], Muskan Mittal[1], Kusum Rani Gupta[1], James Wahlang[2], Rakesh Kumar Gupta[1], Prerna Diwan[1]*

Abstract

Introduction: Betel (Areca) nut intake, one of the most common oral chewing habits in the world, has been linked to the development of oral cancer, with India having an alarming situation with the highest number of registered oral cancer cases in the world. **Method:** A cross-sectional analysis was done among the young population of Meghalaya in the North Eastern Region of India, where this habit is prevalent. A questionnaire for on-ground data collection was administered to a total of n = 315 participants of both sexes from institutions in and near Shillong, Meghalaya. The relationship of this habit with social structure, knowledge, attitude, and risk perception was done. **Result:** A high prevalence rate of 78.09% was found among the school and undergraduate students from Shillong urban and adjoining rural areas for betel nut (BN) chewing with a higher female to male BN chewing ratio. This habit usually starts at the school level and persists for life. Peer pressure, lack of awareness, habituated families, and strong cultural linkage encourage children and adolescents to start chewing BN at an age as early as of 10 years. Lack of adequate awareness programs highlighting the ill-effects of BN and associated masticatory substances adds to the problem. **Conclusion:** Strategic, structured region-specific multifaceted awareness programs highlighting the potential health risks from uncontrolled, habitual usage of Areca nut has been proposed to prevent initiation of this habit.

Keywords: *Areca* nut, Betel nut, Betel quid, North-East India, Oral cancer

Asian Pac. J. Health Sci., (2021); DOI: 10.21276/apjhs.2021.8.3.32

Introduction

Areca nut (AN) or Betel nut (BN), the seed of *Areca catechu* Linn is one of the most unhealthy substance used after nicotine, alcohol, and caffeine in the world.[1] More than half of its global consumption has been recorded in the Pacific Island and South Asian countries.[2] BN is primarily composed of proteins, fats, carbohydrates, crude fibers, polyphenols, mineral matter, and alkaloids.[3] The alkaloids including arecoline[4] have adverse effects on the nervous and cardiovascular systems, generating a sense of euphoria and relaxation to the user. BN is chewed slowly, paving way for the persistent exposure and sustained absorption of its alkaloids in the oral cavity. It increases salivation and is used to tolerate long gaps between the meals, relieving toothaches and to boost digestive system.[5] The addictive practice of BN has an etiological correlation with the susceptibility to oral cavity cancers, one of the major causes of mortality in India and worldwide.[6] According to the International Agency for Research on Cancer,[7] BN is Group 1 Carcinogen, increases risk of oral, liver, biliary tracts, uterus, esophagus, and pharynx cancers. BN chewing causes malignant lesions such as oral mucosal fibrosis leading to oral cancers.[8] Often, BN chewers combine BN chewing with smoking cigarette which harms the cardiovascular and respiratory system increasing the risk of developing oral leukoplakia and submucosal fibrosis.

In the simplest form, BN is chewed wrapped in betel leaf with slaked lime, this preparation is called betel quid (BQ). BN is also consumed alone in its dried or nut form and in packaged chewing products such as "gutka" and "paan masala". In India, BN consumption is mostly confined to the North Eastern Region (NER), coastal areas, and some parts of northern plains. It is called tembul or kwai in NER and paan in north India. In NER, India including Khasi region of Meghalaya, BN and its derivatives are socially endorsed widely used masticatory products. A large number of people chew BN due to their tradition, easy availability, and regional backdrop. Poor people in these areas eat BN with betel leaf to stave off their hunger pangs.

BN chewing habit among school children is becoming common in developing countries like India. The initiation of this habit at a very early age is a matter of serious concern requiring an urgent need to intervene and prevents them from becoming addicted. *Areca* products in the packed form commonly available attracts usage by young community.[9] Studies assessing the prevalence BN habit among school children have been reported from different regions.[10-12] A prevalence rate of 27.06% for AN chewing in Indore (Madhya Pradesh, India) school students has

[1]Department of Microbiology, Ram Lal Anand College, University of Delhi, Dhaula Kuan, New Delhi, India

[2]Department of Biochemistry, St. Edmund's College, Shillong, Meghalaya, India

Corresponding Author: Dr. Prerna Diwan, Department of Microbiology, Ram Lal Anand College, University of Delhi, Dhaula Kuan, New Delhi, India. E-mail: prernadiwan.mic@rla.du.ac.in

How to cite this article: Snigdha S, Bajwa T, Anand S, Mohan L, Goyal K, Mittal M, Gupta KR, Wahlang J, Gupta RK, Diwan P. Cross-sectional Study on Prevalence of Betel Nut Chewing among the Youth of Meghalaya, North East Region of India: Development of Multifaceted Prevention Strategy. Asian Pac. J. Health Sci., 2021;8(3):185-190.

Source of support: Nil

Conflicts of interest: None.

Received: 12/05/21 **Revised:** 20/06/21 **Accepted:** 01/07/21

ORIGINAL ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

Body Mass Index as an Indicator of Depression and Stress-induced Eating Disorders among College Students in Delhi, India

Jain Rita[1]*, Das Deboshree[2], John M. Salome[3]

Abstract

Obesity accounts for a wide range of psychosocial, medical, and health consequences in adolescence leading to depression and low self-esteem which further aggravate eating disorders among individuals. The aim of the study is to observe the association of eating disorders and depression among college students with their body mass index (BMI) status. The study consisted of 460 students studying in different colleges of Delhi from varying disciplines and academic years. The study utilized Patient Health Questionnaire-9 and Eating Disorder Examination questionnaire to assess the depression levels of participants and their level of eating disorder. The study also collected data on the height and weight of the study participants. The association of weight status with eating disorder and depression severity was assessed using multivariate analysis of variance. Significant difference in levels of eating disorder and depression was observed (Wilks' lambda: 0.897) among study participants by BMI status. The *post hoc* tests exhibited mean differences for eating disorders and depression by BMI groups to be higher for overweight compared to underweight (1.196) and normal (0.817) categories at $P < 0.001$. Mean depression score was also observed to be significantly higher for overweight individuals compared to underweight (3.42) and normal (2.53). The study emphasizes the need for strategic plans to increase awareness among the youth on the health implications of eating disorders and its effect on mental health of individuals. The present study suggests perceived body image as a potential risk factor for unhealthy eating habits and signs of depression among college students.

