



99<sup>th</sup>  
**Indian  
Science  
Congress**  
3-7 January, 2012 - Bhubaneswar

# 99<sup>th</sup> Session of the Indian Science Congress

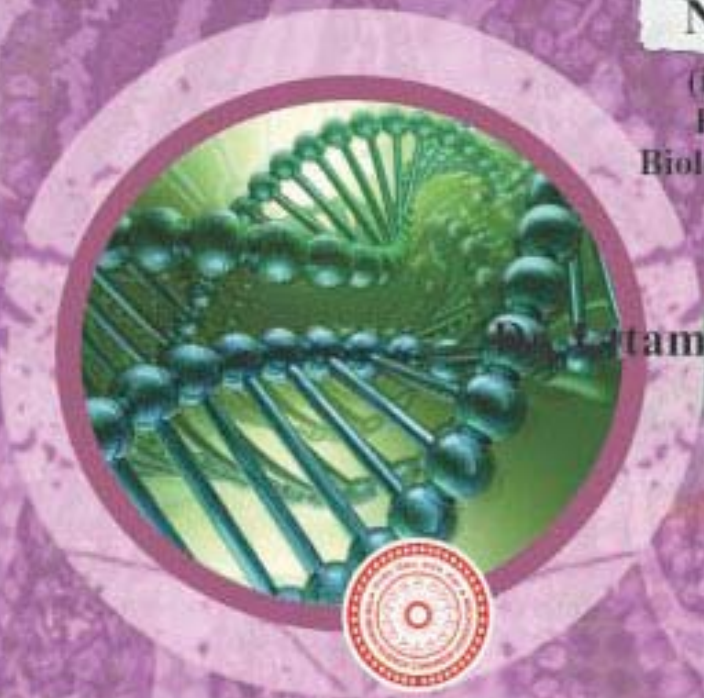
SECTION OF

**NEW BIOLOGY**

(including Biochemistry,  
Biophysics & Molecular  
Biology and Biotechnology)

*President*

**Dr. Satyam Chand Banerjee**



**The Indian Science Congress Association**

**PROCEEDINGS**  
**OF THE**  
**NINETY NINTH SESSION OF THE**  
**INDIAN SCIENCE CONGRESS**

**Bhubaneswar, 2012**

**PART II**

**SECTION OF NEW BIOLOGY**

**(Including Biochemistry, Biophysics & Molecular  
Biology and Biotechnology)**

***President: Dr. Uttam Chand Banerjee***

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# **99<sup>th</sup> Indian Science Congress**

**January 3-7, 2012, Bhubaneswar**

## **I PRESIDENTIAL ADDRESS**

***President: Dr. Uttam Chand Banerjee***

## **Application of enzymes and whole cells for the enantiomeric synthesis of chiral drugs and drug intermediates**

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The synthesis of enantiomerically pure compounds has become necessary in the production of chiral drugs and biologically active materials. Increased understanding of molecular mechanisms of drug interactions has shown that chirality plays an important role in the efficacy of drugs and agrochemicals. Moreover, U.S. Food and Drug Administration have increased regulatory pressure on the pharmaceutical industries to market homochiral drugs. The demand of fine chemicals as single enantiomers has forced the development of effective new chiral catalysts. Enzymes catalyze a wide variety of reactions including oxidation, reduction, hydrolysis, isomerization etc. Use of microbial, plant or animal cells or enzymes thereof, as catalyst for the synthesis of chirally pure chemicals has gained popularity over chemical synthesis because of inherent stereo-, regio- and chemo-selectivity. Biocatalysts can work both in aqueous as well as in an organic medium at mild temperature and pressure. The application of biocatalysts in organic synthesis has become a powerful tool for the synthesis of chiral compounds. Most of the enzymes required for enantiomeric synthesis of drug molecules or intermediates are intracellular in nature. In general whole cells are used for the transformation reaction. It has been reported in the literature that enantiospecificity of enzymes is a function of substrate and enzyme concentration, pH, temperature etc. During the transformation reaction, the *R*-specific or *S*-specific enzymes attack the *R* or *S*-specific enantiomers, respectively and the enantiomeric excess increases upto certain limit (generally 50% conversion in kinetic resolution) and then it decreases. Until and unless the racemization takes place, 50% remaining *R* or *S* enantiomer is of no use. Racemization of the *R* or *S* enantiomer depends on the structure of the particular enantiomer and the reactive groups attached to it. Racemization of all the molecules does not take place by its own. The reaction conditions will have to be optimized in such a way that maximum conversion with maximum enantiomeric (ee) excess is obtained, however, with the increasing of conversion, ee value decreases. Probably, it needs the presence of threshold concentration of both the isomers in reaction mixture



when the specific isomer will be utilized and another one will be untouched. This works in the competitive inhibition mode.

Various enzymes like oxido-reductase, transferase, hydrolase, lyase, isomerase and lipases act on the different prochiral or racemic compounds to yield chirally pure drugs/precursors.

### **1. Oxido-reductases**

Oxido-reductases include oxidases, oxygenases and dehydrogenases which catalyze oxidation reduction reaction through the transfer of electrons. These enzymes are cofactor dependent, either they are supplied or whole cells are used. NADH/NAD<sup>+</sup>, NADPH/NADP<sup>+</sup>, FADH/FAD<sup>+</sup>, ATP/ADP and PQQ are the commonly used expensive cofactors required for the enzymes. Dehydrogenases have been widely used for the reduction of C=O and C=C groups.

### **2. Transferases**

Transferases catalyse the transfer of a chemical group from one compound (donor) to another (acceptor) one. Industrial applications of transferases are limited due to low yield at reaction equilibrium. Substrates for group-transfer coupling reactions are quite expensive and their corresponding products are not easily recycled.

### **3. Hydrolases**

Hydrolases catalyze the hydrolytic cleavage of C-O, C-N, C-C and some other bonds, including P-O bonds in phosphates. Among hydrolases, lipases are the most industrially used enzymes for the resolution of racemic ester to chirally pure acids or alcohols.

### **4. Lyases**

Lyases catalyze the cleavage of C-C, C-O, C-N and other bonds, often leaving double bonds. Lyases have gained significant industrial attention as chiral centers may be generated during new bond formation.

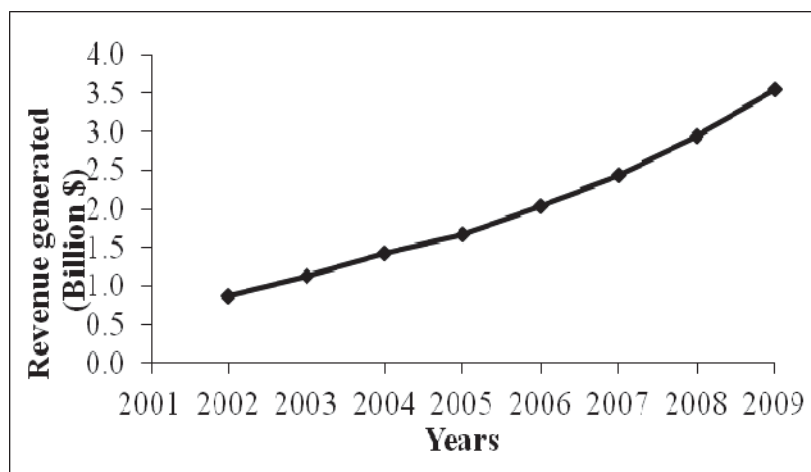
### **5. Isomerases**

Isomerases catalyse geometric or structural changes within one single molecule. Among various isomerases, racemases and glucose isomerase have gained industrial significance.

## 6. Ligases

Ligases catalyze bond formation between two molecules, coupled with hydrolysis of a pyrophosphate bond in ATP or similar triphosphate. Ligases play a significant role in ribosomal peptide synthesis and also in the repairing of DNA fragments and in genetic engineering.

Of all the enzymes, hydrolases including lipases, esterases and acylases are mostly employed for industrial biotransformation. It is estimated that approximately 80% of all the industrially used enzymes are hydrolases. Now days, biocatalysis has been proven an economical tool of organic synthesis. An analysis of the new molecular entities (NMEs) approved by the US FDA in 2008 gave the following approximate distribution: 63% single enantiomers, 32% achiral drugs, and only 5% racemates. The revenues generated by chemical industries through the enzyme catalyzed processes were \$700 million in 2002 which grew at a CAGR of 25 % and reached to \$3.3 billion by 2009 (Figure 1). This is 22% of the revenues generated by the total chiral technologies.



**Figure 1. Revenue generated by the chemical industries using biological processes**

It is estimated that the value of pharmaceutical intermediates generated using enzymatic reactions will reach \$354.4 million by 2013. Avecia, BASF, Bayer, Degussa, Dow, DSM, Lonza, Merck KGaA, Cambrex, Great Lakes and Sepracor are the names of few industries relying on enzyme technology for the production. There are numerous other companies who specialize in biological methods as a single competency or niche technology.

### **Enzymatic synthesis of chiral intermediates**

Among different enzymes used for biocatalytic reactions, lipases, nitrilases and oxidoreductases have found tremendous applications. In principle, biocatalysis can be performed by the cells of microbes, plants and animals or the enzymes derived from them, however, for all the practical purposes, microbes are used.

### **Dehydrogenases in the synthesis of drugs/ drug intermediates**

Baker's yeast was the first biocatalyst used for the enantioselective reduction of various substituted carbonyl groups. For some instances, competition between different types of dehydrogenases resulted in the decreased enantioselectivity. Various newer strains were also isolated and employed in the bioreduction reactions. *Thermoanaerobacter* sp. ADH expressed in *Escherichia coli* was used for the reduction of ethyl 5-oxo-6-heptenoate to (*R*)-5-hydroxyhept-6-enonoate, whereas, the opposite enantiomer (*S*) was obtained by *Lactobacillus brevis* ADH. These chiral alcohols are important intermediates for prostaglandins, leukotrienes, isoprostanes, and atractyligenin. Asymmetric reduction of 1-[3,5-bis(trifluoromethyl)phenyl]-ethanone by *Lactobacillus kefir* gave the corresponding (*R*)-alcohol in >99% *ee*, an intermediate for tachykinin NK1 receptor. On the other hand, *Rhodococcus erythropolis* yielded (*S*)-alcohol, is also an important pharmaceutical intermediate. Various sterically hindered ketones as isopropyl phenylsulfonylmethyl ketones, were reduced by *Trichosporon cutaneum* IAM 12206 and *Pichia minuta* IAM 12215 to the corresponding (*R*)-and (*S*)-alcohols, respectively.

The chiral alcohols are important building blocks for the synthesis of  $\beta$ -aryl ethanol amines which are then used for the synthesis of various antihypertensive, antiarrhythmic and antianginal drugs. Enantioselective reduction of 2-bromo-4-fluoro acetophenones and ester thereof to (*S*)-1-(2'-bromo-4'-fluoro phenyl) ethanol was carried out with many microbial cultures. Many cultures of *Candida*, *Hansenula* and *Pichia* gave high yield with excellent enantioselectivity (>99 %) for this reaction. Chiral phenyl ethanols (both enantiomers) are important building blocks for the synthesis of many pharmaceutical compounds. Various microbial cultures such as Baker's yeast, *Aspergillus terreus* CCT 4083, *Alternaria alternate* EBK-4, *Rhodoturula glutinis* EBK-2, *Rhodoturula* sp. AS2.2241, *Candida viswanathii* MTCC 5158 etc. have been reported for the reduction of acetophenone and substituted acetophenones with good yield and enantioselectivity. Two microbial strains, *Paracoccus pantotrophus* DSM 11072 and *Comamonas* sp. DSM 15091 were reported to accept a wide range of substrates including methyl-aryl, methyl-alkyl, cyclic, sterically hindered ketones

and diketones and produced corresponding chiral alcohols with anti-prelog selectivity.

### **Lipases in the synthesis of drugs/ drug intermediates**

The potential of lipases in organic chemistry is fully exploited by replacing the aqueous medium with an organic one. The first lipase-catalyzed reaction performed in organic medium was reported in 1984 by Zaks and Klivanov. Resolution of halogen alcohols or ciano alcohols using *Pseudomonas cepacia* lipase have been reported which are used as intermediate for the synthesis of (*S*)-propranolol. A dynamic kinetic resolution process with azidoalcohols was developed for the synthesis of (*S*)-propranolol intermediate. Stereoselective acetylation of racemic 7-[*N*, *N'* - bis -(benzyloxy-carbonyl)-*N*-(guanidinoheptanoyl)]-alpha-hydroxy glycine to the corresponding (*S*)-acetate was catalysed by lipases. (*S*)-acetate is a key intermediate for the total chemical synthesis of (*S*)-15-deoxyspergualin, an immunosuppressive agent and antitumor antibiotic. *Candida antarctica* lipase B (CAL-B) was found as an excellent catalyst for the synthesis of chiral pure 2-methoxy-2-phenylethanol, used in the synthesis of 1,4-dihydropyridine derivatives which act as calcium channel antagonists. The enzymatic resolution of 4-[(4-dimethylamino)-1-(4-fluorophenyl)-1-hydroxy-1-butyl]-3-(hydroxyl-methyl) benzonitrile, an intermediate of citalopram, was achieved with *Candida antarctica* lipase B. Lipase from *Candida rugosa* has been used to synthesize lovastatin, a drug that lowers serum cholesterol level. The asymmetric hydrolysis of 3-phenylglycidic acid ester which is a key intermediate in the synthesis of diltiazem hydrochloride, a widely used coronary vasodilator, was carried out with *Serratia marcescens* lipase. The enantioselective hydrolysis of (1 $\alpha$ ,2 $\beta$ ,3 $\alpha$ )]-2-[(benzyloxy)methyl]-4-cyclopenten-1,3-diol diacetate was selectively hydrolyzed to (+)-monoacetate, which is an intermediate for the synthesis of Baraclude, a potential anti-hepatitis B drug. *Pseudomonas cepacia* lipase PS-30 was used with reaction yield of 85 M% and an e.e. of 98%, however, pancreatin lipase yielded 75 M% and an ee of 98.5% product.

Double aminolysis of corresponding malonate ester using *Candida antarctica* lipase B yields enantiopure *trans*-cyclohexane-1,2-diamine and *trans* cyclopentane- 1,2-diamine. These are important class of compounds as chiral auxiliaries in asymmetric synthesis and intermediates of some pharmaceuticals. *Candida rugosa* lipase catalysed the enzymatic resolution of the antimicrobial compounds (*S*)- and (*R*)-elviro and their derivatives (*S*)- and (*R*)-curcuphenol. (*R*)-curcuphenol exhibits antibacterial activity whereas the (*S*)-enantiomer inhibits the gastric H/K-ATPase. Lipase from *Pseudomonas aeruginosa*, has been used for



the enantioselective transesterification of (*R,S*)-1-chloro-3-(3,4-difluorophenoxy)-2-propanol to (*R*)-1-chloro-3-(3,4-difluorophenoxy)-2-propanol, a key intermediate in the synthesis of the chiral drug (*S*)-Lubeluzole. Lipase membrane reactor has been studied for the resolution of racemic ibuprofen ester. Resolution of various racemic acidic compounds such as non-steroidal anti-inflammatory drugs (NSAIDs) of the group arylpropionic acid has been achieved. Lobucavir is used for the treatment of herpes virus and hepatitis B. A biocatalytic process was developed for the synthesis of a prodrug lobucavir L-valine, the regioselective aminoacylation reaction was done by coupling of lobucavir hydroxyl group with the L-valine. With some modifications in the substrate ester, one type of lipase yielded 83% product whereas the lipase from *Candida cylindraceae* yielded 87 %.

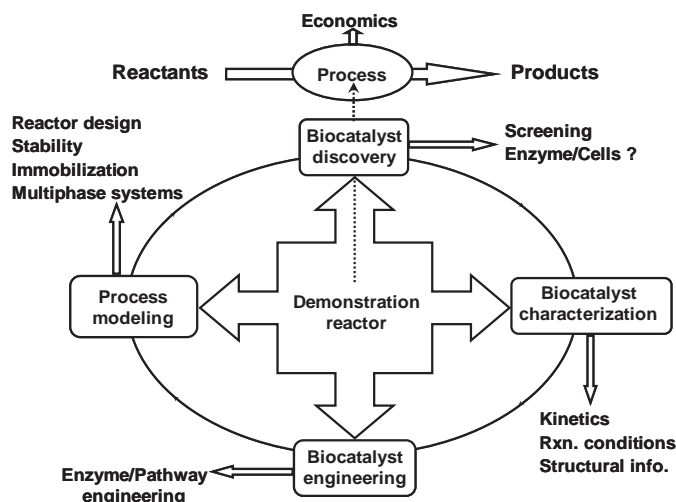
### **Nitrilases in the synthesis of drugs/ drug intermediates**

One of the industrial applications of nitrile metabolizing enzymes is the chemo-enzymatic manufacture of nicotinamide by Lonza Guangzhou Fine Chemicals (Guangzhou, China). Nicotinamide is an antioxidant that is mainly related to prevention and treatment of insulin-dependent diabetes mellitus. It also provides protection against apoptosis in neurons and endothelial cells through the prevention of both DNA fragmentation and the inhibition of membrane. The nitrile hydratase-mediated hydration process can be used for the production of pharmaceutically important amides such as benzamide, isonicotinamide, picolinamide, pyrazinamide and isobutyramide. The benzamide derivative or a salt has an anti-ulcer effect or an antibacterial activity against *Helicobacter pylori*, and has also high safety to be available for the prevention or cure of ulcers. In psychiatry, some substituted benzamides are therapeutically used as neuroleptics and/or antipsychotics, two active substances from the group of benzamides are in uses, they are sulpride and amisulpride. Some analgetics like salicylamide or ethenzamide also have benzamide structures. Their pharmaceutical composition as an antibacterial drug against *Helicobacter pylori* and as an anti-ulcer drugs are available. Pyrazinamide is only used in combination with other drugs such as isoniazid and rifampicin in the treatment of *Mycobacterium tuberculosis*. Isonicotinamide is used as antitubercular agent and has antidepressant activity also. D-phenylglycine amide is an intermediate in the industrial synthesis of  $\beta$ -lactam antibiotics. *Rhodococcus* sp. has been reported for the biotransformation of a racemic mixture of phenylglycine nitrile to D-phenylglycine amide and L-phenylglycine. 2-Arylpropanoic acids are an important class of anti-inflammatory pharmaceutical compounds (e.g., naproxen and ibuprofen are commercially important examples). The (*S*)-enantiomer of these agents has been shown to be much more active than the (*R*)-enantiomer. Chemical synthesis pathways that involve the resolution of isomers by physical means can be costly and are thus

commercially undesirable. One of the strategies being developed for the preparation of optically active 2-arylpropanoic acids is the enantioselective enzymatic hydrolysis of the corresponding nitriles.

### **Strategies for the improved biocatalysis**

Although biocatalysts offer numerous advantages in the organic synthesis, however, they are not totally problem free. The most of the enzymes are highly specific requiring separate enzyme for each substrate. Hence, selection of a suitable biocatalyst with higher activity and desired enantioselectivity towards the substrate has been the key step for the efficient biocatalysis. Enzymes of different origin are obtained from commercial sources and screened for the desired activity. If the enzymes are not commercially available to affect the desired biotransformation, it may be obtained from culture collections or from natural environment using acclimatization/enrichment techniques. Enrichment technique is based on the fact that when the specific nutrients and culture conditions are provided, only specific strain for which the conditions are favorable will grow faster than others and become dominant population. In contrast, the acclimatization technique is based on the physiological adaptation of microbial culture to changes in climate or environment. This technique is widely used to isolate the microorganisms which are to be used for the biotransformation of toxic/unnatural substrates. Acclimatization is time consuming technique, as the substrates need to be fed gradually for a long term which enable organisms to survive beyond their natural experience i.e. production of new enzymes in the microbe which are able to utilize the substrate. Metagenomics is becoming more popular technique in which the genetic material is recovered directly from the environment and cloned in to the suitable vector to construct the genomic library. This is a useful technique to mine the genetic resource of non-cultivable microbes and has led to discover many enzymes and natural products of pharmaceutical importance.



