# icbb2022

## 4th International Conference on

# BIOSCIENCE AND BIOTECHNOLOGY

## (ICBB-2022), HYBRID CONFERENCE

HOTEL JUNGLE CROWN, SAURAHA, NEPAL | March 3 - 6, 2022

"A Decade in Research:
Celebrating RIBB's 10th Anniversary"

10th ANNIVERSARY

RESEARCH INSTITUTE
FOR BIOSCIENCE
AND BIOTECHNOLOGY

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# 4th International Conference on Bioscience and Biotechnology

(ICBB - 2022) - Hybrid Conference

*A Decade in Research: Celebrating RIBB's 10th Anniversary*

March 3 - 6, 2022

Hotel Jungle Crown, Sauraha, Chitwan, Nepal

## Day 1, Thursday, March 3

| **WORKSHOP I**<br>Ms. Suvechhya Bastola, Public Engagement Manager,<br>Research Institute for Bioscience and Biotechnology (RIBB), Kathmandu, Nepal | | |
|---|---|---|
| 10:00 – 13:00 | **WORKSHOP ON "Public Engagement Program at School"** | Orchid School, Chitwan |

| **WORKSHOP II**<br>Dr. Ashim Dhakal, Chief Scientist, Phutung Research Institute (PRI), Kathmandu, Nepal | | |
|---|---|---|
| 10:00 – 13:00 | **WORKSHOP ON "Low Cost Detection of Contamination in Water"** | Hotel Jungle Crown, Sauraha, Chitwan |

| **Interaction with National/International Delegates**<br>Welcome Reception<br>Emcee: Ms. Suvechhya Bastola | | |
|---|---|---|
| 16:00 – 16:30 | **Conference Setup/Registration** (National & International Guest)/Tea & Coffee | Hotel Jungle Crown, Sauraha, Chitwan |
| 16:30 – 16:45 | **Introduction: RIBB Scientific Advisory Board Member** | Hotel Jungle Crown, Sauraha, Chitwan |
| 16:45 – 17:30 | **RIBB's 10 Year Journey – Story Presentation**<br>**Speaker 1** – Mr. Prajwal Rajbhandari, President, RIBB, Kathmandu, Nepal | Hotel Jungle Crown, Sauraha, Chitwan |
| 17:30 – 18:15 | **Biomedicum Research Campus – An Introduction Presentation**<br>**Speaker 2** – Dr. Ashim Dhakal, Chief Scientist, PRI, Kathmandu, Nepal | Hotel Jungle Crown, Sauraha, Chitwan |
| 18:15 – 19:00 | **University of Nepal – Programs & Master plan Presentation**<br>**Speaker 3** – Prof. Arjun Karki, Chair, University of Nepal (UoN) Development Board, Gaindakot, Nawalparasi | Hotel Jungle Crown, Sauraha, Chitwan |
| 19:00 Onwards | **Welcome Reception by Pool Side** | Hotel Jungle Crown, Sauraha, Chitwan |

## Day 2, Friday, March 4

| | | |
|---|---|---|
| 08:15 – 09:00 | **Registration Tea & Coffee** | National Participants |
| 09:00 – 10:00 | **Emcee: Ravi Bhandari**<br>**Inauguration Ceremony:** Puspa Kali | Sauraha Elephant |
| | **ICBB-2022 Group Picture** | Hotel Jungle Crown, Sauraha, Chitwan |
| | **Welcome Remark:** Ms. Suvechhya Bastola, Secretary, ICBB-2022 | Research Institute for Bioscience and Biotechnology (RIBB), Nepal |
| | **Special Remark I:** Dr. Dhakaram Bhandari, Director | Gandaki Province Academy of Science and Technology (GPAST), Nepal |
| | **Special Remark II:** Mr. Ganesh Shah, Former Minister | Ministry of Science and Technology, Government of Nepal, Nepal |
| | **Remark by Chief Guest:** Prof. Arjun Karki, Chair | UoN Development Board, Gaindakot, Nawalparasi, Nepal |

| | | |
|---|---|---|
| **PLENARY I**<br>10:00 – 10:30<br>Dr. Max Paoli (Online), Program Coordinator,<br>The World Academy of Sciences (TWAS), Trieste, Italy | | |
| **SESSION I: TRADITIONAL FERMENTED FOOD & NUTRITIONAL SCIENCE**<br>Chair: Prof. Remco Kort, Virje Universiteit (VU), Amsterdam, the Netherlands<br>Co-Chair: Dr. Keshab Bhattarai, Sattwik Nutri-Food, Pokhara, Nepal | | |
| 10:30 – 10:55 | **Speaker 4** – Prof. Anil Kumar Anal (**Online**) | Asian Institute of Technology (AIT), Bangkok, Thailand |
| 10:55 – 11:20 | **Speaker 5** – Dr. Alex Paul Wacoo (**Online**) | Makerere University, Kampala, Uganda |
| 11:20 – 11:45 | **Speaker 6** – Dr. Keshab Bhattarai | Sattwik Nutri-Food, Pokhara, Nepal |
| 11:45 – 12:10 | **Speaker 7** – Prof. Remco Kort | Vrije Universiteit (VU) Amsterdam, the Netherlands |
| 12:10 – 14:00 | **Lunch / Networking / Poster Session / Stall Exhibition** | |

| **SESSION II: BIOMEDICINE & TRANSLATIONAL RESEARCH**<br>Chair: Prof. Krishna Das Manandhar, Central Department of Biotechnology, Tribhuvan University (TU), Kirtipur, Nepal<br>Co-Chair: Dr. Neha Shrestha, RIBB, Kathmandu, Nepal | | |
|---|---|---|
| 14:00 – 14:25 | **Speaker 8 –** Mr. Anurag Adhikari (**Online**) | Kathmandu Research Institute for Biological Sciences (KRIBS), Lalitpur, Nepal |
| 14:25 – 14:50 | **Speaker 9** – Mr. Braulio M. Valencia (**Online**) | Kirby Institute, The University of New South Wales, New South Wales, Australia |
| 14:50 – 15:15 | **Speaker 10** – Mr. Yogesh Dhungana (**Online**) | KRIBS, Lalitpur, Nepal |
| **15:15 – 15:45** | **Coffee Break** | |
| 15:45 – 16:10 | **Speaker 11** – Dr. Windi Muziasari (**Online**) | Resistomap, Helsinki, Finland |
| 16:10 – 16:35 | **Speaker 12** – Dr. Anup Subedee | PHECT Nepal – Kirtipur Hospital, Kathmandu, Nepal |
| 16:35 – 17:00 | **Speaker 13** – Mr. Nishan Katuwal | Dhulikhel Hospital, Kathmandu, University, Dhulikhel, Nepal |
| 17:00 – 19:00 | ***Sightseeing walk*** | |
| **19:30 onwards** | **Dinner** | **KC's Restaurant and Home, Sauraha, Chitwan** |

## Day 3, Saturday, March 5

| Emcee: Dr. Prativa Pandey<br>**Plenary II**<br>09:00 – 09:30<br>Dr. Alba Abad (Online), University of Edinburgh, UK<br>Connecting the Climate Challenge Documentary Showcase | | |
|---|---|---|
| **SESSION III: PROTEIN SCIENCE AND ITS APPLICATION**<br>Chair: Dr. Subodh Upadhaya, Kathmandu University, Dhulikhel, Nepal<br>Co-Chair: Dr. Annada Rajbhandary, RIBB, Kathmandu, Nepal | | |
| 09:30 – 09:55 | **Speaker 14** – Dr. Alba Abad (**Online**) | University of Edinburgh, Edinburgh, UK |
| 09:55 – 10:20 | **Speaker 15** – Dr. Suresh Paudel (**Online**) | St. Jude Children's Research Hospital, Memphis, USA |
| 10:20 – 10:45 | **Speaker 16** – Dr. Yub Raj Pokharel (**Online**) | South Asian University, New Delhi, India |
| 10:45 – 11:10 | **Speaker 17** – Dr. Basant Giri | Kathmandu Institute of Applied Sciences (KIAS), Kathmandu, Nepal |
| 11:10 – 11:35 | **Speaker 18** – Dr. Anaya Pokhrel | University of Minnesota, Minnesota, USA |
| **11:35 – 13:05** | **Lunch / Networking / Poster Session/Stall Exhibition** | |

| **SESSION IV: WATER, WILDLIFE & ENVIRONMENT**<br>Chair: Dr. Uttam Babu Shrestha, Global Institute for Interdisciplinary Studies (GIIS), Kathmandu, Nepal<br>Co-Chair: Dr. Tista Parsai Joshi, Nepal Academy of Science & Technology (NAST), Lalitpur, Nepal | | |
|---|---|---|
| 13:05 – 13:30 | **Speaker 19** – Dr. Sanjeeb Mohapatra (**Online**) | National University of Singapore, Singapore |
| 13:30 – 13:55 | **Speaker 20** – Dr. Dibesh Karmacharya | Center for Molecular Dynamics-Nepal (CMDN), Kathmandu, Nepal |
| 13:55 – 14:20 | **Speaker 21** – Dr. Anusa Thapa | Phutung Research Institute (PRI), Kathmandu, Nepal |
| 14:20 – 14:45 | **Speaker 22** – Mr. Ashish Bashyal | Biodiversity Conservancy Nepal (Biocon Nepal), Tilottama, Nepal |
| 14:45 – 15:10 | **Speaker 23** – Dr. Tista Prasai Joshi | Nepal Academy of Science and Technology (NAST), Lalitpur, Nepal |
| 15:10 – 15:35 | **Speaker 24** – Dr. Uttam Babu Shrestha | Global Institute for Interdisciplinary Studies (GIIS), Kathmandu, Nepal |
| **15:35 – 16:00** | **Coffee Break** | |

| **SESSION V: GRADUATE STUDENT TALK**<br>Chair: Dr. Basant Giri, Kathmandu Institute of Applied Sciences (KIAS), Kathmandu, Nepal<br>Co-Chair: Dr. Anaya Pokhrel, University of Minnesota, USA | | |
|---|---|---|
| 16:00 – 16:10 | **Speaker 25** – Mr. Sishir Gautam | TU, Kirtipur, Nepal |
| 16:10 – 16:20 | **Speaker 26** – Ms. Jenny Shah | RIBB, Kathmandu, Nepal |
| 16:20 – 16:30 | **Speaker 27** – Mr. Krishna Prasad Kadel | TU, Kirtipur, Nepal |
| 16:30 – 16:40 | **Speaker 28** – Ms. Nasla Shakya | RIBB, Kathmandu, Nepal |
| 16:40 – 16:50 | **Speaker 29** – Mr. Adesh Baral | KRIBS, Lalitpur, Nepal |
| 16:50 – 17:15 | **Poster Award** | |
| 17:15 – 17:30 | **Closing Remarks from Organizer**<br>Dr. Prativa Pandey | Research Institute for Bioscience and Biotechnology (RIBB), Kathmandu, Nepal |
| 17:30 – 19:00 | ***Sightseeing walk*** | |
| 19:30 onwards | **Dinner** | **C-Gate Tharu Restaurant, Sauraha, Chitwan** |

## Day 4, Sunday, March 6

| | | |
|---|---|---|
| University of Nepal site visit, Kotihom, Nawalpur<br>10:00 – 13:00 | | |
| 18:00 Onwards: Closing Dinner - Celebrating RIBB's 10th Anniversary<br>Venue: Narayani Resort, Nawalpur, Nepal<br>Emcee: Rojlina Manandhar | | |
| 18: 15 – 18:40 | - ICBB – 2022 Conference Video Release<br>- RIBB 10th Year Documentary Release | Dress Code: Formal |
| 18:40 – 19:30 | **STARTUP SESSIONS**<br>**Speaker 30** – Mr. Gyanu Raj Pandey, Shubham Biotech Nepal, Nepal<br>**Speaker 31** – Ms. Binita Pokhrel, Pure Joy, Nepal<br>**Speaker 32** – Mr. Prasodhan Niraula, Apex Biotech, Nepal<br>**Speaker 33** – Mr. Ravi Bhandari, Fermentica, Nepal<br>**Speaker 34** – Dr. Prativa Pandey, Herveda Botanicals, Nepal | 10 mins each |
| 19: 30 – 20:00 | **CULTURAL SHOW**<br>- Angel GC<br>- Manish Baral<br>- Sagar Shrestha | Songs |
| 20: 00 – 20:30 | **CULTURAL SHOW**<br>- **Pahilo Number ma Group** *(Rojlina Manandhar & Prajwal Rajbhandari)*<br>- **Dubo Fulyo Group** *(Rozina Giri, Gaurav Adhikari, Kamana Dawadi & Basanta Kumar Chaudhary)*<br>- **Nylon Ko Sari Group** *(Pratima Tamang, Nasla Shakya, Ashish Bhusal & Basanta Kumar Chaudhary)*<br>- **Newari Songs Group** *(Pratima Tamang, Nasla Shakya & Rozina Giri)* | Dance |
| 20: 30 – 21:30 | **RIBB Hall of Fame Inductees** | **Award Ceremony** |
| **21:30 Onwards** | **Dinner** | |

**Jointly Organized by:**

University of Nepal (UoN) Development Board
Gaindakot, Nepal

Research Institute for Bioscience and Biotechnology (RIBB)Lalitpur, Nepal

**Co-organized by:**

Phutung Research Institute (PRI)
Kathmandu, Nepal

Kathmandu Research Institute for Biological Sciences (KRIBS) Lalitpur, Nepal

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The World Academy of Sciences (TWAS),Italy

Society for Applied Microbiology (SfAM), UK

Talk Biotech Forum, Nepal

Nepal Research Alliance (NRA), Nepal

Nepal Wine-ry Academy, Nepal

Sarba Shrestha Seeds, Nepal

**Conference Secretariat:**

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## Biosketch: Mr. Prajwal Rajbhandari [GS 01]

Chair, ICBB-2022
Co-founder, President, RIBB, Nepal
Email: prajjwalrajbhandari@ribb.org.np

**Mr. Rajbhandari** born in Sarlahi, Nepal, received his master's degree in Biotechnology (2010) on a sandwich program between Kathmandu University, Nepal and Institute of Biomolecule Reconstruction (iBR), Sun Moon University, South Korea. He worked as founding Vice President for six and half years before serving as President from January 2018 at Research Institute for Bioscience and Biotechnology (RIBB), Nepal. He has received Nepal Vidya Bhushan "Kha" (2011), National Energy Globe Award (2015) and Elsevier Foundation Green and Sustainable Chemistry Challenge (2018). His research interest includes natural preservatives, secondary metabolites and probiotics.

## Biosketch: Dr. Ashim Dhakal [GS 02]

Co-founder and Chief Scientist,
Phutung Research Institute, Nepal
Email: ad@pinstitute.org

**Ashim Dhakal** is co-founder and chief scientist at Phutung Research Institute. He received EU's prestigious Erasmus Mundus scholarship and obtained MSc degree in Photonics Engineering jointly from Ghent University, Free University Brussels, University of St. Andrews, and Heriot-Watt University. He received his PhD from Ghent University and imec in 2016. His research interests include biophotonics, silicon and silicon nitride photonics, spectroscopy, and optical coherence tomography. He has over 40 international publications and has presented his research in more than a dozen conferences. He has a web-of-science h-index of 11, more than 830 citations, and is a grantee of UK's EPSRC-GCRF and TWAS research grants.

## Biosketch: Prof. Arjun Karki [GS 03]

Chair, University of Nepal Development Board, Nepal
Email: drarjunkarki@gmail.com

**Prof. Arjun Karki** is Chief Consultant and Head of Pulmonary Critical Care and Sleep Medicine at HAMS Hospital, Nepal. He started his career as an innovative health care worker in the rural hills of Nepal. Later completing his medical degree from Brown University, USA, he has been working towards strengthening the health and education framework in Nepal. Dr. Karki has a principal role in the establishment of Kathmandu University and Patan Academy of Health Sciences (PAHS) and is associated with several health and education institutions in Nepal. Very enthusiastic about changing the academic and R&D ecosystem of Nepal, Prof. Karki is the Chair of University of Nepal Development Board.

# PLENARY SESSIONS

## Abstract Book
## ICBB - 2022

## Biosketch: Dr. Max Paoli [PL 01 - Online]

Program Coordinator, The World Academy of Sciences (TWAS), Trieste, Italy

Email: mpaoli@twas.org

**Max Paoli, PhD** with a B.Sc. Hons. in Biochemistry and a D.Phil. in Chemistry, worked in the area of protein structure and molecular recognition for almost 20 years. His research work took him from York, UK, to laboratories in New Zealand and the US, including the Harvard Medical School. With academic positions in Australia and in the UK, he was also a BBSRC David Phillips Research Fellow at the University of Cambridge, UK.

Max and his group solved the structures of several protein-ligand complexes and published research articles in peer-reviewed international journals. He taught both entry-level and advanced university courses and supervised PhD and MSc students. He was a course convener in Australia where he developed a lecture series on proteomics. In Cambridge, he was a tutor at St. John's College.

Max Paoli works at The World Academy of Sciences (TWAS), serving as Programme Coordinator. He is in charge of overlooking the activities of the Academy, such as the PhD and Postdoctoral Fellowships, Research Grants, Exchanges, Prizes. In addition, he delivers regular lectures and presentations on various topics related to sustainability, environmental ethics, sustainable development and education for a sustainable future.

Max is interested in various issues related to the use of science and scientific education for sustainable development and for the implementation of the SDGs.

## Biosketch: Dr. Alba Abad Fernandez

**[PL 02 - Online]**

Research Scientist, University of Edinburgh, UK
Email: mabadfe@exseed.ed.ac.uk

Alba Abad Fernandez, PhD is a research scientist at the Wellcome Centre for Cell Biology in Edinburgh (Edinburgh, UK). She graduated as a Biologist from the Universitat Autònoma de Barcelona (Spain) and obtained her PhD in Neuroscience from the Universitat de Barcelona. Alba's main research interest is understanding the molecular basis for accurate chromosome segregation, essential for faithful segregation of the genetic material during cell division. Her research career thus far has resulted in 19 peer-reviewed publications with 5 of them as a lead author in high-impact journals. Currently, she is using an interdisciplinary approach combining protein biochemistry, biophysics, X-ray crystallography, CryoEM and cell biology to characterise key mitotic regulators. Alba is also passionate about public engagement with science and is the founder and project lead of Engage Nepal with Science.

Engage Nepal with Science is a collaboration between the University of Edinburgh and RIBB and aims to spread the culture of engaging Nepalese communities with science and the scientific research carried out at Nepalese research centres to empower, inspire and build confidence in STEM (Science-Technology-Engineering-Mathematics). More information on Engage Nepal with Science is available at https://engagewithscience.org. You can also follow Twitter/ Instagram/Facebook.