Keywords: Adolescence, Body mass index, Depression, Eating disorder, Obesity

Asian Pac. J. Health Sci., (2022); DOI: 10.21276/apjhs.2022.9.3.37

Introduction

Numerous national and international studies have shown obesity and depression among youth as a major health problem and its alarmingly increased prevalence during the past decade makes it a serious public health concern.[1] Approximately 39% of the world adult population were obese in 2014 indicating that the prevalence has almost doubled since 1975.[2] The prevalence of obesity among adolescents in India is increasing at a faster pace than the world average. It has increased from 2.2% to 5.1% since 1998 to 2015.[3]

Obesity accounts for a wide range of psychosocial, medical, and health consequences in adolescence and is likely to follow through into adulthood. Thus, it is important to investigate the relationship between obesity and depression with eating behavior. Both obesity and depression can be attributed to abnormal functioning of the hypothalamic-pituitary-adrenal axis and serotonin imbalances. In particular, various studies show that overweight adolescents are at a higher risk of experiencing peer victimization and weight-based stigma, which can result in eating disorders and depression. These stressful events may be contributing factors that lead to depression in obese youth. Likewise, lack of physical activity, weight concerns, body dissatisfaction linked psychological distress such as depression and low self-esteem further aggravate eating disorders among individuals trapping them into an unhealthy cycle of obesity and depression which can severely hamper their development.[4,5]

College is a time of tremendous change in an adolescent's life opening them up to stress at various levels. Many biological and psychological changes during the adolescence period may lead to depression indirectly. During college, students move toward independence and they sometimes struggle to find a balance between physical and mental health. Multiple lifestyle choices, peer pressure for body image, competition, and poor coping skills are some of the factors that put them at an increased risk for depression.

Chronic stress is hypothesized to be involved in the etiology of obesity (stress is assumed to be a breeding ground for obesity). A meta-analysis including eight longitudinal studies concluded that there exists a bi-directional relationship between depression and obesity.[6] All these factors indicate a need for research on obesity and eating disorders among college students as college experiences have the potential to influence diet, physical activity, and lifestyle behavior well into adulthood.[7]

[1]Department of Statistics, Ram Lal Anand College, University of Delhi, India.

[2]Research Scholar, International Institute of Population Sciences, Mumbai, Maharashtra, India.

[3]Department of Microbiology, Ram Lal Anand College, University of Delhi, India.

Corresponding Author: Dr Rita Jain, Department of Statistics, Ram Lal Anand College, University of Delhi, Benito Juarez Marg, South Campus, Dhaula Kuan, Delhi - 110 021, India. E-mail: ritajain.stat@rla.du.ac.in/ritajain313@gmail.com. Phone # +91 9891491019

How to cite this article: Rita J, Deboshree D, Salome JM. Body Mass Index as an Indicator of Depression and Stress-induced Eating Disorders among College Students in Delhi, India. Asian Pac. J. Health Sci., 2022;9(3):184-187.

Source of support: Nil.

Conflicts of interest: None.

Received: 11/12/2021 **Revised:** 04/01/2022 **Accepted:** 12/02/2022

Plant Growth Promoting Rhizobacteria (PGPR)-Assisted Phytoremediation of Contaminated Soils

4

Garima Malik, Samira Chugh, Sunila Hooda, and Ritu Chaturvedi

Abstract

The unprecedented augment in the concentration of diverse contaminants in the environment has grim impacts on the ecological balance of our ecosystem. Soil, being a major sink, holds up the maximum load of environmental contaminants. Heavy metals and petroleum hydrocarbons are the most common pollutants present in the soil. Plant growth promoting rhizobacteria (PGPR)-assisted phytoremediation is one of the competent methods for removal of pollutants, which has proven its efficiency in reclamation of contaminated soils. PGPR are bacteria that reside in close association with plant roots and facilitate growth and development of plants by influencing their physiological and metabolic activity. Rhizobacteria are known to amplify the effectiveness of phytoremediation by modulating contaminants transportability and accessibility to the plant via acidification, chelating agents, solubilization of phosphate, and redox changes. This chapter aims to explore the role of rhizomicrobiome in the phytoremediation of heavy metal- and petroleum-contaminated soils, the successful commercialization of PGPR, and the insights into the recent advances in PGPR research.

Garima Malik, Samira Chugh, Sunila Hooda and Ritu Chaturvedi contributed equally with all other contributors.

G. Malik (✉)
Raghunath Girls' Post Graduate College, C.C.S. University, Meerut, Uttar Pradesh, India

S. Chugh
Gargi College, University of Delhi, New Delhi, India

S. Hooda
Ram Lal Anand College, University of Delhi, New Delhi, India

R. Chaturvedi
St. John's College, Agra, Uttar Pradesh, India

A. K. Singh et al. (eds.), *Bacterial Endophytes for Sustainable Agriculture and Environmental Management*, https://doi.org/10.1007/978-981-16-4497-9_4

CHAPTER

1 Understanding assisted phytoremediation: Potential tools to enhance plant performance

Garima Malik[a], Sunila Hooda[b], Sahrish Majeed[b], Vimal Chandra Pandey[c]
[a]*Raghunath Girls' Post Graduate College, C.C.S. University, Meerut, India*
[b]*Ram Lal Anand College, University of Delhi, India*
[c]*Department of Environmental Science, Babasaheb Bhimrao Ambedkar University, Lucknow, India*

1.1 Introduction

Land and soil degradation is one of the global problems that humanity is facing today. The severity of soil degradation has affected ecosystem functions and services. Globally, more than three billion people are suffering by land degradation, especially small farmers and poor people. Scientists have warned that land degradation is happening at an alarming pace and if the trend continues ~90% of world land could become degraded by 2050. Worldwide, governments are investing billions of dollars to restore/reclaim polluted and degraded lands. Sustainable land management has become a focal area of policy makers and efforts are being made to adopt eco-friendly methods for consistent restoration of polluted lands at global scale.

Phytoremediation, the utilization of plants to eradicate, degrade, or stabilize organic and inorganic pollutants from the environment, is a promising, profitable, and eco-friendly bioremediation method (Pandey and Singh, 2020). The basic idea that vegetation (trees, shrubs, grasses, and aquatic plants) can be used for soil, air, and water remediation is primitive; however, several novel scientific studies along with an interdisciplinary research approach has led to the expansion of this knowledge into a global method for restoration of ecological environment (Gajić et al., 2019; Pandey and Bauddh, 2018; Pandey and Souza-Alonso, 2019; Gajić et al., 2020a; Grbović et al., 2019; Grbović et al., 2020; Pathak et al., 2020; Pandey, 2020). Apart from contaminant removal, there are added benefits of opting phytoremediation, such as soil quality enhancement, soil carbon sequestration, biomass production, and aesthetically pleasing (Pandey and Souza-Alonso, 2019). Numerous pollutants, including heavy metals, organic compounds, pesticides, and xenobiotic can be effectively remediated by plants.