**Figure 2. A typical biocatalytic cycle**

Further, over billions of years evolution made these enzymes to operate most effectively under physiological conditions and on a narrow range of natural substrates at relatively lower concentration. As a result, not all the naturally occurring microbial enzymes are suitable for industrial-scale biocatalytic processes where unnatural compounds need to be efficiently used as substrates. Further, the biocatalyst should be stable at reaction temperature, pH and reaction medium etc. There are many strategies for the improvement of biocatalytic efficiency, such as reaction medium engineering, substrate engineering, development of various biocatalyst formulations and change in protein structure by molecular biology tools (Figure 2).

#### *Medium engineering*

The solvents as reaction medium have been extensively used in the biocatalysis reaction. Since most of the substrates are hydrophobic, availability of the substrate to the cells in aqueous medium remains limited. In the presence of a water miscible organic solvent, in which the substrate is soluble, the amount of substrate available to the cells increased. Enzymes retain their activity or even exhibit novel and commercially useful activity such as higher stability in elevated temperature or pH, improved or altered selectivity, changed substrate affinity etc. when an appropriately chosen solvent is used for the reaction. Although no generalization can be made on the effect of solvent nature on the enzyme activity, however, it has been observed that enzyme activity increases with the increase of solvent hydrophobicity. This is because the essential water layer around the enzymes,

required for their activity is not stripped off on the interaction with non-polar solvents.

#### *Substrate engineering*

The chemical modification in the substrate has been proved an efficient method for the enhancement of rate of enzyme reaction, higher yield of product, improved enzyme stability by inhibiting substrate/product inhibition, higher enantioselectivity etc. In some cases the substrate modification provided opportunity of easy separation of product and remaining substrate from the reaction mixture. In a scheme, fluorinated acyl donors were used for the lipase mediated resolution, the fluorinated product was extracted with perfluorinated solvents.

#### *Biocatalyst modification*

Enzyme modification has been a key area of research for numerous research groups in the world. The enzymes may be modified in various types to achieve the desired activity/stability. Immobilization of enzymes on a support material is one of the most ancient techniques of enzyme modification where the enzyme is absorbed or covalently linked with an inert solid support. The immobilized enzyme show higher operational stability (at elevated temperature, adverse pH conditions, presence of organic solvents etc.) as well as easy separation of enzyme from the reaction mixture, making the enzyme recycling more convenient. Thus the overall cost of operation is considerably reduced. The tailoring of enzymes through protein engineering is very attractive approach to improve the enzyme characteristics for improved yield, selectivity, stability etc. The two broad approaches of protein engineering include random mutagenesis and rational redesign. The rational redesign requires the in depth knowledge of structure, function, sequence of the protein of interest. The specific residue that may induce the desired changes in the protein of interest is usually identified based on the extensive sequence analysis or molecular modeling. The change in the sequence is then introduced using site directed mutagenesis and thus the protein variant is generated with altered or improved characteristics. However, the approach of random mutagenesis or directed evolution does not require the prior knowledge of protein function and structure. In this case, the gene encoding for particular protein is directly subjected to mutagenic pressure and during this process the mutations are being incorporated throughout the gene length randomly leading to the construction of variant library. The variant with desired characteristic is then selected from this library. In present scenario many researchers are using the elements of both the approaches together to generate superior variants or

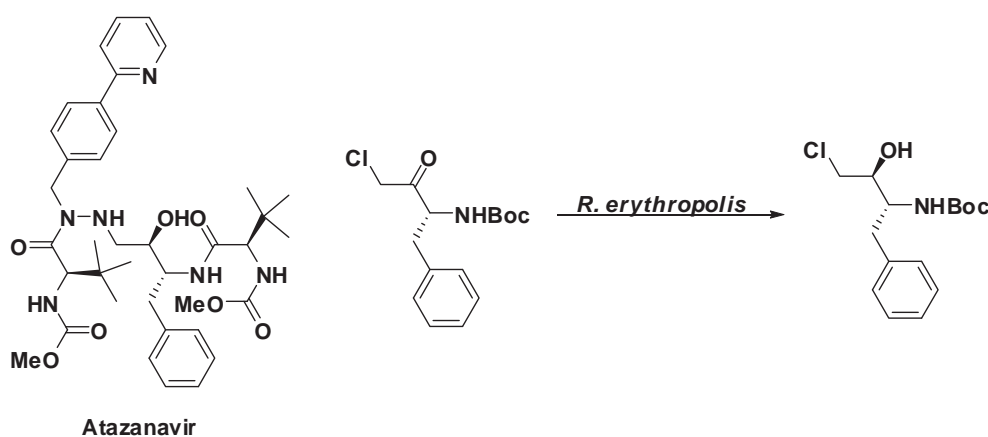
improved therapeutic agents. Chemical modification of enzymes and artificial enzymes are also becoming popular.

## Enzymatic synthesis of various drugs/drug intermediates

### Antiviral drugs

#### Enzymatic preparation of Atazanavir intermediate

The (1*S*,2*R*)-[3-chloro-2-hydroxy-1-(phenylmethyl) propyl]-carbamic acid, 1,1-dimethyl-ethyl ester is required for the synthesis of Atazanavir, a potent HIV protease inhibitor, used for the treatment of AIDS. A biocatalytic process was developed for the diastereoselective reduction of corresponding ketone using *Rhodococcus*, *Brevibacterium*, and *Hansenula* strains to yield (1*S*,2*R*)-product. Three strains of *Rhodococcus* gave >90% yield with a diastereomeric purity of >98%.

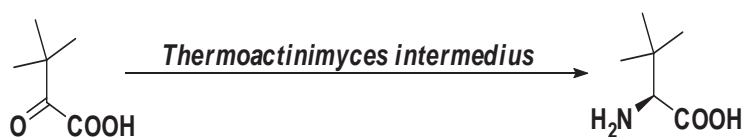


The reduction of ketone was also done in fermentation of *Rhodococcus erythropolis* SC 13845, 95% product yield with 98.2% diastereomeric excess was achieved.

#### Enzymatic synthesis of (*S*)-tertiary-leucine

(*S*)-tertiary-leucine is also an intermediate of atazanavir. The biocatalytic synthesis of this intermediate involved reductive amination of the corresponding ketoacid using recombinant *E. coli* expressing leucine dehydrogenase from *Thermoactinomyces intermedius*, as biocatalyst.





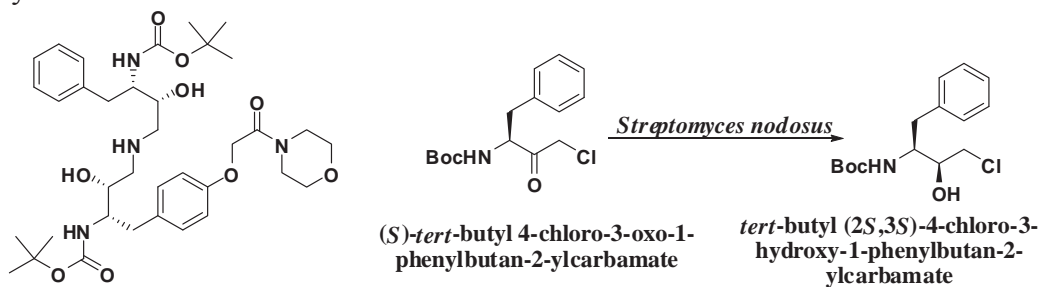
The cofactor NADH was recycled using recombinant *E. coli* expressing formate dehydrogenase from *P. pastoris*. The reaction yielded 95% product with >99.5% e.e.

#### Synthesis of Tamiflu

Used for the treatment of avian influenza and SARS. The starting point for Tamiflu synthesis is shikimate, an intermediate in primary metabolism. Frost and co-workers have developed an alternative pathway to shikimic acid by evolving the primary metabolic enzyme 2-keto-3-deoxy-6-phosphogalactonate aldolase to accept an alternative substrate, ethythrose-4-phosphate.

The result is an *E. coli* strain capable of producing 8.3 g/l of shikimate from glucose by direct fermentation. The Frost group has constructed a biosynthetic system for the production of aminoshikimic acid in *Bacillus subtilis* and recombinant *E. coli*.

#### Synthesis of BMS 186318 intermediate



**BMS 186318**  
HIV protease inhibitor

Enantioselective enzymatic reduction of (S)-tert-butyl-4-chloro-3-oxo-1-phenylbutane-2-ylcarbamate to the corresponding chiral alcohol by *Streptomyces nodosus* was reported in the literature. Among 100 microorganisms screened for this reduction, *Streptomyces nodosus* and *Mortierella ramanniana* proved most efficient and were used to convert ketone. A reaction yield of 67%, an ee of 99.9% and a diastereomeric purity of >99% were obtained using *S. nodosus*. *Mortierella Ramanniana* gave a reaction yield of 54%, an ee of 99.9% and a diastereomeric purity of 92%. A single-stage fermentation-biotransformation

process was developed using *S. nodosus*; reaction yield of 80%, a diastereomeric purity of >99% and an ee of 99.8% were obtained

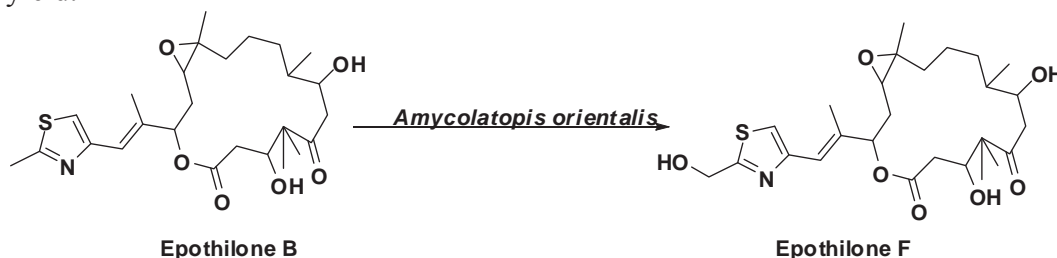
## Anticancer drugs

### Synthesis of paclitaxel

Paclitaxel is an antimetabolic agent, used for various cancer treatments, especially ovarian cancer and metastatic breast cancer. It is obtained from the *Taxus brevifolia* bark, but at very low yield. Various semi synthetic processes were developed using baccatin or 10-deacetylbaccatin to meet the demand of paclitaxel. C-13 taxolase and C-10 deacetylase obtained from *Nocardioides* strain was used for the biotransformation of various taxens to C-10 deacetyl baccatin. This process was scaled up to 5000 L.

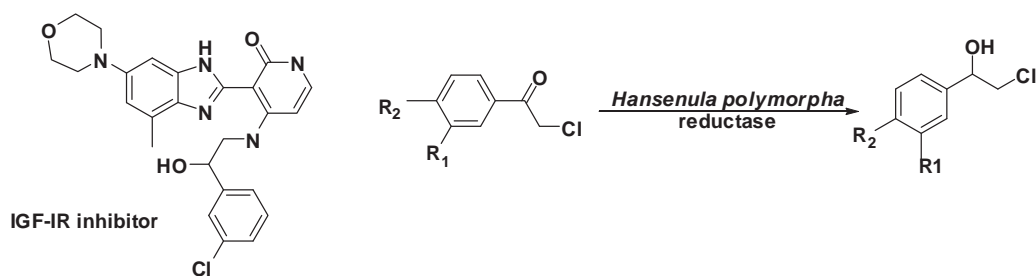
### Synthesis of epothilones

The mechanism of action of the epothilones is similar to that of Taxol. The naturally obtained epothilone B was hydroxylated to more potent epothilone F using *Amycolatopsis orientalis*, and the process was scaled up to 100-250 L. The hydroxylase gene has been cloned in *Streptomyces rimosus* to obtain the higher yield.



### Synthesis of intermediate for IGF-1R inhibitor synthesis

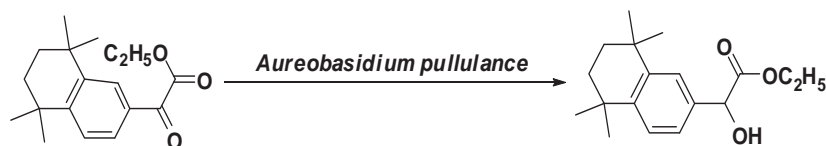
(*S*)-2-chloro-1-(3-chlorophenyl) ethanol is a crucial intermediate in the synthesis of an IGF-1R inhibitor, used for cancer treatment. Biocatalytic process to synthesize this intermediate involves reduction of the corresponding ketone. Two microbial strains were selected namely *Hansenula polymorpha* and *Rhodococcus globerulus* which yielded the product with 73.8 and 71.8 % ee, respectively.



The 100% optically pure product was obtained using the purified reductase from *H. polymorpha*, the corresponding gene was cloned in *E. coli*.

#### Synthesis of $\gamma$ -specific retinoic acid receptor agonist

The 2-(*R*)-hydroxy-naphthalenyl derivative was synthesized by reduction of corresponding ketone using *Aureobasidium pullulans* as biocatalyst, 98 % product yield with 96 % ee was achieved.



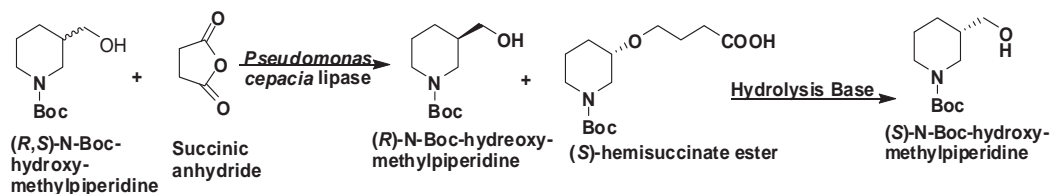
This agonist affects cellular growth and differentiation, used for the cancer treatment.

#### Synthesis of nucleoside analogues

These are used for the treatment of AIDS, other viral infections, heart diseases, stroke, human leukemia etc. These are prepared by transglycosidation reactions including reversible phosphorolysis of nucleosides and purine/pyrimidine base transfer reactions.

#### Synthesis of (*S*)-*N* (tert-butoxycarbonyl)-3-hydroxymethyl piperidine

This is an intermediate for the synthesis of a potent tryptase inhibitor. The biocatalytic strategy involves resolution of racemate by *Pseudomonas cepacia* lipase (PS-30), 16 % yield with 95 % ee was obtained. The use of succinic anhydride as acylating agent resulted in 47.8% yield with 85.7 % ee.

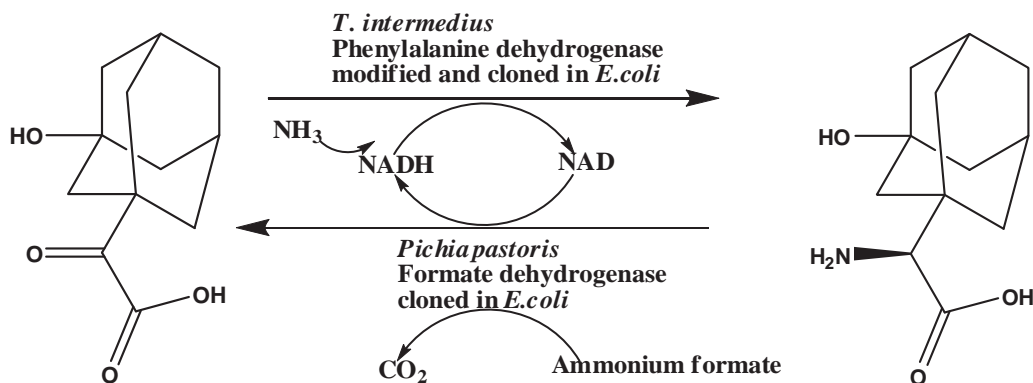


The repeated acylation process was developed, yielding 32% product with 98.9% ee.

## Antidiabetic drug

### Synthesis of Saxagliptin intermediate

Inhibitors of dipeptidyl peptidase IV (DPP-IV) alleviate the inactivation of GLP-1, normalizing the blood glucose level in diabetics. Synthesis of one such inhibitor (Saxagliptin) requires (S)-N-boc-3-hydroxyadamantylglycine as an intermediate. This S-amino acid was synthesized by recombinant phenylalanine dehydrogenase of *Thermoactinomyces intermedius* expressed in *E. coli*.



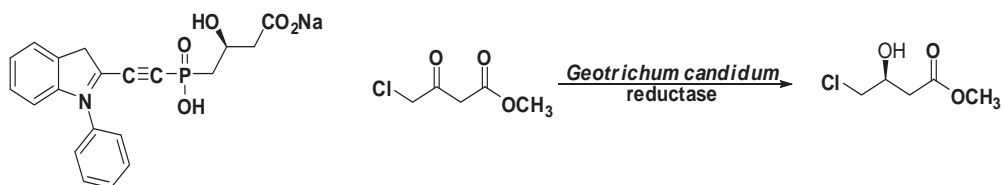
The efficiency of the process was further improved by co-factor recycling employing formate dehydrogenase by *Pichia pastoris* cloned in *E. coli*. The process was scaled up to multi gram scale employing extracts of *P. pastoris* harbouring phenylalanine dehydrogenase from *T. intermedius* and endogenous formate dehydrogenase. Another method with *Candida antarctica* lipase B (CALB)-mediated ammonolysis of (5S)-4,5-dihydro-1H-pyrrole-1,5-dicarboxylic acid, 1-(1,1-dimethylethyl)-5-ethyl ester with ammonium carbamate to form the corresponding amide, without racemization with low levels of side-product formation was described.

## Anticholesterol drugs

### HMG CoA reductase inhibitors

#### Synthesis of (S)-4-chloro-3-hydroxybutanoic acid methyl ester

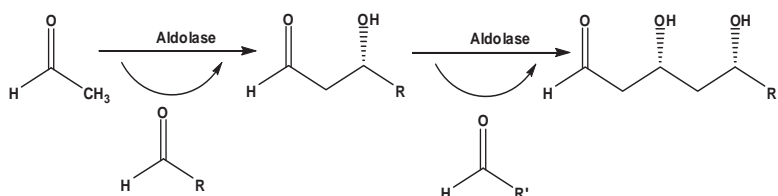
This compound is an intermediate for the synthesis of a HMG CoA inhibitor. It was synthesized by the reduction of the corresponding prochiral ketone using *Geotrichum candidum* as biocatalyst with 95% yield and 96% ee of the product obtained. The heat treatment of the cells (55 °C for 30 min) increased the ee by 98%.



HMG CoA reductase inhibitor

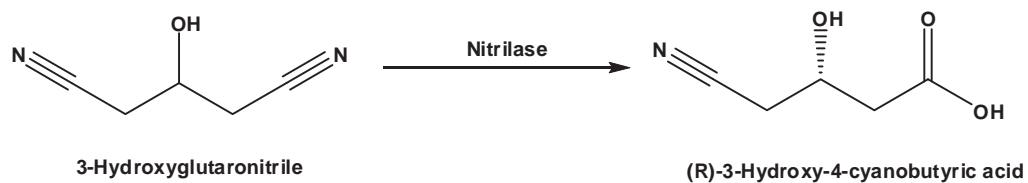
#### Synthesis of 2,4-dideoxyhexose derivative

This is the intermediate for the synthesis of Atorvastatin and Rosuvastatin. The aldolase was cloned in *Escherichia coli*.



