



## VIBIN RAMAKRISHNAN

PROFESSOR

Professor, Department of Biosciences & Bioengineering  
Professor, M F School of Data Science and Artificial Intelligence  
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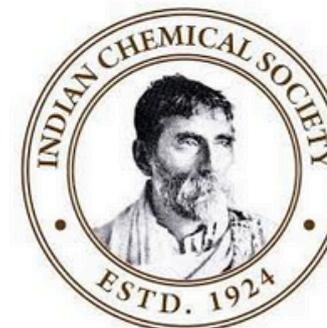
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## ACADEMIC PROFILE

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Dr. Vibin Ramakrishnan is a Professor of Biosciences and Bioengineering at IIT Guwahati. Vibin is an associate faculty of the Mehta Family School of Data Science & Artificial Intelligence. Dr. Vibin received his Master's in Applied Chemistry from Cochin University of Science and Technology and Ph.D. from the School of Biosciences and Bioengineering, IIT Bombay, in the area of Computational Biophysics. He held roles as a Postdoctoral Research Associate at Rensselaer Polytechnic Institute, New York and a Faculty scientist at IBAB Bangalore before joining the Department of Biosciences & Bioengineering at IITG. He has about 79 publications in reputed international journals and 15 patents, including an international patent and US patent to his credit. He is the principal scientific advisor of two biotech companies operating from India and one in the United States. Vibin is the editorial board member of two reputed journals; the Journal of Controlled Release of Elsevier and Amino acids of Springer. He has served in the editorial board of Scientific Reports of Nature publishing group from 2018-2024. He is an elected fellow of Royal Society of Chemistry, Indian Chemical Society and Royal Society of Biology. The Department of Biotechnology, Govt. of India has awarded Vibin, the Innovative Young Biotechnologist Award (IYBA) in the year 2007-08 to recognize his contributions and innovative approach in biotechnology research.



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## ACADEMIC RECORD (CONCISE)

**Publications: 81**

Books: 2

Research Papers: 57

Book Chapters: 22

**Funded Research Projects: 12**

**Consultancy Project: 1**

Completed: 11

Ongoing: 2

**Patents Filed**

International: 1

Indian: 14

Computational Tools: 5

**PhD Thesis: 11**

M.Tech Thesis: 12

B.Tech Dissertation: 14

## EXPERIENCE & EDUCATION

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### FACULTY AT IIT GUWAHATI

- Professor: Indian Institute of Technology, Guwahati – 781039. India (2019 - )
- Associate Professor: Indian Institute of Technology, Guwahati – 781039. India (2015-2019).
- Assistant Professor: Indian Institute of Technology, Guwahati – 781039. India (2011-2015).

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### POST DOCTORAL RESEARCH

- Faculty Scientist: Institute of Bioinformatics and Applied Biotechnology (IBAB) Bangalore and RGCB Thiruvananthapuram.
- Post-Doctoral Research Associate: Center for Bioinformatics, Biology, Jonsson Rowland Science Center, Rensselaer Polytechnic Institute, Troy NY – 12180, USA

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### MASTER OF SCIENCE AND PH.D.

- Ph.D.: Indian Institute of Technology, Bombay, Powai-400076 India  
Doctoral Thesis: Stereo chemical Effects in Protein Structure Folding and De novo Design
- Master of Science: in Applied Chemistry. Cochin University of Science and Technology, Kochi, India.

## RESEARCH INTERESTS

## AWARDS / SCHOLASTIC ACHIEVEMENTS

## EDITORIAL BOARDS

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## AREAS OF RESEARCH

Network medicine, Computational Biology, Drug Delivery, Functional Peptides

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## AWARDS

- FRSC: Fellow of Royal Society of Chemistry, UK
- FRSB: Fellow of Royal Society of Biology, UK
- FICS: Fellow of Indian Chemical Society, Kolkata, India.
- IYBA Fellow: Innovative Young Biotechnologist Award Extension (IYBA 2011-12), Dept. of Biotechnology, Ministry of Science and Technology, Govt. of India.
- IYBA Fellow: Innovative Young Biotechnologist Award (IYBA 2007-08), Dept. of Biotechnology, Ministry of Science and Technology, Govt. of India.
- Post-Doctoral Fellowship funded by National Science Foundation, United States.
- Cochin University Merit Scholarship by CUSAT for top two students in each discipline

