

**Industrial Workshop on  
“Development and Improvement of Strains for Biomolecule  
Production”**

**Jointly organized by**



**Biotechnology Industry Research Assistance Council (BIRAC)  
DBT-ICGEB Centre for Advanced BioEnergy Research (CABeR) and  
International Centre for Genetic Engineering & Biotechnology (ICGEB)**

**Venue**

**ICGEB Campus, Aruna Asaf Ali Marg, New Delhi**

**on**

**September 8<sup>th</sup>-10<sup>th</sup>, 2016**

**Deadline for receipt of applications: 30 Aug 2016**

**Coordinator:  
Dr. Syed Shams Yazdani,  
ICGEB, New Delhi**

## Registration Details

The application will be considered on first-come-first-serve basis. The interested participants have to send a requisition form along with curriculum vitae for attending the workshop through email to [barsebrajesh@icgeb.res.in](mailto:barsebrajesh@icgeb.res.in) with the scanned copy of the duly filled and signed form attached, following which an acceptance email will be sent. Registration fee has to be paid after the acceptance.

### Registration Fee:

<b>for BIRAC funded organization</b>	<b>Rs. 5000</b>
<b>Other organization</b>	<b>Rs. 10000</b>

## Payment Mode: E-Transfer/Demand Draft

### Bank Details for electronic/ wire transfer:

Agency Name- **International Centre for Genetic Engineering and Biotechnology (ICGEB)**

Account No: **23077018**

Bank Name: **Bank of America**

Branch name: **Bank of America, Sansad Marg, 1st floor, New Delhi 11001**

Nature of Account: **Current**

IFSC Code: **BOFA0ND6216**

**For Demand Draft:** DD should be in the name of "ICGEB, New Delhi" payable at Delhi.

**Please mention your name and remark “fee paid for BIRAC workshop” during online payment/wire transfer and write your name and contact number in case of DD.**

**Target Audience:** Industrial R&D scientists/PhDs/Post Docs

\*Accommodation will be provided on availability basis in near hotels/guest house. Participants are expected to pay the cost of their stay.

For details please contact:

**Dr. Brajesh Barse,**

Project Manager and Research Scientist,

DBT-ICGEB Centre for Advanced BioEnergy Research, ICGEB, New Delhi,

Email- [barsebrajesh@icgeb.res.in](mailto:barsebrajesh@icgeb.res.in),

Phone- 011-26742360 (Ext. 462)

## Background

The training program will cover modern tools and techniques used in experimental research in the area of strain development and improvement for the production of biomolecules. This will cover in-depth genetic engineering approach which include DNA cloning, PCR, genome editing and systems biology.

The purpose of the training programme is to **upgrade skills and generate trained human resource in the related sector**. The Training will give an opportunity to have hands-on experience in genetic engineering paradigm for strain improvement and industrial biotechnology applications.

This training workshop is being organized as part of Industry mentoring of BIRAC in collaboration with DBT-ICGEB Centre for Advance BioEnergy Centre, ICGEB, New Delhi.

**Objectives:** Various molecules produced through biological sources have become need of an hour to save our environment from toxic and hazardous chemical processes. However, there is hardly any biomolecule produced naturally by the native organism that can meet the desired titer and productivity. Therefore strain development and improvement becomes a key subject for making the process economically viable at commercial level. This training program will provide theoretical and practical courses on strain development and improvement for biomolecule production. The topics to be covered are as follows:

**The training is to be divided into 3 categories each to be covered over a period of 3 days.**

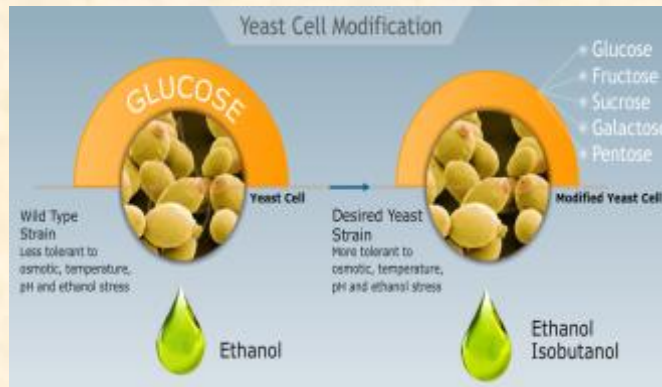
### 1. Bacterial platform for biomolecule production