#### Synthesis of (R)-3-hydroxy-4-cyanobutyric acid

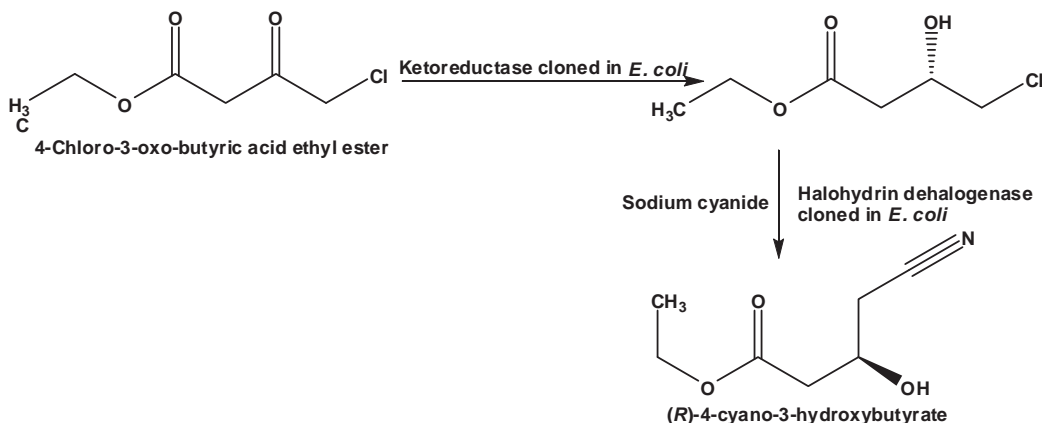
The intermediate for the synthesis of Atorvastatin is obtained through biocatalytic route. The nitrilase was obtained from metagenomic library and expressed in *Escherichia coli*.





### Synthesis of (R)-4-cyano-3-hydroxybutyrate

This is also an intermediate for the HMG CoA reductase inhibitor. Genes encoding ketoreductase from *Candida magnoliae*, halohydrin dehydrogenase from *Alcaligenes tumafaciens*, glucose dehydrogenase from *Bacillus subtilis* and format dehydrogenase from *Candida boidinii* were separately cloned and overexpressed.



### Synthesis of (S)-4-chloro-3-hydroxybutanoate

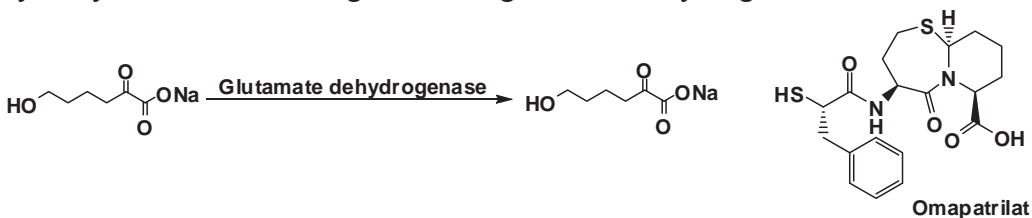
Ethyl 4-chloroacetoacetate was reduced to synthesize this intermediate using *E. coli* cells harboring alcohol dehydrogenase gene from *Pichia finlandica*. The product yield obtained in this process was 98.5% with 99% ee.



### Antihypertensives

#### Synthesis of (S)-6-hydroxynorleucine

This key intermediate of omapatrilat, an angiotensin-converting enzyme (ACE) inhibitor was synthesized by the reductive amination of 2-keto-6-hydroxyhexanoic acid using beef liver glutamate dehydrogenase.



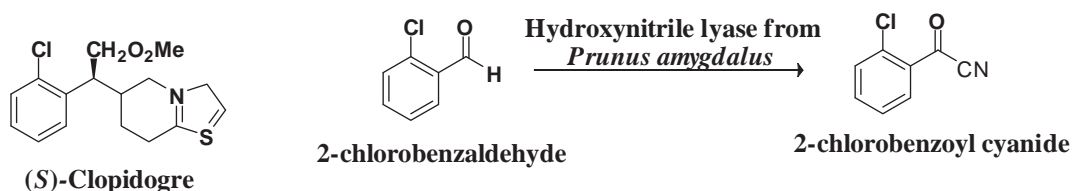
The cofactor NAD was recycled using glucose dehydrogenase from *Bacillus megaterium*. The reaction yield was 92% with >99% *ee*.

### Synthesis of hematology drugs

Xemilofiban is a platelet glycoprotein IIb/IIIa antagonist, disrupts platelet fibrinogen interaction and prevents thrombus formation. The 5- $\beta$ -aminoester intermediate of Xemilofiban is synthesized by the enzymatic resolution of corresponding racemate.

#### Synthesis of (*R*)-*o*-chloromandelonitrile

It is an intermediate of Clopidogre, a potent platelet aggregation inhibitor. It is used as an anti-thrombotic agent for the treatment with vascular diseases, MI and stroke.



(*S*)-Clopidogre

The crucial intermediate 2-chlorobenzoyl cyanide was synthesized by adding nitrile group to the 2-chlorobenzaldehyde using hydroxynitrile lyase from *Prunus amygdalus*, in presence of HCN and isopropyl alcohol-aqueous medium.

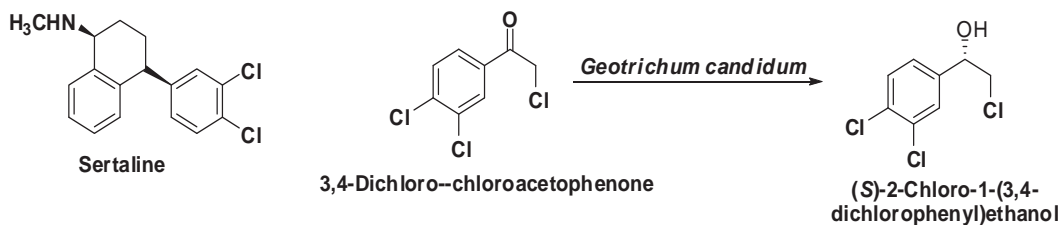
### CNS drugs

#### Synthesis of (*R*)-1-phenyl-3-buten-1-ol

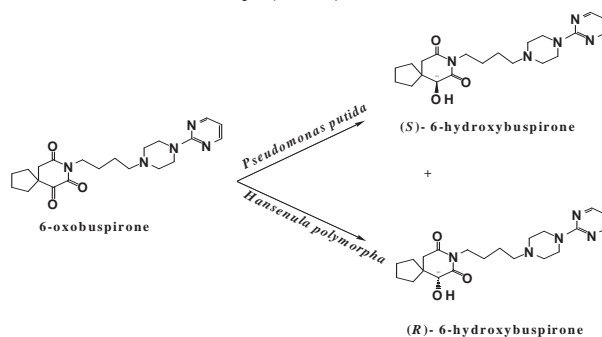
(*R*)-1-phenyl-3-buten-1-ol is a crucial intermediate for the synthesis of fluoxetine and tomoxetine. It was synthesized by the resolution of racemic 1-phenyl-3-buten-1-ol using lipase and vinyl acetate as acyl donor. This process yielded 92 % product with 85 % *ee*.

#### Synthesis of (*S*)-2-chloro-1-(3,4-dichlorophenyl)ethanol

This is an intermediate for the synthesis of sertraline, an antidepressant drug. The biocatalytic synthesis of this intermediate involves the reduction of the corresponding prochiral ketone using *Geotrichum candidum* as biocatalyst, 90% yield with 93% *ee* was achieved. The excellent selectivity (99%) and yield (88%) was obtained with *Rhodotorula mucillaginosa*.



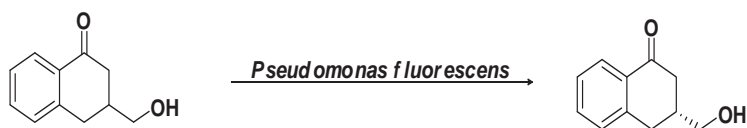
**6-hydroxybuspirone:** A metabolite of Buspirone which selectively inhibits serotonin 5HT<sub>1A</sub> receptor. The S-isomer was more potent than the counterpart. An enzymatic process was developed for the enantioselective hydrolysis of 6-acetoxybuspirone. *Aspergillus melleus* acylase was used for this purpose, good yield (46%) and enantioselectivity (96%) was observed.



In another enzymatic method, buspirone was directly hydroxylated to (S)-6-hydroxybuspirone using *Streptomyces antibioticus*. In another method, first ketobuspirone was synthesized chemically which was selectively reduced to (S)-6-hydroxybuspirone by *P. putida* SC 16269. In this process, >98% yield and >99.9% ee was achieved.

#### Synthesis of (R)-3-hydroxymethyl-1-tetralone tosylate

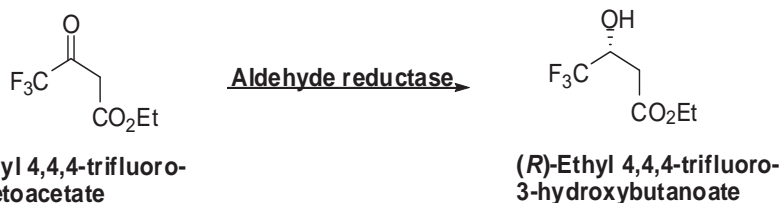
This is an intermediate for the synthesis of haloperidol, used in depression, anxiety, schizophrenia, migraine and panic disorder. The biocatalytic strategy for the synthesis of this intermediate involved the lipase catalyzed resolution of hydroxyketone (hydroxymethyl -1,2,3,4-tetrahydro naphthalene-1-one) using lipase from *Pseudomonas fluorescens*. Good selectivity (93%) with moderate yield (35%) was obtained.



3-(Hydroxymethyl)-3,4-dihydronaphthalen-1(2H)-one    *(R)*-3-(Hydroxymethyl)-3,4-dihydronaphthalen-1(2H)-one

#### Synthesis of *(R)*-ethyl 4,4,4-Trifluoro-3-hydroxybutanoate

*(R)*-ethyl 4,4,4-Trifluoro-3-hydroxybutanoate is a key intermediate of the bexloxtone, used as anti-depressant drug.

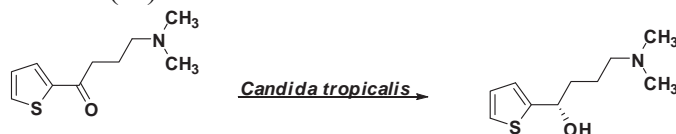


Ethyl 4,4,4-trifluoroacetoacetate

*(R)*-Ethyl 4,4,4-trifluoro-3-hydroxybutanoate

#### Synthesis of *(S)*-*N,N*-dimethyl-3-hydroxy-3-(2-thienyl)-1-propanamine

*(S)*-*N,N*-dimethyl-3-hydroxy-3-(2-thienyl)-1-propanamine is a key intermediate in the synthesis of the duloxetine. It was synthesized by the reduction of *N,N*-dimethyl-3-keto-3-(2-thienyl)-1-propanamine using *Candida tropicalis* PBR-2 as biocatalyst, good yield (>80%) and almost absolute enantioselectivity, with an enantiomeric excess (ee) >99% was obtained.

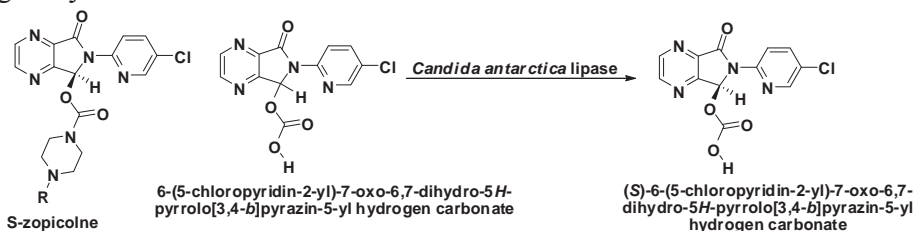


*N,N*-Dimethyl-3 keto-3-(2-thienyl)-1-propanamine (DKTP)

*(S)*-*N,N*-Dimethyl-3 hydroxy-3-(2-thienyl)-1-propanamine (DHTP)

#### Synthesis of *(S)*-6-(5-chloropyridin-2-yl)-7-oxo-6,7-dihydro-5H-pyrrolo[3,4-*b*]pyrazin-5-yl hydrogen carbonate

This is an intermediate for the synthesis of zopiclone, a potent sedative and hypnotic. The biocatalytic synthesis strategy involved *Candida antarctica* lipase mediated resolution of racemic 6-(5-chloropyridin-2-yl)-7-oxo-6,7-dihydro-5H-pyrrolo[3,4-*b*]pyrazin-5-yl hydrogen carbonate, excellent stereoselectivity (99%) with good yield.



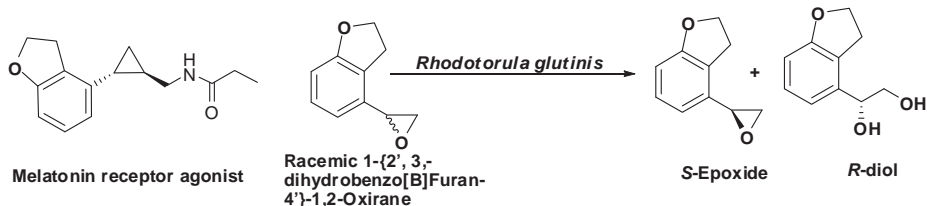
*S*-zopiclone

6-(5-chloropyridin-2-yl)-7-oxo-6,7-dihydro-5H-pyrrolo[3,4-*b*]pyrazin-5-yl hydrogen carbonate

*(S)*-6-(5-chloropyridin-2-yl)-7-oxo-6,7-dihydro-5H-pyrrolo[3,4-*b*]pyrazin-5-yl hydrogen carbonate

### Synthesis of (*S*)-4-(oxiran-2-yl)-2,3-dihydrobenzofuran

The (*S*)-4-(oxiran-2-yl)-2,3-dihydrobenzofuran (*S*-epoxide) is the crucial intermediate for the synthesis of a melatonin receptor agonist. The biocatalytic synthesis process involved resolution of racemic 1-{2', 3,-dihydrobenzo[B]furan-4'}-1,2-oxirane. Two microbial strains, *Aspergillus niger* and *Rhodotorula glutinis* selectively hydrolysed the *R*-epoxide leaving *S*-epoxide intact with 45% yield and >95% *ee*.



### Drugs used in respiratory diseases

The respiratory diseases may be of various types such as obstructive lung disease, restrictive lung disease, parenchymal lung disease, vascular lung disease, infectious lung disease, respiratory tumors etc. Among all these diseases, asthma is very common in now day's life style. The long acting  $\beta_2$  receptor agonist such as salmeterol, formeterol, bumbuterol etc. is frequently used for the treatment of asthma. A biocatalytic process was developed for the complete synthesis of formoterol. The synthesis scheme required two chiral intermediates, (*R*)-1-(4-(benzyloxy)-3-nitrophenyl)-2-bromoethanol and (*R*)-*N*-(1-(4-methoxyphenyl)propan-2-yl) acetamide. The biocatalytic synthesis strategy involved resolution of corresponding racemates using Amano PS-30 lipase and lipase from *Candida antarctica*, respectively. The resolution of racemic 1-(4-(benzyloxy)-3-nitrophenyl)-2-bromoethanol by Amano PS-30 resulted in acylation of (*S*)-enantiomer leaving (*R*) intact with 46% yield, whereas the *Candida antarctica* lipase selectively acylated the (*R*)-1-(4-methoxyphenyl)propan-2-amine with 11% yield and 96% *ee*.

### Regulatory affairs in single enantiomeric drugs

The enantiomers of a chiral drug show different pharmacokinetic and pharmacodynamic profiles. After the mid-1980s, knowledge about effect of chiral drugs and hence the synthesis of drugs in enantiomerically pure form extensively increased which attracted the regulatory authorities of many countries to issue regulatory guidelines on chiral drugs. The first reaction on this concern was from the Japanese regulatory authorities, which issued some guidelines emphasizing investigation in the ADME patterns of each isomer of a racemate. For a mixture of diastereoisomers, it was recommended to investigate metabolism and disposition



of each isomer, and their influence on drug efficacy. These policies were unofficially declared. The first official policy statement on the chiral drug development was issued by the US Food and Drug Administration (FDA) in 1992, which were further amended in 2005 emphasizing synthesis and commercialization of drugs in single enantiomeric form. The commissions of European countries have addressed this concern in 1994. A therapeutic product programme was started in 2000 by the Canadian government addressing the chiral drug development. Overall, all regulatory guidance recommends the investigators to identify the chirality of principle ingredient, manufacturing process, stability testing and labeling criteria of the final drug.



**99<sup>th</sup> Indian Science Congress**  
**January 3-7, 2012, Bhubaneswar**

**II**

**ABSTRACT OF  
PLATINUM JUBILEE LECTURE**



*PLATINUM JUBILEE LECTURE*

**Osteopontin: A key therapeutic target in cancer**

**Gopal C. Kundu**

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**Keywords:** Osteopontin, Cytokine, Tumour, Angiogenesis

**Abstract:**

Recent advancement of cancer research focused on the paradigm that cancer progression involves an intricate crosstalk between tumors and stromal environment. Progression of tumour towards its malignancy needs the interaction among various cytokines, growth factors, transcription factors and the effector molecules. Osteopontin (OPN), a cytokine like, calcified ECM associated SIBLING family of protein plays an important role in determining the oncogenic potential of various cancers. However the molecular mechanism by which various splice variants of OPN (OPN-A and OPN-C) and the role of stroma- and tumor-derived OPN that regulate tumor growth and angiogenesis are not well defined. Our results revealed that both stroma and tumor-derived OPN regulate a series of signaling network through activation of various kinases and transcription factors that ultimately control tumor progression and angiogenesis. Our recent data also suggested that OPN controls epithelial to mesenchymal transition leading to breast cancer progression. Moreover, OPN is not only associated with several tumor types, but its level of expression is directly correlated to various stages of cancers. Thus understanding the molecular mechanism of tumor and stroma-derived OPN-induced signaling in regulation of tumor progression and angiogenesis might identify novel OPN based therapeutic strategy for the management of cancers.



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**III**

**ABSTRACTS OF  
AWARD LECTURE/ YOUNG  
SCIENTIST AWARD  
PROGRAMME**





*YOUNG SCIENTIST AWARD LECTURE*

**Association and effect of C609T (Pro187Ser) polymorphism on protein expression and risk of oral submucous fibrosis among Eastern Indian Population**

**Sanjit Mukherjee, Keya Chaudhuri**  
Molecular and Human Genetics division,  
Indian Institute of Chemical Biology (A Unit of CSIR),  
Kolkata, India

**Key words:** Areca, Oral submucous fibrosis, NQOI, Single nucleotide polymorphism

**Abstract:**

Usage is a major cause for oral submucous fibrosis (OSF). NQOI an antioxidant enzyme detoxifies carcinogens, polymorphism at 609 position (C to T) leads to instable NQOI protein. Present study includes 179 patients and 152 controls for determination of association of this genotype with risk of OSF. TT allele was higher in patients OR 3.335 (1.181-9.355), OSF patients > 40yrs were significantly higher carrier of both CT and TT allele OR (1.77-11.61) and OR 6.4 (1.92-21.35). NQOI protein was 42% reduced in heterozygous patients, whereas a 70% reduced in TT patients. NQOI C609T may present greater risk of OSF.