Plant-assisted bioremediation, a kind of phytoremediation, includes the collaborative action of plant roots and the microbes residing in the rhizosphere to remediate soils containing high concentrations of pollutants. Some "hyperaccumulator" plants have the capacity to accumulate huge amounts of metals in their shoots, many of these metals do not appear to be necessary for plant functioning. A large number of plant taxa belong to this category of metal hyperaccumulators; *Alyssum* and *Thlaspi* species both

Assisted Phytoremediation. DOI: https://doi.org/10.1016/B978-0-12-822893-7.00015-X

Industrial Applications of Soil Microbes

Volume 1

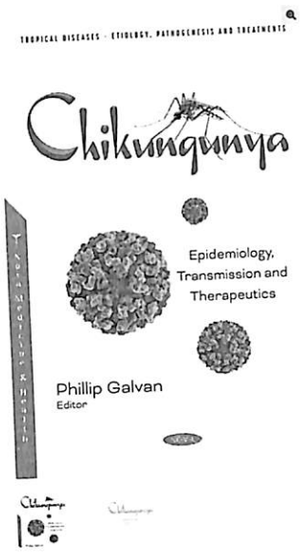
Edited by

Ashutosh Gupta

Shampi Jain

&

Neeraj Verma
Department of Agriculture Science
AKS University, Satna
Madhya Pradesh–485001
India



Chikungunya: Epidemiology, Transmission and Therapeutics

$82.00

Phillip Galvan (Editor)

Series: Tropical Diseases - Etiology, Pathogenesis and Treatments

BISAC: MED097000

Chikungunya (CHIKV) is a viral infection spread by mosquitoes that can cause symptoms such as fever, joint pain, muscle pain, headache, fatigue, and rash, which can become severe. While symptoms generally subside within a week or two, the disease nonetheless imposes a burden on societies around the world and carries a death risk of 1 in 1,000 infections. Chapter One details the history and evolution of the virus, including its epidemiology and extensive spread, and discusses disease prevention and vector control measures. Chapter Two describes the geographical distribution, transmission, and alternative hosts of Chikungunya. Chapter Three provides an insight into the different immunotherapy and immunoprophylaxis strategies that have demonstrated promising results so far for the treatment of this disease. Lastly, Chapter Four provides an overview of the potential therapeutics that have been proposed and developed for CHIKV.

Binding
Softcover Clear

Publication Date: August 11, 2021
Status: AV
Pages: 115

1 Add to cart

Add to Wishlist

ISBN: 978-1-53619-978-9
Categories: 2021, Books, Medicine & Health, Medicine & Health, Medicine and Health, Nova Medicine and Health, Special Topics, Tropical Diseases - Etiology, Pathogenesis and Treatments

Table of Contents | **Additional information** | **Help**

Table of Contents

Edit View History Bookmarks Window Help

novapublishers.com

WhatsApp (331) - prernadiwan.mic@rla.du.ac.in - R... Inbox (960) - dr.pdiwan@gmail.com - G... Repurposing Novel Antagonists for Targe... Chikungunya: Epidemiol

Epidemiology, Transmission and Therapeutics

Pages: 115

1 Add to cart

Add to Wishlist

ISBN: 978-1-53619-978-9

Categories: 2021, Books, Medicine & Health, Medicine & Health, Medicine and Health, Nova Medicine and Health, Special Topics, Tropical Diseases - Etiology, Pathogenesis and Trea

nts Additional information Help

ents

Save Share

Edit View History Bookmarks Window Help

novapublishers.com

WhatsApp (331) - prernadiwan.mic@rla.du.ac.in - R... Inbox (960) - dr.pdiwan@gmail.com - G... Repurposing Novel Antagonists for Targe... Chikungunya: Epidemiol

Epidemiology, Transmission and Therapeutics

Pages: 115

1 Add to cart

Add to Wishlist

ISBN: 978-1-53619-978-9

Categories: 2021, Books, Medicine & Health, Medicine & Health, Medicine and Health, Nova Medicine and Health, Special Topics, Tropical Diseases - Etiology, Pathogenesis and Trea

nts Additional information Help

ents

unya Virus: History, Evolution, Current Epidemiology and Its Burden to the World
ramaniam and Nor Fazila Che Mat – Biomedicine Program, School of Health Sciences, Universiti Sains Malaysia, Kubang Kerian. Kelantan, Malaysia, et al.)

hical Distribution, Transmission, and Alternative Hosts of Chikungunya Virus
– Department of Biochemistry, University of Nairobi, Nairobi, Kenya)

rogress on Immunotherapy and Immunoprophylaxis of Chikungunya Virus
at, Mohd Fardeen Husain Shahanshah, Chanuka Wijewardana, Sachin Pal, Vijay K. Chaudhary, Sanjay Gupta, and Vandana Gupta – Department of Microbiology, Ram Lal Anand College, University of Delhi, Benito Juarez Road, New Delhi, India, et al.)

dvances in Chikungunya Virus Therapeutics: An Overview
ain Shahanshah, Himanshu Sehrawat, Chanuka Wijewardana, Sachin Pal, Amita Gupta, Prerna Diwan, Sanjay Gupta and Vandana Gupta – Department of Microbiology, Ram Lal Anand College, University of Delhi, Benito Juarez Road, New Delhi, India, et al.)

Save Share

JUL 18

14th March – 16th May 2020

12

Substantial Thrust to Indian Rural Economy through Village Dairy Cooperatives as Envisaged by Gandhi

*Rakesh Kumar Gupta & **Prerna Diwan

ABSTRACT

"Not Denmark, but India should be a model State for the finest dairy experiments" Mahatma Gandhi expressed his desire in Young India, 22nd October 1925.

