P.G DEPARTMENT OF MICROBIOLOGY

WEBINAR -II

ON 8/09/2021

3:00 PM TO 4:00 PM

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PG DEPARTMENT OF MICROBIOL
EMEA COLLEGE OF ARTS & SCIENCE
KONDOTTY, MALAPPURAM
Resource Person
Dr. Benesh Joseph
Principal Investigator, Department of Physics
Institute of Biophysics
Goethe University
Frankfurth, Germany
International Webinar on
IN-SITU OBSERVATION OF MEMBRANE PROTEINS USING
ELECTRON SPIN RESONANCE
SPECTROSCOPY
Google Meet // 3-4PM / Sept 8, 2021
Inaugural Address
Dr. Ibrahim Cholakkal
Principal,
EMEA College
Convenor Ashitha K Sanuj
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BROCHURE

PROGRAM CHART

INAUGURAL ADDRESS
Dr.IBRAHIM CHOLAKKAL

PRESIDENTIAL ADDRESS
Dr.SHIJI THOMAS

RESOURCE PERSON
Dr.BENESH JOSEPH

RESOURCE PERSON PROFILE

Employment and Research Experience

- **2019:** Emmy Noether Research Group Leader, Institute of Biophysics, Department of Physics, Goethe University, Frankfurt.
- **2016 - 2018:** Project Leader in SFB807, Institute of Physical and Theoretical Chemistry, Goethe University, Frankfurt.
- **2014 - 2016:** Postdoctoral Fellow at Institute of Physical and Theoretical Chemistry, Goethe University, Frankfurt & Visiting Researcher at Department of Chemistry, University of Virginia, USA

Education

- **2014**: *Dr.Sc.* in Biophysics and EPR spectroscopy, Institute of Physical and Theoretical Chemistry, ETH Zürich, Switzerland
- **2008:** *M. Eng.* in Advanced Science, Graduate School of Engineering, Osaka University, Japan

Research Grants

- **2020:** Pulsed Q-Band ESR Spectrometer (Großgeräteantrag)
- **2019:** Emmy Noether Research Group Leader (DFG)
- **2016 - 2020:** Project Leader in SFB807 (DFG)
- **2014 - 2016:** Independent Investigator (European Union)

- **2018:** Member of the Johanna Quandt Young Academy at Goethe (JQYA)
- **2018:** Young Investigator Award of the German Biophysical Society, Germany
- **2018:** Honor of 'Outstanding Personalities in Science with a Migration Background' from the City of Frankfurt, Germany
- **2017:** Adolf-Messer Prize, Germany
- **2013:** Marie-Curie Postdoctoral Fellowship, Germany
- **2008:** Monbukagakusho Ph.D. Fellowship, Govt. of Japan (declined)
- **2004:** UNESCO-JAPAN Fellowship, Japan

Research Interests

- Electron spin resonance spectroscopy
- Membrane transport mechanisms
- Membrane biogenesis
- *In-situ* / cellular structural biology

WEBINAR REPORT

OBJECTIVE

To understand the structure and conformational changes of outer membrane protein complexes in the native membrane and intact E. coli, with the help of an in-situ pulsed ESR spectroscopy technique

WEBINAR SUMMARY

Membrane proteins frequently traverse a vast energy landscape and endure significant conformational changes while performing their functions. A structural biologist's dream is to examine them in their natural habitat, the cell. However, it

has not yet been possible to recreate a membrane protein structure in situ with adequate precision.

Membrane transport mechanisms

The transport of various substances through the cellular membrane is critical to the operation of cells and organelles. The chemical potential energy could drive transport when molecules move along a concentration gradient. Membrane transporters, on the other hand, frequently transport substrates against a concentration gradient. They connect an external energy source with substrate translocation to overcome such an energy barrier. The energy may come from ATP, an electrochemical gradient, or light, depending on the transporter. Gram-negative bacteria are becoming more resistant to antibiotics, resulting in increased sickness, healthcare expenses, and mortality. Their cell envelope is made up of two membranes: an inner membrane (IM) that surrounds the cytoplasm and an outer membrane (OM) that shields the cells from the environment. Phospholipids (PL) and lipopolysaccharides (LPS) make up the OM, which is an asymmetric bilayer (LPS). In addition, the OM contains a large number of - barrel proteins (outer membrane proteins, OMPs). Both LPS and OMPs are produced in the cytoplasm and then transferred to the OM via the periplasm.

The LPS transport system in E. coli is made up of seven key proteins called that traverse the entire cell membrane. Similarly, the Bam subunits of the -Barrel Assembly Machinery (BAM) mediate the folding and insertion of OMP precursors from the periplasm into the OM .