**S.S. KATIYAR ENDOWMENT LECTURE**

**A glycoproteomic approach: for future diagnosis and therapy in leukemia**

**Chitra Mandal**

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**Keywords:** Acute lymphoblastic leukemia, Sialoglycoproteins, Glycosylation, Bone marrow

**Abstract:**

Acute lymphoblastic leukemia (ALL) is most common in children. It is characterized by aberrant proliferation and accumulation of malignant cells in bone marrow, followed by their migration into circulation. Although ALL is highly responsive to chemotherapy, relapses are common. The detection of minimal residual disease still remains a challenging problem in leukemia research. Therefore, identification of ALL-associated molecular marker(s), whose expression is altered with treatment, could be of utmost biomedical importance. We have demonstrated an enhanced presence of 9-*O*-acetylated sialoglycoproteins (Neu5,9Ac<sub>2</sub>-GP<sub>ALL</sub>)/ disialoglycolipids on these lymphoblasts but not in corresponding cells of healthy children or in patients with other haematological disorders. Sequencing of two such Neu5,9Ac<sub>2</sub>-GP identified them as *O*-acetylated sialo-prohibitin and *O*-acetylated sialo-vimentin, which show modulation in their biological functions in leukemia. Defect in glycosylation of Fc-domain of anti-Neu5,9Ac<sub>2</sub>-GPs<sub>ALL</sub> also showed impaired functional activity and they help cancer cells to survive. Therefore, production of anti-Neu5,9Ac<sub>2</sub>-GPs<sub>ALL</sub> monoclonal/chimeric antibodies with normal Fc-domain would be helpful for immunotherapeutics. The high levels of Neu5,9Ac<sub>2</sub>-GPs<sub>ALL</sub> and disease-associated anti-Neu5,9Ac<sub>2</sub>-GPs<sub>ALL</sub> antibodies have been successfully used for diagnosis, monitoring the disease status and prediction of relapse. The status of four main enzymes namely sialyltransferases (ST), sialate-*O*-acetyltransferase (SOAT), sialate-*O*-acetyltransferase (SIAE) and sialidase responsible for enhanced *O*-acetylation of sialic acids has been investigated. Enhanced SOAT and ST activity and reduced sialidase and SIAE activity show a good positive co-relation with Neu5,9Ac<sub>2</sub>GPs<sub>ALL</sub> level. Thus SOAT represents a new potent biomarker in ALL. Enzymatic modulation of sialidase and/or ST compels lymphoblasts towards

apoptosis. Neu5,9Ac<sub>2</sub>-GPs are also function as developmentally-regulated oncofoetal antigens, whose up-regulation is governing the adhesion, survival and mobilization of cancer cells from bone marrow into blood. Analyzing the status of Neu5,9Ac<sub>2</sub>, we have identified a distinct population, defined as normal hematopoietic progenitor cells from diagnostic ALL-children, which is important for autologous transplantation. Another population, designated as leukemic stem cells, is responsible for minimal residual disease and could be used as imperative targets for immunotherapy. Taken together, this comprehensive study of *O*-acetylated sialoglycoproteins holds tremendous promise in the management of pediatric malignancy.

***PROF. UMA KANT SINHA MEMORIAL AWARD***

**Synergy of NMR and X-ray for studies of protein complexes**

**Neel Sarovar Bhavesh**

Structural and Computational Biology group,  
International Centre for Genetic Engineering and Biotechnology (ICGEB), New  
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Although Protein-RNA and protein-protein interactions are very important for biological functions and regulations still detailed molecular characterization and three-dimensional structures of such complexes are limited. On one hand crystallization of protein-RNA complexes and weak protein-protein complexes pose challenge to X-ray crystallography and on the other obtaining resonance assignment of RNA in complex and inter-molecular NOEs is cumbersome for NMR spectroscopy. We are using both the techniques to understand the structure and dynamics of these complexes at atomic resolution.

Recently using X-ray crystallography and multi-dimensional NMR spectroscopy we showed that canonical RRM fold of ETR-3 protein from human involved in alternate splicing is sufficient for recognising and interacting with its cognate RNA. These results have potential to expand our understanding of molecular mechanism of alternate splicing, which plays major role in expression of multiple transcripts for about half of human genome and is likely to provide targets for design of molecules against various disorders occurring due to alterations in splicing.

Using similar approach we have provided important insight into the protein-protein interaction in parasite infection and cell signalling.



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**IV**

**ABSTRACTS OF  
SYMPOSIUM / INVITED  
LECTURES**





**PROCEEDINGS  
OF THE  
NINETY NINTH SESSION OF THE  
INDIAN SCIENCE CONGRESS  
BHUBANESWAR, 2012**

**PART II: (Abstract of Symposium/Invited Lecture)**

**SECTION OF NEW BIOLOGY  
(Including Biochemistry, Biophysics & Molecular Biology and  
Biotechnology)**

*President:* **Dr. Uttam Chand Banerjee**



## Invited Presentations

### 1. Innovations vis-à-vis drug discovery from natural products and traditional medicines

**Dr. K K Bhutani,**

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**Keywords:** Drug discovery, Traditional medicines, Medicinal plants, Nutraceuticals

#### **Abstract:**

Our country has been slow in terms of innovation in drug discovery though pharmaceutical industry has attained maximum growth during the last decade. There is a well-set feeling that new drug development is a time consuming and needs huge funding that our country and pharmaceutical industry cannot afford forgetting that innovation is the lifeline for survival and growth of this sector. Natural products remain a prolific source for the discovery of new drugs and drug leads. Indian natural products have contributed little despite our centuries old traditional medicines to the available drug discovery space. The main cause of scientific neglect is due to multi-constituent mainstay and mechanism of action being unclear. The rediscovery process with innovations has to begin with new ideology taking into account the synergy, antagonistic and other diverse activities present in the mixtures from medicinal plants. The rediscovery must take into account cellular and molecular mechanisms. It must be realized that drug discovery should not always be limited to discovery of a single molecule and the current belief “one disease-one drug” approach may be untenable in the future and that rationally designed poly-herbal formulations could also be investigated as an alternative multi target therapeutics and prophylaxis. The development on standardized, safe and effective herbal formulations with proven scientific evidence can also provide an economic alternative in several disease areas. Another way to look at harvesting the benefits of traditional medicines is to create new formulations based on combination of secondary metabolites. The new drug formulations should be specific and indicative for particular disease or condition instead of myriad of conditions to bring out most safe and affordable medicines for the existing intervention areas as well as for unmet needs for the therapeutic

purposes. The innovative researches being carried out by the group in drug discovery on metabolic syndrome based diseases and development of nutraceuticals/functional foods shall be discussed.

## 2. Development of enzymes for industrial and diagnostic uses

### Yasuhisa Asano

Biotechnology Research Center and Department of Biotechnology,  
Toyama Prefectural University,  
5180 Kurokawa, Imizu, 939-0398 Japan  
Email: [asano@pu-toyama.ac.jp](mailto:asano@pu-toyama.ac.jp)

**Keywords:** Enzymes, Phenylalanine dehydrogenase, Phenylketonuria, *Marinomonas mediterranea*

### Abstract:

We have been successful in the use of phenylalanine dehydrogenase (EC 1.4.1.20) in the neonatal mass-screening of phenylketonuria (PKU) by a fluorometric microplate assay of L-Phe in blood. More than 5 million new born babies in Japan have been tested with this method. We have created NAD<sup>+</sup>-dependent methionine dehydrogenase for microdetermination of L-Met for the diagnosis of homocystinurea (HCU), by directed evolution approaches. L-Lysine  $\epsilon$ -oxidase (EC 1.4.3.20) from *Marinomonas mediterranea* catalyzes the oxidative deamination of L-Lys into 6-semialdehyde 2-amino adipic acid, ammonia and hydrogen peroxide. The enzyme has been applied to determination of L-Lys and the properties were compared with L-lysine  $\alpha$ -oxidase from *Trichoderma viride*, a commercial enzyme used for L- Lys determination. We found that plasma and serum L- Lys concentrations could be determined with L-lysine  $\epsilon$ -oxidase with much higher accuracy than with L-lysine  $\alpha$ -oxidase. A highly selective L-threonine dehydrogenase (ThrDH) was screened and discovered in *Cupriavidus necator*. L-Thr and DL-2-amino-3-hydroxyvalerate are the only substrates for the ThrDH among other L-amino acids, alcohols and amino alcohols. For the first time, a specific, quantitative and sensitive enzymatic endpoint method for L-Thr determination was developed by using ThrDH microplate assay. The assay was successfully applied for determination of L-Thr in human serum and plasma.

BIOCATALYSIS, MOLECULAR ENGINEERING AND  
NANOTECHNOLOGY IN DRUG DISCOVERY

**Invited Presentations**

**3. Synthetic Antibodies: New Tools for New Biology**

**Sachdev Sidhu**

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**Keywords:** Monoclonal antibodies, Phage display, Synthetic antibodies

**Abstract:**

Over the last decade, therapeutic monoclonal antibodies represent one of the major breakthroughs for the treatment of cancer and other diseases. To date, most therapeutic antibodies have been obtained by the humanization of rodent-derived antibodies, but in recent years, research in antibody engineering has given rise to a new wave of technologies that promise to transform the field. Phage-displayed libraries of “synthetic antibodies” use entirely man-made antigen-binding sites and thus circumvent the need for natural immune repertoires. Using *in vitro* selections, highly functional antibodies with fully human frameworks can be generated against virtually any antigen in a matter of weeks. Access to the encoding DNA allows for rapid affinity maturation, fine tuning of specificity and recasting into different molecular formats. We have developed particularly simple synthetic antibodies that use a single human framework and limited chemical diversity in restricted regions of the antigen-binding site. These structural simplifications enhance the performance of the libraries, which have yielded highly functional and stable antibodies against numerous diverse antigens. These libraries are capable of fulfilling all of the roles of natural antibodies, and furthermore, they extend the use of antibody technologies to many challenging problems, such as the recognition of conformational changes, post-translational modifications, structured nucleic acids and integral membrane proteins. Moreover, the recombinant nature of synthetic antibodies makes them ideal reagents that can be used as crystallization chaperones to aid the elucidation of structures for complex antigens.

#### **4. Role of New Biology in Risk Assessment Process: Prospects, Paradigms and Problems**

**G.B. Jena**

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**Key words:** New Biology, Risk Assessment, Testing Models

##### **Abstract:**

Biology has entered a new era and has become a driving force of all human endeavors in recent times. The contribution of animal-based methods, application of genomics in toxicological hazard identification for chemicals facilitates better risk assessment process. The importance of existing technical and chemical knowledge to the design of safety testing programs should be emphasized. There should be consideration for the presently available toxicity testing approaches and methodologies, including acute and repeated dose toxicity, reproductive and developmental toxicity, neurotoxicity, genotoxicity, carcinogenicity, immunotoxicity in risk assessment strategies. While new challenges are emerging, the paradigm shifts will impact risk assessment for other endpoints as well. Screening techniques for characterizing DNA and its expression (genomics), for measuring and characterizing the products of the expression of DNA (proteomics) and for the identification and measurement of metabolites (metabolomics) are progressing rapidly and will allow the detection of changes in the expression of many genes. Emphasis on mode of action (MOA) will accelerate the movement and pose right question to distinguish from a cancer/non-cancer dichotomy. Testing models should be re-evaluated on the basis of their strength and weakness. Experimental data should be critically judged to fill the gap of animal to human interpretation. Future improvements in the quality of life and longevity will require a better understanding of the etiology and pathogenesis of the complex, chronic toxic insults and the initiation of different diseases. Identification of the major determinants of human health is one of the major challenges of the 21<sup>st</sup> century.

## 5. Construction of recombinant whole cell catalysts expressing a bacterial nitrilase for the enantioselective synthesis of carboxylic acids and carboxamides

Andreas Stolz

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**Keywords:** Nitrilase, Whole cell catalyst, Enantioselective synthesis, Carboxamides

### Abstract:

Organic nitriles are important synthons in the chemical industry because they are easily prepared and allow a facile extension of carbon chains. Therefore, a significant interest exists in biological systems which generate or convert nitriles because these enzymatic processes allow chemo, stereo, and/or enantioselective reactions which are often difficult to perform in classical chemical processes. The synthesis of chiral hydroxynitriles (cyanohydrins) can be accomplished by plant-derived oxynitrilases (hydroxynitrilelyases) which catalyse the enantioselective addition of HCN to aldehydes and ketones. These products (and also various other nitriles) are converted by nitrilases or nitrile hydratases, which form the corresponding carboxylic acids and/or carboxamides. A nitrilase from the soil bacterium *Pseudomonas fluorescens* EBC191 was studied which converts various phenylacetone nitriles (e.g. mandelonitrile, 2-phenylpropionitrile, phenylglycinonitrile or 2-hydroxy-2-phenylpropionitrile) to the corresponding  $\alpha$ -substituted carboxylic acids. The nitrilase formed with some substrates also significant amounts of the corresponding amides. Several mutants of this enzyme were generated and enzyme variants detected with the ability to form significantly increased amounts of amides or demonstrated increased enantioselectivities. Whole cell catalysts were constructed which simultaneously expressed different variants of the nitrilase from *P. fluorescens* together with enantioselective oxynitrilases in recombinant *E. coli* strains. These “bienzymatic whole cell catalysts” catalysed the enantioselective formation of (S)-mandelic acid and/or (S)-mandeloamide from benzaldehyde and cyanide. This strategy could also be used for the synthesis of  $\alpha$ -alkyl- $\beta$ -hydroxycarboxylic acids (and amides) from ketones and cyanide. The application of the “bienzymatic whole cell catalysts” was optimized in two-phase systems consisting of a buffered aqueous phase and ionic liquids. The recombinant catalysts could convert benzaldehyde dissolved in the ionic liquids up to a concentration of 700 mM to (S)-mandeloamide and (S)-mandelic acid with enantiomeric excesses  $\geq 94$  % and product yields of 87 - 100 %.



## 6. Nanobead-based interventions for the treatment of bacterial infections

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**Key words:** Chitosan, Silver nanoparticles, Antimicrobial activity, Biofilm

### **Abstract:**

In this study, silver nanoparticles (AgNPs) were synthesized by using biopolymer chitosan (CS), as stabilizing and reducing agents. The shape and size distribution of composite AgNPs were determined by transmission electron microscopy (TEM). We show that CS-AgNPs exhibit potent antibacterial activity against different pathogenic microorganisms representing gram-positive, gram-negative and acid-fast bacteria. In addition, CS-AgNPs showed no significant effect on DNA fragmentation, cell proliferation and cytotoxicity on macrophages at the bactericidal concentration, and also disrupt bacterial biofilm formation. Propidium iodide staining indicated uptake of CS-AgNPs and decreased intracellular survival of *M. smegmatis* in CS-AgNP treated macrophages, implicating their direct involvement in intracellular killing of bacteria. These results indicate that CS-AgNPs can be useful in different biomedical applications, such as antibacterial therapeutics and drug delivery vehicles.

## 7. Biomaterials in Tissue Engineering and Regenerative Medicine Applications

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**Keywords:** Tissue Engineering, Regenerative medicine, Biomaterials, Scaffold

### **Abstract:**

Biomaterials have emerged as important field of research in modern biology. It has shown promising applications in drug delivery, tissue engineering and regenerative medicine. Tissue engineering in turn plays an important role in the

area of regenerative medicine by restoring, maintaining or enhancing the tissue or organ function. In these biomedical applications, biomaterials have promised vital role as it mimics the extracellular matrix of the native tissue. Biomaterials are fabricated in the form of a three dimensional (3-D) support called scaffold or matrix for the growth and proliferation of cells. Our research focuses on synthesizing the scaffolds from different polymers or polymeric precursors by a novel technology called cryogelation. These cryogel materials have shown suitable properties for application in biomedical area. We used the cryogel scaffolds on a number of technologically challenging processes like, tissue engineering, cell separations, bioreactors for therapeutic protein production and extracorporeal devices. Other promising application of these macroporous matrices have been the cultivation of the mammalian cells on the support matrix. The cells can grow, proliferate and secrete the protein therapeutic in the circulating medium when allowed to culture on the cryogel matrices. The cryogel scaffolds generated with a gradient pore size and mechanical property was used for designing cartilage tissue engineering scaffold. By combination of inorganic-organic materials we designed porous scaffolds that have shown promise for bone tissue engineering. We have also synthesized conducting cryogels for cardiac and neural tissue engineering applications. In conclusion the cryogel polymeric biomaterials have shown promising applications in tissue engineering and regenerative medicine.

## **8. Design of anion recognition short peptide scaffold: a biocomputational approach**

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**Keywords:** Anion recognition, Peptide scaffold, Biocomputational approach, Conserved sequence

### **Abstract:**

Anion-binding motifs in proteins are typically conserved in sequence and conformation. Crystal structural studies have shown that such motifs often occur in loop regions preceding a helix and interaction with the anions can induce their well defined conformational changes. To establish the role of conserved sequence of 'C<sup>□</sup>NN structural motif' and its intrinsic affinity for anion along with the conformational landscape during anion binding; context free five residue and

eighteen residue chimeric peptide sequences comprising of naturally occurring ‘C<sup>□</sup>NN anion binding structural motif’ (Leu-Gly-Lys-Gln: residues 107-110 of DNA glycosylase, 1MUG) at N-terminus have been designed, modeled and studied through computational methods (Docking and MD simulations). Moreover, upon interaction with SO<sub>4</sub><sup>2-</sup> ion the N-terminal L-G-K-Q segment undergoes a non-helical to helical transition similar to what is observed in protein crystal structure. This work clearly demonstrates the “local” nature of anion binding and the accompanying conformational change that helps in understanding the influence of sequence/structural context of anion binding in proteins.

## NEW DRUG DEVELOPMENT AND PROTEIN THERAPEUTICS

### 9. Chaperone assisted protein folding reactions and their application

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**Keywords:** Chaperone, Protein folding, Recombinant proteins, Aggregation

#### **Abstract:**

Protein folding is a process through which newly synthesized polypeptides reach to the unique three dimensional structures having desired biological function. Majority of the polypeptides in a cellular system have the inbuilt ability to fold by itself. However, many cellular proteins are incapable of folding efficiently on their own. The folding landscapes of these proteins seem to be replete with readily populated, non-native states that are highly prone to irreversible aggregation. Aggregation of a critical protein deprives a cell of an essential, functioning molecule. One of the important roles played by molecular chaperones in cellular biology is the prevention or correction of mistakes in folding that lead to the formation of aggregates. Chaperones also have industrial applications. Over production of homologous and heterologous recombinant proteins in bacterial system is necessary for the enhancement of yield. Very often the over expressed recombinant proteins are lodged in inclusion bodies and purification and refolding of the proteins are time consuming and expensive. Bacterial chaperonin GroEL and GroES assist in the prevention of aggregation of various proteins and quite often assist in the folding process of the bound substrates. In this presentation, mechanism of recombinant protein folding in *E.coli* cells as well as *in vitro* processes would be discussed with some emphasis on large protein folding.

Application of GroEL/GroES assisted protein folding process for the enhancement of functional protein preparation in bioreactors would be demonstrated. Substrate specificity for GroEL would be explained and preliminary results of minichaperone assisted refolding of large substrate protein would also be reported.