Milk is the wholesome source of nutrition for almost every Indian household where it is consumed either in its liquid form or after fermentation or in the form of various sweetened preparations. It compensates for the protein deficit in diet arising due to the inadequate consumption of lentils and soy foods. Hence its availability to every household in sufficient amounts is mandatory to thwart any nutritional deficiency. India has become self-sufficient in the production of milk with per capita availability of 394 grams per day after the successful implementation of the largest Dairy Development Program

* Principal and Professor, Ram Lal Anand College, University of Delhi, Benito Juarez Road, New Delhi-110021.

** Associate Professor, Department of Microbiology, Ram Lal Anand College, University of Delhi, Benito Juarez Road, New Delhi-110021

nextgenhelper

E-CERTIFICATE OF PARTICIPATION

This is to certify that

PRERNA DIWAN

from RAM LAL ANAND COLLEGE, UNIVERSITY OF DELHI, has participated in Workshop on 'Basic to Advanced Bioinformatics, Machine Learning, and Multiomics data analysis' organised by **Nextgenhelper, New Delhi** from March 12 -31, 2022. We gratefully acknowledge his/her contribution to the success of the event.

Mamta Gautam

Dr. Mamta Gautam, PhD

April 02, 2022

Date

IQAC Clustor India
Reg No. MAH/236/2021/PUNE
www.iqacclusterindia.com

WhiteCode
Organizing Partner
www.whitecode.co.in

CERTIFICATE

THIS IS TO CERTIFY THAT

Dr. Prerna Diwan

Has successfully completed the

INTERNAL ACADEMIC AUDITOR TRAINING COURSE

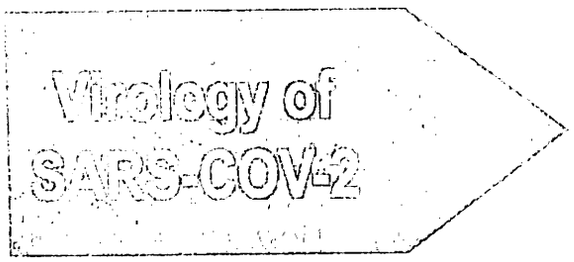
The course includes the internal auditors training, assessment and evaluation of quality management systems to conform the requirements of ISO 9001:2015 and ISO 19011:2018

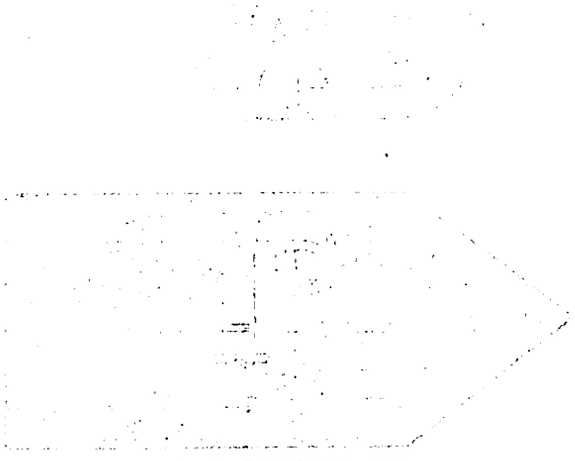
Course Dates:
2nd to 13th August 2021

PROF. PEEYUSH PAHADE
Co-Founder, IQAC Cluster India

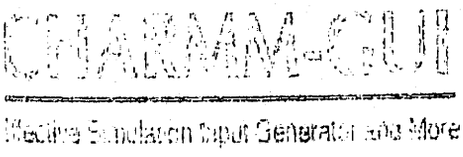
Certificate ID: W10572

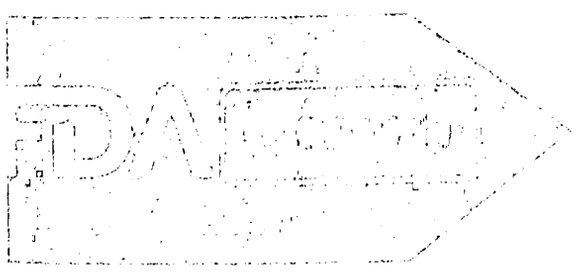
DR. BADRUNNISA S.
ISO Lead Auditor





WORLDWIDE
PROTEIN DATA BANK





This is to certify that Dr. Vandana Gupta, Ram Lal Anand College, New Delhi India delivered a keynote lecture at

A week workshop Exploring resources for COVID-19 research

July 26th to July 30

Organized by
Camarada(YouTube chanel)

In association with
GAUTAM SHIKSHA EVAM GRAMIN VIKAS SANSTHAN
&
Kalyani Welfare Associations

Dear All,
Greetings from BioNEST-UDSC. We are glad to welcome you to the Hands-on workshop on Fermentation Technology. Please note of the following,

1. The workshop hours will be 10am to 5:30pm from 15th to 29th Dec. 2021.
2. Venue: BioNEST-UDSC, GF: Biotech. Building, University of Delhi South Campus, Benito Juarez Road, New Delhi - 110021.
3. Once you come to Biotech. Building asks the security guard here for the BioNEST-Office.
4. In the BioNEST-Office ask for Mr. Aditya Sarin or Mr. Vijay Kantharia - He will guide you further.
5. We will start sharp at 10am with the Introduction of BioNEST facility.
6. After that we will start with the Introduction of Fermentation Technology workshop followed by a small break.
7. Detailed schedule and work plan of the entire Workshop will be intimated to you.
8. Rest of the day will follow the Fermentation workshop module.

If you have any questions or concerns, Please feel free to contact us. You can always reach out to me on 08866282616 (WhatsApp Preferred).

P.S: Please wear Mask...

Kind Regards
Vijay Kantharia

DEPARTMENT OF MICROBIOLOGY
SACRED HEART COLLEGE (AUTONOMOUS), TIRUPATTUR - 635 601, TAMIL NADU, INDIA

In association with
MICROBIOLOGISTS SOCIETY, INDIA
&
WESTERN RIO JANERIO STATE UNIVERSITY (UEZO), BRAZIL

CERTIFICATE OF COMPLETION

is awarded to

Dr. NIDHI S CHANDRA

Assistant Professor, Department of Microbiology, Ram Lal Anand College, University of Delhi, New Delhi, India

for participating in the Four weeks International Faculty Development Online Certificate Course on **"BASIC TECHNIQUES IN MICROBIOLOGY (Phase IV)"** organized by the **Department of Microbiology, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India** in association with **Microbiologists Society, India** and **Laboratory of Chemical and Biological Analysis (LAQB), Western Rio Janeiro State University (UEZO), Rio de Janeiro, Brazil** from 04th July 2021 - 08th August 2021 and has successfully completed with **DISTINCTION**.