The BAM complex – β-barrel folding and insertion mechanism

The core -barrel BamA appears in either an inward-open or lateral-open conformation in the two known structures for the BAM full-complex. Those conformational changes are thought to be linked to OMP folding and insertion via an unknown mechanism. Because the BAM complex includes the asymmetric outer membrane, mechanistic studies must be conducted in entire cells or natural membranes. We're investigating how BAM conformational changes are linked to protein folding and insertion using the in-situ ESR technique that we've demonstrated throughout the years.

The Lpt System – lipopolysaccharide (LPS) transport mechanism

The tans-periplasmic bridge, which consists of LptC, LptA, and the N-terminal domain of LptD, transfers LPS molecules from the inner membrane to the outer membrane in the Lpt system. It's thought that the ABC exporter LptB2FG, which is found in the inner membrane, extracts LPS molecules and

pushes them through the periplasm at the expense of ATP hydrolysis. Individual component structures have been determined. We're looking at how the subunits interact to produce the supramolecular trans-envelope complex, as well as how ATP hydrolysis at the inner membrane drives LPS transport through the periplasmic bridge and into the outer membrane.

LEARNING OUTCOME

Students will understand about

- In-situ Electron Spin Resonance (ESR) spectroscopy
- Membrane transport mechanisms
- Outer membrane Biogenesis.

PARTICIPANTS

JUNAID CP,MSC	AHLAM E -	AMEENA THASNEE	SEETHALAKSHMI. T ,
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FAHMITHA. CM	BINSHA SHARIN	HAFA JABIN	RASHIDA P
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NITHA TP	MOHASEENA THESNI MT	MURSHEEDHA CHONARI..	FASLEENA M KOYA,
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SHARMILA SHERIN K.P -	HISHAM KP		SHIFA SHERIN.PK
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NEETHU K GOPAL,	THABSHEERA KV	SHAHIN AHAMMED MADAMBI -	FARSHANA NK
RAHEENA PONMALATHODI.	SAFA SHANU OP,	SAHLA.K ,	AHLAM E
MYMOONATH LUBANA,	AFSAN.	AMRUTHA.K	APARNA P SASI,
AMRUTHA TP, M.	SHIDAN K -	SOFIYA SALEEM NK	AYISHA RAFA M.
ILFA MOHSINA K.P	JISHA P J	FATHIMA HANA K,	SANDRA
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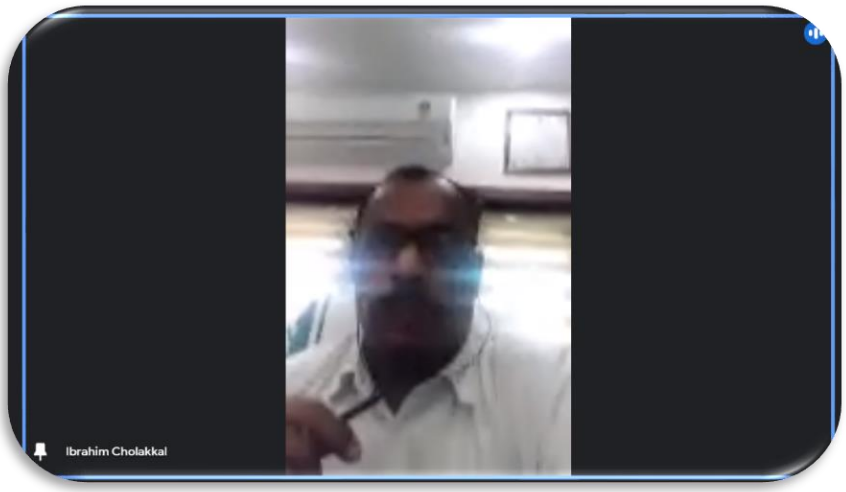
AMANA VK ,	HIBA SHIRIN.K	HANNA PM ,	FARSHIDA NOURIN.

