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Bioinformation up to Date

(Bioinformatics Center, Biotechnology Division)
North-East Institute of Science & Technology
Jorhat - 785 006, Assam

Contents

BIF Upcoming Events

1. 2 Days Training Program on **"Genomics & Proteomics Analysis"** @ Indian Institute of Technology, Kharagpur from September 26th - 27, 2008.

2. 6 Days Training Program on **"Bioinformatics Tools & Softwares"** @ Sikkim State Council of Science & Technology, Gangtok from September 22 - 27, 2008.

Cover Story

14th Dr. J.N. Baruah Memorial Lecture

On 2nd September, 2008, a program was organized by the Dr. J.N. Baruah Memorial Trust in association with the Assam Science Society, Jorhat branch to mark the 14th death anniversary of Dr. J.N Baruah, former Director of North-East Institute of Science & Technology, Jorhat at Darang College, Tezpur. As a part of the program two interesting lectures were delivered by Professor Samir Bhattacharya, former Director Indian Institute of Chemical Biology, Kolkata on the topic entitled "Problems with Diabetics" and another one by Dr. Pradeep Phukan, Department of Chemistry, Gauhati University, Guwahati on the topic entitled " Iodine as a Catalyst".

Professor Bhattacharya began his talk with the global epidemics caused by the so called slow poisoning disease diabetes. It is of two types namely Type 1 diabetes or insulin dependent diabetes mellitus (IDDM) and Type 2 diabetes or non insulin dependent diabetes mellitus (NIDDM). He also mentioned that 90-95 % global diabetes epidemic are due to Type 2 while 3-5% are due to Type 1.

The diabetes lecture was followed by another lecture "Iodine as a Catalyst" by Dr. Pradeep Phukan, Department of Chemistry, Gauhati University. He was awarded the 14th Dr. J. N. Baruah Memorial Young Scientist Award.

Many important persons like Director of our premier institute - North-East Institute of Science & Technology, Jorhat, Director - Defense Research Laboratory, Tezpur, Director - North-Eastern Regional Institute of Water & Land Management, Tezpur, Principal - Darang College, Tezpur, family members of Dr. J.N. Baruah, members of Assam Science Society, Jorhat branch, teachers from Tezpur University, students of Darang College, Tezpur and a group of scientists form this institute were present on the 14th annual memorial program

… Pradeep Salam

Special Interests

Gene Therapy

Gene therapy is the insertion of genes into an individual's cells and tissues to treat a disease, and hereditary diseases in which a defective mutant allele is replaced with a functional one. Although the technology is still in its infancy, it has been used with some success. Antisense therapy is not strictly a form of gene therapy, but is a genetically-mediated therapy and is often considered together with other methods.

In most gene therapy studies, a "correct copy" or "wild type" gene is provided or inserted into the genome. Generally, it is not an exact replacement of the "abnormal," disease-causing gene, but rather extra, correct copies of genes are provided to complement the loss of function. A carrier called a vector must be used to deliver the therapeutic gene to the patient's target cells. Currently, the most common type of vectors are viruses that have been genetically altered to carry normal human DNA. Viruses have evolved a way of encapsulating and delivering their genes to human cells in a pathogenic manner. Scientists have tried to harness this ability by manipulating the viral genome to remove disease-causing genes and insert therapeutic ones.

Target cells such as the patient's liver or lung cells are infected with the vector. The vector then unloads its genetic material containing the therapeutic human gene into the target cell. The generation of a functional protein product from the therapeutic gene restores the target cell to a normal state.

Courtesy: Wikimedia Foundation, Inc, USA

Readers Contribution

Bugs to Boost Assam's Muga Silk Production / Experiment in Assam Helps Worms Produce more of better Quality Silk