Alba's LinkedIn Profile: https://www.linkedin.com/in/alba-abad/

# Session I

## TRADITIONAL FERMENTED FOOD & NUTRITIONAL SCIENCE

**Abstract Book**
**ICBB - 2022**

## Biosketch: Prof. Anil Kumar Anal

**Dr. Anil Kumar Anal** is the Professor of the Food Engineering and Bioprocess Technology and Food Innovation, Nutrition, and Health program at the Department of Food Agriculture and Bioresources in the Asian Institute of Technology (AIT), Thailand. Prof. Anil completed his Master's and Doctoral degrees in Food and Bioprocess Technology at the Asian Institute of Technology, Thailand. Prof. Anil has also experiences working as a researcher and academician at Otago University and the Massey University of New Zealand. His expertise lies in the field of Food and Nutrition Security, Food Safety, Food- and Bioprocessing and Preservation, and Bioeconomy. While at the same time, Prof Anil specializes in the Valorization of food waste and agro-residues for High Value, AMR studies, and delivery systems for bioavailability and bioaccessibility. He has authored 6 patents (US, World Patents, EU, Canadian and Indian); more than 130 referred international journal articles, 37 book chapters, one authored book, 5 edited books, and several in International conference proceedings. Upcoming book include probiotics for industrial application (Wiley-Mar 2022) and Valorization of Agro-industrial waste (CRC- 2022). He has been invited as Keynote Speakers and Experts in various Food, Biotechnology, Agro-Industrial Processing, and Veterinary as well as Life Sciences based conferences and workshops organized by national, regional and international agencies. Prof. Anil has been serving as Advisory members, Associate Editor, Members of Editorial Board of various Regional and International peer-reviewed Journal publications. Prof. Anil has experience on conducting various innovative research and product developments funded by various donor agencies, including Newton Fund, ADB, European Union, FAO, Various Government Agencies, CTCN, USAID, and various food and biotech industries.

## Paraprobiotics- Postbiotics in Traditional Fermented Foods: The Emerging Sources for Biotherapy and Functional foods [OP 01 - Online]

**Anil Kumar Anal**
Asian Institute of Technology, Bangkok, Thailand
**Correspondence:** anilkumar@ait.ac.th

**Abstract**

The increasing research on science and innovation has shifted consumer awareness from conventional to functional foods that are more nutritious and healthier. The ideation of functional food is based on the addition of probiotics, postbiotics and paraprobiotics that promote cognitive response, improved immune system, and general wellbeing. At a time when there is no proven therapy for global pandemic SARS-CoV-2 causing infectious viral disease COVID-19, alternative food and nutritional interventions through diet are studied like never before to limit the infection. Probiotics are live microorganisms that have the potential to modulate the human immune system and prevent such infection. However, in recent years, several concerns on their use have been raised. In particular, industrial processing and storage of probiotic products are still technological challenges as these could severely impair cell viability. On the other hand, safety of live microorganisms should be taken into account, especially when administered to vulnerable people, such as the elderly, lactating mothers, infants and immunodeficient individuals. These drawbacks have enhanced the interest toward new products based on non-viable probiotics such as paraprobiotics and postbiotics. The postbiotics are the complex mixture of metabolic products secreted by probiotics in cell-free supernatants such as enzymes, secreted proteins, short chain fatty acids, vitamins, secreted biosurfactants, amino acids, peptides, organic acids, etc. The paraprobiotics are the inactivated microbial cells of probiotics (intact or ruptured containing cell components) or crude cell extracts. Paraprobiotics and postbiotics hold the ability to regulate the adaptive and innate immune systems, exhibit anti-inflammatory, antiproliferative and antioxidant properties and exert antagonistic effect against pathogens. Moreover, these two can exhibit enhanced safety, assure technological and practical benefits, and can also be used for the development of biotechnological products with functional ingredients for the nutraceutical industry.

**Keywords:** Biotherapy, Functional foods, Paraprobiotics

## Biosketch: Dr. Paul Alex Wacoo

**Paul Alex Wacoo** is a Lecturer in the Department of Medical Biochemistry at Makerere University and a specialist in applied microbiology, human nutrition, and clinical biochemistry. Paul obtained MSc in Biochemistry from Makerere University and PhD from Free University of Amsterdam. For his PhD, he worked on the detection and reduction of aflatoxin in the food chain. His research focuses on the role of the microbiota in mitigation of food toxins. Paul is also working with YOBA for life foundation, the Netherland's based NGO, whose aim is to promote health and wealth to people in resource-poor countries Yoba for life foundation supports local production of a probiotic yoghurt with proven health benefits.

## Fermentation as a novel approach for the prevention of aflatoxins induced liver cancer [OP 02 - Online]

**Paul Alex Wacoo**[1]*, Simon Aliker[2], Andrew Bukenya[1], Deborah Wendiro[3], Joseph F Hawumba[2], Ponsiano Ocama[4]
[1] Department of Medical Biochemistry, School of Biomedical Sciences, College of Health Sciences, Makerere University, P.O. Box 7062 Kampala, Uganda.
[2] Department of Biochemistry and Sports Science, School of Biological Sciences, College of Natural Sciences, Makerere University, P.O. Box 7062 Kampala.
[3] WENA Biosciences Institute P.O. Box 26, Kamuli, Ugand.
[4] Department of Internal Medicine, School of Medicine, College of Health Sciences, Makerere University, P. O. Box 7062 Kampala.
* **Correspondence**: wacooalex@gmail.com

### Abstract

Aflatoxins-induced liver cancer is a hidden public health hazard requiring immediate action. Particularly in sub-Saharan Africa and East Asia where 83% of the new cancer cases have been reported due to synergistic contribution between aflatoxins and highly endemic hepatitis B infection. Aflatoxins are associated with the food chain right from production to post consumption. A novel strategy to decontaminate aflatoxins before and after feeding is the best hope for mitigating the risk effect of aflatoxin. Probiotic bacteria have been demonstrated to mitigate the risk effect of aflatoxin in food and after ingestion thus providing protection against aflatoxicosis and liver cancer and also ensure access to nutritious, safe and healthy food. A case controlled design was employed to evaluate the associated between consumption of food contaminated with aflatoxin and liver cancer. Based on the detectable levels of urinary aflatoxin M1, the odds of developing liver cancer was four times higher in the case group compared with the control group. The odds ratio for other risk factors for liver cancer such as cigarette smoking, alcohol intake and hepatitis B infection were 0, 2.2 and 5.3, respectively. We also assessed the gut microbial profiles of faecal matter of both case and control group patients. A total of 400 isolates of lactic acid bacteria were isolated and screened for their potential in aflatoxin B1 binding and degradation. Although none of the isolates were found to degrade aflatoxin B1 in maize porridge, 90% of the isolates had potential to adsorb aflatoxin. The best binder removed approximately 92% of 1 µg/l of aflatoxin B1 from physiological saline. We hypothesize that identifying gut probiotic bacteria with potential to minimize bio-absorption of aflatoxin in our population and developing locally based probiotics is a locally grown solution to health risk of aflatoxins in common

foods and feeds such as porridge, yoghurt, millet bread, ground nut pastes to mention but a few. However, this would require a randomized double-blind placebo-controlled intervention study to monitor and confirm the potential of the isolate and starter culture in mitigating the risk effect of aflatoxin.

**Keywords:** Fermentation, Aflatoxins, Liver Cancer

## Biosketch: Dr. Keshab Bhattarai

**Keshab Bhattarai**, PhD has earned a doctoral degree in Nutritional Science from Ehime University, Japan on Japanese Government MEXT Scholarship. His study emphasizes the nutritional value of food around us and its impact on human health and behaviour. He has experience in associating and conducting the health awareness program. He also has exposure to documentation, article writing and reports related to the nutritional impact of food and its misuse. He is interested in the research related to the health facility for people from remote and poor backgrounds for sustainable livelihood. His specialization is on the diet and nutrients in relation to chronic diseases like diabetes, pressure, cholesterol and identifying individuals who have an elevated risk of disease that can be controlled by the dietary supplements.

## Nutritional Perspective and its consequences in Nepal [OP 03]

**Keshab Bhattarai**
Sattwik Nutri-food, Pokhara, Nepal
**Correspondence:** keshab.bhattrai@gmail.com

### Abstract

Obesity is the result of chronic imbalance of energy homeostasis. In this process the energy intake exceeds the expenditure and is caused by high-calorie diet & luxury lifestyle. The obesity can be linked to metabolic disorder syndrome like heart disease, stroke, and type 2 diabetes. The numbers of people suffering from diabetes, hypertension and obesity have dramatically increased in last decade in developed as well as in developing countries. After 2015, chronic disease found to be major death factor in this world accounting 70% of the total death factors. And Diabetes stands at 4 among the chronic disease preceded by cardiovascular diseases, cancer and respiratory disease. Diabetes alone is responsible for 1.6 million deaths per year globally. Out of total death worldwide, 80% of global diabetes deaths occur in low-income countries is due to lack of awareness, undiagnosed and unhealthy food habits. Among them Nepal has observed a rapid increase in the prevalence of diabetes in the last two decades. So, its urgent for Nepal to aware her people about the importance of food behavior, nutrition & lifestyle in managing the diabetes and other dietary disease.

Nutrition, the complete combination of micro and macro nutrients are substances obtained from food that helps the body to provide energy and structural materials for growth, maintenance, and repair. Proper nutrition and healthy lifestyle help to live long without any chronic medical complication. However, there are challenges to prepare diet plans with balance of nutrients. Over-consumption and under-consumption of macro and micronutrient can cause various diseases. For example, protein deficiency can result in anemia, but the over intake can place more stress on the kidneys that could lead to a renal deterioration. Fat deficiency can cause dermatitis, growth, and reproductive failures, but the over intake and unhealthy options like refined oils can be a cause of atherosclerosis. Carbohydrate deficiency can cause tissue breakdown, but the over consumption can lead to obesity. Similarly, the deficiencies of micronutrients affect the physical and mental activities of humans, whereas overconsumption may be toxic to human health. Thus, the people who are at the risk of falling into chronic dietary disease channel need proper nutritional services in solving the problem in sustainable way. In this context, the mission of the Sattwik Nutri-Food (a Diet Therapy and Research

Center) is to provide customized food solutions to the people who are in danger of falling in the vicious circle of chronic diseases. While serving diet therapy services Sattwik utilizes the locally grown grains with modern flavor of cooking & presentation. The vision of Sattwik Nutrifood is to co-create chronic disease-free society while supporting the global themes of "Sustainable Agri-ecosystem" and "Sustainable Living". To motivate the people towards healthy food habit, it provides diet counseling, kitchen services, nutrition consultancy & training, Yoga & Meditation, and diet packages. And through its diet therapy services, Sattwik Nutrifood has successfully reversed the dietary disease within 3 months of its execution.

**Keywords:** Obesity, Diabetes, Sattwik Nutri-Food

## Biosketch: Prof. Remco Kort

**Remco Kort** is a Professor of molecular microbiology at the Vrije Universiteit in Amsterdam (appointed in 2010) and a specialist in applied microbiological research. His research focuses on the role of the microbiota in gut heath and lactic acid bacteria in fermented foods leading to over 100 scientific publications (4,500 citations; h-index 36). He is the organizer of the annual lecture series The human microbiome in health and disease and its national Microbiome Award for MSc and PhD-students. In Amsterdam he co-developed ARTIS-Micropia, the only microbe museum in the world, which has been awarded with the Kenneth Hudson award for the most innovative museum in Europe. He authored the popular science book De microbemens (The microbe man, transl.) published by Athenaeum, Amsterdam, 2017. Kort has over 10 years of experience with research and innovations in East-Africa and South-Asia, where he co-founded the non-profit Yoba for Life foundation for the development of an educational program and a distribution network for innovative starter culture enabling the production of probiotic yoghurt.

## Microbial composition of milk fermented by designed and natural starter cultures [OP 04]

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### Abstract

This study aims to elucidate the microbial composition of a variety of fermented milks and investigate the fermentative capacity of a designed starter culture serving as vehicle allowing the propagation of probiotic bacteria to confer intestinal health benefits. First, we have designed a novel starter culture that surmounts the inability of the probiotic model strain *Lactobacillus rhamnosus* GG to grow in milk. Clinical studies have shown that oral administration of this probiotic strain, a human intestinal isolate, reduces the duration of acute infectious diarrhea, including rotavirus-associated diarrhea. Therefore, we have formulated a dried starter culture based on a proteolytic strain of *Streptococcus thermophilus* that enables the propagation of both strains in milk and other food matrices, including soy, millet, and maize. The affordable starter culture is currently used by people in resource-poor communities in Africa to ferment cow's milk and cereals. Second, we have demonstrated that by using this starter culture, we could integrate health-promoting probiotics into a number of fermented food products. Hereto, we characterized the bacterial community composition of a naturally fermented milk product (lait caillé) from northern Senegal, prepared in wooden bowls (lahals) containing bacterial biofilm that serves as an inoculum for the fermentation process. In addition, we have incorporated our probiotic starter culture containing *Lactobacillus rhamnosus* GG into the local fermentation process and demonstrated growth of this probiotic bacterium in several different food matrices. In conclusion, we have set up an efficient and practical delivery method for probiotic bacteria in fermented foods by designing a novel starter culture with the potential to confer additional health benefits.

**Keywords:** Fermented milk, *Lactobacillus rhamnosus* GG, Probiotics

# Session II

## BIOMEDICINE & TRANSLATIONAL RESEARCH

## Abstract Book
## ICBB - 2022

## Biosketch: Mr. Anurag Adhikari

**Anurag Adhikari** is currently working on the functional aspect of human adaptive immunity. His research utilizes the polyclonal antibody Fc effector function to understand the role of humoral immunity during viral diseases so as to understand how it primes innate immunity early in the infection cascade. He has developed the antibody assay platform to understand the Fc effector function of antibodies produced during Hepatitis C virus and SARS CoV-2 infection. He is currently adapting the assay of antibody-dependent cellular phagocytosis (ADCP), antibody-dependent cellular cytotoxicity (ADCC), and antibody-dependent neutralization (ADN) to understand HIV-1 pathogenesis. Additionally, he has worked with neglected tropical diseases like Dengue and is currently working to understand the parasitic disease Lymphatic Filariasis burden in Nepal. In addition to functional immunology during infection, he also has a special interest in B cell ontogeny and how it is affected by germinal center modulation during infection and immunization. Apart from infection, he is also equally interested in non-communicable disease immune pathology including diabetes and autoimmune disorders.

## Longitudinal characterisation of phagocytic and neutralisation functions of anti-Spike antibodies in plasma of patients after SARS-CoV-2 infection [OP 05 - Online]

**Anurag Adhikari**[1]*, Nicodemus Tedla[2], Rowena Bull[2], Andrew Lloyd[2], Chaturaka Rodrigo[2]

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### Abstract

Phagocytic responses by effector cells to antibody or complement-opsonised viruses have been recognized to play a key role in anti-viral immunity. These include antibody dependent cellular phagocytosis mediated via Fc-receptors, phagocytosis mediated by classically activated complement-fixing IgM or IgG1 antibodies and antibody independent phagocytosis mediated via direct opsonisation of viruses by complement products activated via the mannose-binding lectin pathway. Limited data suggest these phagocytic responses by effector cells may contribute to the immunological and inflammatory responses in SARS-CoV-2 infection, however, their development and clinical significance remain to be fully elucidated. In this cohort of 62 patients, acutely ill individuals were shown to mount phagocytic responses to autologous plasma-opsonised SARS-CoV-2 Spike protein-coated microbeads as early as 10 days post symptom onset. Heat inactivation of the plasma prior to use as an opsonin caused 77-95% abrogation of the phagocytic response, and pre-blocking of Fc-receptors on the effector cells showed only 18-60% inhibition. These results suggest that SARS-CoV-2 can provoke early phagocytosis, which is primarily driven by heat labile components, likely activated complements, with variable contribution from anti-Spike antibodies. During convalescence, phagocytic responses correlated significantly with anti-Spike IgG titers. Older patients and patients with severe disease had significantly higher phagocytosis and neutralisation functions when compared to younger patients or patients with asymptomatic, mild, or moderate disease. A longitudinal study of a subset of these patients over 12 months showed preservation of phagocytic and neutralisation functions in all patients, despite a drop in the endpoint antibody titers by more than 90%. Interestingly, surface plasmon resonance showed a significant increase in the affinity of the anti-Spike antibodies over time correlating with the maintenance

of both the phagocytic and neutralisation functions suggesting that improvement in the antibody quality over the 12 months contributed to the retention of effector functions.

**Keywords:** Anti-viral immunity, SARS-CoV-2

## Biosketch: Mr. Braulio Mark Valencia

**Braulio M. Valencia** is a Peruvian infectious diseases specialist and PhD student majoring in human immunogenetics of infectious diseases and virology at the Kirby Institute, The University of New South Wales (UNSW). His research focuses on understanding the human genetic determinants of severe infections. His interest aims to translate cutting-edge technology into understanding the pathobiology, diagnosis, treatment, and prevention of neglected tropical diseases. He has published 24 peer-reviewed papers, two book chapters and contributed to two WHO technical reports in diverse aspects of American Tegumentary Leishmaniasis, HTLV-1, and the severity of viral infections. He is also an active peer-reviewer of journals in genetics, immunology, parasitology, and infectious diseases and is passionate about medical education.

## Introducing cutting-edge technology to prevent and control neglected tropical diseases: how far we are? [OP 06 - Online]

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### Abstract

The applicability of precision medicine, targeted therapy, or next-generation sequencing is commonly associated with chronic communicable or non-communicable conditions highly prevalent in developed countries. However, the accelerated improvement of technology has allowed a considerable reduction in costs and complexity of many of these technologies, making them potentially accessible to many low-income settings and applicable to a wide variety of medical conditions, including neglected tropical diseases. In this presentation, a few examples of cutting-edge applications will be discussed, showing the potential benefits of including them as the standard of care in preventing and controlling selected neglected tropical diseases.

**Keywords:** NTDs, Precision Medicine

## Biosketch: Mr. Yogesh Dhungana

**Yogesh** earned his bachelor's degree in biotechnology in 2012 from Purbanchal University, Nepal. He went on to receive an Erasmus Mundus master's degree in computational systems biology in 2015 from KTH Royal Institute of Technology in Stockholm, Sweden and Aalto University, Helsinki, Finland. Yogesh worked in lab of Dr. Hongbo Chi from 2016 to 2020 as a bioinformatician before starting his PhD in the lab of Dr. Jiyang Yu at St. Jude Graduate School of Biomedical Sciences. His research focuses on using network-based approaches to dissect immunometabolism hidden drivers to enhance CAR T-cell persistence. Additionally, he is working on developing data-driven analytical approach to integrate metabolism and signaling network. His dissertation topic is "Integrative Network Modeling of Metabolomics and Multi-Omics Data for Hidden Driver Discovery." He enjoys outdoor activities such as hiking, soccer (lifelong Gooner), going on motorcycle ride and camping.