## 10. Structure of protein oligomers by Raman microscopy

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**Keywords:** Protein oligomers, Raman microscopy,  $\alpha$ -synuclein, Amyloid- $\beta$  peptide

### **Abstract:**

In the absence of crystal structure and NMR data, Raman spectroscopic method is unique to characterize conformation of protein aggregates. My current investigation involves determination of the structural features of natively disordered proteins/peptides and their aggregates. Particular attention is focused on  $\alpha$ -synuclein and amyloid- $\beta$  peptide, which are implicated in the pathology of Parkinson's and Alzheimer's disease. Combining atomic force microscopy with Raman spectroscopy, my recent investigation efficiently delineated the structural aspects of oligomers and fibrils that are believed to contribute to the toxicity. The study also confirmed unique structural alteration of the peptide backbone as a consequence of the aggregation processes. Further, the Raman microscopic approach was extended to designing drug molecules and the understanding of reaction behavior of the substrate/inhibitor (drug) inside a single enzyme/protein crystal.

## **11. Seeing moon-time: non-visual photoreceptors in a marine midge**

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**Keywords:** Seeing, Photoreceptors, Marine Midge, Photic zeitgebers

### **Abstract:**

“Seeing”, usually means image processing on the basis of information about an organism’s optical environment gathered by specialized photoreceptors, which are organized in sophisticated light guiding systems. “Seeing”, as an information processing function about the photic environment in general, can also be understood as “seeing time”. In this case photoreceptors are supplying the organism with information about the environmental time. As one of the best known cases so-called “photic Zeitgebers” report about the time of day and night, length of day, day-length changes throughout the seasons etc. The lecture will first focus on the different anatomical and functional demands on photic zeitgeber receptors as compared to those serving seeing images. As an example we will demonstrate and discuss our findings about the photoreceptor set of a little marine midge *Clunio marinus*. After a complex timing program of metamorphosis by circadian and circalunar clocks, the moment of eclosion from the pupal to the adult stage of this tiny insect must be synchronized very precisely within a population, because male and female imagines live only about one hour to manage their reproductive behaviour. In addition eclosion is essentially linked to the tidal rhythms underlying the lunar phases. That means photoreceptors are necessary to exactly recognize the night of full-moon and discriminate this illumination from daylight. By the means of immunohistology at the light and electronmicroscopic level combined with synchrotron X-ray radiation measurements and genetical investigations we found in the larvae a whole set of different non-visual photoreceptors which could do this job: on the brain, in the abdominal ganglia, in the wall of the intestine and in the abdominal joints. Astonishingly these photoreceptors are marked by antibodies against ciliary opsins (anti-blue-cone-opsin) which is one of the phylogenetically oldest photopigments. And as an even more striking finding: in the ocelli primarily organized for seeing images the

optical features change when the opaque shielding pigment converts to a complete transparent one. As a functional consequence of this, the larval ocelli become light measuring devices most suitable for seeing the dynamics of nocturnal light during the full moon phase.

## 12. Discovery of Novel Drugs from Snake Venom

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**Keywords:** Novel Drugs, Snake venom, Pharmaceutically important enzymes, Ophidian species

### **Abstract:**

Harnessing of natural sources for discovering pharmaceutically important enzymes and drugs can be a major driving force for the development of bio-industrial sectors. The Indian subcontinent is home to a rich diversity of ophidian species. Snake venom is a highly toxic secretion produced and stored in specialized salivary glands of snakes which constitutes a vast array of biologically-active compounds, such as enzymes, proteins, peptides and low molecular weight compounds. Over 90% of the solid snake venom components are pharmacologically active proteins and polypeptides, responsible for exerting pharmacological effects in victims. During the recent years, much attention has been given to understand the mechanism of action of complex venom proteins for the development of novel drugs and therapeutic agents to treat life-threatening diseases. Investigations over the past few decades have shown that the myriad of proteins found in venoms of different snakes have the potential to be developed as drugs for the treatment of a number of medical concerns such as cardiovascular ailments, thrombosis, arthritis, cancer and many other diseases. Venom toxins have developed highly specific molecular targets, which make them valuable for drug usage in terms of limiting potential side effects. Studies about these protein toxins and their mechanism of action have contributed to the knowledge about the various molecular mechanisms involved in the physiological processes and in the development of novel therapeutic agents for the treatment of various life

threatening diseases. Some of the drugs developed from snake venom for the treatment of thrombosis and cancer includes 'Atropin', 'Laotree' 'Contortrostatin', 'Fibrolase' etc. During the recent years, much more attention has been directed to analyze the snake venom proteomes through the proteomics approach for the discovery of novel drugs.

### 13. Transcriptional gene silencing as a therapeutic modality

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**Keywords:** Gene silencing, siRNA, Oncogenes, Heterochromatization, Transcription

#### **Abstract:**

siRNA has been often used to degrade expressed transcripts (Post Transcriptional Gene Silencing or PTGS) to achieve in therapeutic effects in case of altered cellular genes, like oncogenes and deleterious mutant genes as well as infectious agents. However, PTGS requires that the siRNA be continuously present in order to exert its effects. Another approach, comparatively less used, is to use siRNA directed against a gene promoter to achieve gene silencing by inducing epigenetic changes (Transcriptional Gene Silencing or TGS). The resulting heterochromatization, causes marked reduction of transcription of the deleterious gene for a longer time and with lesser concentration of the siRNA than PTGS. We have attempted this with the c-myc gene and the E6/7 oncogenes of the human papilloma virus. The c-myc gene is dysregulated several cancers and is responsible for the maintenance of cancer stem cells. Transient transfection by a novel siRNA directed to a CpG island in the P2 promoter of the c-myc gene resulted in the hypermethylation of promoter and decreased transcription of the gene and its downstream targets including stemness markers and reduced cell proliferation. A similar effect was observed by stable transfection. A similar approach has also been used to suppress expression of the integrated Human



Papilloma Virus oncogenes E6/E7, by targeting the common enhancer for both by siRNA. This also leads to loss of expression of the oncogenes, with consequential revival of the p53 and Rb tumour suppressor pathway, leading to reduced cell proliferation and apoptosis. In this case, heterochromatinization was not due to hypermethylation, but because of histone modifications. Hence TGS is demonstrated to be a viable therapeutic approach for reducing the expression of deleterious genes.

#### **14. Pharmacologically controlled microglial activation promotes adult neurogenesis following neuronal damage**

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**Keywords:** Microglial activation, Neurogenesis, Astrocytosis, Microgliosis

#### **Abstract:**

Poly I:C trigger both microgliosis and astrocytosis with increased expression of inflammatory surface receptors and secrete bioactive inflammatory cytokines leading to degeneration of neurons and glial cells. It has been suggested that inflammation induced neurodegeneration triggers proliferation of neuron specific precursor cells (NSPCs). Such microenvironment of the brain promotes astrocytogenesis at the expense of neurons. Pharmacological interventions, like administration of minocycline that restricts microglial inflammatory states but not microgliosis has indicated beneficial effects. Minocycline treatment creates depending on treatment type (prophylactic or therapeutic) create two different inflammatory microenvironments and establishes proper adaptive immune response, therapeutic being more effective. We have evidence to suggest that such adaptive immune response further activates microglial cells that influence NSPCs proliferation, differentiation and maintenance of newly formed cells. T<sub>H</sub> cell secreted IFN-gamma mediated microglial activation promotes NSPCs' differentiation more towards neuronal lineage. Thus controlled microglial activation promotes neuronal fate of the NSPCs.

## 15. Usage of microRNA as a novel therapeutic strategy in Asthma

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**Keywords:** microRNA, Asthma, Inflammatory disorder, Interleukin-13

### **Abstract:**

Asthma is a complex inflammatory disorder where interactions between genes and environment play key roles. Up regulated expression of interleukin-13 (IL-13) has been found to play a key role in asthma conditions. It is known to enhance inflammatory response via epithelial cell hyperplasia, goblet cell metaplasia, deposition of various extracellular matrix proteins in sub-epithelial regions and increase in airway smooth muscle cell contractility. Although the expression of IL-13 is controlled at the transcriptional level by transcription factors like GATA-3, NFAT etc, finer control of IL-13 expression at the post-transcriptional level by microRNAs and other RNA binding proteins have not yet been explored. Taking leads from *in-silico* predictions and conducting molecular experiments, we recently identified let-7(lethal-7) microRNAs that found to critically regulate IL-13 expression. These microRNAs were found to be decreased in asthmatic murine lungs where IL-13 levels were high in OVA-induced allergic model. Most importantly, intranasal administration of let-7 microRNA mimics to allergic mice reduced IL-13 levels along with a reduction in cellular infiltration, mucus secretion and airway hyper-responsiveness. These results may have important implications in the development of future asthma therapeutics using microRNAs as targets.

## 16. Genomic resources for the management of plant parasitic nematodes

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**Keywords:** Nematodes, *M. graminicola*, Transgenic brinjal, Repellent peptides

### **Abstract:**

Among the pest and diseases of agriculture, plant parasitic root knot and cyst nematodes of the genera, *Meloidogyne* and *Heterodera* are the most damaging with a wide host range. Current agronomic/biological practices are less efficient and chemical nematicides are banned. Search for environmentally sustainable solutions specific to plant parasitic nematode management inspired increased research on generating genomic resources. Reviewing global efforts, we present here the our laboratory achievements on generating genomic resources through sequencing of rice root knot nematode, *M. graminicola* and wheat cyst nematode, *H. avenae*. Brinjal transgenics developed for tolerance to *M. incognita* targeting vital structural and functional genes of the parasite, nematode repellent peptides and plant protease inhibitors.

## 17. Epigenetic control of origin licensing during mammalian DNA replication

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**Keywords:** Epigenetic control, DNA replication, c-Myc, Origin

### **Abstract:**

The genome-wide mapping of replication origins in human cells have shown that most mammalian origins overlap with transcriptional regulatory elements suggesting a role of transcription factors in origin selection. However, the role of

trans-factors-related chromatin modifications and cis-element-specific epigenetic signatures in the regulation of replication initiation has been debated for higher eukaryotes. To understand the molecular underpinnings, we initiated a locus specific study on the human lamin B2 origin that spatially overlaps with TIMM 13 promoter. We observed that early G1 occupancy of c-Myc was not associated with transactivation of TIMM 13 gene and rather facilitated the loading of MCM4 proteins in the subsequent mid G1 phase. The locus-specific effect was controlled by an E-box element present in lamin B2 origin. Investigations on Myc-induced downstream events suggested that lamin B2 origin was assembled into nucleosomes during early G1 phase. Further, recruitment of acetylase HBO1 during mid-G1 facilitated histone H4 hyperacetylation leading to remodeling of nucleosomes and MCM4 loading. Moreover, the Myc-dependent chromatin modifications in origin licensing were under the tight control of epigenetic changes in the E-box. The cell cycle-regulated demethylation of E-box during early G1 triggered the phase-specific recruitment of Myc to lamin B2 origin and subsequent downstream events. The frequent (43%) occurrence of E-box amongst 283 human origins mapped so far suggests that epigenetic control of E-box could be a mechanism for specifying the licensing of early replicating origins.

## DRUG DISCOVERY AND DRUG RESISTANCE

### 18. Evaluation of anti arthritic drugs on CIA animal model

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**Keywords:** Anti arthritic drugs, *Ruta graveolens*, Collagen induced arthritic, Pathogenesis

#### **Abstract:**

Drug discovery has been the prime area of research in the disease control. Natural products have served as the source of the most active ingredients of medicines since ages, and now most of the drugs are either derived from natural compounds or inspired by them. In our laboratory active therapeutic compounds have been isolated from *Ruta graveolens*. One of the active

compounds showed high potency against arthritis. It markedly suppressed the inflammation in the collagen induced arthritic (CIA) rats within 15 days with a concentration of 2mg/kg body weight/day. Levels of cytokines such as TNF- $\alpha$ , IL1 $\beta$  and IL6 were also reduced. Protective effect of the compound was evidenced by radiographic and histological evaluation of the joints. Recovery of body weight and normalization of the index of spleen was also observed. Behavioral studies, such as the open field test, showed the convalescence of compound treated as compared to the untreated rats, which indicated that this compound may be used as a suitable therapeutic agent for RA. The innovation in biological science has brought about better understanding of diseases and their pathogenesis; hence efficient drug development methods have put control over disease progression providing better health management for the mankind.

### **19. Biosynthesis of unsaturated fatty acids in *Trypanosoma brucei*: characterization and validation as a drug target**

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**Keywords:** Unsaturated fatty acids, *Trypanosoma brucei*, Drug target, Flagellated parasite

#### **Abstract:**

*Trypanosoma brucei* is a flagellated parasite of the order Kinetoplastida causing sleeping sickness in human beings and a similar disease called 'nagana' in cattle. The disease is transmitted between the mammalian hosts by insect vector tsetse fly. During its life cycle the parasite is exposed to important changes in metabolites and temperature. The fluidity of the parasite membranes plays a crucial role to adapt to these changes. The fluidity of the membranes are mediated through its fatty-acid composition, Both procyclic and bloodstream form *Trypanosoma brucei* are capable of *de novo* synthesis of fatty acids and the process is essential for parasite survival. Polyunsaturated fatty acids (PUFAs) are synthesized by enzymes known as desaturases. Two desaturase enzymes were identified in *T. brucei*: stearoyl-CoA desaturase (SCD) and oleate desaturase (OD). SCD or  $\Delta 9$  desaturase that synthesizes oleate(C18:1) from stearate(C18) and OD or  $\Delta 12$  desaturase that converts oleate into linoleate(C18:2). Knocking down these desaturase enzymes by RNAi, in both procyclic and bloodstream form *T. brucei*,

caused a growth phenotype and also exerted a significant effect on the total fatty-acid composition of the parasite. Isoxyl and 9-thiostearate, known  $\Delta 9$  desaturase inhibitor, showed an inhibitory effect on the growth of bloodstream form trypanosomes with  $EC_{50}$  of  $0.1\mu M$  and  $1\mu M$ , respectively. Two  $\Delta 12$  desaturase inhibitors, 12- and 13-thiostearate, totally inhibited parasite growth with  $EC_{50}$  of  $2\mu M$  and  $7\mu M$ , respectively. The results suggest that  $\Delta 9$  and  $\Delta 12$  desaturase are essential for both procyclic and bloodstream form *T. brucei*. In addition, *T. brucei*-infected mice were fed with Isoxyl, causing a reduction of the parasitemia and an increase of the rodents' survival. The complete absence of  $\Delta 12$  enzyme activity in mammalian cells and the significant structural differences between trypanosome and mammalian  $\Delta 9$  desaturases, highlight these enzymes as promising targets for selective chemotherapeutic intervention against the parasitic disease.

**20. Molecular events underlying drug susceptibility/resistance in *L. donovani*: What can be seen from the proteomics point of view?**

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**Keywords:** Leishmaniasis, *L. donovani*, proteomics, Pentavalent antimonials

**Abstract:**

Leishmaniasis is a major public health problem and till date there are no effective vaccines available. The control strategy relies solely on chemotherapy. Pentavalent antimonials are the standard first line of treatment for leishmaniasis. However, the present repertoire of drugs is limited and increasing resistance towards them has posed a major concern. The mechanism of resistance and mode of action of these drugs is not known. Till date no cellular or molecular markers of resistance to currently used anti-leishmanial drugs are available. Therefore, identification of such markers is not only desirable but also fundamental to prevent compounding of the current situation. We have used comparative proteomics approach to investigate the drug mechanism of action, biochemical basis of drug activity and cellular pathways that drugs act on. Differential protein expression profiling is a commonly used approach which examines the comprehensive protein alteration after drug treatment to elicit new drug-associated

parameters missed by conventional method. Comparative proteome analysis has been also been used as a high throughput approach for identification of biomarkers as the gene transcription is by large regulated at post transcriptional level in trypanosomatids. In an attempt to identify biomarkers for resistance against the drugs, antimony and paro- momycin, we have performed different proteomics based approaches. We compared the proteome profiles of genetically related pairs of drug sensitive and drug resistant isolates by iTRAQ and SILAC followed by quantitative mass spectrometry to identify global proteome differences between the drug –susceptible /-resistant isolates. Comparative proteomic analysis indicated increase in glycolysis in the antimony -resistant field isolates. Elevated expression of stress related proteins implicated in oxidative stress was observed in the resistant parasites. Most importantly, we observed upregulation of proteins that may have a role in intracellular survival of the parasite in the resistant isolates. Comparison of the proteome of the wild type strain and the paromomycin resistant (PRr) strain showed upregulation of proteins that may have a role in vesicular trafficking and protein synthesis in the PRr strain. The identified parasite proteins could serve as surrogate markers for resistance or susceptibility and enabled us to identify the underlying mechanism of resistance to these drugs in *Leishmania donovani*.

**21. Swapping Acyl Transferase Domain of Module six within Rifamycin Polyketide Synthase gene cluster of *Amycolatopsis mediterranei* S699 with Acyl Transferase domain of Module two of *Streptomyces hygroscopicus* to produce rifamycin B analog: 24-desmethylrifamycin B**

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**Keywords:** Acyl Transferase, Rifamycin, *Amycolatopsis mediterranei*, *Streptomyces hygroscopicus*

**Abstract:**

Rifamycin B is an important antibiotic, produced by *Amycolatopsis mediterranei* S699. Semisynthetic derivatives of rifamycin B are used widely for treatment of tuberculosis (*Mycobacterium tuberculosis*), leprosy (*Mycobacterium leprae*) and AIDS related mycobacterial infections. However, partial treatment of tuberculosis with rifamycins has resulted in the emergence of drug resistant strains of



*Mycobacterium tuberculosis*. The complex structure of rifamycin B allows chemical alterations in the molecule only at C-3 and C-4 of the aromatic core. This limits the number of altered molecules that can be produced by chemical synthesis. Apart from the existing rifamycin B derivatives (rifampicin, rifaximin, rifabutine rifampentine), no further analogs have been produced. To overcome this problem, an alternative approach of 'Combinatorial Biosynthesis' was used to generate modified rifamycin B analogue. The collinear architecture of the rifamycin polyketide synthase makes it an easy target for combinatorial biosynthesis. A strategy was designed to genetically manipulate the rifPKS of *A. mediterranei* S699 by swapping the acyl transferase domain of module 6 of rif PKS (AT6) that adds propionate unit to the growing polyketide chain with that of AT module 2 (AT2) of rapamycin of *Streptomyces hygroscopicus* that adds an acetate unit. The construct to swap rifAT6 by rapAT2 was made that resulted in two step homologous recombination and generation of AT6 mutants. The NMR and LC-MS studies were carried on the novel analogue produced by AT6 mutants which revealed its molecular weight to be 740 instead of 755 (mw of native molecule rifamycin B). This loss of a methyl pendant at C-33 resulted in formation of 24-desmethylrifamycin B. Antibacterial assays showed that this novel analog of rifamycin B is more active against *Mycobacterium smegmatis* in comparison to rifamycin B.