Armed with hand-held canisters of plant-friendly microbes, biochemist Bala Gopalan Unni, Scientist F, NEIST, Jorhat, is hoping to turn Assam's celebrated muga silk stronger, softer, and more plentiful than it is today. A cocktail of microbes called rhizobacteria that Unni has helped put together, improves the quality and quantity of silk when sprayed over plants that host silkworms that make muga, exclusive to the region. Muga, which grows only in India's north-eastern states and comes with an indelible natural, shimmering golden colour, is one of India's most expensive silks. It is used in traditional woven materials, fabrics and even umbrellas that absorb ultraviolet rays. In an effort to find ways to boost the quality and production of muga silk, scientists at the North East Institute of Science and Technology (NEIST) in Jorhat turned their attention to a class of rhizobacteria that can promote growth. "These microbes increase carbohydrates, essential fatty acids and proteins of the host plants," Unni, a senior scientist at the biology division of NEIST said. "The silkworms get better nutrition and produce more silk of higher quality," he said. The quantity of silk produced from such well-fed silkworms can increase by 10 to 30 per cent, Unni said. An increase in elasticity and longevity leads to production of stronger and softer variety of silk, he said. Scientists estimate some 40,000 households along Assam's stretches of the Brahmaputra are involved in harvesting muga silk. However, a decline in muga production in recent years is worrying farmers as well as scientists. According to muga silk scientists, attacks by pests and parasites, non-availability of high-yielding seeds and lack of personnel to take up farming operations have contributed to this decline. Last year, Unni and his colleagues at the NEIST came out with another silk-boosting technology for farmers that has its origin in fruit juices of a medicinal plant called ***Terminalia chebula.*** "The fruit extract has the ability to kill a dreaded bacteria that infects the muga silkworm," Unni said. Spraying the fruit extract on host plants' leaves protects silkworms from the bacteria, leading to a higher yield from each plant. The NEIST and the Central Muga Eri Research and Training Institute in Jorhat are now trying to persuade silk farmers across Assam adopt the technology. According to researchers, field tests of spraying of rhizobacteria have so far yielded positive results and evoked good feedback from farmers. Silk farmers and processors, however, appear unhappy with the tardy pace of application of the technology. "Muga production witnessed a decline last year because of inclement weather and the technology isn't moving fast enough," said Dulal Chowdhury, a silk fabric processor with Muga Vastra Udyog who sells umbrellas made of muga silk. Unni admits that the cost of rhizobacteria spray is yet to be worked out. The NEIST has been producing the spray to conduct experiments. It, however, hopes to transfer the technology to the industry. The rhizobacteria release certain biochemical's that allow plants to draw nutrients from the soil which they are unable to do without the help of the bacteria.

Courtesy: Business World / The Telegraph, 6th April 2008

Contributed by: Dr. B.G. Unni, Area Coordinator (Biological Sciences), NEIST, Jorhat

Proteomics

ExPASy—Expert Protein Analysis System

The ExPASy (Expert Protein Analysis System) is a proteomics server of the Swiss Institute of Bioinformatics (SIB) which analyzes protein sequences and structures and two-dimensional gel electrophoresis (2-D Page electrophoresis). The server functions in collaboration with the European Bioinformatics Institute. ExPASy also produces the protein sequence knowledgebase, UniProtKB/Swiss-Prot, and its computer annotated supplement, UniProtKB/Trembl.

The EXPASY also comprise of other databases PROSITE - Protein families domain, ENZYME - Enzyme nomenclature, UniPathway - Metabolic Pathways etc. The server also provides important bioinformatics tools and software packages for proteomics and sequences analysis such as Aldente - Peptide mass fingerprinting tool, FindMod - Predict potential protein post-translational modifications, Popitam - Identification and characterization tool for peptides with unexpected modifications, Phenyx - Protein and peptide identification / characterization. pI/Mw - Compute the theoretical isoelectric point (pI) and molecular weight (Mw). ProtParam - Physico-chemical parameters of a protein sequence etc.

Courtesy: Swiss Institute of Bioinformatics, Geneva, Switzerland

Genomics

DDBJ - DNA Data Bank of Japan

DNA Data Bank of Japan is a DNA data bank. It is located at the National Institute of Genetics of Japan. It is also a member of the International Nucleotide Sequence Database Collaboration or INSDC. It shares its data with European Molecular Biology Laboratory at the European Bioinformatics Institute (EBI) and with GenBank at the National Center for Biotechnology Information (NCBI). DDBJ began DNA data bank activities in earnest in 1986 at the National Institute of Genetics (NIG). From the beginning, DDBJ has been functioning as one of the International DNA Databases.

DDBJ is the sole DNA data bank in Japan, which is officially certified to collect DNA sequences from researchers and to issue the internationally recognized accession number to data submitters. DDBJ collect data mainly from Japanese researchers, but of course accept data and issue the accession number to researchers in any other countries. Since DDBJ exchange the collected data with EMBL/EBI and GenBank/NCBI on a daily basis, the three data banks share virtually the same data at any given time.

Courtesy: DNA Data Bank of Japan, Mishima, Japan

Software Mania

Bioedit

BioEdit is a biological sequence alignment editor that runs in Microsoft Windows and is intended to provide basic functions for protein and nucleic sequence editing, alignment, manipulation and analysis. BioEdit is not a powerful sequence analysis program, but offers many quick and easy functions for sequence editing, annotation and manipulation, as well as a few links to external sequence analysis programs. Sequence lengths and numbers are limited only by available system memory. Alignments greater than 100 Mb have been edited on an average desktop with reasonable efficiency. The document interface was originally modeled after the very nice programs SeqApp and SeqPup by Don Gilbert.