## Network-based systems immunology approach enables the discovery of hidden drivers of T cell persistence [OP 07 - Online]

**Yogesh Dhungana**

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### Abstract

Adoptive cell therapy (ACT) has garnered significant excitement due to unprecedented success for hematological malignancies in clinical studies leading to US Food and Drug Administration (FDA) approval of CD19 targeted Chimeric antigen receptor (CAR) products. However, solid and brain tumors' clinical outcomes remain a challenge, with only a few patients achieving a complete response. Multiple preclinical and clinical studies have highlighted roadblocks such as i) poor persistence and function (fitness) of transferred T cell ii) a limited array of targetable antigens, iii) an inability of T cells to traffic and penetrate tumor sites iv) an immunosuppressive tumor microenvironment. We employ our network-based systems immunology approach to comprehensively dissect hidden drivers of T cell persistence using in-vitro and model-derived single-cell RNA profiles of clinically relevant ACT models of hematological, solid, and brain malignancies. Using such approaches, we have discovered a subset of the T cell population that are persistent and have potent anti-tumor activity.

**Keywords:** Adoptive Cell Therapy, T cell persistence

## Biosketch: Dr. Windi Muziasari

**Dr. Windi Muziasari** is the CEO and co-founder of Resistomap. Windi has over 10 years of experience working and conducting research on antibiotic resistance in the environment with experts all over the globe before deciding to take the step into the business world by founding Resistomap to further advance in the fight against antibiotic resistance, which has led to over 140 projects in 26 different countries.

## Resistomap provides a complete service to map environmental resistomes [OP 08 - Online]

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### Abstract

The United Nations Environment Program (UNEP) identified antibiotic resistance in the environment as one of its top six emerging issues of environmental concern with global implications in its Frontiers 2017 report. Huge, global need for monitoring of antibiotic-resistant bacteria and their antibiotic resistance genes (ARGs) in the environment is emerging. Therefore, Resistomap Oy, a biotechnology company registered in Helsinki, Finland comes in to help researchers to monitor the ARGs and genes associated with mobile genetic elements in the environment by providing a complete service with personalized analysis and interactive report of ARG profiles. Resistomap team has industry leading research expertise that enables to employ molecular genomic method and high-throughput SmartChip quantitative Polymer Chain Reaction (qPCR) technology (Takara Bio) for monitoring of ARGs in any environment such as but not limited to manure, soil, sediment, surface water, wastewater, and stool samples. The SmartChip qPCR technology has proven effective in research but hasn't yet been used commercially for ARG monitoring. Resistomap currently offer a service with DNA sample pick-up and transport, DNA extraction, detection, and quantification of 12 – 384 ARGs using the SmartChip qPCR and an online interactive visual report of the ARG profile. From 2019-2021, Resistomap served over 130 projects from 26 countries, and analyzed over 1500 environmental samples. Resistomap goals is to map environmental resistomes across the globe for understanding the development and spread of antibiotic resistance in the environment.

**Keywords:** Antibiotic Resistance, Resistomap

## Biosketch: Dr. Anup Subedee

**Dr Anup Subedee** is a physician and infectious diseases specialist. He went to medical school at Guangxi Medical University in China. He obtained residency training in internal medicine at Reading Hospital Internal Medicine Residency Program in Reading, USA. He also obtained fellowship training in infectious diseases and completed Masters in Public Health and Tropical Medicine at Tulane University at New Orleans, USA. He has worked as a clinician in the United States and in Nepal. He has contributed to developing guidelines for clinical management of COVID-19 and guidelines for infection prevention and control in healthcare settings during COVID-19 pandemic as the coordinator of the Nepal Medical Council COVID-19 treatment guidance committee. He has written opinion page articles on various aspects of the pandemic, healthcare quality improvement and public health policy in Nepal in different magazines in Nepal.

## Reviewing the gaps and the achievements in healthcare and biomedical research in Nepal during the COVID-19 pandemic [OP 09]

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### Abstract

The COVID-19 pandemic has exposed significant gaps in the area of healthcare and biomedical research in Nepal, similar to most other low- or middle-income countries. There have also been significant advances made in certain areas of research. This session aims to review the achievements and gaps in the context of the societal and national challenges brought forth by the pandemic's relentless march and the evolution of healthcare and biomedical research globally. Lessons that can help improve the capacity to produce valuable information and knowledge in future pandemics will be discussed.

**Keywords:** COVID-19, Nepal

## Biosketch: Mr. Nishan Katuwal

**Mr. Nishan Katuwal** is working as Molecular Biologist and Incharge of Molecular and Genomic Sequencing Research Lab in Dhulikhel Hospital, Kathmandu University hospital. He received in MSc in Biotechnology from Norwegian University of Science and Technology (NTNU), Norway. His research background is in molecular biology, nanomedicine, nanoparticle drug delivery and pharmaceutical rheology. He is currently working in the field of infectious diseases with the utilisation of molecular methods including next generation sequencing and genomic-data analysis.

## Metagenomic Next Generation Sequencing and its utilisation in context of public health in Nepal [OP10]

**Nishan Katuwal**[1]*, Rajeev Shrestha[2]

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### Abstract

Metagenomic Next Generation Sequencing (mNGS) is a sequencing approach that allows to comprehensively sample all genetic material present in a given complex sample and compare the genetic material to global database of all known pathogen, to identify which organisms are present. There are various applications to mNGS in diagnosing infectious diseases, outbreak tracking, infection surveillance, pathogen discovery and many more. In context of health, the identification of the causative agent behind any illness is important for developing effective clinical management strategies. However, the characterization of complex infections possess tremendous burden as such infections are difficult to culture and investigate in underdeveloped infrastructures. Additionally, the employment of molecular methods, such as PCR, require prior genetic information on the causative agents, for developing specific primers for detection. Metagenomic Next Generation Sequencing approach, on the other hand, can parallelly identify minute amounts of infections and coinfections, of varying origin in a single investigation. Instead of performing multiple targeted assays, each looking for a specific pathogen, metagenomic approach uses a single sequencing-based method that is capable of identifying most, if not all, microorganisms. It is a very sensitive and rapid method that can promptly assist the selection of treatment regimens for the disease.

Additionally, metagenomics has helped to elucidate strong correlation between antimicrobial resistance and microbiome through discovery of complex microbial communities and their components involved in antimicrobial resistance. It can also be utilized for identification of novel antimicrobial molecules by screening for microbial populations that possess antimicrobial activity against clinically relevant microorganisms. In Nepal, where public health struggles with proper clinical management algorithms, findings from metagenomic next generation sequencing can provide vital information to the clinicians to develop treatment regimens against any infection and to the public health authorities to develop effective management strategies. Thus, metagenomic

next generation sequencing is a vital tool for public health management that can investigate for known or novel pathogens, outbreaks and complex diseases.

**Keywords:** Metagenomics, Next Generation Sequencing

# Session III

## PROTEIN SCIENCE AND ITS APPLICATION

**Abstract Book**
**ICBB - 2022**

## Biosketch: Dr. Alba Abad Fernandez

**Alba Abad Fernandez**, PhD is a research scientist at the Wellcome Centre for Cell Biology in Edinburgh (Edinburgh, UK). She graduated as a Biologist from the Universitat Autònoma de Barcelona (Spain) and obtained her PhD in Neuroscience from the Universitat de Barcelona. Alba's main research interest is understanding the molecular basis for accurate chromosome segregation, essential for faithful segregation of the genetic material during cell division. Her research career thus far has resulted in 21 peer-reviewed publications with 6 of them as a lead author in high-impact journals. Currently she is using an interdisciplinary approach combining protein biochemistry, biophysics, X-ray crystallography, CryoEM and cell biology to characterise key mitotic regulators. Alba is also passionate about public engagement with science and is the founder and director of Engage Nepal with Science. Engage Nepal with Science is a collaboration between the University of Edinburgh and RIBB and aims to spread the culture of engaging Nepalese communities with science and the scientific research carried out at Nepalese research centres to empower, inspire and build confidence in STEM (Science-Technology-Engineering-Mathematics). For more information on Engage Nepal with Science visit: https://engagewithscience.org

## Understanding the Molecular Basis for Accurate Cell Division

**[OP 11 - Online]**

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### Abstract

Cell division is an essential biological process important for the development, growth, and repair of all living organisms and thus, a process with vast relevance to human health. During cell division, the genetic information organised in the form of chromosomes, must be equally distributed to the two newly formed daughter cells. Errors in cell division result in cells with an abnormal chromosome number which is often associated with birth defects, different syndromes and diseases like cancer. To achieve faithful chromosome transfer, cells undergo a number of highly orchestrated events that include: 1. chromosome packing, 2. assembly of a filament-based network called the mitotic spindle, 3. physical attachment of chromosomes to the mitotic spindle, 4. movement of the two sister chromatids of the chromosomes, with the help of the mitotic spindle, towards the opposite poles of the cell, and 5. completion of the physical division between the two newly formed cells. A number of mitotic molecular machines involving an extensive network of protein-protein interactions are implicated in all the steps above and their proper function is essential to achieve accurate cell division. In the lab we are interested in understanding the machinery that ensures faithful segregation of the genetic material by studying the molecular and structural basis of key mitotic proteins and protein-protein interactions. To do so, we use an interdisciplinary approach that involves the use of protein biochemistry, biophysical and structural techniques combined with cell biology.

**Keywords:** Cell division, Mitotic spindle, Protein-protein interactions

## Biosketch: Dr. Suresh Poudel

**Suresh Poudel** was born in a rural region of Nepal's Kaski District, where he spent his childhood and teens under difficult financial circumstances. Despite numerous deprivations, he persevered, making his way to college. While earning his undergraduate degree at Kathmandu University, Poudel received the Vice Chancellor Gold Medal and National Gold Medal for securing the highest cumulative grade-point average in the entire university and its affiliated colleges. He started his first job as a teacher in the Department of Biotechnology at Kathmandu University. His teaching experiences in courses such as Biochemistry and Enzymology laid a strong foundation for success in his future master's and doctoral research.

After two years of teaching, Poudel received the prestigious QUOTA scholarship to pursue an MSc at the Norwegian University of Science and Technology. After receiving his MSc, he returned to Kathmandu University to work as a lecturer in the Department of Biotechnology; two years later, he was accepted into the Genome Science and Technology program at the University of Tennessee, Knoxville. While pursuing his PhD, he worked in Robert L. Hettich's lab at Oak Ridge National Laboratory (ORNL). During his PhD, Poudel's research was focused on describing microbial proteins using mass spectrometry techniques and computational tools in order to understand the metabolism within the microbe. While in his graduate program at UT, Suresh attained two first-author publications in the journal Biotechnology for Biofuels, along with multiple papers on which he was a co-author. He served as the president of the University of Tennessee Nepali Students Association (UTNSA) from 2016–2017 and is actively involved in advisory activities for the association.

Poudel started his professional career as a postdoctoral researcher in the Biosciences Division at ORNL, focused on establishing a platform for comprehensively studying

metabolites in a system and understanding the potential functions for proteins of unknown functions from a bioinformatics perspective. Poudel, then moved as a bioinformatics postdoctoral researcher at St. Jude Children's Research Hospital, Memphis, Tennessee, USA in the Department of Structural Biology and Department of Developmental Neurobiology. His major role is to develop Bioinformatics tools for metabolomics and to perform a comprehensive posttranslational modifications (PTMs) in Alzheimer's disease and Cancer patients. Currently, Poudel has established himself as the Bioinformatics Research Scientist at the Center for Proteomics and Metabolomics. He leads several computational proteomics projects mainly focusing on the development of algorithms and software novel in the field.

## Integrated omics reveals the details of metabolic adaptation of *Clostridium thermocellum* ATCC-27405 grown on switchgrass

**[OP 12 - Online]**

**Suresh Poudel**[1]*, Richard J. Giannone[2], Miguel Rodriguez Jr.[1], Babu Raman[1], Madhavi Z. Martin[1], Jonathan R. Mielenz[1], Nancy L. Engle[1], Intawat Nookaew[1], Steven D. Brown[1], Timothy J. Tschaplinski[1], David Ussery[1], Robert L. Hettich[2]

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### Abstract

Microbial production of biofuels from plants such as switchgrass is limited by the recalcitrant nature of the complex lignocellulose. Although environmental microbes, such *as Clostridium thermocellum*, can solubilize and convert lignocellulosic biomass into ethanol, most work to date has centered on characterizing their metabolism on model cellulosic substrates such as cellobiose or Avicel. *C. thermocellum* is a thermophillic, anaerobic Gram-positive bacterium that produces extracellular complexes, termed cellulosomes, that solubilize and degrade cellulose for eventual production into biofuel materials. To enhance our understanding as to how this organism metabolizes a complex biomass substrate, we have examined a time course progression of C. thermocellum growing on switchgrass and mapped the metabolic and protein changes during the conversion of plant biomass to ethanol.

*C. thermocellum* was grown on switchgrass in triplicate and harvested for transcriptomics, metabolomics, and proteomics, at 19 hours, 43 hours, 91 hours and 187 hours post-inoculation. Proteins were subjected to trypsin digestion followed by two-dimensional high performance liquid chromatography on-line with ESI-MS/MS on an LTQ-XL MS. Tryptic peptides were matched with collected spectra using SEQUEST algorithm with a 1% false discovery rate (FDR) at the protein level and were normalized using normalized spectral abundance factors (NSAF). Metabolite data were measured with GC-MS and the data were expressed as fold change relative to the 43 h sampling time point with significant differences determined with Student's t-tests. The OMICS data were analyzed using various bioinformatics tools.

Metabolomic analysis of *C. thermocellum* grown on pre-treated switchgrass revealed the accumulation of hemicellulose catabolic metabolites including: xylose,

xylobiose, xylotriose, arabinose and various sugar alcohols (xylitol, arabitol, and ribitol). Interestingly, a large accumulation of branched-chain fatty acids related to heptadecanoic acid and other higher-order saturated fatty acids was observed in late exponential phase. Proteomic measurements yielded 1551 proteins, representing ~50% of predicted *C. thermocellum* proteins, with about a third of the proteins (566) having significant changes in abundance during the course of growth. Most enzymes involved in central metabolism (e.g., amino acid and protein synthesis, glycolysis) decreased in abundance with growth time, while cellulosomal-, S-layer- and bacterial secretion system-related proteins increased in abundance, even well into stationary phase. Clustering analysis revealed two significant groups of proteins that increased substantially with time; these were mainly populated with ABC transporters, catabolic enzymes (cellulosomal proteins) and transport-related proteins. Interestingly, we observed ethanol being produced and accumulating gradually with time, albeit at a lower level as compared to previous work on simpler lignocellulosic substrates. This would allow microbe to metabolically adapt gradually towards the accumulating ethanol, likely by modifying the cellular membrane composition to enhance stability under the increased concentrations of ethanol. This is accomplished by *C. thermocellum* diverting resources towards the pentose phosphate pathway. In addition, valine, leucine and isoleucine producing enzymes changed significantly over time, suggesting a possible diversion of PEP/pyruvate towards amino acid biosynthesis. Furthermore, intermediates generated from the degradation pathway of these amino acids are the precursor for the synthesis of branched fatty acids. In total, the integrated omics analyses indicate that *C. thermocellum* adapts to the gradual increase of ethanol and other stresses by reconstructing the cell membrane by synthesizing branched fatty acids and diverting the PEP/pyruvate flux towards valine, leucine or isoleucine biosynthesis.

**Keywords:** Biofuel, Membrane remodelling

## Biosketch: Dr. Yuba Raj Pokharel

**Yuba Raj Pokharel** is Associate Professor at Cancer Biology Laboratory, Faculty of Life Science and Biotechnology, South Asian University, New Delhi, India. He has completed his Master's degree from the Central Department of Botany, Tribhuvan University (TU), Nepal and Ph.D. degree from the College of Pharmacy, Chosun University, South Korea with a prestigious Koreans Research Fellowship. He has got BK21 fellowship for his Postdoctoral training in Chosun University, South Korea, and Finish Institute for Molecular Medicine (FIMM) Fellowship in Turku University and Abo Akademi, Turku, Finland. He teaches cell biology, cancer biology and extensively works on cancer biology research. He received SAU-Start Up fund (45K $) from Institute of South Asian Grant to study the EGFR mutation in Nepalese Lung Cancer Patients (12 L INR). Presently, he is working in Effects of UNANI medicines in Atopic Dermatitis (50 L INR), Role of PTOV1 in Exosomes Biosynthesis in Breast Cancer (55 L INR), and Research and Development of RDT kits for Measles and Rubella (3 L Dollar). Currently, two Postdoctoral fellows, two Junior Research fellows, four Ph.D. students are working under him, and three Ph.D. students already graduated from his laboratory. He has research collaboration with the Central Department of Chemistry, TU, Nepal and has published more than 55 peer-reviewed research papers and obtained one Indian Patent. He belongs to Pyuthan, Nepal.

## Role of SUPT5H Breast Cancer Tumourigenicity [OP 13 - Online]

**Bilal Ahmad Lone**, and **Yuba Raj Pokharel***

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## Abstract

Breast cancer (BrCa) is one of the most common cancers and highly heterogeneous diseases, both at the pathological and molecular level. A common element for the progression of cancer is the presence of aberrant transcription. Targeting the misregulation of transcription may serve as a tool for cancer therapeutics. SUPT5H is a highly conserved RNA polymerase II-associated transcription elongation and processivity factor. Here, we showed that SUPT5H is upregulated in breast cancer tissue as compared with the adjacent normal tissue in breast cancer patients. In human breast cancer cells, the levels of SUPT5H and PIN1 are positively correlated with each other. Our biochemical analysis showed that PIN1 interacts with SUPT5H through WW domain that promoted SUPT5H protein stability. Depletion of SUPT5H by siRNA technology reduced the tumorigenic and metastatic properties, promoted s-phase cell cycle arrest and apoptosis of MDA MB 231 cells. Moreover, depletion of SUPT5H abrogated MAPK molecules thereby regulating the oncogenic behavior of breast cancer cells. Our findings demonstrate an important role of SUPT5H in BrCa tumorigenicity by regulating the expression levels of genes that control proliferation, migration, cell cycle, and apoptosis.