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## EDITORIAL BOARDS

1. Journal of Controlled Release, Publisher: Elsevier, Impact Factor: 10.8
2. Amino acids, Publisher: Springer, Impact Factor: 2.4
3. Scientific Reports (2018-2024), Publisher: Nature Publishing Group, IF: 3.9

# PUBLICATIONS (selected)

- 1. Yvonne Christian, Amay Sanjay Redkar, Naveen Kumar, Shine Varghese Jancy, Aneesh Chandrasekharan, T R Santhoshkumar and Vibin Ramakrishnan\*, Structural Regression Modelling of Peptide based Drug Delivery Vectors for the Treatment of Triple-Negative Breast Cancer. (2024) **Drug Delivery and Translational Research**. DOI:10.21203/rs.3.rs-4294444/v1. Impact Factor: 5.671. Publisher: Springer
- 2. Gaurav Jerath, Pramod Darvin, Yvonne Christian, Vishal Trivedi, T. R. Santhosh Kumar and Vibin Ramakrishnan\*. Delivery of Small Molecules by Syndiotactic Peptides for Breast Cancer Therapy. **Molecular Pharmaceutics** (2022) DOI: acs.molpharmaceut.2c00238 Impact Factor: 5.364. Publisher: American Chemical Society
- 3. Sasidharan, Sayandeep Ghosh, Rishi Sreedhar, Kalpana Kumari, Subhash Thota, and Vibin Ramakrishnan\* Anisotropic Ferromagnetic Organic Nanoflowers, **Journal of Physical Chemistry C** (2022) DOI: 10.1021/acs.jpcc.2c01462. Impact Factor: 4.177. Publisher: American Chemical Society
- 4. Ruchika Goyal, Gaurav Jerath, Akhil R., Aneesh Chandrasekharan, Eswara Rao Puppala, Srikanth Ponneganti, Anupam Sarma, V.G.M. Naidu, T. R. Santhoshkumar, and Vibin Ramakrishnan\* "Geometry Encoded Functional Programming of Tumor Homing Peptides for Targeted Drug Delivery", **Journal of Controlled Release** (2021) DOI: 10.1016/j.jconrel.2021.03.0101 Impact Factor: 11.467. Publisher: Elsevier
- 5. Aparna Rai, Vikas Kumar, Gaurav Jerath, C. C. Kartha & Vibin Ramakrishnan Mapping drug-target interactions and synergy in multi-molecular therapeutics for pressure-overload cardiac hypertrophy, **npj Systems Biology and Applications** (2021) DOI: 10.1038/s41540-021-00171-z Impact Factor:4.0. Publisher: Nature (npj)
- 6. Ruchika Goyal, Gaurav Jerath, Aneesh Chandrasekharan, Yvonne Christian, T. R. Santhoshkumar, and Vibin Ramakrishnan\*, Molecular hybridization combining tumor homing and penetrating peptide domains for cellular targeting, **Drug Delivery and Translational Research** (2021) DOI : 10.1007/s13346-021-01035-z. Impact Factor: 5.671. Publisher: Springer
- 7. Jahnu Saikia, Gaurav Pandey, Sajitha Sasidharan, Ferrin Antony, Harshal B. Nemade, Sachin Kumar, Nitin Chaudhary, and Vibin Ramakrishnan\*. Electric Field Disrupts Amyloid Aggregation; Potential Non-invasive Therapy for Alzheimer's Disease. **ACS Chemical Neuroscience**. (2019), doi:10.1021/acchemneuro.8b00490. Impact Factor: 5.78. Publisher: American Chemical Society
- 8. Gaurav Jerath, Ruchika Goyal, Vishal Trivedi T.R. Santhoshkumar and Vibin Ramakrishnan\*. Syndiotactic Peptides for Targeted Delivery. **Acta Biomaterialia**. (2019), doi: 10.1016/j.actbio.2019.01.036. Impact Factor: 10.663. Publisher: Elsevier
- 9. Rahul Metri, Gaurav Jerath, Govind Kailas, Adityabarna Pal & Vibin Ramakrishnan\*. Structure Based Barcoding of Proteins. **Protein Science** (2014) 23, 117-120. Impact Factor: 6.725. Publisher: Wiley
- 10. Vibin Ramakrishnan, Saeed Salem; Saipraveen Srinivasan, Mohammed Zaki, Suzanne Mathews, Wilfredo Colon and Christopher Bystroff. Developing a detailed mechanistic model for protein unfolding. **Proteins: Structure Function & Bioinformatics** (2012), 80, 920-934. Impact Factor: 3.756 Publisher: Wiley
- 11. Vibin Ramakrishnan; Ranjit Ranbhor and Susheel Durani. Existence of Specific "Folds" in Polyproline-II Ensembles of an Unfolded Alanine Peptide Detected by Molecular Dynamics. **Journal of the American Chemical Society** (2004) 126, 16332-16333. Impact Factor: 15.420. Publisher: American Chemical Society