Dr. P. Saranraj
Head, Dept. of Microbiology,
Sacred Heart College (Autonomous)
Tirupattur, India

Dr. A. M. Deshmukh
President
Microbiologists Society,
India

Dr. Alexander Machado Cardoso
Pro-Rector of Research & Post Graduate,
Laboratory of Environmental Biotechnology,
Western Rio Janeiro State University, Brazil

Rev. Dr. D.Maria Antony Raj
Principal
Sacred Heart College (Autonomous)
Tirupattur, India

S.No.FDP51058

सत्यमेव जयते
Ministry of Education
Government of India

Mahatma Hansraj
Faculty Development Centre

A Centre of MoE, Govt. of India
Under Pandit Madan Mohan Malaviya National
Mission on Teachers and Teaching
(PMMMNMTT)

Certificate

This is to certify that Prof./Dr./Mr./Ms.

Nidhi S Chandra

from

Ram Lal Anand College, University of Delhi

has successfully completed

Two Week (Online) Interdisciplinary Faculty Development Programme on

'MOOC's, E-Content Development, Research Methodology and Statistical Tools in Open Education World'

(3rd August – 17th August 2021)

organised by

Kalindi College, University of Delhi

in collaboration with

Mahatma Hansraj Faculty Development Centre

Hansraj College, University of Delhi

Dr. Naina Hasija	Dr. Jyoti Bhola	Prof. Rama
Principal, Kalindi College	Coordinator, MHRFDC	Chairperson, MHRFDC

RAM LAL ANAND COLLEGE
UNIVERSITY OF DELHI

TRAINING SESSION ON FLUORESCENCE MICROSCOPY

For students, faculty and laboratory staff

Resource Person:
Mr. Mohit Mahajan
BE Mtech, Partner, CTO
Imagene Innolab LLP

MARCH 29,2022
10–2 PM

ORGANISED BY:
DEPARTMENT OF MICROBIOLOGY

UNDER DBT STAR COLLEGE SCHEME

Prof. Prerna Diwan
DBT Star College Coordinator

Ram Lal Anand College

UNIVERSITY OF DELHI

Department of Microbiology

Training Session on Colony Counter and Anaerobic Gas Pak System

for Students and Faculty

Resource person:
Mr. Arun Singh
Hi Media Labs

Feb 22, 2022
10:00 am - 1:00 pm

Prof. Prerna Diwan

Coordinator, DBT Star College Scheme

Ram Lal Anand College

UNIVERSITY OF DELHI

DEPARTMENT OF MICROBIOLOGY

Training Session on PCR

FOR STUDENTS AND FACULTY

Resource person:

DR. SUNILA HOODA,
ASSISTANT PROFESSOR,
DEPARTMENT OF MICROBIOLOGY

FEB 16, 2022 | 10:00 - 2:00 PM

Prof. Prerna Diwan
Coordinator, DBT Star College Scheme

Ram Lal Anand College

UNIVERSITY OF DELHI

Department of Microbiology

Hands on Training Session on Biosampler

for Students and Faculty

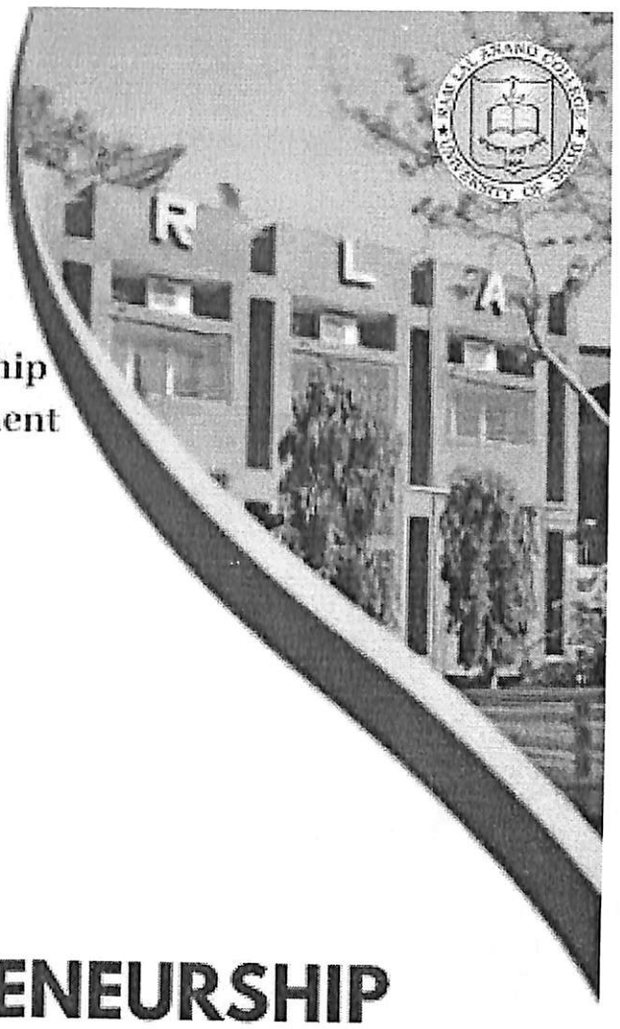
Resource person:
Mr. Sameer Ahmad
Engineer, Swan Environment Pvt. Ltd., Telangana, India

Feb 22, 2022
10:00 am - 1:00 pm

Prof. Prerna Diwan

Coordinator, DBT Star College Scheme

MIKRO BIOLOGIKA



Mikrobiologika
The Microbiology society
&
Centre for Entrepreneurship and Technology development
E-cell

RAM LAL ANAND COLLEGE
University of Delhi

invite you to a talk on

Bio-ENTREPRENEURSHIP
&
AN INTRODUCTION TO BioNEST-UDSC
Under DBT STAR College Scheme

Speaker:
Mr.VIJAY KANTHARIA
CEO BioNEST-UDSC
Founder: Cerebroz Edu Tree

DATE: 23rd October, 2021
TIME: 11am
PLATFORM: Google Meet:
https://meet.google.com/guc-amav-pcm
Or dial: (US) +1 347-509-5465 PIN: 529 544 329#

For further queries, contact:
Abhilash (President) - 9599456214
Pritika (Vice-President)-8447026321
Saumya (Secretary)-85278 91648