**Keywords:** SUPT5H, breast cancer, apoptosis, cell proliferation

## Biosketch: Dr. Basant Giri

**Dr. Basant Giri** received BSc and MSc in chemistry from Tribhuvan University, Kathmandu, Nepal, and a second MS degree from the Oregon State University, Corvallis, USA. He completed his PhD degree from the University of Wyoming, Laramie, USA. He is a co-founder of Kathmandu Institute of Applied Sciences (KIAS) and currently works as a senior scientist and director of international relations at KIAS. He also serves as a founding chair of National Young Academy of Nepal (NaYAN). Dr. Giri's research interests include development of new measurement technologies appropriate in resource-limited settings. He has several years of teaching experience in high school, undergraduate, and graduate levels in Nepal and USA as a faculty and teaching assistant, respectively. Dr. Giri has authored/co- authored more than two dozen peer-reviewed research articles and two books in addition to giving more than 50 talks in national and international platforms. International Foundation for Science, Sweden, The World Academy of Science, Italy, and National Science Foundation, USA, National Academy of Sciences/USAID have funded his research works in Nepal. Dr. Giri has received several prestigious awards including the TWAS Atta-ur-Rahman Award in Chemistry 2020.

## Enzyme assay on paper-based analytical devices [OP 14]

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### Abstract

Paper-based analytical devices (PADs) are promising low-cost and easy to use platforms for rapid on-site analysis. They fulfil World Health Organization (WHO)'s ASSURED criteria for point of care (POC) devices. PADs have attracted increasing attention in the past decade because of their unique advantages. They are commonly made using Whatman filter or chromatography paper or nitrocellulose paper. Common signal detection methods for PADs assays involve colorimetric reaction. Smartphone image acquisition and apps are used for signal reading, analysis, and reporting of results. The PADs platforms have been shown to be applicable in biomedical & clinical diagnostics, environmental analysis, food and water quality screening and many others. Enzymes assays have been widely employed in PADs methods for the determination of important target analytes such as creatinine, glucose, cancer biomarkers, human hormones, pesticides, food quality markers etc. In this presentation, I will provide a brief overview of enzyme essays on PADs with examples. In addition, enzyme assays on PADs developed in our lab for the determination of pesticides and milk quality will be explained. One of challenges of enzyme assays on PADs is the long-term storage of enzymes on the paper substrate at ambient environmental conditions which is essential in POC testing. To address the stability issue, we have developed a sandwich model to retain the activity of enzyme on paper substrate at ambient condition. I will conclude my talk with this sandwich model that helped us retain more than 80% enzyme activity for four months.

**Keywords:** Enzyme assay, Paper-based analytical devices (PADs), Point-of-care

## Biosketch: Dr. Anaya Pokhrel

**Anaya Pokhrel** is working as a Postdoctoral Research Associate at Schmidt-Dannert lab in the University of Minnesota (Twin-cities). He received his M.S. from the Kathmandu University (Nepal) and his Ph.D. from the Institute of Biomolecule Reconstruction Lab at Sun Moon University (Korea). His research background is in metabolic engineering of natural products biosynthetic pathways. His recent work uses the tools of synthetic biology and protein engineering to develop protein-based nano-materials useful for different biomanufacturing applications including the fabrication of functional biomaterials.

## EutM Shell Protein as Building Blocks for Multifunctional Biomaterials [OP 15]

**Anaya Pokhrel**, Sun-Young Kang, Sara Bratsch, Claudia Schmidt-Dannert*
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### Abstract

Bacterial microcompartments (BMCs) are protein-based organelles that encapsulate diverse metabolic pathways inside semipermeable, icosahedral or pseudo icosahedral shells. BMC shell is composed modular self-assembling proteins, which are valuable targets for bioengineering. EutM shell protein serves as one of the major building block for Ethanolamine utilization BMC. EutM assemble as flat hexamers and purified recombinant EutM self-assemble to form 2D-scaffolds. EutM is highly amenable to engineering and tolerate the fusion of diverse N-terminal and C-terminal peptide tags and domains while still self-assembling into robust scaffolds. The EutM shell protein can therefore serve as excellent platform building blocks for the design of diverse functional protein-based nanomaterials. In one recent application, we took advantage of the engineerability and self-assembling properties of this protein for the design of an extracellular protein matrix for the fabrication of a living biocomposite material capable of self-fabrication and regeneration. As a living component of the material, we engineered *Bacillus subtilis* to secrete self-assembling EutM scaffolds for functionalization, and cross-linking of cells. *B. subtilis* was engineered to display SpyTags on polar flagella for cell attachment to SpyCatcher modified secreted EutM scaffolds. A silica biomineralization peptide was genetically fused to EutM to form a silica material with enhanced mechanical properties. We showed that the resulting engineered living material (ELM) can be regenerated from small piece of the cell containing biocomposite material and that new functions can be readily incorporated by co-cultivation of different engineered *B. subtilis* strains. Our work serves as a framework for the future design of more resilient autonomous self-fabricating ELMs. Applications and prospects for EutM engineering in vitro and in vivo for synthetic biology and biotechnology will be discussed.

**Keywords:** Bacterial microcompartment, EutM shell protein, self-assembly, Engineered Living Material

# Session IV

## WATER, WILDLIFE AND ENVIRONMENT

**Abstract Book**
**ICBB - 2022**

## Biosketch: Dr. Sanjeeb Mohapatra

**Dr. Sanjeeb Mohapatra**, after finishing his Ph.D. degree at Environmental Science and Engineering Department, IIT Bombay, India, joined the National University of Singapore. Dr. Mohapatra is pursuing his research at Energy and Environmental Sustainability for Megacities (E2S2), Singapore, a major collaboration between the National University of Singapore and Shanghai Jiao Tong University (SJTU), China. His research interest broadly covers the detection, monitoring, and fate of emerging contaminants (ECs), photo-degradation and enzymatic degradation of ECs, and the role of dissolved organic matter in deciding the fate of such contaminants. He is a recipient of the Water Advanced Research Innovation (WARI) Fellowship awarded by the Department of Science and Technology (DST) and Indo-U.S. Science and Technology Forum (IUSSTF). He is also a recipient Newton-Bhabha Fellowship jointly awarded by DST, India, and British Council, U.K. Dr. Mohapatra also won several international and local awards for his research work for the last couple of years and has many publications in reputed journals, book chapters, and refereed conferences to his credit.

## Analysis of Disinfectants and other Emerging Contaminants during Covid19 Pandemic [OP 16 - Online]

**Sanjeeb Mohapatra**
National University of Singapore, Singapore
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### Abstract

Disinfectants and other pharmaceuticals such as antibiotics and NSAIDs are of emerging concern due to their rapid use during this pandemic. While disinfectants are widely used to clean contaminated surface areas in hospitals, houses, and other institutional buildings, antibiotics and NSAIDs have been used to treat secondary infections caused by bacteria and inflammation, respectively. Inadequate removal at the wastewater treatment plants (WWTPs) further increases their concentration in the environment, leading to antimicrobial resistance and toxicity to aquatic organisms. Additionally, the trauma associated with the pandemic has forced many people, especially students, to undergo depression. Thus, it is crucial to understand various emerging contaminants' occurrence patterns and monitor university campus resident health through wastewater-based epidemiology.

**Keywords:** Disinfectants, Antibiotics, Wastewater

## Biosketch: Dr. Dibesh Karmacharya

**Dr. Dibesh Karmacharya** has a Conservation Biology degree from Wayne State College, USA and a PhD on Conservation and Microbiome Genetics from Griffith University, Australia. He worked extensively in the US for Caliper Lifesciences in New Jersey as a research scientist (transgenic animal models). He promoted Genomics and Proteomics technology platforms for GE Healthcare Lifesciences in the US and Canada. He founded the Center for Molecular Dynamics Nepal (CMDN), a wildlife genetics and clinical epidemiology research center and is the Chairman and Executive Director of the Organization. He also founded Intrepid Nepal Pvt. Ltd.-a molecular diagnostics-based Biotechnology Company, and Intrepid Cancer Diagnostics-a leading cancer diagnostic laboratory. He leads several innovative researches in Nepal including building Nepal's first genetic database of wild tigers through Nepal Tiger Genome Project. He is the Principal Investigator of PREDICT Nepal project-an emerging pandemic threat project. He also founded BIOVAC Nepal Pvt. Ltd. - a vaccine research, development and manufacturing company. He specializes in One Health and Conservation Genetics.

## Overview on genetics and genomics based research on global health and environmental (biodiversity) studies in Nepal- from Tiger genetics, Aquatic eDNA to emerging diseases [OP 17]

**Dibesh Karmacharya**

Center for Molecular Dynamics-Nepal and its consortium of research institutions.

**Correspondence:** dibesh@cmdn.org

### Abstract:

I will be highlighting our effort in understanding biodiversity and ecological pyramid to disease dynamics with the use of biotechnology tools- including genomics in Nepal. Nepal Tiger Genome Project, Nepal Fish Biodiversity Project and PREDICT- Emerging Disease Research project will be showcased to demonstrate a wide range of cutting edge research done in Nepal in collaboration with some of the leading global institutions.

**Keywords:** Tiger Genome, PREDICT.

## Biosketch: Dr. Anusa Thapa

**Anusa Thapa** did her doctoral studies in Biochemistry from the University of Virginia. She was an undergraduate research fellow in Mayo Clinic, Immunology department. She worked in Biovac Nepal Pvt Ltd, a startup vaccine research and development company. She is currently working at Phutung Research Institute in the Metalens project to develop a handheld fluorometer to detect Tryptophan-like Fluorescence (TLF) in drinking water.

## Tryptophan-like fluorescence (TLF) for real-time detection in drinking and environmental water samples in Nepal [OP 18]

**Anusa Thapa**[1]*, Suvechhya Bastola[1, 2], Shishir Gautam[1], Sanket Bohara[1], Prashant Waiba[1], Prajwal Rajbhandari[2], Thomas Krauss[3], Ashim Dhakal[3]

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[2] Research Institute for Bioscience and Biotechnology (RIBB), Kathmandu, Nepal

[3]University of York, UK

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### Abstract

A real-time detection method that is portable and cost-effective for the detection of fecal contamination in drinking water has been in demand, especially in developing countries. For 150 water samples in Nepal from various sources, a Spearman's correlation of ρ = 0.69 was found between the Tryptophan-like fluorescence (TLF) and the number of colony forming units (CFU) of Thermotolerant Coliforms (TTC), which is considered to be statistically significant. A clear distinction in TLF between an absence (low risk) and presence (intermediate risk) of TTC was found when total data were averaged, but could not differentiate between the other WHO risk categories. A sensitivity of 97% to impurities above 1 ppb of TLF signal was found, whereas a specificity of 43% to TTC above 1 ppb was found. Preliminary data show that the sample measurements from our portable device, using a new flat-lens based technology, has a similar performance as that of a high-end fluorometer setup.

**Keywords:** Water contamination, Fluorometer, TLF, TTC, Low-cost technology

## Biosketch: Mr. Ashish Bashyal


**Ashish Bashyal** is a co-founder of Biodiversity Conservancy Nepal (Biocon)—a non-profit research institute dedicated to wildlife conservation in Nepal. He works as a Chief Conservation Scientist at the Endangered Species Research Unit of Biocon. He has a B.Sc. in Environment Science from the Kathmandu University and M.Sc. in Zoology from the Texas Tech University.

Ashish is broadly interested in application of genetic and ecological tools for the conservation of globally threatened yet often neglected wildlife. He has worked in the USA, Panama and Nepal in collaboration with Smithsonian Tropical Research Institute, Texas Tech University, Zoological Society of London and National Geographic Society. Currently, he is working on conservation of gharial, mugger crocodile, Indian and Chinese pangolins. Ashish is a recipient of conservation grants and fellowships from 10 internationally renowned conservation organizations and zoos. He has published over a dozen peer-reviewed research articles. He is also a National Geographic explorer and a member of the IUCN Crocodile Specialist Group.

## Population and habitat ecology of one of the world's rarest crocodilian –gharial (*Gavialis gangeticus*) in Bardia National Park, Nepal [OP 19]

**Ashish Bashyal**[1]*, Sandeep Shrestha[2]

[1] Biodiversity Conservancy Nepal, Manigram, Rupandehi-32903, Nepal
[2] Kathmandu University, Dhulikhel, Kavreplanchok, Nepal

* **Correspondence:** bashyal.ashish@gmail.com

### Abstract

Gharial (*Gavialis gangeticus*) is a Critically Endangered species of crocodilian endemic to Indian sub-continent. There are less than 700 mature wild gharials currently distributed just in 14 widely spaced locations in Nepal and India. In Nepal, gharials occur in the Chitwan National Park (CNP) and the Bardia National Park (BNP). Gharials are relatively well-studied in the CNP but there is scant information on gharials in the BNP. The main purpose of this project is to generate new and relevant information on the status of population, habitat and breeding of gharials in BNP, to substantially contribute in their long-term conservation. To achieve our purpose, we conducted multiple surveys in breeding, nesting and hatching seasons of gharials in 46 km protected stretch of the Babai River in BNP between 2019 and 2021. We counted a total of 14 gharials distributed across four localities in both 2020 & 2021. The male to female sex ratio was roughly 1:5. We located two breeding groups one each in Soth Khola (2–3 individuals) and Dhanuse (5–6 individuals). In March 2020 & 2021, we observed abundant signs of nesting in Dhanuse including 5–7 trial nests. We found three gharials nests and approximately 100 hatchlings in Dhanuse in June 2019 which was the first record of gharial nesting and reproduction in the Babai River within BNP since 1982. However, we did not find any sign of hatching in June 2020 & 2021 since nesting areas were flooded probably before the eggs hatched. More than 80% of available habitat in 46 km stretch of the Babai was rocky with sand bank comprising less than 10%. Nonetheless, gharials preferred sandy banks for basking. We also identified seven sites as potential nesting areas of gharials. We established baseline data for gharial population and documented that resident gharials are breeding in the Babai River in BNP. The conservation of this Babai population is crucial for the survival of gharial in BNP.

**Keywords:** *Gavialis gangeticus*, Nepal

## Biosketch: Dr. Tista Prasai Joshi

**Dr. Tista Prasai Joshi** is a scientist at the Nepal Academy of Science and Technology (NAST). She has consistently worked in NAST for the last 18 years with a key focus on drinking water quality research. She received an M.Sc. degree in Environmental Microbiology and an M.A. degree in Anthropology in the years 2001 and 2005, respectively from Tribhuvan University, and a Ph. D. degree in Environmental Engineering in 2017 from the University of Chinese Academy of Sciences (UCAS). Her research work associated with water quality and treatment has appeared in many leading journals, such as Water Research, Chemical Engineering Journal, Journal of Hazardous Materials, Science of the Total Environment, and so on. She has registered a patent in China and also writes several science awareness articles in her native language. She has presented her work at many national and international conferences. She mentors the research work of the post-graduate students and delivers guest lectures at university colleges in her field of expertise. She also facilitates and mentors the master and Ph.D. level research works in particular water-related projects. She is an editorial board member of various national and international journals. Except for academic research, she is active in the community, governmental, and industrial consulting activities. She has been awarded the OWSD-Elsevier Foundation award in Biological Sciences from the Asia Pacific region 2019, UNESCO-OWSD early career fellowship 2019 and UCAS Excellent International Student award, 2017.

## Adsorptive and oxidative transformation of para arsanilic acid on manganese oxide at its structural level [OP 20]

**Tista Prasai Joshi**
Environment and Climate Study Laboratory, Faculty of Science
Nepal Academy of Science and Technology (NAST), Khumaltar, Lalitpur, Nepal
**Correspondence:** tistaprasai@gmail.com

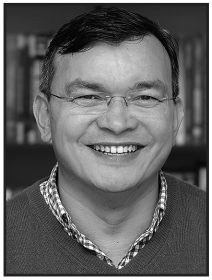
### Abstract

Para arsanilic acid (p-ASA) has been extensively used as feed additives in the poultry and pork industries for promoting growth rate and feed efficiency. Most of the organoarsenic compounds are excreted chemically unchanged in the manure, which is commonly applied in agricultural applications, then enter the environment through the litter. Upon entering environments, p-ASA tends to transform into more mobile toxic inorganic arsenic by microbial activities, which can inadvertently spread toxic inorganic arsenic through the environment to surface and groundwater sources. Thus, it is more essential to remove aromatic organoarsenic compounds from the manure to control organoarsenic transformation into the environment. The objectives of this study were to investigate the adsorptive and oxidative behavior of manganese oxide (MnO2) for the removal of p-ASA at its structural level under different pH conditions. The structural properties of MnO2 were characterized by X-ray diffraction patterns (XRD), nitrogen adsorption (SBET), zeta (ζ-) potential, and scanning electron microscopy (SEM). The process of p-ASA transformation works in detail on the surface of MnO2 was investigated by comparing it with phenylarsonic acid (PA) and aniline, which have similar chemical configurations, which could provide an in-depth mechanistic understanding of p-ASA transformation pathways. Combining the results of inductively coupled plasma optical emission spectroscopy (ICP-OES), high-performance liquid chromatography (HPLC), ultra-high performance liquid chromatography inductively coupled plasma mass spectroscopy (UPLC-ICP-MS), Ultra-performance liquid chromatography-Quadrupole-time-of-flight-mass spectrometry (UPLC-Q-TOF-MS), UV-Vis spectrophotometer (UV-vis spectra), Fourier transform infrared (FTIR) spectra, and X-ray photoelectron spectroscopy (XPS) were employed in order to identify the adsorption and oxidation products. The formation of new oxidation products was confirmed and recognized as a major functional group of protonated amines, which was a crucial species in the transformation pathway. The increased oxidation of p-ASA on MnO2 was observed as major products including arsenate, benzoquinone, and azophenylarsonic acid, which

provided new insights into the oxidation. Identification of the products provided further insights into the oxidation of p-ASA on MnO2.

**Keywords:** Para arsanilic acid, Feed additives.

## Biosketch: Dr. Uttam Babu Shrestha



**Uttam Babu Shrestha**, PhD is the founding director of the Global Institute for Interdisciplinary Studies (GIIS), Nepal. He has completed a PhD in Environmental Science from the University of Massachusetts Boston, USA and has two masters' degrees, one in Geographic Information Technology from Northeastern University, USA and the other in Botany from Tribhuvan University, Nepal. He has more than 10 years of experience in teaching, research, student supervision and project management. He has worked at Tribhuvan University, Nepal, Technical University of Munich, Germany, University of Maine and Harvard University, USA and University of Southern Queensland, Australia.

He was a recipient of the Outstanding Graduate Student Award for his PhD at the University of Massachusetts Boston in 2014 and the Graduate Academic Excellence Award for his Master's degree at the Northeastern University in 2008. He also received PLoS One Early Career Travel Award from the Public Library of Science, USA. In 2021, he was bestowed with the National Science Award 2020 by the National Academy of Science and Technology (NAST), Nepal. Dr. Shrestha has published more than 65 peer-reviewed papers including in prestigious journals like Science, Nature, PNAS, one book, three book chapters, and several articles in the popular press. He has received competitive grants from USAID, National Geographic Society, Australian Government, Norwegian Environment Agency, Rufford Foundation, National Academy of Science and Technology (NAST), University Grant Commission (UGC), Nepal. His research interests are climate change and its impact on ecosystems and species, biodiversity conservation, land-use change, and human use of natural resources.