## **22. *Mycobacterium tuberculosis* and the host innate immune response**

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**Keywords:** *Mycobacterium tuberculosis*, innate immune response, alveolar macrophages

### **Abstract:**

A prerequisite for successful establishment of *Mycobacterium tuberculosis* in the host is its ability to survive after internalization in alveolar macrophages. The innate immune response protects some individual to the extent that they remain uninfected. In others, the innate immune system is not sufficient and an adaptive immune response is generated. In susceptible individuals, *M. tuberculosis* successfully escapes immune surveillance. Our laboratory has focused on



understanding of this interplay between *M. tuberculosis* and the host macrophages which is of importance in dictating the course of the disease. Mycobacterial cell surface and secreted antigens are the predominant players involved in manipulation of the host immune system. We have shown that the glycolipid, mannose-capped LAM (ManLAM) from *M. tuberculosis* inhibits IL-12p40 production by virtue of its ability to induce IRAK-M, a kinase-deficient IRAK family member which is a negative regulator of the classical NF- $\kappa$ B pathway. ESAT-6, a secretory antigen of *M. tuberculosis* also dampens IL-12 p40 production by downregulating NF- $\kappa$ B activation. It does so by attenuating MyD88-IRAK4 interaction, inhibiting MyD88/TLR-dependent signaling. In addition to its ability to inhibit IL-12 p40 production, Man-LAM also dampens apoptosis of macrophages by phosphorylation the BH3-only Bcl-2 family member, Bad, and by upregulating the anti-apoptotic Bcl-2 family member Bfl-A1 at the transcriptional level. More recently, our studies show that *M. tuberculosis* interacts with murine macrophages to upregulate microRNA-155 (miR-155), which in turn regulates the expression of a number of genes such as the transcriptional repressor BACH1 and the lipid phosphatase SHIP1. This, in turn, helps in the survival of *M. tuberculosis* in macrophages. Taken together, our studies provide insight into how pathogenic mycobacteria modulate the host innate immune response, tilting it in a direction favoring survival of the pathogen in macrophages.

### **23. Seaweeds (marine macro-algae) of Orissa coast and their utilization for production of agar agar, UV-sunscreen compounds and SLF**

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**Keywords:** Orissa coast, Seaweeds, *Enteromorpha usneoides*, *Gracilaria verrucoasa*

#### **Abstract:**

The seaweeds of the entire 460 KM long Orissa coast was surveyed during 2000-2005. Out of the twenty one species of seaweeds *Enteromorpha usneoides* and *Gelidium divaricatum* were reported for the first time from India and *Enteromorpha linza*, *E. clathrata*, *Colpomenia sinuosa*, *Catenella impudica*, *Compsopogon aeruginosa* and *Grateloupia lithophyla* were the new records for

Orissa coast. Three macro-algae, *Gracilaria verrucosa*, *Enteromorpha intestinalis* and *Chaetomorpha linum* occurred abundantly in the lagoon throughout the year. These organisms preferred moderate salinity of Southern and Central sectors and their biomass changed in response to the salinity levels during different seasons. Of these *Gracilaria verrucosa* occur in harvestable quantity comprising of principally two varieties, e.g. yellow-long, red-busy forms; the former occur at a salinity range of 8 to 12 ppt and where there is strong wave action together with sand-silt-rock substratum. Besides a MAA compound like Shinorine or Threonine ( $\lambda$  328) absorbing at the UV region of the spectrum was isolated from *G. verrucosa* showing sun protection capacity. Most of these seaweeds also possess growth promoting potential, and the aqueous extract prepared from them was applied as foliar spray to assess the efficacy on yield of several vegetable crops which showed positive results. All these finding showed the possibility of use of seaweeds of Chilika lake for use in industry for production of marketable agar agar, UV-sunscreen compounds and SLF leading to entrepreneurship.

#### **24. Developmental Basis of Obesity: Obesogen Hypothesis**

**Jerrold J. Heindel**

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North Carolina USA  
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**Keywords:** Obesity, Obesogen Hypothesis, Diabetes, Metabolic syndrome

#### **Abstract:**

The prevalence of obesity, diabetes and metabolic syndrome has risen dramatically in the United States and around the world in the last few decades. Obesity/diabetes/metabolic syndrome is interrelated endocrine diseases/disorders with metabolic syndrome encompassing obesity, diabetes and lipid and cardiovascular abnormalities. Obesity is the leading comorbidity factor for diabetes. Thus while the main focus of this presentation will be on obesity, aspects of diabetes and metabolic syndrome will also be covered. It is now clear that obesity, diabetes and metabolic syndrome have both a genetic and an environmental component, with environment defined as nutrition, stress,

infections, drugs and environmental chemical exposures. For years the focus of research in these diseases has been on genetics however it is now clear that genetics can account for only a small portion of the diseases. In addition the dramatic increase over the past 40 yrs. cannot be due to genetics; therefore it is time to focus on the role of environment. Since these diseases/dysfunctions are due to perturbations in the endocrine system that controls weight gain, glucose homeostasis and lipid metabolism, then these systems are likely sensitive to disruption by chemicals with endocrine activity, e.g. endocrine disruptors. Endocrine disruptors are chemicals that were developed for a specific purpose such as plastic, insecticides etc. but now have been shown to also mimic or antagonize normal hormonal functioning. Additionally it is now clear that obesity as well as diabetes and metabolic syndrome are programmed during development, in utero and the first few years of life. This new field is called Developmental Origins of Health and Disease, DOHAD. This talk will thus focus on the role of developmental exposures to endocrine disrupting chemicals in the development of obesity, with some reference to diabetes and metabolic syndrome. There are endocrine disrupting chemicals that specifically affect weight gain and this subclass is called obesogens. Animal data support the hypothesis that developmental exposure EDCs including tributyl tin, bisphenol A, organochlorine and organophosphate pesticides, air pollution, lead, Diethylstilbestrol, perfluorooctanoic acid, monosodium glutamate and nicotine can lead to increased weight gain later in life. Furthermore, there are data in humans supporting the view that exposure to EDCs during development can affect weight gain in infants and in children. The obesogen hypothesis shifts the focus of disease etiology from classical genetics to a series of complex interactions that include epigenetic alterations combined with nutritional and environmental chemical exposures during critical developmental milestones. More importantly, however, it changes the focus from intervention to prevention.

## **25. Multidrug resistance: from microbes to man**

**Rajendra Prasad,**

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Email: [rp47jnu@gmail.com](mailto:rp47jnu@gmail.com)

**Keywords:** Multidrug resistance, Microbes, Cancer, Prokaryotes

### **Abstract:**

Multi Drug Resistance (MDR) can be defined as resistance of an organism against spectrum of drugs that neither share a target nor a common structure. MDR phenomenon is spread throughout the evolutionary scale. Of note humans are posed with double edged threat; firstly, their own malignant cells acquire resistance to drugs in due course of time and that results in failure of cancer chemotherapy and secondly, they are constantly attacked by pathogens which could already be resistant to common drugs. It has been established that the overproduction of certain efflux pump proteins belonging to ABC (ATP binding Cassette) or MFS (Major Facilitators) super-family of proteins in prokaryotes and eukaryotes, is linked to MDR. The efflux protein catalyzed extrusion of noxious compounds from the cell is one of the most frequently used strategies for resistance to cytotoxic drugs in both prokaryotes and eukaryotes. MDR is not restricted to bacterial infections and cancer cells. Human disease such as malaria, amoebiasis, leishmaniasis causing organisms also show MDR. Human fungal pathogen acquiring resistance to antifungals is a relatively new phenomenon. But in view of the increasing threat posed by fungal infections, in immunocompromised patients and due to the non-availability of effective treatments, antifungal resistance has become a serious concern among clinicians. Studies so far suggest that while antifungal resistance is the culmination of multiple factors, there could still be a unifying mechanism of drug resistance in these pathogens. ABC proteins e.g. Cdr1p, Cdr2p and MFS such as CaMdr1p drug transporters are the most prominent contributors of MDR in *C. albicans*. Considering the importance of Cdr1p as major antifungal transport and the fact that it has novel mechanism of ATP hydrolysis and drug transport which is unique to all fungal transporters, our main objective is to understand the structure and function of Cdr1p to design inhibitors/modulators to jam the pump protein activity so the drug already in use could again sensitize resistant *Candida* cells.

# **99<sup>th</sup> Indian Science Congress**

**January 3-7, 2012, Bhubaneswar**

**V**

## **ABSTRACTS OF ORAL / POSTER PRESENTATIONS**



**PROCEEDINGS  
OF THE  
NINETY NINTH SESSION OF THE  
INDIAN SCIENCE CONGRESS  
BHUBANESWAR, 2012**

**PART II: Abstracts of Oral/Poster Presentations**

**SECTION OF NEW BIOLOGY  
(Including Biochemistry, Biophysics & Molecular Biology and  
Biotechnology)**

*President : Dr. Uttam Chand Banerjee*

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## **I. ORAL PRESENTATIONS**

### **1. Role of $\alpha 5\beta 1$ integrin (fibronectin receptor) in modulation of MMP-9 and MMP-2 activity in A375 melanoma cells**

**A Banerji<sup>1</sup> and A Chatterjee<sup>2</sup>**

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<sup>2</sup> OIC (Research), Sr. Asst. Director Grade Scientist,  
Department of Receptor Biology and  
Tumor Metastasis, Chittaranjan National Cancer Institute, 37 S.P. Mukherjee  
Road, Kolkata, West Bengal, India.

**Key words:** Fibronectin, MMP-2, FAK, Integrin  $\alpha 5\beta 1$ , Melanoma

#### **Abstract:**

Fibronectin, an extracellular matrix (ECM) protein, plays a crucial role in tumour biology. Integrin receptors bind to ECM proteins like fibronectin and trigger signalling cascades. Integrin  $\alpha 5\beta 1$  binds to fibronectin. Our findings indicate culture of A375 melanoma cells in presence of fibronectin generates a signalling cascade probably via FAK/ ERK which leads to expression of MP-9 and activation of MMP-2 within 2 hrs. MMP-2 is activated by a membrane associated activation mechanism in which MT1-MMP plays an important role. The information could help in developing new therapies designed to interfere with MMP activation and management of cancer and metastasis.

### **2. Antimalarial efficacy of homeopathic drugs *artemisia vulgaris* and *curcuma longa* against *plasmodium berghei* in balb/c mice**

**U. Bagai, S. Kalia and N. S. Walter**

Department of Zoology, Panjab University,  
Sector 14, Chandigarh-160014.

**Keywords:** P. berghei, Artemisia vulgaris, Curcuma longa and Chemosuppression.

#### **Abstract:**

Antimalarial efficacy of mother tincture and 6,30 and 200 potency of *Artemisia vulgaris*, alone and in combination with *Curcuma longa* ( $\Phi$ ) was checked against

*P. berghei* infection. Combination therapy was more effective than monotherapy as evident from chemosuppression ( $\geq 65\%$ ) and MST ( $\geq 20$  days) as compared to Artesunate (100mg/kg) and Artesunate (4mg/kg) + Sulfadoxine (1.25 mg/kg) designated as positive controls. ALP activity increased significantly ( $p < 0.0001$ ) in all test groups except *A. vulgaris* ( $\Phi$ ) + *C. longa* ( $\Phi$ )- treated group. Bilirubin significantly increased in monotherapy groups than combination groups as compared to standard drugs. *A. vulgaris* (potency) groups exhibited normal creatinine and urea levels in monotherapy and in combination as compared to infected control. The study points towards better antiplasmodial efficacy of *A. vulgaris* potencies in combination with *C. longa*.

### **3. An *In silico* approach of hyperthermia in the treatment of epithelial ovarian cancer**

**G. Wadhwa, and P. S. Rath**

Bioinformatics Division,  
Department of Biotechnology, Ministry of Science and Technology  
New Delhi

**Keywords:** Epithelial ovarian cancer, BRCA1, IL18, MTA2, PIK3CA, EGF, FGF

#### **Abstract:**

The goal of current investigation is to gain deeper insight into heat generation mechanisms of magnetic nanoparticles and their activity with suitable protein at binding site to eradicate cancer through *in silico* technique. Treatments at temperatures of 42–45°C for few minutes –denoted as hyperthermia – need a combination with other assisting toxic agents for reliable damage of tumor cells. Docking studies among the proteins and ligands Fe<sub>3</sub>O<sub>4</sub> and LY29004 have been carried out using MVD software. Structural changes have been observed in six selected proteins EGF1, FGF2, PI3KC, BRCA1, MTA2 and IL18 using Hyperchem Release8 Software. Fe<sub>3</sub>O<sub>4</sub> nanoparticles along with heat sensitizer molecule LY294002 which are usually biocompatible and could able to provide the required thermal environment at the tissue, have exhibited effective binding affinity with minimum free energy with PIK3C.

**4. Biochemical evaluation of anticancer efficacy of Shemamruthaa (a phytochemical formulation) on 7,12-dimethylbenz[a]anthracene induced mammary carcinoma in rats**

**A. Purushothaman, and P. Sachdanandam**

Dr. ALM Post-Graduate Institute of Basic Medical Sciences,  
University of Madras,  
Taramani Campus, Chennai – 600113

**Key words:** Breast cancer , *Hibiscus rosa-sinensis*, Antioxidant, Anticancer activity

**Abstract:**

Breast cancer is the second leading cause of cancer death among women in India. The biochemical alterations observed in cancer bearing animals in the present study may be due to the induction of lipid peroxidation and reduction of antioxidant level following DMBA administration. However, oral administration of 400 mg/kg body weight of SM drug significantly reversed the alterations to near normal level in cancer-bearing animals. From the results it can be inferred that the drug possesses a profound anticancer effect through its role in reviving the lysosomal membrane stability and restoring the normal activities of marker enzymes. Further investigation on the anticancer activity mechanisms of the SM drug is going on.

**5. Antimicrobial peptides an alternate therapeutical approach to combat multi drug resistance disasters**

**S.P. Nemade, S.P. Saraf, and M. Musaddiq**

Department of Microbiology, Shri Shivaji College of Arts, Commerce and  
Science,  
Akola-444001, Maharashtra

**Key words:** Enterocin, Antimicrobial activity, *Enterobacteriaceae* family

**Abstract:**

The antibiotic resistance can be viewed as a global problem. Bacterial infection is the most common cause for hospital visits. One of the major limitations to

successful antimicrobial therapy of enteric bacterial pathogens has been the progressive emergence of resistance to these drugs. The present investigation has been carried out to evaluate inhibitory potential of enterocin produce by enterococci against multidrug resistant isolates of *Enterobacteriaceae* family. In the present study, we screened out multidrug resistant organisms from *Enterobacteriaceae* family and analyzed ability of enterocins to inhibit them by agar well diffusion method. Most potent fractions were exposed to purification steps. The enterocin fractions were found to be stable at various pH range and did not lost antimicrobial activity even when treated at 100 °C for 30 min.

## **6. Phytochemical contents and antimicrobial activity of *Solanum sisymbriifolium* extracts**

**V. K. Gupta, A. Simlai, M. Tivari and A. Roy\***  
Center for Biotechnology, Visva-Bharati University,  
Santiniketan- 731235, West Bengal

**Key words:** *Solanum sisymbriifolium*, Phytochemical analysis, antimicrobial activity, Disc diffusion

### **Abstract:**

The present study was aimed at screening the phytochemical contents, antimicrobial activity of different organic solvent extracts, separation and analysis of the extracts components using TLC-bioautography from the arial parts of *solanum sisymbriifolium*. Phytochemical analysis revealed the presence of phenolics, flavonoids, tannins, alkaloids, and saponins in moderate quantities. Screening of the anti microbial activity by disc diffusion assay against four organisms revealed the presence of antimicrovial activity in the extracts of this species. The activity was stable despite drastic thermal and ph treatment. TLC separation and bioautography resulted in determining the active fraction suggesting the species as source of new antimicrobial drugs and natural preseavatives.

**7. Use of monoclonal antibodies in identification and quantification of Pneumococcal polysaccharides by rate nephelometry**

**M. Kumar, P. Khokale, H. Mane and S.V. Kapre**

Serum Institute of India Ltd.,

Pune, Maharashtra

**Key words:** Monoclonal antibody, Serum, Nephelometry, Pneumococcal polysaccharide, Immunoassay

**Abstract:**

Murine monoclonal antibodies (MAbs) against capsular polysaccharide (PnPS) of *Streptococcus pneumoniae* serotypes 1,4,6B,7F,9V,14,23F and Cell wall polysaccharide (CWPS), were developed by hybridoma technology using standardized protocols. MAbs were used to develop turbidimetric rate nephelometry (RN) immunoassay for identification and quantitation of PnPs and CWPS of various serotypes at various stages of Pneumococcal polysaccharide production, purification and conjugation. Assay was checked for various validation parameters and found to be specific with spiking recovery accuracy of  $\pm 20\%$ , intra- and inter-assay variation of  $< 20\%$ , a satisfactory linearity and sensitivity upto  $0.5 \mu\text{g PnPS/ml}$ . Use of MAbs and commercially available polyclonal sera gave comparable results using the standardized assay.

## I. POSTER PRESENTATIONS

### i. Genomics and Proteomics

1. **A comparative study on the antioxidant defences in the diapausing pupae of daba and modal ecoraces of tasar silkworm, *Antheraea sp.***

**G. C. Patra<sup>1</sup>, N. Mohanty<sup>1</sup>, J. Majhi<sup>1</sup>, R. Maharana<sup>1</sup> and D.G. Dey<sup>2</sup>**

<sup>1</sup>P. G. Department of Zoology, North Orissa University,  
Takatpur, Baripada, Mayurbhanj, Orissa

<sup>2</sup>Udala College, Udala,  
Mayurbhanj-757041, Orissa

**Key words:** *Antheraea*, Fat body, Haemolymph, Protein, Ascorbic acid, GSH, and LPX.

#### **Abstract**

In India tropical tasar is produced by silkworm, *Antheraea paphia* Linn. Modal is one of the wild ecoraces of this species. Daba is one of the ecoraces of *Antheraea mylitta* Drury, which is cultivated commercially for the production of tasar silk. The present investigation accounts for some of the antioxidants status in the diapausing pupae of the above two ecoraces. Emphasis has been given on the contents of protein, ascorbic acid (Vitamin C), reduced glutathione (GSH), and level of lipid peroxidation (LPX) i.e. malondialdehyde (MDA) content formed in the haemolymph and fat body tissues of pupae of the silkworm. Results of the present study indicate that the pupae of Modal cocoons are superior to Daba based on their antioxidant status.



**2. Ecogeographic differentiation in drosophilid populations from gujarat state in India; drosophilidae:diptera**

**R. Kumar, and A.Kumar**

Genetics and Molecular Biology Laboratory, Department of Zoology  
Feroze Gandhi College, Raebareli- 229001

**Key words:** Geographical, Responding, Drosophilidae, Species

**Abstract:**

This study present the results of many field collections carried out from previously unexplored forest and wild geographical regions at Valsad, Vapi, Dangs, Navsari, Surat, Bharuch, Panchmahal, Sabarkantha, Ahmedabad, Srendra Nnagar, Rajkot, Junagarh, Sassan, Jam Nagar and Kuchch disrtct of Gujarat state in India. During this investigation a total of 20 species respomding 4 genera of family- Drosophilidae were collected. In addition keys to Indian genera, subgenera, species group and few different species are provided. A consolidated list of species recorded from Gujarat state in India has been included.

**3. Molecular evolution of dengue viruses in India**

**P K Dash**

Virology Division, Defence Research & Development Establishment,  
Gwalior-474002, Madya Pradesh

**Key words:** Dengue, Genome, Sequence, Epidemiology

**Abstract:**

Dengue is the most important arboviral infections of public health importance and is now endemic in most parts of India. All the four serotypes of Dengue viruses are isolated in India since 1956. A detailed molecular evolutionary analysis of dengue viruses was carried out through nucleotide sequencing of Dengue viruses isolated from different outbreaks, in addition to the sequences available in Genbank. The recently circulating Dengue virus types 1,2,3 and 4 in India are found belong to genotype V, IV, III and I respectively. These circulating genotypes are most virulent ones and responsible for fatal outbreaks globally.