FACULTY

Prof. Rakesh K. Gupta (Principal and patron)
Dr. Sudha Chaudhry (TIC)
Prof. Prerna Diwan (Coordinator, DBT Star College Scheme)
Prof. Vandana Gupta
Dr. M. Salome John
Dr. Nidhi S. Chandra
Dr. Sunila Hooda
Dr. Shalini Swami

Ram Lal Anand College

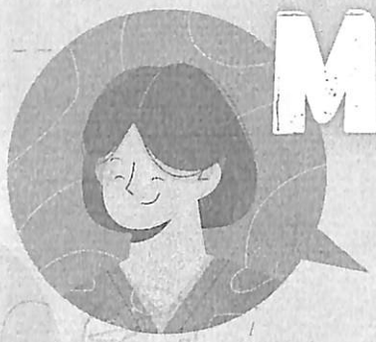
University of Delhi

आज़ादी का अमृत महोत्सव

MIKROBIOLOGIKA

The Microbiology Society

MIKROVITAE '22



presents

A TALK

on

"Antibodies" - एक नाम, अनेक काम

by Prof. Vijay Kumar Chaudhary

NASI-Senior Scientist at CIIDRET, UDSC and Director (Hon.). DSSEED, DU

Date: 25th February 2022, 3:00pm

(Under DBT Star College Scheme)

Principal
Prof. Rakesh Kumar Gupta

Coordinator, DBT Star College Scheme
Prof. Prerna Diwan

Convener, Mikrobiologika
Dr. M. Salome John

ALUMNI TALK

MIKRO BIOLOGIKA

..listen to the Batch of 2014 share about their journey beyond RLAC

RAM LAL ANAND COLLEGE
University of Delhi

Under DBT Star College Scheme

Guest Speakers:

Rahul Sanwlani

PhD student | Mathivanan Lab
Department of Biochemistry and Genetics, La Trobe University

Manasvini Markandey

Senior research fellow
Department of Gastroenterology, AIIMS, New Delhi.

Aditya Bajaj

Senior research fellow
Department of Gastroenterology, AIIMS, New Delhi.

Saturday
OCTOBER 2
From 11am-1pm

The Meet will be running on Zoom, Join Zoom Meeting here:

https://us06web.zoom.us/j/89844592191?pwd=QVJYeUVoSWRob2tCUWxRYVpDc21rZz09

To participate in the talk, you need to register at:

https://forms.gle/wHyLsCxBuThnaCZq8

FACULTY

Prof. Rakesh K. Gupta
(Principal and patron)
Dr. Sudha Chaudhry
(Teacher-in-charge)

Prof. Prerna Diwan
Prof. Vandana Gupta
Dr. M. Salome John
Dr. Nidhi S. Chandra
Dr. Sunila Hooda
Dr. Shalini Swami

For further queries, contact:
Abhilash (President) - 9599456214
Pritika (Vice-President)-8447026321
Saumya (Secretary)-85278 91648

RAM LAL ANAND COLLEGE, UNIVERSITY OF DELHI

Department of Microbiology

Presents

An Online 40 hour Certificate Course

On

Basic Statistics for Biological Sciences

(Under DBT Star College Scheme)

5th July 2021 – 16th July 2021

Limited Number of Seats Available!!
Do Register by 2nd July 2021

FEES FOR THE COURSE

For Non- RLAC Students : Rs. 500/-
For RLAC Students: FREE

Click Here to Register
Click Here for Payment

Registration QR Code

RESOURCE PERSONS

Dr Rita Jain, Assistant Professor, Dept of Statistics, Ram Lal Anand College: A dynamic, dedicated and motivated teacher involved in teaching Biostatistics to undergraduate students at RLAC for over two decades

Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI, Karnal: An experienced, seasoned scientist who has guided many students pursuing research and an inspiring, innovative teacher who has extensively used statistical tools for data analysis

Ms Deboshree Das, PhD scholar at International Institute for Population Sciences; an M.Phil in Biostatistics and Demography and an outstanding Alumnus of Dept of Statistics, RLAC, Batch of 2017

ABOUT THE DEPARTMENT OF MICROBIOLOGY, RAM LAL ANAND COLLEGE

Ram Lal Anand College is a University of Delhi maintained college, fully funded by UGC (Govt. of India). The college offers 14 undergraduate programs for students of different streams including Humanities, Commerce, and Science along with one Post Graduate Degree Program in Hindi. The college is a NAAC accredited college with a B++ Grade. The Honours Degree in Microbiology is a prestigious and highly sought after program of the college. The Department of Microbiology has been recently inducted into the Star College Scheme by the Department of Biotechnology (DBT), Govt. of India and has received research grants under this scheme. This recognition mandates orienting students to emerging areas of scientific research and imparting necessary skills and training that would enable students and give them the confidence to take up research projects.

In the recent years, the department has organized many International and National seminars, workshops and certificate courses and faculty members are actively engaged in scientific research.

COURSE OUTCOMES

On successful completion of this course, students would be able to:

- Understand the basic concepts of statistics
- Handle biological data and learn to represent it graphically using Excel.
- Appreciate and understand how statistics helps in analysing biological data with the help of simple examples.

WHO SHOULD ATTEND THIS COURSE ?

This course aims to orient participants to basic statistics tools used in Biological sciences. It has been designed to be easy enough to grasp for those students who have not opted for Mathematics after class 10. For this reason, every session includes a hands-on component which is conceived to be important for helping students to gain confidence in the actual handling and representation of data.

MODULES

MODULE 1: Introduction to Biostatistics, Collection, Classification, Tabulation and Visual Plotting of Data

MODULE 2: Measures of Central Tendency, Measures of Spread or Dispersion

MODULE 3: Variables: Continuous, Discrete and Random

MODULE 4: Curves: Types, Fitting, and Scatter Diagram, Karl Pearson Coefficient of Correlation, Rank Correlation and Tied Ranks

MODULE 5: Sample and Population, Sample Size, Types of Sampling, Standard Error, Levels of Significance, p- value and Confidence Limits.