## TEACHING

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### **UNDERGRADUATE COURSES (BIOSCIENCES & BIOENGINEERING)**

- BT 101 Modern Biology\*
- BT 301 Bioinformatics and Computational Biology\*
- BT 305 Computational Biology
- BT 205 Biophysics\*
- BT 310 Bioinformatics and Computational Biology Laboratory\*

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### **GRADUATE COURSES (BIOSCIENCES & BIOENGINEERING)**

- BT 501 Biotechniques
- BT 510 (L) Bio-techniques Laboratory
- BT 617 Concepts and Methods in Proteomics
- BT 601 Analytical Biotechnology
- BT 530 (L) Experimental Techniques in Bioengineering Laboratory

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### **UNDERGRADUATE COURSE (DATA SCIENCE & ARTIFICIAL INTELLIGENCE)**

- DA 461 Bioinformatics (Undergraduate 4<sup>th</sup> year)

## COMPUTATIONAL TOOLS

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### COMPUTATIONAL TOOLS DEVELOPED

- **1. Protein Barcode**
- Description: Tool structure based barcoding of proteins (MID, IIT Guwahati)
- Reference: Structure Based Barcoding of Proteins Rahul Metri, Gaurav Jerath, Govind Kailas, Nitin Gachhe , Adityabarna Pal & Vibin Ramakrishnan (2014) Protein Science 23:117–120 (Cover page)
- 
- **2. Basic Protein Engineering Toolkit (bPE Toolkit, MID IIT Guwahati)**
- Description: Consists of six useful protein modeling tools
- Reference: bPE toolkit:Toolkit for Computational Protein Engineering Gaurav Jerath, Prakash K. Hazam and Vibin Ramakrishnan. Systems and Synthetic Biology. (2014) 8:337–341.
- 
- **3. Geofold:** Protein Unfolding Pathway prediction server (Bystroff Lab, RPI New York)
- Description: Tool for predicting protein unfolding pathways
- Reference: Vibin Ramakrishnan, Saeed Salem; Saipraveen Srinivasan, Mohammed Zaki, Suzanne Mathews, Wilfredo Colon and Christopher Bystroff. Proteins: Structure Function & Bioinformatics (2012), 80, 920-934.
- 
- **4. IDEAS** (Durani Lab, IIT Bombay)
- Description: Software for protein inverse design
- Reference: Ranbhor Ranjit, Anil Kumar, Abhijit Tendulkar, Kirti Patel, Vibin Ramakrishnan\*, and Susheel Durani. IDeAS: Automated Design Tool for Hetero-chiral Protein Folds. Physical biology. (2018), doi::10.1088/1478-3975/aacdc3
- 
- **5. Time Piece model** for Virtual Activity Profiling of Drug molecules (Vibin Ramakrishnan Lab, IBAB Bangalore)
- Description: Tool for virtual activity profiling of drugs.
- Reference: Aimy Sebastian, Andreas Bender and Vibin Ramakrishnan\*; Virtual Activity Profiling of Bioactive Molecules by 1D Fingerprinting. Molecular Informatics (2010) 29, 773-779.