**4. Development of species specific DNA marker as barcode sequence of greater Indian rhinoceros (*Rhinoceros unicornis*)**

**T.H. Mazumder and S.K. Ghosh**

Department of Biotechnology, Assam University

**Key words:** DNA barcoding, mitochondrial DNA, COI-5', *Rhinoceros unicornis*.

**Abstract:**

The North East India is a reservoir of rich biodiversity for much of India's flora and fauna, and as a consequence, the region is one of the richest in biological values. DNA based species identification or DNA barcoding is an exciting tool for documenting biodiversity with a gene sequence. Here we focus our interest on the development of DNA barcode sequence of Greater Indian Rhinoceros (*Rhinoceros unicornis*) by determining the DNA sequence of its mitochondrial 5' COI gene region using cross primer design for PCR amplification and other bioinformatical analysis. The length of the sequence reported is 632 nucleotides.

**5. Placental global DNA methylation patterns in pregnancy complications**

**P. C.Gautam<sup>1</sup>, A. Kulkarni<sup>1</sup>, D. Sundrani<sup>1</sup>, H. Pisal<sup>1</sup>, V.Nimbargi<sup>2</sup>, S. Mehendale<sup>2</sup> and S. Joshi<sup>1</sup>**

<sup>1</sup>Department of Nutritional Medicine, Interactive Research School for Health Affairs,

<sup>2</sup>Department of Obstetrics and Gynecology, Bharati Medical College and Hospital,  
Bharati Vidyapeeth University, Pune.

**Key words:** Placenta, DNA methylation, Preterm, Preeclampsia

**Abstract:**

Placental development involves spatio-temporally programmed epigenetic processes which, if altered, may affect the gene expression patterns thereby affecting the pregnancy outcome. The present study examines placental global DNA methylation levels in normal term pregnancies and those complicated with

preeclampsia and preterm birth. Our results show altered ( $p < 0.01$ ) global DNA methylation levels in complicated pregnancies which are further associated with gestation and severity of the complication. These findings may reflect abnormal regulation of placental gene expression patterns with implications for fetal programming of adult diseases since children born to women with pregnancy complications are at risk for neuro-developmental and metabolic disorders in later life.

**6. Common variants in CRELD1 gene: a susceptible risk factor for atrioventricular septal defects in down syndrome individuals.**

**P. Ghosh<sup>1</sup>, P. Bhaumik<sup>1</sup>, B. Bandyopadhyay<sup>2</sup> and S. K. Dey<sup>1</sup>**

<sup>1</sup>Human Genetics Research Unit, Department of Biotechnology and Biological Sciences, West Bengal University of Technology, BF- 142, Salt Lake Sector 1, Kolkata 700064.

<sup>2</sup>Rabindranath Tagore International Institute of Cardiac Sciences, 124, Mukundapur  
E.M.Bypass, Kolkata 700099

**Key words:** Congenital heart disease, Down syndrome, SNP, Biomarker

**Abstract:**

Atrioventricular Septal Defect (AVSD) a type of Congenital Heart defect seen in 50-60% of Down Syndrome Individuals. Previous studies highlighted mutations in the CRELD1 (Cysteine Rich EGF like Domain) as a risk factor for AVSD in Euploid population. We have investigated the genetic variation in CRELD1 with pathogenesis of AVSD in Down Syndrome. Result shows three SNPS of CRELD1 to be associated with occurrence of AVSD in Down Syndrome patients. Our study demonstrated two different CRELD1 haplotypes contribute significantly in pathogenesis of AVSD in Down Syndrome. Thus these common variants may serve as a bio-marker for diagnosis of AVSD in individuals.

**7. Isolation and molecular characterization of chikungunya virus from the andaman and nicobar archipelago, India: evidence of east central african genotype**

**M. Nagarajan<sup>1</sup>, I.K. Chaaithanya<sup>1</sup>, S.G. Sundaram<sup>1,2</sup>, A. N. Shriram<sup>1</sup>, D. Bhattacharya<sup>1</sup>, A. B. Sudeep<sup>3</sup>, N. P. Kumar<sup>4</sup> and P. Vijayachari<sup>1</sup>**

<sup>1</sup> Regional Medical Research Centre, Indian Council of Medical Research, Andaman & Nicobar Islands

<sup>2</sup> Dr. M.G.R. Educational & Research Institute, Chennai-95

<sup>3</sup> National Institute of Virology Microbial Containment Complex, Pune

<sup>4</sup> Vector Control Research Centre, Puducherry

**Key words:** Chikungunya, CHIKV, Genotype, DLST, Andaman

**Abstract:**

In 2006, Chikungunya virus (CHIKV) infection struck Andaman and Nicobar archipelago, the attack rate was >60%. 11 patients had acute flaccid paralysis simulating the Guillian Barre Syndrome and many patients suffered with severe chronic arthropathy. Nine isolates were isolated from subjects showing clinical manifestation. cDNA was sequenced for partial E1 and nsP1 genes and aligned based on Double Locus Sequence Typing (DLST). Phylogenetic analysis confirmed the first ever conformed CHIKV outbreak in these remote Islands by ECSA genotype. DLST was used for the first time to genotype the virus. This technique was found to be more economic and accurate.

**8. A coumarin derivative isolated from *Ruta graveolens* L. alleviates collagen induced arthritis by inhibition of proinflammatory cytokines, inducible nitric oxide synthase and overall joint damage.**

**D. Sahu and H. R. Das**

Division of Genomics and Molecular Medicine, Institute of Genomics and Integrative Biology, Mall Road, Delhi-110007.

**Keywords:** *Ruta graveolens*, 8-methoxy-chromen-2-one, Anti-inflammatory, Collagen-induced arthritis.

**Abstract:**

The active compound (Rg3) isolated from *R. graveolens* was evaluated for its therapeutic potency towards the CIA in a rat model. The compound in concentrations of 2 and 20mg/kg body weight/day showed marked suppression of inflammation in CIA within 15 days. Visual analyses showed decreased arthritic score in the Rg3 treated CIA rats and paw volume measurement by plethysmometer also showed decreased arthritic index. Levels of pro inflammatory cytokines were also reduced significantly in the Rg3 treated CIA rats. Protective effects of Rg3 towards joint damage were also evidenced by radiographic and histological evaluation. Recovery of body weight and normalization of the index of spleen was observed in the Rg3 treated CIA rats. Behavioral studies showed that the Rg3 rats were convalescent as compared to the untreated rats.

**9. Molecular marker studies in medicinal plants**

**B.K. Chikkaswamy, S. Kumar, R. P. S. Majuntha, and P.N. N. Gowda**

Om Bioscience Research Center, 530, 16th Cross 2<sup>nd</sup> stage, Indira nagar  
V.V. Pura College of science, K.R. road, Bangalore 560004

**Keywords:** Molecular markers, Medicinal plants diversity, RAPD, PCR

**Abstract:**

RAPD markers are decamer (10 nucleotide length) DNA fragment from PCR amplification of random segments of genomic DNA with single primer of arbitrary nucleotide sequence and which are able to differentiate between genetically distinct individuals, although not necessarily in a reproducible way. It is used for analyse the genetic diversity of an individual by using random primers. Unlike traditional PCR analysis, RAPD does not require any specific knowledge of the DNA sequence of the target organism the identical 10-mer primer will or will not amplify a segment of DNA, depending on positions that are complementary to the primers sequence. The use of molecular techniques in genetic diversity studies in 25 is supported by the findings that evolutionary forces such as natural selection and genetic drift produced divergent phylogenetic branching which can be recognized because the molecular sequence on which they are based share a common ancestor.

**10. Genetic diversity and relationship of medicinal plants using molecular markers**

**B.K. Chikkaswamy, S. Kumar, P.N.N. Gowda and S. Majunatha**

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V.V. Pura College of science, K.R. road, Bangalore 560004

**Key words:** Molecular markers, Medicinal plants diversity, Polymorphism, Amplification

**Abstract:**

The Random Amplified Polymorphic DNA (RAPD) is a PCR based method that uses short primers of arbitrary sequences. Polymorphisms of amplified fragments are caused by either base substitutions or deletions in the priming sites or insertions that render priming sites too distant to support amplification. RAPD was used in this study as a tool for assessing genetic diversity and relationships among 20 species of medicinal plants, procured from the forests of Karnataka and Tamilnadu. The similarity of the various coefficients indicated presence of high level of genetic diversity and dendrograms constructed by UPGMA method showed that some medicinal plants were closest to each other and others had marked dissimilarity. Genetically distinct genotypes identified using RAPD markers could potentially be used for improvement of medicinal plants.

**11. A review of genetic polymorphism of CYP450 and GST genes as a biomarker of susceptibility in pesticide workers**

**KanuPriya<sup>1</sup>, A. Yadav<sup>1</sup>, N. Kumar<sup>1</sup>, S. Gulati<sup>1</sup>, R. Gupta<sup>2</sup>, N. Aggarwal<sup>2</sup>, S.K. Gautam<sup>1</sup>**

<sup>1</sup>Deptt. of Biotechnology, Kurukshetra University,  
Kurukshetra (Haryana)-136119

**Keywords:** Genetic polymorphism, Cytochrome P450, Glutathione S-transferases

**Abstract:**

Majority of pollutants are toxic for organisms, some being connected to disease development. Pesticides are important group of environmental pollutants. Recent findings suggest that inherited differences in metabolites increase to risk for cancer. Genetic polymorphisms exist in some of phase I and phase II genes. Phase I genes cytochrome P450 are involved in the metabolism of many indirect carcinogens. Among phase II genes, glutathione S-transferases (GST) genes are the most important group of detoxifying genes. Genotypes responsible for inter-individual differences in the ability to activate or detoxify genotoxic substances are recognised as biomarkers of susceptibility to mutations, cancer and other diseases. Unfavourable metabolising alleles of CYP genes and GST genes are more susceptible to genotoxic effects and thus with increased risk of cancer than those with favourable alleles.

**12. Isolation, partial purification and detection of immunoglobulins from human serum and chicken egg yolk**

**R. B. Padalia, S. A. Patil, S. G. Bhagiya, S. K. B. Swamy, P. S. Shete and S. P. Kamble**

Center for Biotechnology, Pravara Institute of Medical Sciences,  
Loni-Bk 413736. Tal. Rahata; Dist. Ahmednagar, Maharashtra

**Keywords:** Immunoglobulin G, Immunoglobulin Y, SDS-PAGE, DEAE

**Abstract:**

Immunoglobulin G (IgG) is an antibody from  $\gamma$ -immunoglobulin super family. Each IgG is composed of four peptide chains — two heavy chains  $\gamma$  and two light chains. It is most abundant class in serum, constitutes about 80% of the total serum immunoglobulin and IgY is found in chicken egg yolk. Aim of the present work was to isolate, purify and detect IgG from human, and IgY from chicken egg yolk. The IgG and IgY species isolation was done through, using ammonium sulphate precipitation solution and purified by using dialysis and ion exchange chromatography (DEAE-cellulose). The detection of IgG and IgY was done by using polyacrylamide gel electrophoresis (SDS-PAGE). Different fractions of various molecular mass were observed in SDS-PAGE.

**13. Designing of universal barcode primer for detection of wildlife poaching in India**

**A. Bhattacharjee and S. K. Ghosh**

Department of Biotechnology,  
Assam University Silchar. Assam

**Keywords:** Poaching, DNA Technology, Cytochrome Oxidase subunit I (COI)

**Abstract:**

Wildlife trafficking is a major area of concern in the conservation of wildlife biodiversity. Design of novel universal primers capable of amplifying the target gene in a wide variety of animal species is one of the major aspects of DNA technology in detection of wildlife crime but lack of authenticated marker is the major area of concern. DNA barcoding is now an alternative to traditional taxonomic methods that could become a useful tool for species identification by focusing analysis on a short standardized segment of the genome and successfully demonstrated that a 648 bp sequence of the 5' portion of the mitochondrial gene Cytochrome *c* Oxidase subunit I can be a reliable tool to identify animal species. In the present endeavor we have designed a universal primer set for the amplification of Cytochrome Oxidase subunit I (COI) gene of mitochondria from different wildlife animals. We performed *in silico* PCR with the designed primers and used *in silico* PCR-RFLP method with different restriction enzyme to differentially identify the commonly poached animal species of India.

**14. THBS1 and FLNC genes are aberrantly methylated in gallbladder cancer and its risk factor, calculus cholecystitis.**

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<sup>3</sup>Gajra Raja Medical College, Gwalior-474007

**Key words:** Epigenetics, Gallbladder cancer, Calculus cholecystitis, Methylation



**Abstract:**

Epigenetic alteration plays an important role in the temporal and spatial expression of genes in the tumorigenesis of Gallbladder. Late detection of the cancer makes it intricate and its prognostic management always remains a problem. Hence, development of an appropriate biomarker is a major objective of the current investigations. Our study has revealed the incidence of Gallbladder cancer to be very high in North Central India. We checked the methylation status of *THBS1* and *FLNC* genes in Gallbladder cancer and Calculus cholecystitis. We have observed an aberrant pattern of methylation in both the cases. Our findings suggest that these two genes might play major roles in Gallbladder tumorigenesis, including its risk factor, Calculus cholecystitis.

**15. Cross- localisation of *Fusarium* induced stress protein by anti-cadmium stress associated protein-antibody in wheat.**

**A. Banerjee<sup>1</sup>, B.P. Rath<sup>1</sup>, A. Das<sup>1</sup>, R. Nanda<sup>1</sup>, S. Mohapatra<sup>1</sup>, S. Ghosh<sup>2</sup>,  
P. Mohanty<sup>3</sup> and B. Mitra<sup>1</sup>**

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<sup>2</sup>Department of Biophysics, South campus, Delhi University.

<sup>3</sup>Department of Biotechnology, OUAT, Bhubaneswar, Orissa.

**Key words:** *Fusarium oxysporum*, *Triticum aestivum*, Biotic stress, FISP, CSAP

**Abstract:**

Seven day old germinated wheat seedlings infected with four days old *F. oxysporium* spores showed wilting symptoms. SDS-PAGE analysis of the total soluble protein obtained from infected tissues yielded an over-expressed ~51 kDa protein as compared to the control uninfected sample. The protein (constitutive) designated as FISP was further purified and characterized by MALDI-TOF analysis. The protein at the preliminary stage could be identified as fructose bisphosphate aldolase. However, the *Fusarium* infected root tissue when cross-challenged with anti-CSAP-antibody showed positive labeling. Interestingly, anti-CSAP-antibody showed negative labeling when challenged with *Fusarium* spores, suggesting the protein to be of plant origin. Labelling FISP with anti-CSAP-antibody creates ambiguity and provides an opportunity to investigate whether both the FISP and CSAP are similar protein or they carry a consensus which is recognized by anti-CSAP-antibody.

**16. Study of epidemiology & physiology of proteins HA and NA of influenza A virus**

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Ahmednagar, Maharashtra

**Key Words:** H<sub>1</sub>N<sub>1</sub>, Epidemiology, ClustalW2, Physiology, Phylogeny

**Abstract:**

The recent pandemic crisis of H1N1 virus (a strain of influenza virus) is the result of reassortment and mutational changes occurred in the virus. These changes occur frequently at irregular intervals. The major pandemics are associated with antigenic shifts- when viral H (Haemagglutinin) or N (Neuraminidase) or both are changed. This shift results from acquisition of a complete new RNA segment 4 and/or 5. The epidemism of a virus results from drifts (gradual changes in the virus antigenicity) and pandemism of a virus results from shifts (sudden changes in the virus antigenicity that 'fools' immune system which leads to pandemism of the disease). In the present studies application of bioinformatics tools e.g., BLAST, ClustalW2, InterProScan, NJPlot are used to demonstrate the relationship between influenza pandemics and epidemics. Sequential regions associated with antigenic drifts and shifts are found out and comparative study is followed. This can be efficiently used in the further working areas like drug discovery.

**17. Inhibition of TMV multiplication by siRNA constructs against TOM1 and TOM3 genes of *Capsicum annum***

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Bangalore 560065, Karnataka.

**Key words:** TOM1, TOM3, siRNA, TMV

**Abstract:**

TOM1 and TOM3 proteins are host proteins associated with tonoplast membrane and are shown to be required for efficient multiplication of Tobamoviruses. In this study, we identified homologous of TOM1 and TOM3 genes in pepper (*Capsicum annuum*) using specific primers. siRNA approach was used to investigate whether these genes support multiplication of *Tobacco mosaic virus* in tobacco. *Nicotiana* plants agroinfiltrated with siRNA constructs of TOM1 or TOM3, showed no mosaic and necrosis infection symptoms upon inoculation with TMV. The results indicated that silencing of TOM1 and TOM3 using the siRNA constructs from pepper is an efficient method to check TMV multiplication.

**18. Figure print**

**A. Sinha**

Arvind Mahilla College,  
Patna

**Key word:** Figure print, DNA, Medical diagnosis, Revolutionary technology

**Abstract:**

The technique by which we conduct the variation in copy number between individuals is called DNA finger Print. DNA pattern of each individual is as unique as our Figure Print. In fact our DNA figure-Print Pattern are much more unique compared to our figure print. DNA Finger Printing is more commonly and popularly known as a tool to tack down criminals. But today it is finding applications in as varied areas as Medical diagnosis, Pedigree analysis, sex selection in animals, wildlife conservation and even ascertaining human origins Here's as insight into this revolutionary technology by someone who helped establish its authenticity available evidence in court of law in India. This discovery of DNA fingerprint as a surprise to population geneticists who believed that all of us have similar DNA and that there is no difference.

## 19. Family history in metabolic syndrome: a tool for genomic study

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**Key words:** Metabolic syndrome, Family history, Obesity, Genomics

### **Abstracts:**

Family history has been shown to be a risk factor for a majority of chronic diseases of public health significance, including cardiovascular disease (CVD) and diabetes. The present study was an attempt to understand whether family history of CVD has any association with metabolic syndrome (MS). Nearly 448 adult ( $\geq 30$  yrs) Asian Indians living in and around Kolkata participated in the study. Family history of diabetes, hypertension and CVD was recorded from each participant. The confounding factors related to MS were studied among the individuals with and without family history. It was found that prevalence of MS was 29.2%. It was also observed that significant difference ( $p < 0.0001$ ) occurs between individuals with/ without family history of MS. Family history, thus, could be used as a tool for genomic studies in order to understand the underlying shared 'gene-environment' interrelation associated with complex traits.

## 20. F0F8.2 Protein of *Caenorhabditis elegans*

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**Keywords:** *Caenorhabditis elegans*, F0F8.2 protein, molecular modelling, human HMGR protein

### **Abstract:**

The present study focused on gene on chromosome 3 of *Caenorhabditis elegans*, putatively referred as F0F8.2, homologous to HMGR gene of human. 3D

structural model of F0F8.2 protein is presented here on the basis of known structure of human HMGR protein. Probably F0F8.2 produces an enzyme that plays an important role in synthesis of cholesterol type molecule in nematode as it is closely homologous to HMGR gene of human where the HMGR product plays a rate limiting role in production of cholesterol. Results obtained from this project gives analytical study of the genome of *Caenorhabditis elegans* are expected to throw light on the fundamental genomics of the nematode and some of the poorly understood gene functions of the human with which nematode is known to share a number of functional features.

## 21. Genetic Analysis of Killer Immunoglobulin-like Receptor (KIR) Gene Content in Association with End Stage Renal Disease

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Bhubaneswar 751024, Odisha.