He was a member (2015-2020) of the Global Young Academy—a global organization of young scientists around the world where he co-leaded a working group—Science Diplomacy in South Asia. He is a fellow for the global

assessments of Biodiversity at the Intergovernmental Panel for Biodiversity and Ecosystem Services (IPBES) from 2016-2019 and lead author for the assessments of sustainable use of wild species at IPBES from 2018-2021. He is a fortnightly columnist for Kantipur daily–the most widely circulated daily newspaper in Nepal. He is an avid traveller and an enthusiast photographer. His photos have won several national and international awards.

## Moving Beyond Disciplinary Silos: Experience of Conducting Interdisciplinary research in Nepal [OP 21]

**Uttam Babu Shrestha**
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### Abstract:

Interdisciplinary research is a mode of research that combines data, information, tools, techniques, concepts and theories from more than one research disciplines to find solutions of a problem that cannot be solved by a single discipline. Addressing current day development challenges of Nepal such as poverty, environmental degradation, social and economic marginalization, depletion of natural resources to climate change and public health is beyond a scope of single discipline requires interdisciplinary perspectives. The presentation mainly focuses on the importance and need of interdisciplinary thinking in Nepal. It brings theoretical and practical cases of interdisciplinary research that has been conducted in Nepal and elsewhere. With a learning experience of Global Institute for Interdisciplinary Studies, it also highlights opportunities and challenging doing interdisciplinary research atmosphere in Nepal. At the end, it will emphasize how interdisciplinary research can be fostered in Nepalese context.

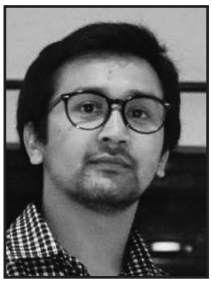
**Keywords:** Interdisciplinary research, Nepal

# Session V

## GRADUATE STUDENT TALK

## Abstract Book
## ICBB - 2022

## Biosketch: Mr. Sishir Gautam



**Sishir Gautam** is a part of Biophotonics department at Phutung Research Institute (PRI), Nepal. He has been working for 2 years in developing a fluorometer for assessing water quality. He received his Bachelor's degree in Biotechnology from SANN International College, Purbanchal University in 2015 with a research component focused on studying APO E gene polymorphism. He earned his Master's degree in Biotechnology from Central Department of Biotechnology, Tribhuvan University. He received a University Grant Commission (UGC) master research grant for studying immune response against dengue virus during the 2019 dengue outbreak in Nepal.

## Cytokine Profiling in the Dengue Infection during the 2019 Outbreak

**[OP 22]**

**Sishir Gautam***, Ramanuj Rauniyar, Krishna Das Manandhar

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### Abstract

Dengue is the most common mosquito-borne flaviviral infection in the world today. Although the clinical manifestations of dengue infection have already been described, the immunopathogenesis of these diseases is still not completely understood. A hypothesis put forward for severe dengue is the cytokine storm, a sudden increase in cytokines that induces vascular permeability. This study was conducted to explore the expression of pro- and anti-inflammatory cytokines and how they relate to clinical dengue manifestations. The serum levels of six cytokines, namely interleukin (IL)-1β, IL-6, IL-8, IL-10, IL-12p70 and TNF were measured by using Cytometric Bead Array (BD Bioscience, USA) with the support of the FACS Calibur-E3318 Flow Cytometer System in 29 dengue infected patient in 2019 dengue outbreak. The results showed that the DV-infected patients had significant elevated serum levels of IL-6 and IL-10 during acute phase as compared to the convalescent phase ($p<0.05$), while serum levels of IL-1beta, IL-10, IL-12p70 and TNF were found to be significantly increased in the patient with hemorrhagic manifestations. In conclusion, IL-6 which was significantly increased in the acute fever could be targeted for the therapeutic purpose. IL-1β, IL-12p70 and TNF were found to be associated with dengue severity, although their role in the severe dengue pathogenesis remains unclear. Additional studies are required to shed further light on the function of these cytokines in severe dengue.

**Keywords:** Dengue virus, Immunopathogenesis, Cytokine, Flow Cytometry

## Biosketch: Ms. Jenny Shah

**Jenny Shah** is currently a master's thesis student at Department of Applied Microbiology and Food Technology, Research Institute for Bioscience and Biotechnology (RIBB). She completed her BSc. in Microbiology from Trichandra College, Tribhuvan University in the year 2017. Her research is mostly focused on microbiology and molecular biology aspect of antimicrobial resistance (AMR) which was funded by International Foundation of Science (IFS), Sweden in the year 2019.

# Antibiotic Resistance Surveillance and Molecular Characterization of ESBL and Carbapenemase Genes Present in Bacteria Isolated from Fruits and Vegetables Sold in Kathmandu. [OP 23]

**Jenny Shah**[1,2], Ashish Bhusal[1,2], Bishnu Marasini[2], Era Tuladhar[2], Mitesh Shrestha[1]*

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[2]National College, Kathmandu, Nepal

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## Abstract

Antibiotic resistance has become a global threat. Resistant bacteria can spread between individuals, animals, and the environment. Foods can serve as a vehicle for transmitting antibiotic resistant bacteria, especially the fresh fruits and vegetables which are often eaten raw can become a source for food borne illness. A total of 40 samples including fresh fruits and vegetables were collected from vendors around ten major hospitals and seven major market places in Kathmandu. Samples were transported in sterile condition to the laboratory where they were washed with MRD (Maximum Recovery Diluent) separately, followed by 3 hrs. incubation. Bacteria were then isolated by using spread plate technique in MacConkey and VRBG (violet red bile glucose) agar. Gram staining followed by different biochemical tests were performed for the preliminary identification of bacteria. Antimicrobial susceptibility test was done using twenty different antibiotic discs by disk diffusion method. Polymerase chain reaction was carried out for the detection of ESBL and Carbapenem genes. Of the 162 isolates from different samples, 60 (37%) were identified as ESBL producers and 7 (4%) were identified as carbapenemase producer. Among these, blaTEM (19), blaSHV(2), blaOXA(2), blaIMP(1) and blaNDM(1) were found. In conclusion, fresh produce and fruits could be one of the potential sources for transmission of antibiotic resistant bacterial pathogens.

**Keywords:** Antibiotic Resistance, Carbapenem Resistance, ESBL, Fruits and Vegetables.

## Biosketch: Mr. Krishna Prasad Kandel

**Mr. Krishna Prasad Kandel**, a native of Bharatpur, Chitwan, Nepal, received his Master degree in 2004 from Central Department of Chemistry, Tribhuvan University, Nepal. At present, he is working as Assistant Professor at Department of Chemistry, Birendra Multiple Campus, Bharatpur, Chitwan, Nepal. Currently, he is also a PhD scholar at Tribhuvan University and conducts research on bio-nanocomposite material. His research interests include natural fiber and nanocomposite and has three research papers to his credit.

## Material properties of lignocellulosic fiber obtained from traditional Himalayan plants [OP 24]

**Krishna Prasad Kandel**[1], Bhanu Bhakta Neupane[1]*, Girja Mani Aryal[1], Madhav Kharel[1], Shiva Pandeya[1], Mahesh Kumar Joshi[1], Bipeen Dahal[1], Bhoj Gautam[2], Menuka Adhikari[2]

[1]Central Department of Chemistry, Tribhuvan University, Kathmandu, Nepal
[2]Department of Chemistry, Physics and Materials Science, Fayetteville State University, Fayetteville, North Carolina 28301, United States
* **Correspondence**:newbhanu@gmail.com

## Abstract

In recent years composite materials, which incorporate lignocellulose fibers as one of the major components, are being explored as safer materials over traditional plastic based materials. These materials are finding wide range of applications from automobile to agro-based industries. In this research, we measured several materials properties of cellulosic fiber obtained from two traditionally important and relatively less explored Himalayan plant species *Sterculia villosa* (locally named as Mudilo or Murgilo) and *Bauhinia vahlii* (locally named as Bharlo). The cellulose content in raw *Sterculia* and *Bauhinia* fiber was found to be nearly 58% and 54%, lignin 28 and 22%, hemicellulose 29 and 32%, ash content 6 and 7%; respectively. Mechanical strength of the fiber treated under different conditions were compared. Information on the fiber morphology of the treated and untreated fibers was obtained from scanning electron microscopic (SEM) images. The existence of major chemical components in the untreated and alkali treated fibers were confirmed from Fourier Transform Infrared (FTIR) spectra. X-ray diffraction (XRD) data showed the increased crystallinity index in alkali treated samples. The water sorption behavior of *Sterculia Villosa* and *Bauhinia vahlii* fiber were also studied and sorption kinetic data were fitted with Fickian diffusion model to get information on sorption parameters such as diffusion and sorption coefficients and permeability. Water absorptivity at equilibrium in the alkali treated fiber was reduced significantly due to removal of lignin and hemicellulose. In future, applications of differently treated fiber samples in fabrication of Nano-composite membrane for water purification will be explored.

**Keywords:** Alkali treatment, Fiber morphology, Lignocellulose biomass, Nano-composite, Water absorptivity

## Biosketch: Ms. Nasla Shakya

**Nasla Shakya** is currently a research intern at the Department of Biomedicine and Translational Research, Research Institute for Bioscience and Biotechnology (RIBB), Kathmandu, Nepal. She completed her BSc. in Biotechnology from SANN Int'l College, Purbanchal University in the year 2020. Her research is primarily focused on algae, low molecular weight hydrogel, and peptide-based hydrogel

## Utilization of Fmoc-3f-Phe Hydrogel for Encapsulation of *Zanthoxylum armatum* and *Cinnamomum camphora* Oil for Enhancing Their Antibacterial Activity [OP 25]

**Nasla Shakya**[1], Santosh B.C[2], Susan Joshi[2], Annada Rajbhandary[1]*

[1]Research Institute for Bioscience and Biotechnology, Kathmandu, Nepal
[2]Tri Chandra Campus, Durbar Marga, Kathmandu, Nepal, Tri Chandra Campus, Durbar Marga, Kathmandu, Nepal
* **Correspondence:** annada_raj@hotmail.com

### Abstract

While essential oils have many applications in medicine and ayurvedic sciences not many researches have been done in the past to address issues of active targeting, enhancing bioavailability and absorption of the oils for better applications in medical sciences. Herein, in this research, we use low molecular weight (LMW) Fmoc-3F-Phe amino acid based hydrogels to encapsulate essential oils *Zanthoxylum armatum* and *Cinnamomum camphora* to allow sustained release of the oil in bacterial cultures and further enhance its antibacterial property for solving key issues of active targeting and increasing bioavailability. In our results we found that while Zanthoxylum oil showed active antibacterial property against bacteria *E. coli, P. luteus, M. hauseri*, and *B. subtilis* at short incubation time (14hrs), the same propensity could not be maintained at longer periods of time (22 hrs) with oils showing diminished antibacterial activity. However, on using essential oil encapsulated hydrogels on to agar plate with bacterial culture via well diffusion method, we found that the antibacterial property of Zanthoxylum oil could be retained even at longer incubation time of 22 hrs. In case of the camphor oil, which failed to show any antibacterial property with only the use of the oil, possible due to its high volatile nature, the encapsulated oil in hydrogels allowed the oil to show excellent antibacterial property for *B. subtilis* and *M. hauseri*, strain. The hydrogels ability to capture the oil within its system and not allow the oil to sublime allowed, successful utilization of even highly volatile camphor oil to showcase its antibacterial property. Therefore, we were successfully able to use Fmoc-3F-Phe based hydrogels for controlled release application of essential oil to enhance the antibacterial properties of Zanthoxylum oil at longer periods of time while improving the bacterial property of camphor oil via preventing sublimation of the oil by efficient capturing of the oil in its system.

**Keywords**: Hydrogel, Fmoc-3F-Phe, essential oil, *Zanthoxylum armatum, Cinnamomum camphora*, encapsulation, well diffusion, antibacterial

## Biosketch: Mr. Adesh Baral

**Adesh Baral**, completed his undergraduate in B. Tech Biotechnology from Kathmandu University in the year 2020. He is currently working as Research Assistant at the Kathmandu Research Institute for Biological Sciences (KRIBS), where he is involved in a research project titled "Characterization of anti-HIV antibodies for their role in immune effector (neutralizing and Fc mediated) functions.

## Selection of the Optimal L-asparaginase II Against Acute Lymphoblastic Leukemia: An In Silico Approach [OP 26]

**Adesh Baral**, Ritesh Gorkhali, Amit Basnet, Shubham Koirala, Hitesh Kumar Bhattarai*
Kathmandu University, Dhulikhel, Nepal
***Correspondence**: hitesh.bhattarai@ku.edu.np

### Abstract

A periplasmic protein isolated from Escherichia coli and Erwinia species, L-asparaginase II (asnB), is frequently utilized to treat acute lymphoblastic leukemia. The enzyme L-asparaginase transforms L-asparagine to aspartic acid and ammonia. Leukemia cells need asparagine from other sources to develop, and when the enzyme depletes asparagine levels in these cells, the leukemia cells die selectively. L-asparaginase, which is sold commercially, has a number of negative side effects. The asnBs with the lowest Michaelis constant (Km; most powerful) and immunogenicity are thought to be the best. We aimed to design a strategy to screen for optimal enzymes that are better than commercially available enzymes in this work. The asnB sequence from E. coli was used to look for homologous proteins in various organisms. A phylogenetic tree with the highest probability was created. In terms of immunogenicity, the sequences that are the farthest away from *E. coli* and *Erwinia* were regarded the best candidates and were chosen for further processing. Homology modeling was used to construct the structures of these proteins, and asparagine was docked with them to compute the binding energy. *Streptomyces griseus, Streptomyces venezuelae*, and *Streptomyces collinus* asnBs had the highest binding energy (–5.3 kcal/mol, –5.2 kcal/mol, and –5.3 kcal/mol, respectively; higher than E. coli and Erwinia asnBs) and were predicted to have the lowest Kms because binding energy and Km have an inverse relationship. This technique may be used to predict the most optimum enzymes when the substrate is known and the structure of one of the homologs is solved, in addition to predicting the most optimal asparaginase. We developed an in-silico method for predicting enzyme kinetics from an enzyme sequence and screening for alternative asnBs that are more effective against acute lymphoblastic leukemia.

**Keywords:** L-asparaginase, Enzyme kinetics, Docking, Acute Lymphoblastic Leukemia.

# START-UP SESSION

## Abstract Book
## ICBB - 2022

**Mr. Gyanu Raj Pandey,**
**Shubham Biotech Nepal, Nepal** **[GS-04]**
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**Gyanu Raj Pandey** is the Founder & Chief Executive Officer of Shubham Biotech Nepal (SBN) Pvt. Ltd. and Chief Technology Officer at Mycelia Nepal Pvt. Ltd. Gyanu Raj completed his B. Tech in Biotechnology from Kathmandu University, Nepal in 2016. His research is focus on fermentation and biomass technology. He is working to diversify bio-based products through SBN and Mycelia Nepal. He has also been working to establish a culture collection of microbes and mushrooms with industrial, environmental and agricultural applications at SBN. SBN has now collection of more than 1000 microbes (yeast, bacteria, molds, mushrooms and algae) with potential to develop different bio-based products. From their existing microbial collection, SBN is working to establish a Yeast manufacturing unit here in Nepal using the native strain of yeast. SBN is also working in Plant Tissue Culture, Mushroom Spawn production, Essential Oil production and Bio-pesticides production. He along with the team has also established the facilities to provide gene sequencing and data analysis services.

His interest to explore mushroom biotechnology started during 2019 and is producing spawn of different mushroom varieties. He along with the team has also developed technology to produce mushroom based ecofriendly materials. He is now working with Mycelia Nepal in collaboration with SBN to establish a high-tech mushroom farm to produce organic mushrooms round the year. He has planned to introduce new varieties of mushroom at commercial level to existing mushroom market.

**Ms. Binita Pokhrel**
**Pure Joy, Nepal** **[GS-05]**
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## Biography

**Binita Pokhrel**, Cofounder and Managing Director at Pure Joy Pvt. Ltd. and Founder at Prashrit Agro Pvt Ltd, is a researcher and entrepreneur. She earned her B.Tech in Biotechnology degree and MS by Research at Kathmandu University. Pure Joy is a company based on research and industrial production of wine with fruits from Nepal. Founded with objectives to connect agriculture, hospitality and product formation, Purejoy is one of the leading companies in Nepal that produces wine using locally grown fruits for raw materials. Ms. Pokhrel also co-owns Bherikhola Dalechuk Prasodhan Kendra, a Jumla based company that works basically on processing and product formation from Seabuckthorn plants.

**Mr. Prasodhan Niraula**

**Apex Biotech, Nepal** **[GS-06]**

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## Biography

**Prasodhan Niraula** is the Founder and CEO at Apex Biotech and Agro Forestry Research Center Pvt. Ltd, Khudunabari, Jhapa. He has received his Bachelor's degree in Microbiology from Tribhuwan University (TU), and his M.Tech. degree in Biotechnology from Kathmandu University (KU). He worked as a MS Research thesis student at Research Institute of Bioscience and Biotechnology (RIBB), project funded by The World Academy of Sciences (TWAS), Italy. He has three international and one national peer reviewed publication in the field of medicinal plants and has presented his research work in a number of conference and seminar in Nepal. He was also awarded as the "Young Scientist Award" at Young Scientist Summit 2016 (YSS) held on June 4 and 5, 2016 at Kathmandu, Nepal. In addition to this, he was a faculty member in Department of Biotechnology at Kantipur Valley College (KVC) and Asian Institute of Technology and management (AITM) delivering lecture on Bioinformatics and Enzymology, assisting and supervising course work laboratory. Besides that, Mr. Niraula has worked as a Research Officer in National Ayurveda Research and Training Center (NARTC), Kirtipur from August 2016 – July 2019. Currently, he is engaged in producing virus free banana saplings and Pre-Basic Seed (PBS) of potato along with the production of mushroom spawn and biopesticides.

**Mr. Ravi Bhandari**
**Fermentica, Nepal** **[GS-07]**
**Co-founder, Sales & Marketing Manager**
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**Mr. Ravi Bhandari** is Co-founder and heads Sales and Marketing department in the company. He has earned biotechnology degree from Kathmandu University in the year 2007.