- ❖ Identification and design of pathway for a particular biomolecule, e.g., fatty alcohols
- ❖ Selection of appropriate host and vector for biomolecule production
- ❖ Introduce deletion of genes/pathways in host to divert flux towards biomolecule formation
- ❖ Overexpression of genes/pathways in host to produce biomolecule
- ❖ Analysis of metabolites via HPLC, LC-MS, GC or GC-MS
- ❖ Fine tuning of host/vector system to improve biomolecule formation



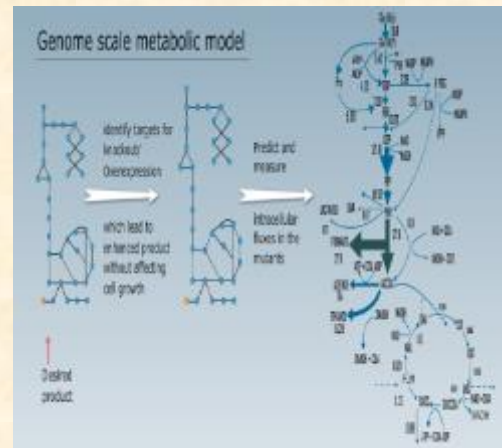
## 2. Yeast platform for biomolecule production

- Selection of appropriate host system for biomolecules production
- Synthetic biology application to construct metabolic pathway network for biomolecule production, e.g., C5 fermentation to ethanol
- Optimizing regulatory network for biomolecule production
- CRISPR-Cas9 and its application for biomolecule synthesis
- Evaluating the cost, activity, titre and productivity of biomolecule



## 3. Systems Biology application & bioreactor studies

- Systems biology tools such as Flux Balance Analysis to optimize the pathway *in silico* (Specific to synthesis of ethanol as well as lactic acid and succinic acid)
- Production of biomolecules in bioreactors



**Teaching methodology:**

The training programme will include lectures, demonstrations, hands-on practices and discussions. A theoretical introduction to each topic will be followed by the practical module, which will entail the demonstration of the laboratory technique followed by its practical execution by the participants (wherever possible). The learning process will develop through direct contact with the laboratory experimental techniques and by the systematic execution of all the essential steps conducting to the successful completion of the experiment. Major interest on problem solving and practical skill development will be conducted during the workshop

**Outcome****Intended Knowledge Outcomes**

On completing this workshop participants should understand the day-to-day workings of a molecular biology laboratory. Participants will gain basic knowledge of synthetic biology techniques and specific knowledge of regulation of gene expression in bacteria and yeast.

**Intended Skill Outcomes**

Participants will gain subject specific skills through basic experiments in molecular biology domain. The ability to carry out laboratory procedures correctly, accurately and precisely on an individual basis is promoted. Intellectual skills will be developed through relating laboratory methods to principles of molecular biology and through data interpretation and analysis. Participants will be able to assess where and why experiments have failed and be able to rectify procedures or protocols in such situations.

## Program Agenda

### DAY 1- Thursday, 8th September 2016- Bacterial platform for biomolecule production

<b>9:00</b>	Inauguration of the Workshop	<b>Dr. Dinakar M. Salunke</b> (Director, ICGEB)
<b>9:15</b>	Introduction about BIRAC	<b>Dr. Shilpi Gupta</b> (Birac)
<b>10:00</b>	<b>Introductory lecture</b> – Engineering <i>E. coli</i> for short and long chain alcohol production	<b>Dr. Syed Shams Yazdani</b> (ICGEB, New Delhi)
<b>10:45</b>	<b>Tea/Coffee Break</b>	
<b>11:15</b>	<b>Lecture</b> – Genome engineering of bacterial system for biomolecule production	<b>Prof. K J Mukherjee</b> (JNU, New Delhi)
<b>12:00</b>	<b>Experimental session</b> <ul style="list-style-type: none"> <li>• Identification and design of pathway</li> <li>• Selection of appropriate host and vector</li> </ul>	
<b>13:00</b>	<b>Lunch</b>	
<b>14:00 – 18:00</b>	<b>Experimental Session</b> <ul style="list-style-type: none"> <li>• Introduce deletion of genes/pathways in host to divert flux towards biomolecule formation</li> <li>• Overexpression of genes/pathways in host</li> <li>• Fine tuning of host/vector system</li> </ul>	

