Transcriptomics in health and diseases

One week GIAN course

(6th April to 10th April 2020)

Host institute: Central University of Kerala

Overview

The advancement of genomics and next generation sequencing (NGS) technologies has revolutionised the biology and field of medicine. With the help of NGS technology we are able to ask difficult questions such as how and when genes are expressed in healthy as well as diseased cells. Scientists are addressing these questions by concentrating their efforts on measurement of RNA transcripts in entire cell. In parallel to genome, a "transcriptome" refers to whole set of RNAs in a given cell. This course will give introduction to transcriptomics methods and how they have impacted modern biology.

This course is designed, taking into consideration our prior success in running transcriptomics workshop in the UK and adapting it according to proficiencies of current students in the workshop, at Central University of Kerala**.** We will start the course with basics of transcription, leading on to explaining latest methods in studying transcription. One of the challenges of transcriptomics is that it generates huge amount of data and analysing this data is equally important for fruitful completion of the experiment. Through our tutorials we aim to give attendees opportunity to analyse the data generated from actual transcriptomics experiments. This will help them to develop deeper understanding of transcriptomics and prepare them for future applications of transcriptomics in their own work.

Teaching Faculty

Dr. Aditi Kanhere (AK): 10 hrs Lectures and 5hrs Tutorials
Dr. Smita Sudheer (SmS): 2 hrs Lectures
Dr. Tony Grace (TG): 1 hr Lecture

Modules

Day 1	
	Introduction to "Omics"
	Basics of prokaryotic gene expression regulation (part I)
	Basics of prokaryotic gene expression regulation (part II)
Day 2	
	Basics of eukaryotic gene expression regulation (part I)
	Basics of eukaryotic gene expression regulation (part II)
Day 3	
	Transcriptomics methods : Microarray
	Hands on experience: Microarray data
Day 4	
	Next Generation Sequencing technologies
	Transcriptomics methods : RNA-seq
	Applications of Transcriptomics: part I
	Applications of Transcriptomics: part II
	Applications of Transcriptomics: part III
Day 5	
	Transcriptomics methods: ChIP-seq (roughly)
	Hands on experience: RNA-seq data
	Hands on experience: ChIP-seq data
	Conclusion and Summary

Faculty

Dr. Aditi Kanhere
University of Liverpool, UK
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Dr Aditi Kanhere is a Senior Lecturer in the Institute of Translational Medicine, University of Liverpool, UK. Her lab seeks to understand the role of non-coding RNAs (ncRNAs) in epigenetic modifications and transcriptional regulations. She has many years of experience in cutting-edge genomics technologies and computational biology. During her research Dr. Kanhere has extensively used transcriptomics and other OMICs technology to discover a new class of short ncRNAs which interact with chromatin-modifying complexes (Kanhere et al. Mol. Cell 2010, Kanhere and Jenner, Silence, 2012, Barnes and Kanhere, Methods Mol. Bio, 2016, Pillay S et al. 2019, Jones et al. 2019) and provide a solution for the long-standing problem of their recruitment. In addition she has done a lot of work on understanding transcription factors and chromatin modifiers in gene regulation (Al Raawi et al. EMBO 2018, Pérez-Schindler J et al., Sci.Report, 2017, Choudhury SR et al. eLife, 2016). Dr. Kanhere has extensive experience in analyzing high-throughput data generated from RNA-seq, ChIP-seq and other next generation sequencing experiments, which has resulted in a number of publications (e.g. McClellan et al. PloS Path. 2013 Kanhere et al Nature Comm. 2012, Ramasubramanyan, Kanhere et al. J Virol. 2012,). She has conducted a number of transcriptomics analysis workshops and trained several students. She is a member of editorial board of "Dataset Papers in Science" and has reviewed research articles for journals such as PLoS biology, Journal of Virology and BMC bioinformatics. She also regularly reviews grants for major funding agencies such as BBSRC and MRC.