The important features in BioEdit's are given below:

Several modes of hand alignment; Automated ClustalW alignment; Automated Blast searches; Plasmid drawing and annotation; Accessory application configuration; Restriction mapping; RNA comparative analysis tools; Graphical matrix data viewing tools; Shaded alignment figures; Translation-based nucleic acid alignment; ABI trace viewing; editing and printing.

The software can be freely downloaded from the url **http://www.mbio.ncsu.edu/BioEdit/bioedit.html**

Courtesy: Ibis Biosciences, Carlsbad, CA, USA.

Bio Servers

BLAST Server

BLAST (Basic Local Alignment Search Tool) is an algorithm for comparing primary biological sequence information, such as the amino-acid sequences or the nucleotides sequences. A BLAST search enables a researcher to compare a query sequence with a library or database of sequences, and identify library sequences that resemble the query sequence above a certain threshold. The BLAST program was designed by Eugene Myers, Stephen Altschul, Warren Gish, David J. Lipman and Webb Miller at the NIH and was published in J. Mol. Biol. in 1990. The BLAST program can be accessed for free over the web at the web server, hosted by the NCBI, and allows anyone with a web browser to perform similarity searches against constantly updated databases of proteins and DNA that include most of the newly sequenced organisms. BLAST is actually a family of seven programs. Some important program are listed below:

1. **Nucleotide-nucleotide BLAST (blastn):** Search for the most similar DNA sequences from the DNA database that the user specifies for a given query DNA.
2. **Protein-protein BLAST (blastp):** Search for the most similar protein sequences from the protein database that the user specifies for a given protein query.
3. **Position-Specific Iterative BLAST (PSI-BLAST):** Find the distant relatives of a protein.

Courtesy: National Center for Biotechnology Information, Maryland, USA

Current Trends

Biodiesel

Biodiesel refers to a non-petroleum-based diesel fuel consisting of short chain alkyl (methyl or ethyl) esters, made by transesterification of vegetable oil or animal fat (tallow), which can be used (alone, or blended with conventional petrodiesel) in unmodified diesel-engine vehicles. Biodiesel is distinguished from the straight vegetable oil (SVO) used alone, or blended as fuels in some converted diesel vehicles. "Biodiesel" is standardized as mono-alkyl ester and other kinds of diesel-grade fuels of biological origin are not included.

Biodiesel can be used in pure form (B100) or may be blended with petroleum diesel at any concentration in most modern diesel engines. Biodiesel has different solvent properties than petrodiesel, and will degrade natural rubber gaskets and hoses in some vehicles. Biodiesel use and production are increasing rapidly. Fueling stations make biodiesel readily available to consumers across Europe, and increasingly in the USA and Canada. Biodiesel is often more expensive to purchase than petroleum diesel but this is expected to diminish due to economies of scale and agricultural subsidies versus the rising cost of petroleum as reserves are depleted.

In our country, the former President, Dr. Abdul Kalam, advocates the cultivation of jatropha for production of bio-diesel & the Indian Railways has already started to use the oil (blended with diesel fuel in various ratios) from the Jatropha plant to power its diesel engines with great success.

Courtesy: National Biodiesel Board, Missouri, USA

Bioinfy Quiz - 004

(By Abhijit S. Roy - Biotech Division, NEIST, Jorhat)

1. What is the name of the diseases characterized by the fusing of a newborn's legs, giving the baby the appearance of a mermaid?
a) Sirenomelia
b) Klinefelter syndrome
c) Huntington's disease

2. If you have loss of memory and intellectual function, and are having changes in mood, you may have ?
a) Amnesia
b) Binswanger's disease
c) Alzeihmer’s disease

3. Which of these is an antiviral agent ?
a) Zovirax
b) Candicin
c) Niclosamide

4. Which of the following species lack a 'classical' histone H1?
a) Strongylocentrotus purpuratus
b) Saccharomyces cerevisiae
c) Xenopus laevis

5. What was the first protein whose complete tertiary structure was determined?
a) Lysozyme
b) Pancreatic Ribonuclease
c) Myoglobin

Computers for Biologist

My NCBI

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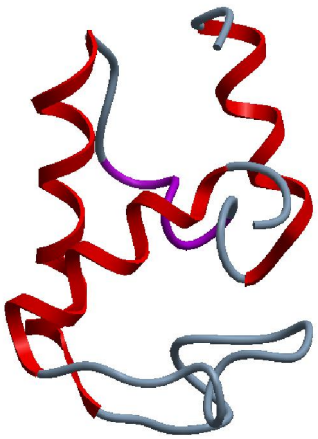
My NCBI can be used to:
1. Save searches that include search field tags or selection from the Limits page use an abbreviated what's new search to ensure that all citations are retrieved.
2. Set up e-mail alerts for new content
3. Display links to Web resources (LinkOut)
4. Choose filters that group search results
Like all other NCBI resources, My NCBI is free.