### DAY 2- Friday, 9<sup>th</sup> September 2016- Yeast platform for biomolecule production

<b>9:30</b>	<b>Lecture</b> – Engineering yeast strain for efficient utilization of C5/C6 sugars	<b>Dr. Naseem Gaur</b> (ICGEB, New Delhi)
<b>10:30</b>	Tea/Coffee Break	
<b>11:00</b>	<b>Lecture</b> – An industrial perspective of biomolecule production from engineered host platform	<b>Dr. Rishi Jain</b> (Praj Industries Ltd, Pune)
<b>12:00</b>	<b>Experimental Session</b> <ul style="list-style-type: none"> <li>- Synthetic biology tools and techniques for yeast engineering</li> </ul>	

<b>13:00</b>	<b>Lunch</b>	
<b>14:00-18:00</b>	<b>Experimental Session</b> <ul style="list-style-type: none"> <li>- Optimization of regulatory network</li> <li>- CRISPR-Cas9 application</li> </ul>	
<b>DAY 3 - Saturday, 10th September 2016- Systems Biology application &amp; Bioreactor studies</b>		
<b>9:30</b>	<b>Lecture</b> – Flux Balance Analysis: Systems biology application to identify targets for biomolecule overproduction	<b>Dr. Shireesh Srivastava</b> (ICGEB, New Delhi)
<b>10:30</b>	<b>Tea/Coffee Break</b>	
<b>11:00</b>	<b>Lecture</b> – Issues and bottlenecks during bioreactor studies for biomolecule production	<b>Dr. Amulya Panda</b> (NII, New Delhi)
<b>12:00</b>	<b>Experimental Session</b> <ul style="list-style-type: none"> <li>- Flux Balance Analysis</li> </ul>	
<b>13:00</b>	<b>Lunch</b>	
<b>14:00-17:00</b>	<b>Experimental Session</b> <ul style="list-style-type: none"> <li>- Demonstration of fermentation process</li> <li>- Analysis of metabolites via HPLC, LC-MS, GC or GC-MS</li> </ul>	
<b>17:00-18:00</b>	<b>Participants Feedback and Vote of thanks</b>	

**Industrial Workshop on**  
**“Development and Improvement of Strains for Biomolecule Production”**  
**Date 8<sup>th</sup> to 10<sup>th</sup> September, 2016**

**Venue:**

**International Centre for Genetic Engineering and Biotechnology (ICGEB)**  
**Aruna Asaf Ali Marg- 110 067 New Delhi, India,**

**Requisition form**

**Instructions for filling the format:**

- All fields are mandatory.
- Details should be provided in the non-highlighted space only and in block letters.
- Please refer to the advertisement for schedule of workshop.
- Please send the filled-in applications by email to [barsebrajesh@icgeb.res.in](mailto:barsebrajesh@icgeb.res.in)

**Title:** Dr.  Prof.  Mr.  Mrs.  Ms.

**First Name:** \_\_\_\_\_ **Middle Name:** \_\_\_\_\_

**Last Name:** \_\_\_\_\_

**Organization:** \_\_\_\_\_

**Designation:** \_\_\_\_\_

**Address:** \_\_\_\_\_  
\_\_\_\_\_

**Telephone:** \_\_\_\_\_

**Fax:** \_\_\_\_\_

**Email:** \_\_\_\_\_

**Area of Expertise:** \_\_\_\_\_

**Brief objective of attending the workshop**

(Please mention your interest in Development and Improvement of Strains for Biomolecule Production):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dated:**

**(SIGNATURE)**