Dr. Tony Grace
Central University of Kerala
tonygrace99@gmail.com

Dr .Tony Grace is an Assistant Professor in the Department of Genomic Science at Central University of Kerala and held an Adjunct Assistant Professor Position in the Division of Biology at Kansas State University, Manhattan, USA. He completed his PhD in Genetics from Kansas State University, USA in addition to a PhD from IARI, New Delhi. He worked as Post-Doctoral Research Associate and Project Manager of the Bioinformatics Centre at Kansas State University, USA before he joined Central University of Kerala. He has more than 35 International and National Publications in high impact journals like Current Biology, Molecular Ecology, Microbial Ecology and obtained research grants from funding agencies including US Department of Agriculture (USDA), National Science Foundation (NSF) USA, American Philosophical Society and DBT. He has organized/moderated 8 high impact international symposiums and has received 16 International and National Awards/Honors. He has graduated 3 PhD, 7 MPhil, and more than 40 MSc students. Dr Tony also offers the most popular and highest enrolled courses in Central University of Kerala.

Course coordinator

Dr. Smita Sudheer
Central University of Kerala
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Dr. Smita Sudheer is an Assistant Professor in the Department of Genomic Science at Central University of Kerala. Her research aims to understand how cell fate decisions are taken by human and mouse Pluripotent Stem Cells either to maintain pluripotency or differentiate into a particular embryonic or extraembryonic lineage during development and disease. Having pursued her PhD and postdoctoral work at the prestigious Max Planck Institute for Molecular Genetics, Berlin, Germany, she has used a combination of molecular biology and Bioinformatics and state-of-art transcriptomic platforms (microarrays and RNA sequencing) for her research. Her work has led to the discovery of novel transcriptomic changes during bovine preimplantation development (Sudheer et al., PNAS, 2009) and the crucial role played by FGF signalling in the specification of placental derivatives (Sudheer, Stem Cells and Development, 2012) and skeletal muscle progenitors (Sudheer et al., Stem Cells, 2016, Koch et al., Developmental Cell, 2018, Sweta et al., Frontiers in Cell and Developmental Biology, 2019). She has guided several MSc. Students and currently has 4 PhD students. She is a reviewer for journals such as Stem Cells International, Stem Cells and Development, BMC Genomics, BioMed Central and Stem Cells Translational Medicine. Currently, her research is funded by DST, DBT and ICMR.

Who can attend

Students/Research Scholars at all levels (BSc, MSc, PhD) and/or faculties

Registration Fee

The participation fee (including taxes) for taking the course for different categories is as follows

- Participant from outside of India: USD 500
- Academic Institutions
  - BSc. and MSc. Students: INR 1,000
  - Ph.D. and Postdoctoral Fellows: INR 2,500
- Faculty from academia: INR 5,000
- Industry/Research Organizations: INR 10,000

The above fee includes all instructional materials, computer use for tutorials and assignments, free internet facility, lunch and tea during session breaks.

Accommodation: The participants will be provided with accommodation on payment basis, subject to availability

Registration Procedure

The registration can be done

Step 1: The payment can be made By Demand Draft: Demand Draft should be drawn in favor of "Registrar, Central University of Kerala", payable at Peiya, Kasaragod District, Kerala Or By NEFT Transfer: Registration fee can be paid through NEFT. Transfer of the amount can be done to the A/c number given below:

Name of the Beneficiary : The Registrar, Central University of Kerala
Name of Bank : Syndicate Bank
Branch Code : Periya, Kerala-671 316
Beneficiary Account No. : 42042200069750
Bank MICR Code : 671025056
Bank IFS Code : SYNB0004704

Step 2: After completing the payment of registration fee, fill the application form available **http://gian.iitkgp.ac.in/GREGN/index** to complete the registration. If payment is made through Demand Draft, send your Demand Draft to the course coordinator (also e-mail the scanned copy of the Demand Draft to sudheer@cukerala.ac.in

Registration deadline: **15th March 2020.**