Courtesy: National Center for Biotechnology Information, Maryland, USA

Molecule of the Month

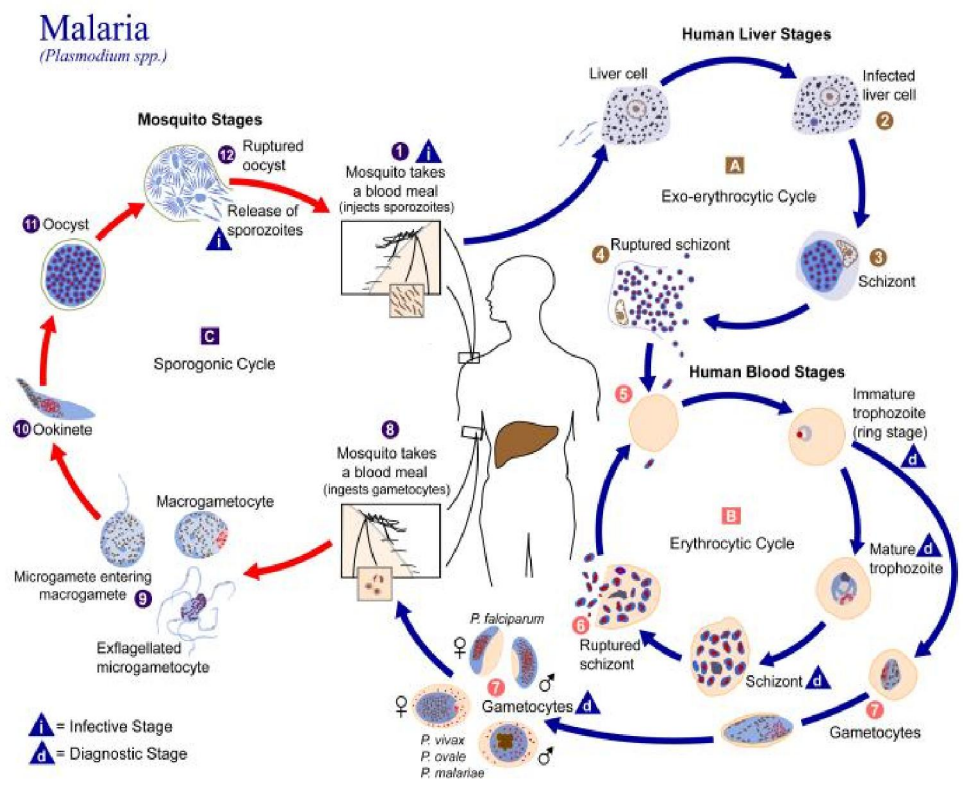
Acyl Carrier Protein

The acyl carrier protein (ACP) is an important component in both fatty acid and polyketide biosynthesis with the growing chain bound during synthesis as a thiol ester at the distal thiol of a 4'-phophopantethiene moiety. Shown below is the Acyl Carrier Protein (ACP) from the malaria parasite, Plasmodium falciparum (PfACP) in its holo form which is found to exist in two conformational states in solution. The unique 3D solution structures of holo-PfACP have been determined for both equilibrium conformations, using high-resolution NMR methods.



Molecular Data

PDB ID	: 2FQ2
Amino acids	: 79
Atoms	: 1270
Exp. Method	: NMR
Chains	: A (1)
Deposition	: 2006-01-17
Release	: 2006-08-08
Source Organism	: P. falciparum
Depositor	: IISc, B'lore.



Bioinfy Animator - Life Cycle of Plasmodium

Courtesy: Division of Parasitic Diseases, Center for Disease Control & Prevention, Atlanta, USA

Amino Acid Sequence Single Letter Representation

Amino Acid	Single Letter Code	Leucine	L
Alanine	A	Lysine	K
Arginine	R	Methionine	M
Aspargine	N	Phenylalanine	F
Aspartic acid	D	Proline	P
Cysteine	C	Serine	S
Glutamic acid	E	Threonine	T
Glutamine	Q	Tryptophan	W
Glycine	G	Tyrosine	Y
Histidine	H	Valine	V
Isoleucine	I	Answer to Bioify - 04	1-a ; 2-b ; 3-a ; 4-b; 5-c

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