## INDUSTRIAL ASSOCIATIONS/ CONSULTANCY

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## INDUSTRY & CONSULTANCY

### **AKSIVIAR Technologies LLP**

Aluva, Kochi, India

Role: Principal Scientific Consultant

### **IVORY 7 LLC**

Hawaii, United States

Role: Principal Scientific Consultant

### **PEPTHERA LABORATORIES PVT. LTD.**

Ahmedabad, India

Specific Role: Principal Scientific Advisor

### **SEVIT HEALTHCARE PVT. LTD**

Mumbai, India

Specific Role: Member, Advisory Board



## OUTREACH

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### OUTREACH (TEACHING)

#### SA Course on Meditation and Heartful Communication

The meditation and heartful communication program is offered as a non-credit SA course in the second and third semesters of the Undergraduate program of IITG. The course has fifteen hours of Meditation and fifteen hours of Heartful communication (HC). Heartful Communication weaves together Heartfulness system of meditation and Rosenberg's Non-violent communication, offering beautiful tools and practices to connect with our 'self' and others. It is primarily based on a communication system developed by clinical psychologist Marshall Rosenberg widely known as "Non-Violent Communication". This introductory course will help students to live a more disciplined and productive life, stay away from disruptions like drug abuse and to communicate more effectively in their professional years. I am offering this as an additional component apart from my assigned teaching responsibilities.

### OUTREACH (RESEARCH)

#### AUSHADHI (Open Innovation Platform for Healthcare)

AUSHADHI platform is meant to develop the scientific ideas of common people by supporting them with scientific and technological expertise of IITG faculty community. Our primary focus is in the area of healthcare. Presently we are working with Luko Aukhodi Sikitsya Sewa (LASS) Ashram, Dhemaji, Assam for validating few therapeutic practices in tribal medicine.

# aushadhi

Open Innovation Platform for Healthcare 

**Coordinating Faculty: Vibin Ramakrishnan**

URL: <https://www.iitg.ac.in/aushadhi/index.html>

## PROFESSIONAL AFFILIATIONS

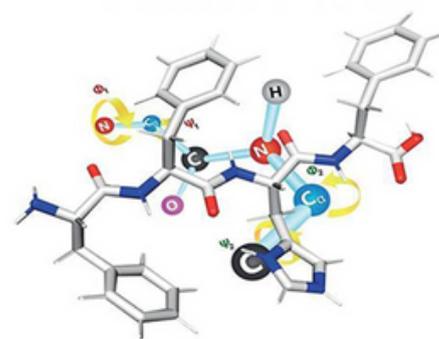
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National Academy of Sciences, India  
Royal Society of Chemistry, UK  
Biophysical Society  
Controlled Release Society of India  
Protein Society  
Indian Chemical Society, Kolkata

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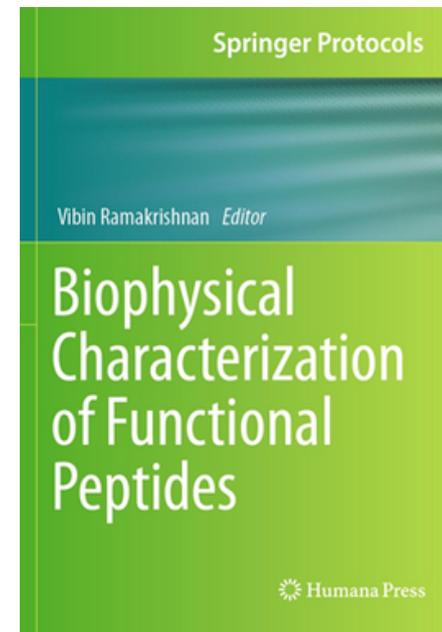
American Chemical Society  
Royal Society of Biology, UK  
American Peptide Society  
Society of Biological Chemists  
The International Society of  
Indian Chemical Society for Computational  
Biologists (ISCB)