**Dr. Prativa Pandey**
**Herveda Botanicals, Nepal** **[GS-08]**
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**Dr. Prativa Pandey**, Founder/CEO of Catalyst Technology and Herveda Botanicals, is a researcher and a science entrepreneur. Her research is focused on the value addition of Medicinal and Aromatic Plants of Nepal. She is a Principal Investigator at the Research Institute for Bioscience and Biotechnology (RIBB) and a visiting faculty at RECAST, TU. She completed her Ph.D. in Organic Chemistry from Northwestern University in 2013 and Management Certificate from the Kellogg School of Management. She returned to Nepal in 2015, after a decade of research and industrial experience in the US and Singapore. She has published several research reports, articles, and holds three US patents. She is a member of the STI Policy Implementation and Promotion Council at the Ministry of Education, Science and Technology and lead formulation of R&D and Innovation implementation plan as a coordinator. She serves as an executive board member of various organizations related to innovation, leadership and entrepreneurship, as an STI expert. She also co-founded two platforms for women and young scientists, Women Scientists Forum Nepal (WSFN) and Young Scientists Forum Nepal (YSFN), in initiation of Nepal Academy of Science and Technology (NAST). She received prestigious UNESCO-OWSD Early Career Fellowship 2019 and NAST-NABIL Science and Technology Award 2019 in recognition of her leadership and excellence in STEM.

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# POSTER PRESENTATION

## Abstract Book
## ICBB - 2022

## Nanophotonic wave guide integrated evanescent upconversion spectroscopy for biomedical applications [PP 01]

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### Abstract

We explore an on-chip SiN-on-insulator (SiNOI) device for enhanced evanescent spectroscopy for biochemical sensing applications. The device design consists of a single mode propagating nano-photonic waveguide, optimized for operating in near-infrared (NIR) wavelengths of 800 nm, which is considered suitable for biological applications because of the low fluorescence originating from biological molecules. Use of integrated photonics circumvents many problems faced by complex contemporary optical sensing systems, such as issues with beam alignment, coupling losses, form-factor, etc., thereby making it a robust new method to characterize biomolecules. Here, we focus on materials that show upconversion phenomena, which have various applications in biosensing like in vivo photodynamic therapy. In nanophotonic waveguides, confinement of light in a sub-nanoscale enhances the spontaneous emission rate of particles which are in close proximity due to enhanced evanescent interaction which can be extended to the length of the waveguide there by extending the interaction volume to boost the evanescently excited signals. We also derived an analyte cross-section independent parameter called integrated luminosity Λ1D to theoretically calculate the efficiency of excitation and collection of upconverted signals in a waveguide. This enhancement of signal using nanophotonic waveguides make this technique a new and improved method to characterize nano molecules and use them in various bio-sensing applications.

**Keywords:** SiNOI, Biochemical sensing, Integrated photonics, Upconversion, Evanescent interaction, Integrated luminosity.

## Extract of *C. parqui* reduces the proliferation of triple negative breast cancer cells MDA-MB-231 in vitro. [PP 02]

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### Abstract

There has been a constant demand for targeted therapies against cancers. Most of the anticancer drugs clinically trigger cytotoxic effects through apoptosis, DNA damage, genome instability and mitotic catastrophe. Nepal's diverse ecological landscape is favorable for many medicinal herbs rich in compounds that may have anti-cancer effects. Thus, we screened selected medicinal plants of Nepal for their anticancer efficacy. Crude methanolic extract was prepared mostly from the dried leaf parts and vacuum evaporated for storage until further experiments. Qualitative phytochemical screening followed by quantitative estimation of total phenolic compounds yielded highest concentration in *Eucalyptus alba* bark extract (422.37 ±9.34 mgGAE/gm crude extract). Similarly, quantitative estimation of total flavonoid content yielded highest concentration for *Ageratina adenophora* (156.94±0.7 mgQE/gCE). Anti-inflammatory potential was assessed by DPPH free radical scanvenging activity and showed *E. alba* bark extracts had IC50 value as low as 0.046 mg/mL. Few plant extracts such as *Solanum nigrum* and *Cestrum parqui* did not show DPPH radical scavenging activity. However, when tested for anticancer potential by cell proliferation inhibition on a triple negative breast cancer (TNBC) cell line MDA-MB-231, *C. parqui* extract inhibited cell proliferation by more than 50%. While other plant extracts had null effect on cell proliferation, extracts from Tinospora cordifolia showed enhanced cell proliferation. In accordance to the cell proliferation inhibition results, C. parqui induced highest percentage of cell death via apoptosis (68.7%) at 24 hrs which upon prolonged co-incubation proceeded to necrosis. Similarly, *E. alba* leaf extract also induced apoptosis in approx. 61.7% of the cancer cell during 24hrs co-incubation which proceeded to necrosis upon prolonged co-incubation. We conclude that high flavonoid compound does not correlate with reduced cell proliferation in TNBC cells. Currently, we are investigating the active compound responsible for inducing cell death in C parqui crude extract.

**Keywords:** Phytochemicals, *Cestrum parqui*, anti-cancer, breast cancer, MDA-MB-231, MTT assay, apoptosis, Flowcytometry.

## In-vitro Insecticidal Activities of Native Bacillus thuringiensis Combinations Against the Tomato Leaf Miner, Tuta absoluta [PP 03]

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### Abstract

*Bacillus thuringiensis* (Bt) is one of the most used microbial control agents for commercially important agricultural insect pests owing to its highly efficient insecticidal property and safety in use. Cry proteins are one of the primary proteins responsible for its insecticidal properties. The purpose of this study was to analyse insecticidal activities of native Bt against common insect pests like tomato leaf miners (*Tuta absoluta*). To this end, one hundred and forty-four soil samples were collected from various parts of Nepal for Bt isolation. From these, 12 isolates were confirmed as Bt based on their colony characteristics, gram staining, endospore staining, observation of crystal proteins when stained with amido black and 16s rRNA sequencing. Crystal protein diversity was observed through SDS-PAGE. Compatibility assay was carried out to develop combinations of bacteria that would be used for insecticidal assay. In this way, four (three non-redundant and one with repeated bacteria) combinations were made, each containing four bacterial isolates. Varied results were obtained for each of the combinations for insecticidal assay, with highest (80 %) mortality being observed for Combination 1. Hence, we can conclude that the combination of different strains of Bt had synergistic effect on insect mortality, which could help us to address the rising resistance of the insects against most preferred single bacteria method.

**Keywords:** *Bacillus thuringiensis*, Cry Proteins, Tuta absoluta.

## Development of a smartphone assisted thin layer chromatographic method for the determination of veterinary doxycycline and oxytetracycline antibiotics [PP 04]

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### Abstract

Low-quality drugs are a global problem. The problem is more severe in low- and middle-income countries. In this work, we report the development of thin layer chromatography (TLC) method to determine the active pharmaceutical ingredient (API) and contaminants in doxycycline and oxytetracycline antibiotics available in the market of Kathmandu for veterinary use. We used silica coated fluorescent TLC plate for separation. Dichloromethane-methanol-water was used as a mobile phase for doxycycline and chloroform-methanol-acetone used as a mobile phase for oxytetracycline. The TLC plates were pre-sprayed with a 10% sodium edetate solution to adjust the pH. Image of TLC plate after the completion of assay was captured using a smartphone in a custom-built light box illuminated with UV light. API in the antibiotic samples were identified with a reference retention factor value. The smartphone captured image was further processed with Image-J image processing software to calculate area under the curve of each spot in the chromatogram. Both oxytetracycline and doxycycline followed a linear range of 0.125 – 1.5mg/mL on the calibration curve. The TLC methods were used to test 42 doxycycline and 7 oxytetracycline samples collected from veterinary pharmacies in Kathmandu valley. Both smartphone assisted TLC methods were found to be reliable and low-cost quantitative methods for the screening of drug quality. Our next step in this work is to develop a smartphone app to perform the data reading, analysis, and reporting.

**Keywords:** Drug quality, TLC, low-cost method, smartphone assisted TLC, vet drugs

## Production of sake from local variety of rice using isolated mold from local starter culture murcha [PP 05]

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### Abstract

Rice wine is alcoholic beverage made by simultaneous saccharification and fermentation by using mold and yeast. Rice (*Oryza sativa*) is staple food for half the world population. In Nepal, local starter culture (Murcha) has been used for starter culture for production of cereal based alcoholic beverage. The quality of alcoholic beverage always varies due to lack of process standardization in term of culture and process. There for an attempt was made to isolate and screen mold from the murcha collected from different districts of Nepal and used in production of rice wine. The performance of mold was tested for saccharifying capacity. Seven molds isolates from murcha were tested for saccharification by halo zone on starch media, microscopic observation, liquefication and DNS test. All the isolated molds exhibit better growth in YPD media and showed positive result of starch hydrolysis. Among all the isolates the mold isolated from murcha (Rajbiraj) showed better saccharifying capacity than other isolates. It showed 36% saccharifyimg capacity, higher than that of other isolates. The mold which have higher saccharifying capacity is used for production of rice wine. In the rice wine total volume of alcohol was found to be 8%, pH was 3.42, succinic acid was 3.9 mg/L and ester was 11.1 mg/L. The lab prepared rice wine was compared with a commercial rice wine, and found comparable with respect to alcohol content, pH, total acidity and ester content. The essential oils was determined by using GC/MS.

**Keywords:** Murcha, saccharification, fermentation, GC/MS, rice wine

# Phytochemical Assessment by GC-MS and Pharmacological Potentials: Comparative Study of *Allium hypsistum* and *Allium przewalskanium*

**[PP 06]**

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## Abstract

*Allium hypsistum* (common name-jimbu) and *Allium przewalskanium* (common name-lamboo) are popular herbs which are widely used as spice and traditional medicine in rural villages and towns in Nepal; however, chemical profiling and experimental therapeutic evidence are still unsettled. Hence, the study is focused to assess chemical constituents and selected pharmacological properties-antioxidant, antidiabetic and lipid lowering activities of ethanolic extracts of *Allium hypsistum* (EEAH) and *Allium przewalskanium* (EEAP). From GC-MS analysis, six compounds in EEAH and three compounds in EEAP were identified and some of these compounds were already illustrated with their pharmacological activities. The antioxidant activities were evaluated for total phenol content (TPC) and DPPH assay. TPC were found 172±6.53 mgGAE/100mg in EEAH and 122±5.72 in EEAH. Similarly, DPPH assay was found higher in EEAH (59.44±1.20 %RSA) than EEAP (39.53±0.43). Antidiabetic and lipid lowering abilities of both EEAH and EEAP were studied at dose 500mg/Kg body weight and compared with similar dose of reference drug (metformin) exposing to streptozotocin (STZ) induced diabetic albino mice. The fasting blood glucose level (BGL) was measured after 72hrs of STZ administration (baseline) and, at 7th day and at 14th day. The lipid profiling (total cholesterol (TC), triglycerides (TG), high density lipoprotein (HDL), low density lipoprotein (LDL) and very low-density lipoprotein (VLDL)) was estimated at 14th day from the baseline. Throughout the study, significantly decreases in BGL and improvement in lipid profile were noticed in the mice exposing the EEAH and EEAP while comparing with the control groups of mice (diabetic control and normal control). Reduction in BGL and improvement of lipid profile might indicate antidiabetic and lipid lowering potentials of EEAH and EEAP. Hence, both EEAH and EEAP were found to be promising sources for phytomedicine with the pharmacological activities.

**Keywords:** Phytochemical, antioxidant, antidiabetic, lipid lowering, *Allium hypsistum, Allium przewalskanium*

## DNA Barcoding of Coffee Varieties Grown at Coffee Development Center, Gulmi, Nepal Using ITS2 gene sequence [PP 07]

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### Abstract

The molecular identification and genetic relationship of 25 coffee samples from the Nepal Coffee Development Centre were studied using ITS-specific PCR, sequencing, followed by phylogenetic tree construction. This is the first approach to document coffee varieties cultivated in Nepal. ITS phylogeny has been successful in separating coffee species. The samples were found to be distributed into mainly three clades. Samples CDC-S48, CDC-S58, CDC-S41, and CDC-S91 fall on the same clad implying close phylogenetic relatedness. Similarly, CDC-S1, CDC-S73, and CDC-S65 can be seen closely related to the NCBI retrieved reference sequence *Coffea arabica* Cultivar Kent in the tree. Also, 14 out of 25 study sequences, namely, CDC-S88, CDC-S70, CDC-S54, CDC-S23, CDC-S75, CDC-S6, CDC-S92, CDC-S79, CDC-S85, CDC-S78, CDC-S82, CDC-S5, CDC-S36, and CDC-S4, were found clustered closely in a clad. Close to this cluster were the sequences CDC-S66, CDC-S21, and CDC-S2. And, finally, CDC-S3 was found to be close with a reference sequence with a GenBank ID MF417757.1, C. arabica isolates 3-sn, yet distant from the rest of the sample sequences. The coffee species from the destined place were speculated to be *C. arabica* until this time, which is validated by the distinct clad separation of *C. arabica* along with our sample species in the Maximum-Likelihood phylogenetic tree. Barcode was generated with detailed information in each variety.

**Keywords:** Coffee, DNA Isolation, Polymerase Chain Reaction, Intenal Transcirbed Region, Gene Sequencing, Phylogentic Tree, DNA Barcoding.

## Valorization of whey-rich dairy wastewater by microalgae cultivation [PP 08]

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### Abstract

Microalgae are highly diverse, rapidly proliferating, photosynthetic, aquatic microbes-contributing nearly half of the global oxygen production. They have inherently efficient photophysiology of utilizing inorganic/organic C, N, P and accumulating biomass rich in carbohydrate, protein, lipid, pigments, and various bioactive molecules. The abundance of bioactive compounds in microalgal biomass has gained accelerated global interest in exploring their extensive potential applications: from 3D-printing bio-ink to bulk chemicals for pharmaceutical/medicinal, food, feed, and fuels. Although industrial microalgae products are limited to a few species (*Chlorella, Spirulina, Haematococcus*, etc.) targeted for high-value products (pharma-/nutraceuticals), specific barriers in the biorefinery chain need to be addressed to expand the industry sustainability towards low-value, bulk products (feed, fuels). The microalgae-based biorefinery includes; species-strain selection, cultivation, harvesting, and processing into targeted products. The cultivation stage significantly contributes to the total cost of biorefinery. Growth medium is one of the crucial cultivation parameters that can be optimized to reduce production costs. The inorganic salts-based macronutrients (C, N, P) in standard growth medium can be replaced with cheap resources such as nutrient-loaded wastewater.

In this study, the growth of microalga *Chlorella* sp. was investigated in cheese whey compared to standard Bold's Basal Medium (BBM). The cheese whey was obtained from the local dairy farm, where it is either discarded or underutilized as a waste by-product. The optimum growth rate (based on cell counting) analogous to BBM was observed in 20% (v/v) diluted cheese whey (referred to as CW). The dry cell weights of 0.80 g/L and 0.69 g/L were obtained for CW and BBM. The growth characteristics in CW were significantly replicable in scale-up (18 L) batch cultivation. The ongoing study aims to optimize nutrient recycling from waste resources using microalgae. The microalgal biomass thus obtained will be tested as a biostimulant for the growth of probiotics such as *Lactobacillus*.
**Keywords:** Biomass, Algae-Bacteria Consortium, Dairy-Waste, Nutrient-Recovery

## *Bacillus cereus* in ready-to-eat foods available in Kathmandu [PP 09]

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### Abstract

The food items that do not need to be prepared significantly except reheating or completing the cooking procedure are referred to as ready-to-eat foods. Like other food items, ready-to-eat food items can also harbor microorganisms and can cause the transmission of foodborne microorganisms into the human body, if not handled and stored properly. *Bacillus cereus* is more known to cause 'fried rice syndrome', along with different types of food poisoning caused by the emetic toxin or enterotoxin producing microorganism. The aim of this study was to assess the ready-to-eat food samples available in Kathmandu and detect if *Bacillus cereus* were present. The study period was from February 2021 to January 2022 during which the convenient sampling method was employed to collect 240 ready-to-eat food samples from different food outlets in Kathmandu. The food samples were grouped into three main categories- rice dishes (plain rice, fried rice, biryani), bakery items (pizza base, patties, and other bread items), and dairy items (cheese, cream, yogurt). The samples were processed following the standard microbiological procedures and the bacterial isolates were identified as Bacillus cereus with the help of different standard biochemical tests. Out of 240 food samples (80 each from the three categories) analyzed, 40% of the samples showed the presence of Bacillus cereus and was most prevalent in bakery items followed by rice dishes and dairy items (50%, 42.5%, and 28% of the samples tested showed the presence of Bacillus cereus respectively). One of the Bacillus cereus isolates was emetic toxin-producing type as detected from the phenotypic analysis. The contamination of Bacillus cereus ranged from 1.64 log cfu/g to 6.83 log cfu/g and 20.8% of ready-to-eat food samples were found to be potentially hazardous (>5 log cfu/g), because of the potential toxin-producing ability of the contaminant bacteria. It is therefore imperative to maintain appropriate standards during the preparation, packaging, storage, and transport and regular monitoring of ready-to-eat food items to prevent any food poisoning incidences.

**Keywords**: *Bacillus cereus*, food poisoning, contamination, ready-to-eat

## Understanding the material properties of Nepali kagaj fabricated from lignocellulose biomass of Himalayan fibrous plants [PP 10]

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### Abstract

Handmade paper making started more than two thousand years ago and supports livelihood of many people globally. Handmade Nepali paper (HNP), locally named as Nepali Kagaj, is made from fibrous biomass of Himalayan plant species such as Daphne bholua and Daphne papyracea or their combination following traditional ecofriendly method of fiber and pulp processing. A systematic study on the material properties of HNP down to sub–microscopic level, which help to understand end properties and explore novel applications, is not explored in literature. In this study, we measured several important material properties handmade paper samples collected from local paper enterprises and industries. The mean values for apparent density, grammage, brightness, opacity, tensile strength, of the ten independent paper samples ranged from 0.2–0.4 g/cm3, 50–400 g/m2, 56–67 %, 83–98 %, 30–2900 N/m; respectively. These properties suggested that HNPs are light weight papers having high to intermediate mechanical strength. Electron microscopic images revealed nicely cross-linked networks of long, and intact fiber. Also, parallel orientation of micro-fibrils were revealed in the electron microscopic images of single cellulose fiber. These features could provide strength and durability to the paper samples. We also measured concentration of major chemical components in the paper samples. Characteristic features of amorphous and crystalline and amorphous cellulose phase were identified in X–ray diffraction (XRD) data, and characteristic peaks of of hemi–cellulose, cellulose, and lignin were observed in Fourier transform infrared spectra (FTIR) of all the samples.