ORGANISING COMMITTEE

PATRON
Dr Rakesh Kumar Gupta, Principal
Ram Lal Anand College

ORGANISING COMMITTEE
Dr Prerna Diwan, Associate Professor & Coordinator,
DBT Star College Scheme

COURSE COORDINATORS
Dr M Salome John, Assistant Professor,
Department of Microbiology
(Mobile number: +91 8860504883
email: microrlastar@gmail.com)

Dr Shalini Swami, Assistant Professor,
Department of Microbiology

STUDENT VOLUNTEERS

Abhilash Jeas George (+91 9599456214)
Vasu Sharma (+91 9310269277)

Online Certificate Course on

Basic Statistics for Biological Sciences

Day-wise Schedule

Name of the Resource Person	Module	Date	Day	Time	Topic
Dr Shalini Swami/ Dr M Salome John, Course Coordinator		5th July	Monday	10 am to 10.10 am	Welcome note
Dr Rakesh Kumar Gupta, Principal and Patron		5th July	Monday	10.10 am to 10.30 am	Address by Principal
Dr Prerna Diwan, Coordinator, DBT Star College Scheme		5th July	Monday	10.30 am to 10.45 am	Opening remarks and interaction with Students
Dr Rita Jain, Assistant Professor, Dept. of Statistics, RLA College	1	5th July	Monday	10.45 am to 12.30 pm	• An Introduction to Biostatistics and the course layout
Ms Deboshree RLA College Alumnus, Batch 2017	1	6th July	Tuesday	10 am to 12 noon	• Collection, classification and tabulation of data • Types of Data
Ms Deboshree RLA College Alumnus, Batch 2017	1	6th July	Tuesday	12 noon to 2.00 pm	• Practical/Assignment: Based on types of Data
Ms Deboshree RLA College Alumnus, Batch 2017	1	7th July	Wednesday	10 am to 12 noon	• Visual Plotting of Data: Bar diagrams and Histograms
Ms Deboshree RLA College Alumnus, Batch 2017	1	7th July	Wednesday	12 noon to 2.00 pm	• Hands-on training based on above using Excel

Ms Deboshree RLA College Alumnus, Batch 2017	1	8th July	Thursday	10 am to 12 noon	• Visual Plotting of Data: Frequency curve, Frequency polygon, Ogives
Ms Deboshree RLA College Alumnus, Batch 2017	1	8th July	Thursday	12 noon to 2.00 pm	• Hands-on session based on above using Excel
Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI Karnal	2	9th July	Friday	10 am to 12 noon	• Measures of central tendency: Mean, Median, Mode
Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI Karnal	2	9th July	Friday	12 noon to 2.00 pm	• Practical: Handling of data using measures of central tendency
Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI Karnal	2	12th July	Monday	10 am to 12 noon	• Measures of spread or dispersion
Dr Anupama Mukherjee, Principal Scientist, Animal Genetics and Breeding Division, NDRI Karnal	2	12th July	Monday	12 noon to 2.00 pm	• Hands-on session: Handling of data using measures of dispersion
Ms Deboshree	3	13th July	Tuesday	10 am to 12 noon	• Types of variables • Discrete and Continuous Variables

RLA College Alumnus, Batch 2017					• Random Variables
Ms Deboshree RLA College Alumnus, Batch 2017	3	13th July	Tuesday	12 noon to 2.00 pm	• Practical/Assignment: Based on Types of Variables
Ms Deboshree RLA College Alumnus, Batch 2017	4	14th July	Wednesday	10 am to 12 noon	• Types of Curves • Fitting of Curves • Scatter Diagram
Ms Deboshree RLA College Alumnus, Batch 2017	4	14th July	Wednesday	12 noon to 2.00 pm	• Hands-on session/Assignment: Fitting of Curves, Scatter Diagram
Ms Deboshree RLA College Alumnus, Batch 2017	4	15th July	Thursday	10 am to 12 noon	• Karl Pearson's coefficient of correlation • Rank correlation and tied ranks
Ms Deboshree RLA College Alumnus, Batch 2017	4	15th July	Thursday	12 noon to 2.00 pm	• Hands-on session: Finding Karl Pearson's correlation coefficient and interpretation of result
Dr Rita Jain, Assistant Professor, Dept. of Statistics, RLA College	5	16th July	Friday	10 am to 12 noon	• Sample and Population • Types of sampling, sample size • Standard Error • Level of significance and p-value • Confidence Limits
Dr Rita Jain, Assistant Professor, Dept. of Statistics, RLA College	5	16th July	Friday	12 noon to 2.00 pm	• Assignment based on above and Valedictory Session

Date: 29.3.2022

To
The Principal
Ram Lal Anand College
University of Delhi

Dear Sir

This is to request you to sanction the purchase of the following books from DBT -star College grant:

1. Biostatistics with scientific applications
2. Research and Publication ethics
3. Expression System: Methods Express
4. Whole Genome Amplification: Methods Express
5. DNA Microarrays: Methods Express
6. Genetic Analysis: An Integrated approachThanking You

Regards

Prof. Prerna Diwan
Coordinator DBT Star college scheme
Department of Microbiology

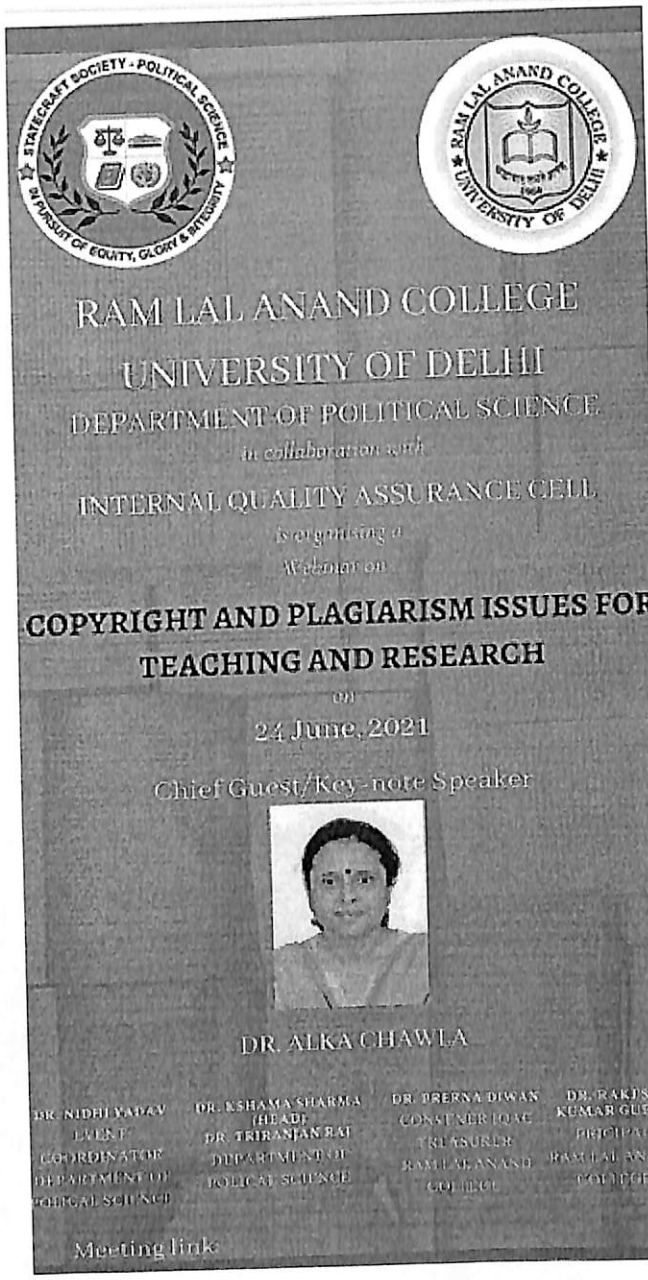
We are trying to gather information on the community awareness level of Human Papilloma Virus (HPV). Please help us out by filling this survey form: https://forms.gle/wZEhujtwNYooish66