## BOOKS

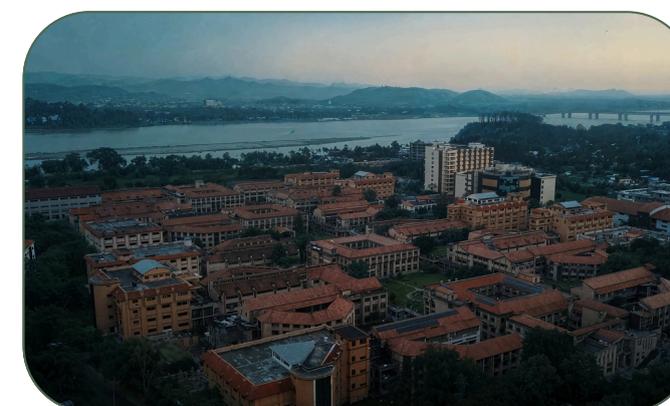
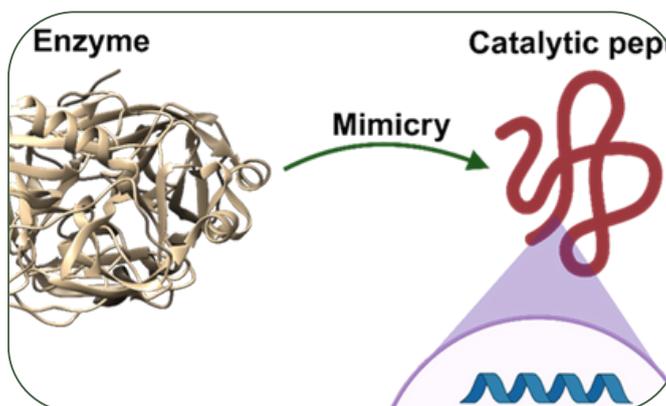
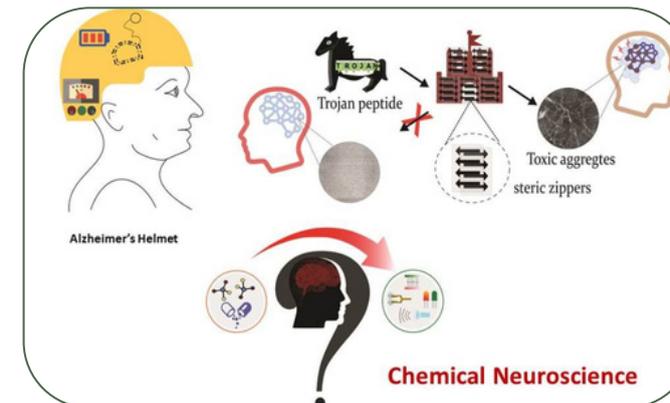
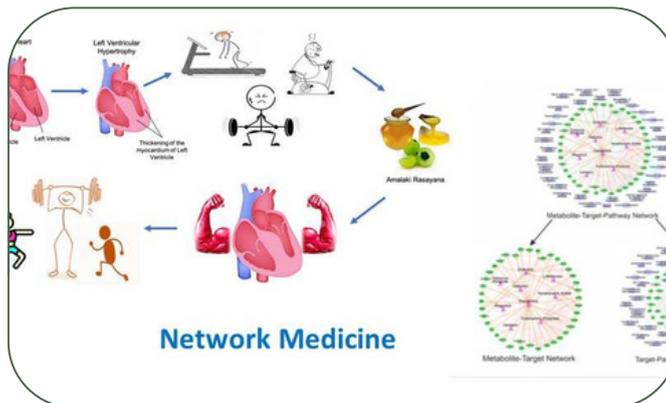


### **De Novo Peptide Design** Principles and Applications

Edited by  
**Vibin Ramakrishnan**  
**Kirtikumar Patel**  
**Ruchika Goyal**

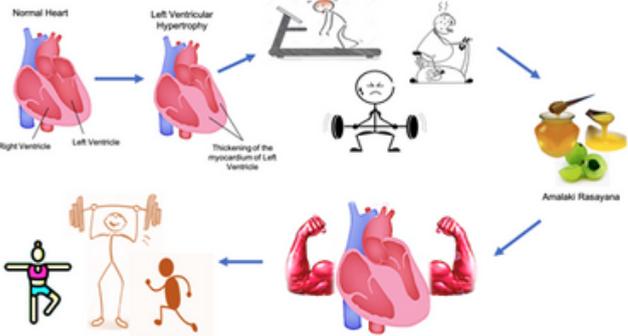


# MOLECULAR INFORMATICS & DESIGN LABORATORY



Molecular Informatics and Design group integrates diverse disciplines of science and engineering in understanding the efficacy and mode of action of drugs and the design and development of advanced materials. Our approach to a research problem is 'idea centric' with a clear emphasis on the design phase, adopting modeling and informatics tools.