**Keywords**: Nepali paper, Cellulose fiber, Mechanical strength, Crystallinity Index, Pulping

## Co-circulation of *Orientia tsutsugamushi, Anaplasma, and Leptospira* bacteria among febrile patients in southern Nepal [PP 11]

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### Abstract

In Nepal, febrile illness is one of the most common reasons for seeking medical attention. However, the limited capacity of diagnostic and microbiological laboratory facilities thus results in many unreported cases of fever with unknown origin. Among the reported febrile cases, the Malaria, Dengue and Salmonella are among the top diagnosis, whereas recently the tick-borne pathogens including the Rickettsia spp. (typhus) has been attributed to a significant fraction of such diagnosis in Nepal. This study aims to utilize a polymerase chain reaction-based assay to identify the circulating tick-borne pathogens among febrile patients from South-West Nepal. This study utilized Malaria, Dengue, and Salmonella negative acute febrile patient's whole venous blood to extract, amplify and partially sequence the 47kD and 56kDa region of Orientia tsutsugamushi, groEL gene of *Anaplasma*, and rpoB gene of *Leptospira* to identify the contemporary phylogenomic of these tick-borne bacteria.

Among thirty-six febrile participants in the study, 16 were positive for O. *tsutsugamushi* 47kDa in-house PCR, however, only 2 were positive for O. tsutsugamushi 56kDa in-house PCR. Among thirty-six suspected patients for typhus, only 19/36 had a higher anti-*O. tsutsugamushi* IgM above the cut-off titre of128. Among the total febrile patients, two patients tested positive for *Anaplasmosis phagocytophilum* groEL gene PCR (2/36), whereas one of these patients was positive for *Leptospira interrogans* rpoB gene PCR. The phylogenetic analysis of the partial genome of *O. tsutsugamushi* 47kDa gene (GenBank accession: OL770337-OL770352) showed a close relation with Karp-UK strain(87.5% of the patients), as well with CRF93-Thailand strain(6.25%), and Karp-Thailand strain (6.25%). Similarly, phylogenetic analysis of *O. tsutsugamushi*56kDa gene (GenBank accession: OL770323-OL770336)showed close relation with Gilliam-Bangladesh strain(35.7% of the patients), Karp-Bangladesh strain(28.6%), Gilliam-UK strain(14.3%),Shimokoshi-Taiwan strain(14.3%), and with TA763-Vietnam strain(7.14%). We also show that the patient derived groEL gene of *Anaplasma* (GenBank accession:

OL770355 -OL770356)was closely related to D-GB-gro-8-South Korea strain (5.5% of patients), and rpoB gene of Leptospira (GenBank accession: OL770353-OL770354) was closely related to Linhai 56609-China strain(5.5% of the patients).

This study shows for the first time, that the Karp, Gilliam, and Shimokoshi strains of Orientia tsutsugamushi are circulating in southern Nepal. Additionally, this is the first study to identify the co-presence of *Anaplasma*, and *Leptospira* in the febrile symptomatic patient. Further genotype and serotype screening study for these bacteria among febrile patients is a current need so as to identify the tick-borne bacterial disease burden among Nepalese population.

**Keywords:** *Orientia tsutsugamushi, Anaplasma, Leptospira*

## Adsorption of Dimethylarsinic acid (DMA) from aqueous solution on iron aluminum-based adsorbents [PP 12]

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### Abstract

The involvement of anthropogenic activities including mining and application of pesticides in agricultural field has been a contributing factor for increasing the concentration of methylated arsenic in water sources, posing a serious threat to the environment and human health. Therefore, removal of methylated arsenic from water applying an efficient method is required. Treatment of water using adsorption technique has been mostly used being cost-effective, the release of the low amount of residues, easy operation and regeneration capability. The study was carried out with the objective of preparing an iron aluminum-based adsorbent for the adsorption of dimethylarsinic acid from an aqueous solution. The adsorbent prepared were characterized using X-Ray Diffraction (XRD), zeta potential, and particle size to determine their structural properties. The adsorption capacity of the prepared adsorbent was determined by application of adsorption kinetics, adsorption isotherm, and effect of pH which was compared with single metal oxide alumina. The XRD pattern of Fe-Al showed few crystalline peaks indicating the adsorbent to be slightly crystalline whereas alumina was amorphous in nature. The results of the adsorption isotherm showed the adsorption capacity of Fe-Al and alumina increased with the increasing concentration of DMA. The adsorption capacity of Fe-Al and alumina was found to be 2.44 mg/g and 1.33 mg/g respectively. The adsorption of DMA increased rapidly in the initial stage and slowed down with increasing time periods. Adsorption of DMA onto Fe-Al and alumina was more favorable at pH 5.0 and pH 6.0 respectively. The interaction characteristics of DMA and adsorbents were analysed by applying FTIR analysis. Fe-Al showed higher removal capacity than alumina thus Fe-Al adsorbent could be effective for the removal of DMA from aqueous solution.

**Keywords:** Methylated arsenic, Dimethylarsinic acid, adsorption, adsorbent, Fe-Al

## Low-cost Polymerase Chain Reaction (PCR) Technology for the Detection of DNA Amplicons [PP 13]

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### Abstract

We present the design of a low cost, bespoke PCR machine (Pagoda PCR) based on the openPCR concept, with a capacity of 16 samples, and a desktop interface. The console operates on a web browser through any PC connected with it, and thus the required protocols for different nucleic acid amplification tests (NAAT) can be set manually. The tested temperatures in each well of Pagoda PCR was found to be approximately ±2°C (measured with calibrated k-type thermometer Testo 925). The Pagoda PCR was tested with four different DNA samples (negative control, positive control, and two random DNA samples) for 35 cycles (3 hours), and then samples were run in agarose gel electrophoresis to quantify the amplified DNA after thermocycling. The performance of Pagoda PCR was found to correspond to commercial PCR thermocycler from Bio-Rad. Therefore, the Pagoda PCR can be a reliable alternative to high cost commercial devices in budget limited settings. This is especially useful in situations where widespread PCR testing might be critical, such as in the case of COVID-19 outbreaks, early in the pandemic.

**Keywords:** Thermocycling, openPCR, DNA, NAAT, PCR

## Degradation of potato peels using amylase and pectinase producing fungal strain for electricity generation in Electrochemical cell and byproduct analysis [PP 14]

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### Abstract

Potato peels are the mostly abundant waste in Asian household. Degradation of the waste using amylase and pectinase producing fungal strain in Microbial fuel cell (MFC) can be a sustainable and economic strategy for solid waste management and hence alternative electricity generation. A fungal strain Isolated from soil showed both amylase and pectinase activity and molecular characterization of isolated strain was done which was found similar with Aspergillus niger. Potato peel waste had pH 6.51± 0.08, Total suspended solid (TSS) 21.4±1.27%, moisture content 78.6±1.26%, ash content 11.68±7.05%, volatile suspended solid (VSS) 88.31±7.056 %, chemical oxygen demand (COD) 10.24±0.12 mg/g, reducing sugar 1.061±0.64 mg/g, ammoniacal-nitrogen 0.01±0.01 mg/g and phosphorus 0.015±0.017 mg/g. Similarly potato peels contained iron 0.167 mg/g, copper 0.007 mg/g, zinc 0.007 mg/g and manganese 0.005 mg/g but lead and nickel was not found. Microbial fuel cell was constructed using different concentration of finely pasted potato peel waste sample in anode and from which 1:10 dilution showed better result used for further operation. After that effect of different electron acceptor in catholytes, inoculum added to sample, electrode modification were observed, each experiment was done in triplicate. Open circuit voltage (OCV) generation was highest while using KMnO4 in catholyte (505±18 mV). The electrode was modified by coating of the graphite electrode with MWCNT, which was used as an anode in the OCV generation. Microbial fuel cell in fed batch was also performed by adding 10% of sample in every 24 h, and clearly improved result was obtained in this operation. Power density was determined using 100 ohm and 1000 ohm external resistors which was found 119±7 W/m3 and 42±9 W/m3 respectively. From Microbial fuel cell operation at optimized condition removal rate of COD, ammoniacal-nitogen, reducing sugar and total suspended solid were found to be 37.69%, 67.72%, 72.64% and 65.95% respectively. The Microbial fuel cell electrical performance was examined and analyzed by oxidation and reduction peaks in cyclic voltammetry (CV) technique. Sugar analysis in sample and byproduct analysis after MFC operation was done by HPLC

using suitable mobile phase and concentration of each compound was determined. Finally, this research conveys that the use of enzyme produced by fungal strain can be a novel alternative approach in bioelectricity production and is beneficial in management of solid waste also, as it does not require separate pretreatment.

**Keywords:** Potato peel waste, Microbial fuel cell (MFC), Chemical oxygen demand (COD), Multi-walled carbon nanotube (MWCNT), Total suspended solid (TSS), Cyclic voltammetry (CV), High pressure liquid chromatography (HPLC)

## Plant Extract as Natural Priming Agent for Supplementing Seed Quality Traits and Salt Stress in Primed Seeds [PP 15]

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### Abstract

Plants plays an imperative role in providing food for humans. Priming is one of the most important developments to help rapid and uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental conditions. Seed priming not only improves the speed and uniformity of germination but also stimulates various biochemical changes in the seed, which are vital in breaking dormancy, the mobilization or hydrolysis of seed reserves, enzyme activation, and the emergence of embryonic tissues. Seed is a crucial component of crop production. Seed quality has been seen as a critical factor in the development of agriculture since the beginning of time, and proof of this can be found in ancient Vedic literatures.

We have taken two plants Tulsi (*Ocimum tenuiflorum*) and Creeping wood sorrel (*Oxalis corniculata*) as a plant extract as a natural priming agent for supplementing seed (wheat and bean) quality trials. For Tulsi extract we use 10%, 5%, 2.5% and for creeping wood sorrel 2%, 1%, 0.5% concentration. Our research is focused on plant extract as natural priming agent for supplementing seed quality traits. The water uptake by the wheat is lower with various priming agent so that wheat has been good significance in water uptake. So the germination % of the bean is significantly good to creeping wood sorrel with various priming agent whereas, in Tulsi at 5% concentration is significantly good as compare to unprimed and distilled water. Germination percentage of wheat at 10% concentration is significantly good as compare to unprimed seeds whereas, the vitality index of wheat at 2.5% is significantly good as compare to unprimed seeds. Antioxidant assay of beans is good significance in Tulsi. In the bean the TPC, TFC is not increase with different priming seeds whereas, in the wheat TPC, TFC is increase with different priming seeds. On top of that alpha- amylase activity and total soluble sugar have good significance in both bean and wheat as compare to unprimed seeds.

**Keywords:** Priming, Seed, Plant extracts

## Bioscience in Water Quality Monitoring: A case study of Spatio-Temporal Variation in Ecological Health of Bagmati River within Kathmandu Valley [PP 16]

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### Abstract:

The Bagmati River cradle has been an indispensable part of lives in the Kathmandu Valley, providing an abundance of ecosystem services ranging from drinking water, irrigation, hydropower, cultural and religious values, to flourishing biodiversity. However, the Bagmati River has been impaired by various anthropogenic activities and other stressing factors inflicted due to the rapid population growth and haphazard urbanization. Therefore, an assessment of the river water quality, and identification of the stressors is imperative for restoration of the river. Thus, the aim of this research is to assess the present ecological status, determine the decadal changes in the river system (2008-2021) and determine the stressing factors that deteriorate the river basin. The study uses both physico-chemical parameters and benthic macroinvertebrates (BMIs) as bio-indicator and was conducted in 18 sites from the main stem Bagmati and its tributaries within the Kathmandu Valley during the dry period; January, 2021. The standard methods were used to estimate physico-chemical parameters, whereas a multi-habitat sampling procedure was adapted for the sampling of BMIs. Similarly, the ecological river water quality class (RWQC) was determined through GRS-BIOS/ASPT index which was further verified through the field screening protocol. In total, 2,881 individual BMIs belonging to 46 families and 11 orders were recorded from 18 sampling sites. High diversity of BMIs were obtained in the upstream section having a river water quality of Class I and Class II. As the river flows downstream in the semi-urban and urban areas, the diversity of BMIs were found to be declining therefore resulting in the river water quality of Class V. Two sites were categorized as RWQC I depicting unpolluted river status, whereas nine sites were categorized as RWQC V indicating an extremely polluted river condition. Redundancy Analysis (RDA) was carried out to determine the relation between macroinvertebrate assemblages and

physio-chemical parameters, which indicated dissolved oxygen, pH and ammonia as significant environmental variables influencing macroinvertebrate assemblages in the Bagmati River. Various sources of stressors responsible for the degradation of water quality of the river basin were also identified. The entire river segment, flowing from upstream headwaters to downstream urban sections, was observed to have fair to poor water quality. Consequently, all the six tributaries were found to have degraded river condition over a decade time span. The study findings provide a basis for long-term analyses and promote the use of bio-indicators for environmental monitoring, management processes and restoration strategies of the Bagmati River.

**Keywords:** Bagmati River, Bio-indicator, Benthic macroinvertebrates, Water Quality Map, River health

# Isolation, Antifungal Activity, Physiological Features and Growth Potential of Native *Trichoderma* spp. on Alternative Substrates

**[PP 17]**

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## Abstract

Biological Control Agents (BCAs) have recently gained huge traction owing to their potential for becoming a healthy and environment-friendly alternative to toxic chemical pesticides. *Trichoderma* is one of the most used BCAs owing to their global distribution and broad range of antagonism against various phytopathogens as well as plant-growth promoting activities. Owing to the geographical and climatic variability, it is useful to utilize the native local resources. To this end, we isolated six native *Trichoderma* species present in soil from Chitwan, Dhapakhel, Godawari, Phulchowki, Pokhara and Simtal. Similarly, during dual culture against two phytopathogens *Fusarium oxysporum* and *Alternaria alternata*, strain from Pokhara showed the highest antagonistic activity of 62.71 % and 55.19 % respectively. There was a gradient effect of nitrogen on *Trichoderma* growth, with higher concentration inhibiting the growth. The fungicide Carbendazim inhibited all *Trichoderma* species as well as *Fusarium oxysporum* while had limited effect on *Alternaria alternata* at all used concentrations (0.1 %, 0.15 %, and 0.2%). Similarly, the mass multiplication of *Trichoderma* sp. on various alternative liquid (Potato Dextrose Broth, 3 % Molasses, and 20 % Whey) and solid (wheat, inner flesh of sugarcane bagasse, whole sugarcane bagasse, and rice husk) substrates showed excellent growth, with the highest growth observed in 20 % whey and rice husk. Hence, we found that the isolated *Trichoderma* sp. could be grown utilizing low-cost, alternative agricultural byproducts.

**Keywords:** Alternative substrates, Biological Control Agents, *Trichoderma*

## Probing the Antibacterial Propensity of Cationic Ac-(Fkfk)2-Nh2 Peptide and Fmoc-Phe Amino Acid Based Hydrogels [PP 18]

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### Abstract

Hydrogels are networks of fibrils cross-linked together via physical or chemical bonding to form 3D structures with capability of holding high water content. These have found uses in many biomedical applications in drug delivery, wound healing and tissue engineering due to their biocompatibility, biodegradability, mechanical stability and ease of tunability. Cationic antimicrobial peptides (AMP) with several units of positive charges have already been greatly studied to assess their antibacterial properties. However, design of hydrogels with dual functionality of tissue regeneration applications as well as inherent antibacterial activity is more applicable and may be a better alternative to hydrogels used in many biomedical applications. Therefore herein we explored the use of cationic Ac-(FKFK)2-NH2 peptides, and LMW Fmoc-Phe-diaminopropane linker that can form hydrogels and may also exhibit inherent antibacterial properties. In our experiments we found that these hydrogels have significant antibacterial activity against *E.coli, K. pneumoniae, S. aureus,* and *B. subtilis*. The anionic version of LMW hydrogel (L-Fmoc-3-fluorophenyl-alanine) however, showed no death of the bacteria where in fact it actually supported bacterial growth. These results supported the hypothesis that cationic hydrogels used in our experiments possess inherent antibacterial properties and may have enhanced applications in tissue engineering than other hydrogel analogues.

**Keywords:** Self- assembly, Low molecular weight, Peptide, Fmoc-Phe, Hydrogel, Antibacterial

## Screening of Phytochemicals and Medicinal Properties of *Pterocarpus marsupium* Sawdust [PP 19]

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### Abstract

Nepal is a natural storehouse of various important medicinal plants due to its rich biodiversity, climate, and geographical variance. About 80% of the world's inhabitants rely heavily on medicinal plants and traditional practitioners for their primary health care needs since there is a scarcity of advanced medical facilities in most remote areas. In addition, over 59% of all modern drugs are of natural product origin and play a key role in drug development. A lot more medicinal plants are under the shadow due to a lack of proper government support, sufficient funds, and advanced equipment to carry out their research analysis. *Pterocarpus marsupium* is an important medicinal plant found in the far western part of Nepal. This plant has a long history of use in ayurvedic, homeopathic, and Unani systems of medicine because of its curative and palliative properties. This plant is traditionally used for the treatment of diabetes. In this study, we screened the phytochemicals and medicinal properties of Pterocarpus marsupium neglected sawdust. The sawdust sample is highly enriched with saponins, terpenoids, flavonoids, tannins, phenols, and alkaloids which was proven by preliminary phytochemical analysis. Two solvents i.e., water and ethanol (12% and 75%) were used to prepare sample extracts and then the sample was subjected to anti-oxidant, TPC, TFC, anti-diabetic, anti-inflammatory, anti-bacterial, and cytotoxicity tests, and it was found that both aqueous and ethanolic extract showed good antioxidant, anti-diabetic and anti-inflammatory activity in them. Aqueous extract involved normal, microwave-assisted, and hot water extraction in which microwave-assisted showed the best anti-oxidant results IC50 of approximately 200 µg/ml whereas both the normal and microwave-assisted extraction was able to show good anti-diabetic both with IC50 approximately 165 µg/ml and a good anti-inflammatory result at a range of 80-90%. Likewise, the sample was found to be non-toxic with LC50 <1000 µg/ml except 75% ethanol with LC50 > 1000 µg/ml. However, all the samples showed negative

antibacterial activity against 3-gram positive bacteria *Bacillus subtilis, Micrococcus, Staphylococcus aureus,* and 3-gram negative bacteria *Escherichia coli, Klebsiella, and Enterobacter* used for the antibacterial assay. In conclusion, we propose that both normal and microwave-assisted extraction are the best methods for antioxidant and anti-diabetic properties.