VIDEO LINK

https://youtu.be/HaV-mrumtAc

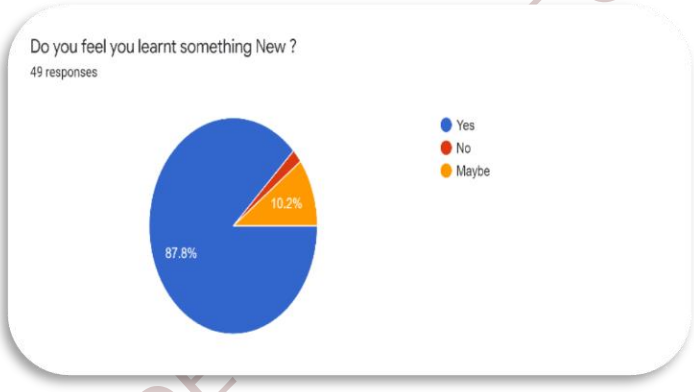
PHOTOES

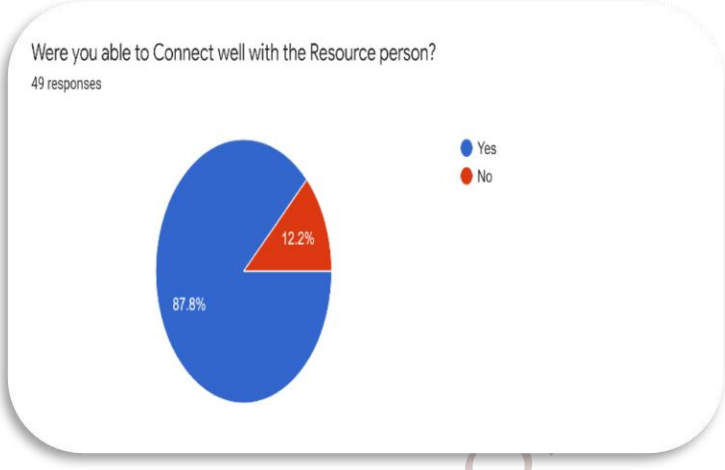
HOD AND RESOURCE PERSON Mr. BENESH JOSEPH

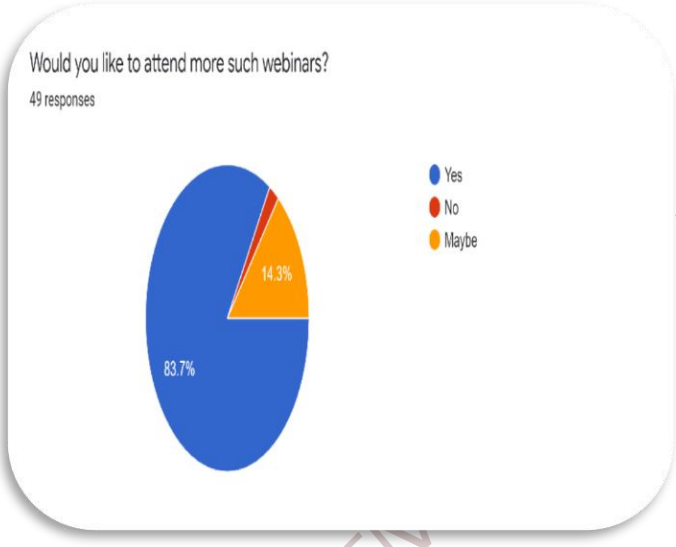


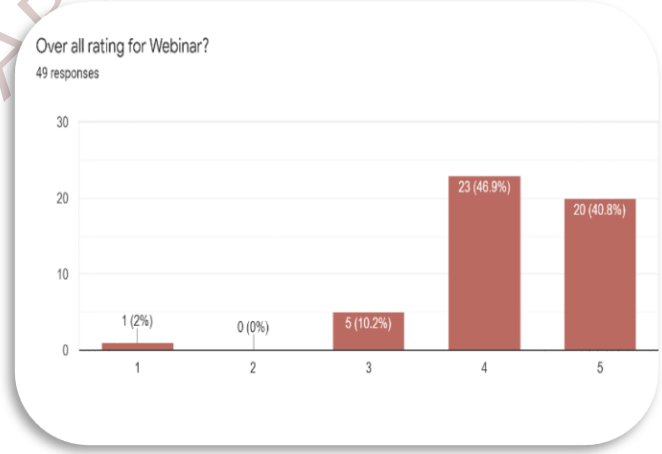
INAUGURAL ADDRESS BY Dr.IBRAHIM CHOLAKKAL -Principal EMEA

FEEDBACK FROM STUDENTS









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Any suggestion you would like to share?

33 responses

No
Nothing
Good👍
It was a good session
Excellent webinar
GOOD
It is better
Conduct more interactive sections
Good

Any suggestion you would like to share?

33 responses

It is good
These kind of webinars are really helpful
It was a well informative webinar
Informative class
Very nice
Have some net work issues. But amazing class. Get more effective informations.
It's and wonderful section and i enjoyed it. Thank you for conducting the webinar.
Nothing
very informative