In our Network Medicine projects, we combine the principles of network sciences, systems biology, proteomics, and synthetic organic chemistry to understand the causes of human diseases, efficacy of treatment options and their mode of action..In our Bionanotechnology projects, we adopt a reductionist approach in understanding the interaction between molecules resulting in the formation of assembled architectures at nano and micro scale, and further employ it in the design of future materials. An information based modeling approach has been employed in the design and characterisation of tumor homing and cell penetrating molecules to test their efficacy as future Drug Delivery vehicles



Ministry of Education @EduMinIndia · Mar 19

In their study, they have shown how Amalaki Rasayana reduces high blood pressure-induced structural and functional changes in the heart. Good work by #IITGuwahati professors!



IIT-Guwahati researchers use modern drug development methods to u... Prof. Ramakrishnan and Prof. Kartha had earlier found that long term oral intake of Amalaki Rasayana reduces the thickening of heart muscul...  
 economicimes.indiatimes.com

# The Assam Tribune

## Working of ayurvedic medicine analysed through modern methods

In a study Prof Vibin Ramakrishnan and Prof CC Kartha have shown how Amalaki Rasayana reduces high blood pressure-induced structural and functional changes in the heart.

**NEW REPORTER**

**GUWAHATI, March 19** Prof Vibin Ramakrishnan of the Department of Biotechnology, Indian Institute of Technology (IIT) Guwahati and Prof CC Kartha of the Academy of Cardiovascular Sciences, Thiruvananthapuram, have used modern drug development methods to analyse the molecular action of an ayurvedic rejuvenating medicine - Amalaki Rasayana.

In their study, the results of which were recently published in a prestigious Nature partnership journal *Systems Biology and Applications*, they have shown how Amalaki Rasayana reduces high blood pressure-induced structural and functional changes in the heart, according to a press release.

Prof Ramakrishnan and Prof Kartha had earlier found that long term oral intake of Amalaki Rasayana reduces the thickening of heart muscle and improves heart function.

The present study that used the emerging scientific approaches of network pharmacology and cheminformatics, shows how the formulation is likely to work in the human body.

Network pharmacology analyses the influence of drugs on diseases as a whole rather than the one gene-one target-one drug approach that has been conventionally followed as drug discovery.

Network pharmacology is effective for identifying multi-component therapies, which is typical of traditional systems like ayurvedic and Chinese medicines. The drugs prescribed in these systems act on multiple targets and pathways.

Cheminformatics helps in comparing drug molecules using standard computational tools.

While ayurvedic remedies and therapeutics have been handed down over generations and shown anecdotal to be efficacious, they have not yet been subjected to a great extent to the modern methods of drug development, said the statement.

"The backbone of an ayurvedic system is the large standing unrefined-herb that it is a holistic approach. It treats the body as a whole. Multiple components in an ayurvedic medicine are believed to act synergistically to register a desired medicine. For analysing the links and networks of modern medicine regarding the same subject, this study is a robust step," said Prof Ramakrishnan.

The team employed an innovative model which integrates gene expression and protein-protein interaction networks and the techniques of systems medicine, all of which are used for the development of diagnostic drugs.

They also measured the protein energy along the action of different components of the Rasayana using the network pharmacology approach.

## EDUCATION IIT Guwahati finds new ways to prevent memory loss due to Alzheimer's

The research team explored new ways to prevent the accumulation of neurotoxic molecules in the brain that are associated with short-term memory loss due to Alzheimer's disease.