**Keywords:** *Pterocarpus marsupium*, Phytochemicals, Anti-oxidant, TPC, TFC, Anti-diabetic, Anti-inflammatory, IC50, LC50, Cytotoxicity

## Fluorescence Properties of Organic Contamination in Water [PP 20]

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### Abstract

Increased anthropogenic activities around water bodies have dramatically changed the loads and compositions of dissolved organic matter (DOM) in natural water sources. DOM does not pose health risk by itself but may indicate other risk factors and may also be potentially harmful in combination with other contaminations. DOM can also interfere with the disinfection processes such as chlorination, ultraviolet, and ozone sterilization. Existing methods for detecting organic contaminants require skilled manpower, infrastructure, and expensive resources. The objective of this study is to explore rapid and cheaper methods based on fluorescence properties of DOM in Water. Using a cooled fiber coupled spectrometer, we have measured fluorescence from underground water in different parts of Kathmandu valley to quantify the presence of protein and humic matter using the amplitude of fluorescence at wavelengths of 350 nm and 420 nm respectively, when excited at 260 nm. We have also observed the presence of emissions in the complete fluorescence spectra from 330 nm to 1200 nm. Results from this study demonstrate that tracking of Tryptophan-like-fluorescence (TLF) and Humic-like-fluorescence (HLF) intensity may be an appropriate warning tool for rapid and cost effective monitoring of sewage inputs to aquatic environments.

**Keywords:** Anthropogenic activities, Dissolve organic matter (DOM), Fluorescence, Tryptophan-like-fluorescence (TLF), Humic-like-fluorescence (HLF)

## Evaluation of the effectiveness of wastewater treatment plant in removing microplastics in Kathmandu, Nepal [PP 21]

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### Abstract

Microplastics (MPs) pollution in river water systems is one of the major global environmental concerns with potentially widespread ecological, socio-economic, and health implications. Wastewater treatment plants (WWTPs) are identified as an important source of MPs released into the aquatic environments. The purpose of this study is to evaluate the effectiveness of WWTPs in removing MPs before the treated water is released into the river. In this work, we optimized MPs quantification method in wastewater samples. The wastewater samples were collected from the Guheshwori Wastewater Treatment Plant located in Kathmandu representing influent, secondary aeriation tank, effluent, and sludge from digestion cake. Recovery experiments in the laboratory consisted of spiking MPs of commercial polyethylene (PE) and polyethylene terephthalate (PET) with sizes ranging from 150 µm to 500 µm into wastewater. We used zinc chloride for density separation for both types of MPs and stereomicroscopic examination for morphological identification. The recovery percentage was found to be 93.3 ± 5.7% for PET and 96.6 ± 5.7% for PE. Our preliminary results showed that the number of microplastics detected was 28 ± 5 MPs/L in influent, 10 ± 2 MPs/L in secondary aeration tank, and 9 ± 9 MPs/L in the effluent. Number of MPs in the sludge was 27 ± 1 MPs/g. Particles of different morphology such as fibers, foam, and fragment were identified in the influent, secondary aeriation tank and sludge samples.

**Keywords:** Microplastics, Wastewater

## Molecular Characterization of *Leishmania* spp. Causing Cutaneous Leishmaniasis in Nepal [PP 22]

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### Abstract

Leishmaniasis is one of the leading vector-borne disease to cause death world-wide. Nepal, was formerly endemic for the visceral leishmaniasis (VL) where fewer cases of cutaneous leishmaniasis (CL) has been reported recently. CL has been reported from most of the hilly regions of Nepal, in increasing trend all over the country. The concern right now is due to misdiagnosis of CL with other skin diseases displaying similar clinical symptoms and appearance, another is to determine the types of *Leishmania* spp. that are currently prevalent in Nepal. The aim of the present study is to molecular detection by kinetoplast DNA (kDNA) PCR and characterization of Leishmania parasite by amplifying by ITS1-PCR-RFLP, followed by sequencing.

A total 40 patients with cutaneous lesions were sampled for parasitological diagnosis using direct examination, PCR targeting two markers [kinetoplast DNA (kDNA) and internal transcribed spacer 1 (ITS-1)]. Further, the kDNA positive samples were amplified for the ITS-1 region. The amplified ITS-1 region were subjected to restriction fragment length polymorphism (RFLP) and sequencing. The data were statistically analyzed using graph pad prism.

Only 22 (55%) were found to be positive for nested PCR targeting kDNA observed bands were 720bp, 600bp for *Leishmania donovani* complex and Leishmania major respectively and 12 (30%) on ITS-1 PCR. Following, ITS1 PCR-RFLP genotyping of ITS-1 with restriction enzyme HaeIII, results in two distinct patterns that clearly distinguished *L. donovani* (50,75,180 bp) from L. major (140, 210bp). The RFLP finding was then validated by sequencing the amplified ITS1 PCR products.

This study finds that *L. donovani* and *L. major* are circulating in Nepal that caused CL. *L. donovani* which causes VL is also the causative agent for CL. As the CL is in increasing trend in Nepal. PCR based diagnostic facilities might help to prevent misdiagnose the disease.
**Keywords:** Cutaneous leishmaniasis, inetoplast DNA, nested PCR, RFLP, Sequencing.

## Genetic Polymorphisms of Genes Involved in Host Immune Response to Dengue Severity in Nepalese Population [PP 23]

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### Abstract

In dengue, an endemic country like Nepal all four serotypes(DENV1-4) of dengue virus(DENV) is found to be prevalent causing dengue fever and its severe form dengue hemorrhagic fever(DHF) and dengue shock syndrome(DSS). The severity of the disease is determined by virus serotype, host immune, and genetic status which if known, can help in early disease management. A study on the severity determining marker is being carried out in endemic areas in human samples, as there is no appropriate animal model mimicking the DHF/DSS as in humans. The individual's genetic makeup differs from place to place around the world, which might be the reason for one population being more susceptible and the other being resistant to the virus. Study is focused on the severity marker prediction which might help in the early diagnosis of severe dengue cases. Genetic Marker was detected by Single nucleotide polymorphism detection by ARMS PCR.

Statistical analysis of the clinical parameters of all the case samples was performed to classify the samples in dengue hemorrhagic(DHF) 53%, severe dengue(DS) 14%, and Dengue fever(DF)33%. Serotyping by Real-time and Nested PCR showed the co-circulation of DENV-2 in the year 2019. Single nucleotide polymorphism(SNP) of four different genes were identified using amplification refractory mutation system PCR using allele-specific primers for TNF-α (+308A/G), IFNG(+874A/T), IL-10(819C/T,1082 A/G) and FCgRIIa. CT genotype of TNF-α was observed in 60% of the case population, in the case of Interleukin-10(819 C/T,1082 A/G) CT and AG genotype was seen in most of the study population 71% and 62% respectively. For IFNG(+874A/T), AT(45%) genotype was followed by AA(40%) whereas only 15% with TT genotype was reported. In case of FCgRIIa, a heterozygote genotype AG variant was detected in all study populations. As the population size was small, the role of SNPs in severity could not be exactly predicted but the study provides future insight into predicting the role of these biomarkers in susceptibility, progression, or protection of disease.

**Keywords:** Severity markers, SNP, TNFα,IFNG, IL-10, FCgRIIa

## Mining Envelope Domain III of Dengue Virus for recombinant tetravalent DNA vaccine candidate from Nepalese samples [PP 24]

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### Abstract

Dengue is a mosquito borne infection caused by single stranded positive sense RNA flavivirus, Dengue virus (DENV), which leads to disease in human from mild dengue fever (DF) to a severe Dengue Hemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS). All four serotypes (1-4) of dengue viruses can infect human. Once infected the risk of development of severe dengue during secondary infection due to Antibody Dependent Enhancement (ADE) increases. ADE results in enhanced virus entry and greater virus replication leading to severe dengue. It is also one of the challenges in the vaccine development thus acceptance. So there is an urgent need for a dengue vaccine that induces long-lasting, protection to all four serotypes of dengue while avoiding the immune enhancement of viral infection. Envelope region has been widely studied for vaccine development. Among Domains I, II and III of envelope region, Domain III remain choice of interest due to its reduced risk of Antibody Dependent Enhancement (ADE) in dengue infection. Envelope Domain III (EDIII) of the dengue envelope protein has been implicated in receptor binding, thus EDIII region has emerged as a promising target for a vaccine candidate. Considering EDIII as candidate instead of whole envelope might address the solution to existing problems of dengue vaccine in use and it might eliminate the risk of ADE. In the present study, we aim to identify all four serotypes and amplify serotype specific EDIII region. Further we aim to fuse EDIII region of all four dengue virus serotypes to make a single recombinant tetravalent ED III dengue vaccine construct for its subsequent use as a novel vaccine candidate.

**Keywords:** Dengue, Envelope Domain III, Neutralizing Antibody, Recombinant DNA, Vaccine

## Detection of Arsenic, Lead in The Bagmati River Water and Their Removal Using Microbial Fuel Cell With Simultaneous Generation of Electricity [PP 25]

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### Abstract

Microbial Fuel Cell is a system which has ability to turn waste into energy. It is based on the electrochemical techniques that utilizes micro-organisms as catalysts to mediate direct conversion of chemical energy stored in organic matter into electrical energy via the anaerobic process. Besides that, it also has a proven ability for the removal of heavy metals through the cathodic reduction reaction, while organic substrates are oxidized and serve as the carbon and electron donor at the anode. An attempt was made to detect arsenic in the Bagmati river water. For that, the samples from three different sites: Kupondol (BM-KD1), Balkhu (BM-BK2) and Chovar (BM-CV3) were taken. The water samples had a temperature < 15oC, and pH least of 6.2(BM-KD1) and highest of 7.2(BM-CV3). The total dissolved and suspended solids were also estimated that measured the highest of 3.14 mg/LTDS and least of 0.04mg/L TSS in sample BM-KD1 and BM-BK2 respectively. Alongside the physical parameters, COD of the samples: BM-KD1, BM-BK2 and BM-CV3 measured as 770±5.01 mg/L, 461.564±31.56 mg/L and 398.630±2.869 mg/L respectively i.e. BM-KD1 had comparatively increased concentration of organic substance and thus reduced Dissolved Oxygen Concentration. The Atomic Absorption Spectrometry was used for the determination of concentration of Arsenic and Lead. This research aims to remove arsenic and lead present in the Bagmati River using microbial fuel cell system since the Bagmati water religiously is considered holy and numbers of individuals are using this water for many purposes. If present, these heavy metals can be hazardous so, an eco-friendly, green technology can be a solution to remove these heavy metals, might not completely but may be to some extent and prevent people from the toxic risks it posses with simultaneous advantage of electricity production.

**Keywords:** Microbial Fuel Cell; Arsenic, Lead Removal; Electricity generation

## Hands-on Science learning program for Schools [PP 26]

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## Abstract:

Engage Nepal with Science runs as collaboration between the University of Edinburgh (United Kingdom) and the Research Institute for Bioscience and Biotechnology (Nepal) and aims to spread the culture of engaging with science to empower, inspire and build confidence in STEM (Science-Technology-Engineering-Maths). We use gamification and 'learning-by-doing' as tools to promote engagement and sustained motivation in learning (for both students and teachers). We cover different sections of the science school curriculum and have been successfully incorporating biology, chemistry and environmental science through our school engagement programs. We have created a network of 35 schools from different parts of Nepal and Scotland, UK; with whom we have been working together to boost science engagement. Apart from our physical hands-on workshops we also have engaged our schools through online sessions amidst the current pandemic situation. We have been effectively carrying out our projects as per the requirement, whether it be physically with strict covid-protocols or online in some unavoidable situations. In the poster we highlight two programs: Meet the Microbes and Connecting the Climate Challenge both of which we were able to accomplish during the current unpredictable pandemic situation. Meet the Microbes is funded by the Society for Applied Microbiology and highlights the presence of 'bad' microorganisms that cause diseases while also discovering the importance of microorganisms for our daily lives. Connecting the Climate Challenge is supported by the British Council and aims to link schools in Nepal with schools in Scotland (UK) to share lived experiences and perform parallel environmental experiments to find solutions to tackle the climate crisis together.

**Keywords:** Students, Teachers, School, Science, STEM, Training

## Efficacy of Biological Treatments against Root-Knot Nematode (*Meloidogyne* Spp.) in Okra (*Abelmoschus Esculentus L.*) at Nawalparasi East, Nepal. [PP 27]

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### Abstract

Root-knot nematode (*Meloidogyne* spp.) is an important soil-borne pathogen affecting several vegetable crops including Okra. A pot trial was carried out in the vegetable zone, Danda, Nawalparasi East from February to June 2021 to assess the management strategy against root-knot nematode in Okra var. Arka anamika under field condition. The experiment was carried out in Randomized Complete Block Design with seven treatments replicated thrice. The treatment consisted of Neem cake, Trichoderma viride, Abamectin, Pseudomonas fluorecsens, Trichoderma viride + Spent Mushroom Substrate (SMS), A-Arya 009, and control. All the treatments showed significant results in percentage disease reduction ($p < 0.001$) compared to the control treatment. Abamectin (69.57%) was the most effective at reducing the root infection followed by neem cake (56.52%) *Pseudomonas fluorescens* (47.83%), *Trichoderma viride* + SMS (34.78%), and Trichoderma viride (34.78%) while the least reduction in disease was recorded in A-Arya 009 (17.39%). The highest yield advantage over control was recorded in Neem cake (45.45%) followed by abamectin (38.22%), Trichoderma viride + SMS (32.28%), *Pseudomonas fluorescens* (32.02), *Trichoderma viride* (31.67%), and the least yield improvement was recorded in A-Arya 009 (15.77%). A significant negative correlation ($p < 0.001$) was found between gall index and total yield implying heavy losses with the progression of root infection. The study concluded that neem cake and Abamectin as an effective biological treatment for managing root-knot nematodes and improving the yield of Okra.

**Keywords:** *Trichoderma*, SMS, *Pseudomonas*, Abamectin

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Our first employee, who exemplifies our core value of driving success very well and laid the foundations of grant writing and fund acquisition leading to the inaugural research culture of the institution. Your effort on optimizing lab protocols for bioethanol project is highly valued. Your contributions on establishment of Microbiology & Natural Product Lab at Sinamangal will always be acknowledged. – **Dr. Satish Adhikari**

An exceptional performer and an inspiration to all, who established the foundation of grant writing at RIBB. Your endeavour on optimizing lab protocols for Streptomyces project is always treasured. Your efforts on laying the foundation of Microbiology & Natural Product Lab at Sinamangal is well recognized. – **Mr. Sagar Atri**

A diligent and dedicated member of the institute whose efforts during the initial grant writing and fund acquisition era of the Institute is forever commemorated. Our Institute is forever indebted to your contributions on optimizing lab protocols for bioethanol project as well as foundation of Microbiology & Natural Product Lab at Sinamangal. – **Dr. Sanjiv Parajuli**

Being an individual with consistent positive attitude and immense vibrancy you have remarkably supported the foundations of grant writing at RIBB. Your contributions on optimizing lab protocols for Streptomyces project as well as your effort on the foundation of Microbiology & Natural Product Lab at Sinamangal will always be valued. – **Ms. Gayatri Sharma**

An incredible person, whose true commitment to the institution's advancement and your dedication to put forth the establishment of the bioethanol project will always be valued. Your effort to lay the foundation of Microbiology & Natural Product Lab at Sinamangal will forever be commemorated. – **Ms. Swechhya Pradhan**

A persevering and selfless member who exemplifies dedication. Your contribution on grant writing, fund acquisition as well as efforts as a Co-Investigator will always be appreciated. Your endeavours on optimizing lab protocols for natural preservative project along with your dedication on laying the foundation of Cell Culture & Green Chemistry Lab at Nakkhu are highly commended. – **Ms. Rojlina Manandhar**

A very charming and cheerful member of our team who laid the foundation of setting up Public Bioscience Learning Center at the institute to engage school students on science related activities. Your contribution on drafting organizational policies and administrative related work to smoothly run the institute daily activities will always be remembered. – **Ms. Suvechhya Bastola**

An amazing personality with utmost nature of cooperation, you have always been able to gain trust, admiration and respect from your colleagues. Your effort on grant writing has facilitated the institute appreciably. Your contributions on laying foundations of Green Chemistry Lab at Nakkhu and Balkumari will always be commemorated. – **Ms. Rita Majhi**

An incredible personality with distinct professionalism. Your effort on paper writing at RIBB exemplifies willingness to learn. Your contributions on laying foundations of Green Chemistry Lab at Nakkhu and Balkumari will always be commemorated. – **Ms. Rukusha Maharjan**

An amazing performer whose efforts on the grant writing, fund acquisition as well as Co-Investigator are highly admirable. Your expertise and mentorship went a long way in the establishment of plant science related projects and also led to the inauguration of the Plant Science Laboratory at Balkumari. – **Mr. Manish Baral**

A founding member of RIBB who has always excelled as a "creative head" for the institution. You contributed significantly in RIBB's every outreach programs whether it be workshops, trainings or conferences. Your efforts on the profile videos and 10th Anniversary documentary is highly appreciated. Institute is forever indebted for your support in all the ICBB editions as a media partner. – **Mr. Kshitiz Shrestha**

Inscribed in the history of the institute as the designer of RIBB's first logo, you will always be cherished for your kind contributions to various RIBB's outreach programs like workshops, training and conferences for the last 10 years. Our institute will always be grateful to you for the support as a sponsor in all the ICBB editions. – **Mr. Ramesh Parajuli**

Our institute will always be thankful to this highly motivated and inspiring individual for designing the institute's second logo. Your in kind support as creative designer to various RIBB's outreach programs workshops, training and conferences during the last 10 years is highly commendable. The amazing design and management of the ICBB logo and website is also credited to you, for which the institute will always be grateful. – **Mr. Aagat Awasthi**

An impressive personality who has always supported the institute with her spectacular interactive hosting abilities. You have time and again proved yourself as an amazing conversationalist during all the ICBB editions, RIBB's national conference and workshops as an Emcee in the last 10 years, for which the institute will always be thankful. – **Ms. Manisha Bista**

An Inspiring and motivated individual, whose efforts to support the logistics of all the ICBB editions is well recognised by the institute. Credit for the smooth running of all the RIBB's national conference and workshops goes to Mr. Bhandari. Your endless support whether it be mentally, physically or financially during hard times of RIBB establishment is well recognised and has certainly helped the institute reach its new heights. **– Mr. Ravi Bhandari**

Highly reliable and trustworthy individual who has excelled as a sole supplier of all the instruments, chemicals and consumables for the institute. Your contribution for the hassle free logistics, procurement and customs clearance to run different laboratories at the institute is highly commendable. Your support to all ICBB editions as Platinum Sponsor is always appreciated. **– Mr. Firoz Ahmad**

Your professionalism is well recognised in the hassle free management of the institute's official records and legal issues. The institute is forever grateful for the up to date and balanced accounting. **– Ms. Uma Bhattarai**

We are grateful for having a reliable partner whose logistic support has helped the institute to run various outreach programs workshops, trainings and conferences during the last 10 years. **– Mr. Deepak Thapa**

RIBB appreciates your support and effort on design, print and the logistics to organise different ICBB editions successfully. **– Mr. Parasendra Bhakta Sakha**

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