If after filling this form you wish to learn more about HPV and its health impact, cancers caused by it and availability of vaccines, please follow the link that appears after filling the form.

If you wish to shoulder responsibility in spreading awareness and want to volunteer for this campaign, you may join us by signing up as volunteer: https://chat.whatsapp.com/DxWmeOrxCzBBV3VvZCMCea

Remember to join the Whatsapp group for further communication.

About UDISHA:
We, the members of a scientific community from Department of Microbiology, Ram Lal Anand College, University of Delhi, are interested in spreading awareness regarding Cancers Caused by HPV (Human Papilloma virus) and it's vaccination. As a part of this initiative, we are conducting a survey to analyse the Public awareness regarding the occurrence and prevention of HPV caused cancers. Kindly fill this form and help us progress through the campaign.


STATECRAFT SOCIETY - POLITICAL SCIENCE
IN PURSUIT OF EQUITY, GLORY & DIVERSITY
RAM LAL ANAND COLLEGE
UNIVERSITY OF DELHI
RAM LAL ANAND COLLEGE
UNIVERSITY OF DELHI
DEPARTMENT OF POLITICAL SCIENCE
in collaboration with
INTERNAL QUALITY ASSURANCE CELL
is organising a
Webinar on
COPYRIGHT AND PLAGIARISM ISSUES FOR TEACHING AND RESEARCH
on
24 June, 2021
Chief Guest/Key-note Speaker
DR. ALKA CHAWLA
DR. NIDHI YADAV
EVENT COORDINATOR
DEPARTMENT OF POLICAL SCIENCE
DR. RSHAMA SHARMA
(HEAD)
DR. TRIRANJAN RAI
DEPARTMENT OF POLICAL SCIENCE
DR. PRERNA DIWAN
CONVENER IQAC
TREASURER
RAM LAL ANAND COLLEGE
DR. RAKESH KUMAR GUPTA
PRINCIPAL
RAM LAL ANAND COLLEGE
Meeting link:

Research and IPR Cell, Ram Lal Anand College
Department of Microbiology, Ram Lal Anand College

In collaboration with

IPloea
The IP Perfectionist

Present Webinar at 4 PM on Friday, September 3rd

WEBINAR ON INTELLECTUAL PROPERTY RIGHTS (IPR) FOR STUDENTS AND FACULTY

WHY, WHAT, and HOW of IPR and Patents

Why you need to register a Patent?
What can be Patented?
How to get a Patent in India?
Overview of patent commercialization
What are the other forms of IPR?
How are patents different from other IPR forms?

Speaker

Latika Khanduja
Founder of IPLOEA, Expert IPR & Patent firm
Registered Indian Patent Agent
Lawyer
Engineering in Electronics & Instrumentation
latika.khanduja@iploea.com | 9811899881

Webinar Link: https://us06web.zoom.us/j/81466491185?pwd=aE55MDhYUUpibCtwMzFMT0VGNktUdz09
Meeting ID: 814 6649 1185
Passcode: 662981

To join by phone, find your local number here - https://us06web.zoom.us/u/kdYgDUALDl

Under patronage of
Prof. Rakesh Kumar Gupta

Organizer
Prof. Vandana Gupta
Dr. Nidhi S Chandra

RAM LAL ANAND COLLEGE
UNIVERSITY OF DELHI

DEPARTMENT OF COMMERCE IN ASSOCIATION WITH IQAC

IS ORGANISING

A WEBINAR ENTITLED

CYBER CRIMES IN INDIA: MODUS OPERANDI, PREVENTION AND PUNISHMENT

SPEAKER : DR. MEGH RAJ

ASSISTANT PROFESSOR
FACULTY OF LAW
UNIVERSITY OF DELHI

5TH OCTOBER, 2021

3.00 P.M – 5.00 P.M

WEBINAR PLATFORM - ZOOM

REGISTRATION LINK
CLICK FOR REGISTRATION

PROF. PRERNA DIWAN
(CONVENER IQAC)

MR. RAJINDER SINGH
(ORGANIZING SECRETARY)

PROF. RAKESH KUMAR GUPTA
(PRINCIPAL)

E-CERTIFICATE WILL BE PROVIDED TO ALL THE REGISTERED PARTICIPANTS

SATVA - THE SUSTAINABILITY INITIATIVE

of Ram Lal Anand College, University of Delhi

under Sustainable India Trust
& in association with Internal Quality Assurance Cell (IQAC), RLAC

presents

INAUGURATION PROGRAMME

Tuesday, 11th January 2022 (Online)
1 PM

Webinar on

Challenges in achieving the SDG Goals on Health & Nutrition in India

CLICK HERE TO JOIN THE EVENT

ZOOM ID: 861 5248 9419
PASSCODE: 428609

Guest Speaker

Dr. Dipa Sinha
Asst. Professor
Ambedkar University, Delhi

JOIN US AS VOLUNTEER!

FOR QUERIES, CONTACT:
Subhag Singh: 8439707172 | Sachin Pal: 9319916976
Angelin Binny: 8848184773 | Gouripriya: 9526611052

Dr. Rakesh K. Gupta (Principal) Prof. N. Raghuram (President, SIT) Prof. Prerna Diwan (IQAC Co-ordinator) Dr. Sunila Hooda (Teacher Co-ordinator, Satva)