IIT Guwahati | By Indo Asian News Service  
 PUBLISHED ON MAY 20, 2020 01:35 PM IST



Representational image (Urnsplash)

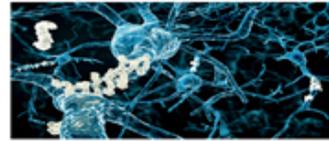
Indian Institute of Technology Guwahati (IIT-G) on Wednesday said its researchers have discovered new ways that can help prevent or reduce short-term memory losses associated with the Alzheimer's disease.

## IIT-Guwahati takes 'Trojan horse' route to fight Alzheimer's disease

Designer peptides to impede aggregation of brain plaque

By Indo Asian News Service

A war trick borrowed from Greek mythology, specifically from Homer's epic *Iliad*, could help reduce short-term memory losses associated with Alzheimer's disease.



Slow degradation. Amyloid plaques on axons of neurons affected by Alzheimer's disease. - GETTY IMAGES/ISTOCKPHOTO

Researchers at the Indian Institute of Technology-Guwahati (IIT-G) have, after a five-year study, arrived at methods for preventing the accumulation of neurotoxic molecules in the brain, which leads to memory loss.

One is the use of "Trojan peptides" that show what the Trojan horse did for the ancient Greeks in their victory over Troy.

The other is the application of a low-voltage electric field toward preventing amyloid plaques from aggregating to cause memory loss.

The cause of Alzheimer's is the accumulation of amyloid-beta peptides in the brain.

"This peptide is akin to the plaque that blocks arteries over a period of time, affecting blood supply and leading to cardiovascular diseases. Its aggregation, meaning the formation of one over the other, defines the centre of the brain leading to Alzheimer's," Vibin Ramakrishnan, IIT-G's department of Biotechnology, told The Hindu.

He teamed up with Professor Harshad Nemade of IIT-G's Department of Electronics and Electrical Engineering, and research scholars Gaurav Pandey and Jahnvi Sarkis, for the study on the neurochemical principles of Alzheimer's disease and ways of arresting it.

The peptide molecules need to have a certain structure to aggregate.

The use of an external electric or magnetic field modulates these molecules to "pull back the possibility of Alzheimer's to a certain extent".

The second approach has been to design a "deceitful" peptide with "negative syntactical points" for checking the plaque aggregation.

The development of a peptide that mimics the body, but while it goes along with the other peptides, its function is contrary

to aggregation. Through intravenous injection of the Trojan peptide, we can retard the degeneration of nerve cells by 17-35%, translating into a 10-year delay in the onset of the disease," Dr. Ramakrishnan said.

The next step for the researchers is to work with these techniques on mice infused with Alzheimer's of the National Institute of Pharmaceutical Education and Research in Guwahati.

The IIT-G researchers said some 100 potential drugs for the treatment of Alzheimer's disease failed between 1998 and 2018.

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# MOLECULAR INFORMATICS AND DESIGN LAB INFOGRAPHIC (Key Technologies)

## IIT-G researchers make headway in delaying onset of Alzheimer's disease

By Indo Asian News Service

IIT-G researchers have discovered new ways that can help prevent or reduce short-term memory losses associated with the Alzheimer's disease.

The research team explored new ways to prevent the accumulation of neurotoxic molecules in the brain that are associated with short-term memory loss due to Alzheimer's disease.

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Dr. Ramesh Pokhriyal Nishank @DrRPNishank · Mar 20

In their study, they have shown how Amalaki Rasayana reduces high blood pressure-induced structural and functional changes in the heart. Good work by #IITGuwahati professors!



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 economicimes.indiatimes.com

## IIT finds way to prevent Alzheimer's

IIT-Guwahati researchers claimed that they have worked on ideas that can help prevent or reduce short-term memory loss associated with Alzheimer's disease. They studied the neurochemical principles of Alzheimer's and explored new ways to prevent accumulation of neurotoxic molecules in the brain that are associated with short-term memory loss. The IIT team reported methods such as application of low-voltage electric field and the use of "Trojan peptides" to arrest the aggregation of neurotoxic molecules in the brain.

## IIT Guwahati researchers discover new ways to prevent memory loss due to Alzheimer's disease

By Indo Asian News Service

IIT Guwahati researchers have discovered new ways to prevent memory loss due to Alzheimer's disease.

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