**Key words:** End stage renal disease; Natural killer cells; Killer immunoglobulin-like receptors; Activating and inhibitory receptors; Inflammation

### Abstract

NK cells are one of the earliest producers of immune modulating cytokines as IFN- $\gamma$  which contributes to the activation of pro-inflammatory cytokine milieu. The activity of NK cells is regulated by a series of inhibitory and activating receptors known as KIRs which interact with the groups of HLA class-1 alleles. The high degree of polymorphism and inter individual variation in both the number and types of KIR genes can account varied NK cell responses and inflammatory activation and a particular KIR genotype can influence the development and pathogenesis of the ESRD. PCR-SSP was used to determine the individual KIR genotypes in 192 ESRD patients and 250 healthy controls, free from any renal disease. A higher prevalence of activating KIR2DS1 ( $p = 0.0094$ , OR = 1.67, 95%CI = 1.14-2.44) and KIR3DS1 ( $p = 0.0429$ , OR = 1.50, 95%CI =

1.02-2.19) and a significant protective effect against ESRD associated with inhibitory KIR2DL1 ( $p = 0.0156$ , OR = 0.41, 95%CI = 0.20-0.82) and 2DL5 ( $p = 0.0364$ , OR = 0.62, 95%CI = 0.40-0.95) gene carriage was observed among patients and controls. Genotypic and haplotypic result shows significantly higher activating Bx haplotype among patients (77.3%) than controls (61.0%). In conclusion our data suggests that balance between inhibitory and activating receptor-mediated signals present in natural killer cells is inclined toward a more activating state that may contribute to the pathogenesis and progression of ESRD.

**22. Deletion in the *invH* gene in *Salmonella enterica* serovar Typhimurium does not completely inactivate the secretion of TTSS-I dependent effector proteins.**

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Bhubaneswar -751024, Orissa.

**Key words:** *Salmonella enterica*, The type 3 secretion system I, Salmonella Pathogenicity Island I, Amplification

**Abstract:**

TTSS-I of *Salmonella enterica* serovar Typhimurium is important to mediate active invasion and subsequent inflammation in genetically susceptible C57BL/6 mice. *S. Typhimurium* translocates its effector proteins through SPI-I encoded TTSS-I needle complex. Although many of the proteins which are directly or indirectly involved in the SPI-I mediated inflammation are known, but the individual contribution to the whole mechanism is still to be understood. We focused on the *invH* gene of *S. Typhimurium* which has been known to play an active role in SPI-I mediated effector protein translocation. We observed that deletion of *invH* gene in *Salmonella Typhimurium* reduced the invasion efficiency to 31% as compared to wild type *Salmonella Typhimurium* (100%) in HCT116 cell line. To further investigate the role of *invH* mutant in SPI-I mediated inflammation, an *invH* mutant (MT1) deficient in systemic spread (*Salmonella Typhimurium*;  $\Delta$ ssaV) was used to infect C57BL/6 mice. We observed a marginal difference in the degree of caecum inflammation, between wild type *S. Typhimurium* (SB300) and *invH* mutant (MT1) after two days of post infection.

In a 12h post infection we found a significant difference in the caecum inflammation level in between the wild type and *invH* mutant strain. In contrast to the phenotype of *invH* mutant in bovine model in a time bound experiment, we found a delayed caecal inflammation in the mouse model of *Salmonella* diarrhea. To check the proper secretion of effector proteins through the TTSS needle channel in *invH* mutant, we performed a western blot of sipA effector protein. We found a decreased quantity of sipA secretion in *invH* mutant in comparison to the wild type *S. Typhimurium*. In order to confirm the phenotype of *invH* gene we cloned the *invH* gene in a plasmid (pCH112) and transformed to the respective mutant strain. The complemented strain was further tested *in vitro* and *in vivo* and found to be equally invasive to the wild type *S. Typhimurium*.

### **23. Truncation of Paratose Synthase and Glycosyl Transferase Gene Renders *Salmonella enterica* Serovar Enteritidis Unable to Synthesize Complete O-Antigen and Increases the Cell invasion Significantly *In-vitro***

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KIIT University,  
Bhubaneswar.

**Key words:** Lipopolysachharide, *Salmonella enterica*, O-antigen, rfbS and rfbV genes

#### **Abstract:**

The Lipopolysachharide of gram negative bacteria is a major virulence determinant. It consists of lipid A, core polysaccharide and O-antigen (O-Ag). It accounts for the membrane stability and provides resistance against serum mediated killing. The effect of deletion of O-antigen biosynthetic genes on virulence of bacteria has been studied in detail. However most of the studies are restricted to *Salmonella enterica* Serovar Typhimurium. Here we report the effect of deletion of rfbS and rfbV genes of *Salmonella enterica* Serovar Enteritidis on O-Antigen synthesis, invasion into HCT-116 cell line and intracellular survival efficiency in RAW 264.7 The deletion of above two genes renders bacteria unable to synthesize O-antigen. In addition we also found that O-antigen regulates negatively the invasion of the bacteria i.e. the O-antigen deficient strains are more

invasive than wild type. However the intracellular survival was found to be significantly less than that of wild corresponding isogenic wild type.

#### **24. Proteolysis of Histone H2A by a Histone H2A specific protease from chicken liver nuclei**

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**Key words:** H2A specific protease (H2Aase), Proteolysis, Histones, PTM

#### **Abstract**

Histones, the conserved regulators of eukaryotic gene expressions are susceptible to diverse PTM. Along with all the known reversible PTM, they are also subjected to an irreversible PTM known as proteolysis. However, till date there are very few reports available depicting the purification and characterization of any H2Aase. Here we have purified and characterized a histone H2Aase from chicken liver nuclei that is responsible for specific clipping of histone H2A. Total Histone isolated from chicken blood and also PTM free bacterially expressed Histone H2A were digested with H2Aase in the specified assay system developed by us caused complete disappearance of the H2A band in the SDS-PAGE. When it was probed with anti H2A antibody we identified a faster migrating H2A band. This observation showed the possibility that the faster migrating H2A was a proteolytically cleaved product of H2A. This protease was only specific for H2A as the other histones present in the assay system inadvertently acted as internal control. Further, H2Aase did not cleave other non-histone proteins like BSA, RNAase and lysozyme. H2Aase was active in a wide range of pH from pH 3-10 and was active to a maximum temperature of 50° C. It is probably a serine protease since its activity was inhibited by serine protease inhibitors like PMSF. The exact physiological role of the histone H2A specific protease is yet not known.



**25. Evaluation of genotoxicity caused by doramectin in edible fish *Channa punctatus* using comet assay**

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Department of Zoology, Bareilly College, Bareilly

**Key Words:** Genotoxicity, *Channa punctatus*, Comet assay

**Abstract:**

The edible fish *Channa punctatus* was exposed to different concentration of doramectin for 144h and 96h LC 50 value was determined for this fish species. On the basis of LC 50 value three sublethal concentration (0.008 ppm, 0.012 ppm and 0.016ppm) of doramectin were selected for studying genotoxicity after different exposure periods. One of the most promising genotoxicity biomarker, comet was used in the present study. A concentration and duration dependent increase in comet scores was observed in till 120h exposure of doramectin. Thereafter, a nonlinear decrease was recorded in comet scores.

**26. Confounding association maternal chewing tobacco habit and down syndrome birth: an introspection into the maternal age effect through telomere length estimation**

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<sup>2</sup>Department of Zoology . BijoyKrishna Girls College. 5/3 Mahatma Gandhi Road. Howrah

<sup>3</sup>Humans Genetics Research Unit, School of Biotechnology and Biological Sciences. West Bengal University of Technology, BF- 142, Salt lake City, Sector 1. Kolkata.

**Key words:** Down syndrome, Nondisjunction, Meiosis, Maternal age

**Abstract:**

In exploring the association between maternal behavior risk factors for maternal molecular age and subsequent Down syndrome birth, we estimated the telomere

length of chromosomes of mothers with Down syndrome child and analyzed their exposure to smoke less chewing tobacco (SCT) through regression models. We found a strong interaction of SCT with shorter telomere length among women who experienced meiosis I nondisjunction and the effect is maternal age independent. This is for the first time that we report some environmental impact on maternal TL shortening as a risk for the chromosome 21 nondisjunction and associated Down syndrome birth.

**27. Cross talk between the cytokine/chemokine network and immunoregulatory circuits in pathogenesis of *Entamoeba*.**

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Canberra, Australia

**Key words:** Gal/GalNAc lectin, *Entamoeba histolytica*, *Entamoeba dispar*, Chemokines, Lectin conditioned medium.

**Abstract:**

*E histolytica*, a gastrointestinal protozoan parasite causes invasive diarrhoea and liver disease. The differential induction of various pro inflammatory cyto and chemokines by the Gal/Gal NAc lectin of pathogen in the intestinal epithelial cells can regulate the immunoregulatory functions of host's competent cells. The soluble levels of interlukins, MIP-1 $\alpha$ , MCP-1, RANTES, GRO- $\alpha$ , GMCSF were found to be significantly higher in pathogenic LCM as compared to non pathogenic LCM. The monocytes from ALA patients responded to the presence of P-LCM by lowering intracellular Ca<sup>2+</sup>. Similarly the proinflammatory MCP-1, GRO- $\alpha$  and GMCSF levels in the monocytes were recorded to be higher along with their respective receptors, with P-LCM as compared to NP-LCM. A significant increase in the ROS and chemotactic index was observed in the monocytes and neutrophils when treated with P-LCM. These findings point towards understanding the mechanism of immunopathogenesis of amoebiasis.

**28. Differentiation of amniotic fluid stem cells into multiple lineages in Buffalo (*Bubalus bubalis*)**

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Animal Biotechnology Lab, Department of Biotechnology  
Kurukshetra University-136119

**Key words:** Amniotic fluid, Stem cells, Neurogenic, Adipogenic, Osteogenic, Differentiation.

**Abstract:**

The aim of this study was to know the differentiation potential of amniotic fluid derived stem cells into multiple lineages like neurogenic, adipogenic and osteogenic etc. Expression of Oct-4, Sox-2, Nestin, FGF-5, Nanog, ALP, 18s rRNA, SCF, cyclin A,  $\beta$ -actin, GAPDH and GATA-4 were observed from the amniotic fluid stem cells in different passages with RT-PCR amplicon of 314, 277, 307, 210, 317, 180, 162, 216, 421, 178, 180 and 334bp respectively. A quantitative real-time PCR analysis of AFS cells, Oct-4, Nanog, Sox-2, SCF, nestin and FGF-5 expression was found positive. Amniotic fluid stem cells strongly expressed Oct-4, Nanog, Sox-2, SSEA-1, SSEA-4, TRA-1-60, TRA-1-81 and ALP markers by immunofluorescence staining. Differentiated stem cells were observed and confirmed by oil red O, Von Kossa staining followed by RT-PCR analysis of neurogenic, adipogenic and osteogenic differentiation. The cells were found to have a normal karyotype at different passages. We conclude that amniotic fluid cells have the stem cells potential and may contribute towards establishing non-embryonic pluripotent stem cells for various therapeutic and reproductive biotechnological applications in the species.

**29. Increased Serum Cystatin C Level, CST3 Genotype and Apo E  $\epsilon$ 4 Allele: Biomarker for the detection of Alzheimer's disease**

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2. National Neuroscience Centre, Peerless Hospital, Panchasayar Kolkata

**Keywords:** Serum Cystatin C, CST3 Genotype, ApoE Genotype, Alzheimers disease, Dementia.

**Abstract:**

Serum Cystatin C co-localizes with brain beta-amyloid, a hallmark of Alzheimer's disease (AD). We investigated the role of serum Cystatin C level and its genetic polymorphism as biomarker of AD and other dementias (non-AD). Demented individuals have higher serum Cystatin C level than control. CST3 AA or AG genotypes are significantly associated with AD but not with non-AD group. ApoE  $\epsilon$ 4 allele increases the risk of AD by lowering the onset age in CST3 AA genotype carriers. Results shows, serum Cystatin C, CST3 genotype together with ApoE genotype determination could contribute to the diagnosis of Alzheimer's disease as a prospective biomarker.

**30. Thermostable amylase activity of *Bacillus subtilis* isolated from the local hot spring Atri, Odisha, India**

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Ravenshaw University, Cuttack-753003,

**Key words:** Amylase, *Bacillus*, Thermostability

**Abstract:**

The amylase positive *Bacillus* strain ARBELICrg, isolated from hot spring at Atri located 42km away from Bhubaneswar, capital city of Odisha, India, showed high thermostability for 4hours at 100<sup>0</sup>C. Biphasic pattern of amylase production and

optimum amylase activity at 100<sup>0</sup>C, pH 8.0, and 3mins of reaction time was obtained. The amylase activity increased with heat treatment at 100<sup>0</sup>C and stable upto 2hours with 165.92% relative activity. Native and SDS-PAGE indicated the amylase consisted of a single polypeptide of 18kDa molecular weight. The molecular characterization of the strain was carried out by sequencing, RFLP patterning and restriction map construction of amplified 16S-rRNA gene. The BLAST and multiple sequence alignment analysis characterized the strain to be a variant of *Bacillus subtilis* strain with high thermostability than its normal counter parts.

**31. Glial fibrillary acidic protein as novel citrullinated autoantigen in rheumatoid arthritis MTCC 428**

**S. Kashyap, H.R.Das and S. Biswas\***

**Key Words:** Glial fibrillary acidic protein, Rheumatoid arthritis, Citrullinated autoantigen

**Abstract:**

Glial fibrillary acidic protein is an intermediate filament type 3 protein and is important in modulating astrocyte motility and shape by providing structural stability. It plays a role in the cartilage differentiation in tumor types and is reported to be present in the dendritic cells found in the synovial fluid and in synovial fluid of rheumatoid arthritis (RA) patients. In the present study the increased level of GFAP was confirmed in RA blood by RT-PCR. The expression of GFAP was also validated in plasma and synovial fluid of RA by western blot analysis and enzyme-linked immunosorbent assay. The immunohistochemistry result revealed the presence of GFAP in RA synovium. Binding of GFAP with citrulline antibody revealed that GFAP is citrullinated autoantigen and can be used as specific biomarker for the diagnosis of RA.

**32. Analysis of RAPD fingerprints of scented rice for selective identification and genetic divergence**

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New Delhi-110012

**Key words:** Scented rice, Genetic divergence, RAPD markers, Loci, Crop improvement

**Abstract:**

The intra-specific variation in rice is extensive and sub-specific classification has always been important for rice breeders and geneticists. Scented (aromatic) rice constitutes a small but special group of rice which is considered for better aroma, superfine grain and cooking quality. A large number of these collections are available but there is still scope for development of quick and reliable identification method as well as genetic divergence. Molecular marker based DNA fingerprinting may help in this direction. During the present investigation attempt were made to analyze the relatedness and distances among forty five scented rice genotypes including basmati and other similar rice germplasm using forty five RAPD markers. In this study 19 RAPD markers amplified 23 exclusive loci in 20 genotypes. These markers can be used as a tool for quick and reliable detection of specific genotype.

**33. IL-6 mediated epigenetic regulation of Socs3 promoter in asthma pathophysiology**

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**Key words:** Asthma, IL-6, Acetylation, Socs3

**Abstract:**

Bronchial asthma is associated with low expression of IL 6 and overexpression of Socs3. As exogenous IL-6 treatment lowers the level of Socs3 in asthmatic conditions, we hypothesize that IL-6 may alter the epigenetics of Socs3 promoter. Effect of IL-6 was studied on the acetylation pattern of H3 (Lys 23) and H4 (Lys 8) in asthmatic lung. Their association with Socs3 promoter was studied using ChIP assay. Chromatin Immunoprecipitation of asthmatic lung revealed high expression of acetylated H4, whereas no change was observed in the acetylation pattern of H3. High enrichment ratio of Socs3 promoter was observed in Ac-H4 of asthmatic lung. Low expression of Ac-H4 and insignificant enrichment of Socs3 promoter was found in case of IL-6 treated asthmatic lung. Our finding delineates the role of IL-6 in asthma pathogenesis by modulating the status of histones in Socs3 promoter region.

**34. Subcloning of *Plasmodium rrf* gene and investigation of the effect of *Pf* EF-G and *Pf*RRF on the growth profile of the *E. coli* RRF mutant LJ14**

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**Keywords:** *Pf*- *Plasmodium falciparum*, RRF-ribosome recycling factor, EF-G: Elongation factor G, LJ14, *E.coli*.

**Abstract:**

Resistance to commonly used malaria drugs is spreading at an alarming rate and there is an urgent need to develop new drugs. The apicoplast is an important

organelle, that have generated immense interest as putative drug targets due to their indispensability for parasite survival. Two proteins, elongation factor G (EFG) and ribosome recycling factor (RRF), predicted to be required for translation in the apicoplast are being investigated for their functional activity. It is intriguing that two nuclear-encoded EFGs are targeted to the apicoplast and mitochondria, respectively. However, only one RRF is predicted on the nuclear genome and this is targeted to apicoplast. So without RRF how mitochondrial translation process is completed in *Plasmodium*, and if RRF is not present then which translational factor is playing the role of RRF. The clear understanding of this mechanism will provide a different target to develop antimalarial drug which will overcome the problem of drug resistance.

### **35. Polymorphisms of Cytochrome b in three populations of Golden Mahseer (*Tor putitora*) (Family: Cyprinidae)**

**A. Barat, G.K. Shivaraman, S. Ali, J. Sati, S. Sah, R. Kumar and P. C. Mahanta**

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Bhimtal-263136, Nainital, Uttarakhand

**Key words:** *Tor putitora*, *Cytochrome b*, Polymorphism, Mitochondrial DNA, Conservation

#### **Abstract:**

The golden mahseer is the commercially important cold water fish of the Himalayan region but now is endangered in wild population. In the present study we have sequenced a fragment of the cytochrome b mitochondrial gene of three population of *T. putitora* to investigate the nucleotide variation *i.e.* river Jiaboroli, river Kosi and river Satluj. Gene sequences of the cytochrome b of three populations were analyzed and 3 polymorphic nucleotides were observed in the population of Arunachal Pradesh. The mutation involves 3 codon in position 276CTA, 318GGG and 465CTA of the cytochrome b mitochondrial gene. The modified codons codify the amino acids leucine, glycine and leucine respectively. All polymorphism represent conservative missense mutation, not altering protein structure and biological function. They might be employed as marker for genetic characterization of different population.



**36. Studies on genotoxicity of non-ionizing radiations on human population using comet assay**

**S. Gulati<sup>1</sup>, A. Yadav<sup>1</sup>, S. K. Giri<sup>1</sup>, K. Dev<sup>1</sup>, A. Kumar<sup>1</sup>, N. Kumar<sup>1</sup>,  
Kanupriya<sup>1</sup>, S.K. Gautam<sup>1</sup> and R. Gupta<sup>2</sup>**

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**Keywords:** Electromagnetic radiation, Cellular base station radiation, DNA damage, Olive tail movement (OTM).

**Abstract:**

Every second we are exposed to different kind of radiation such as mobile, ultraviolet, radio and television waves. Very limited information is available on the exposure to cellular radiation. To study the effect of cellular radiation, 2 ml blood was collected from 25 individuals exposed to mobile tower radiation and 25 control individuals. DNA damage among exposed and control individual was analyzed by comet assay. Exposed individual show significantly higher OTM  $12.36 \pm 4.02 \mu\text{M}$  as compare to control subjects  $0.23 \pm 0.06 \mu\text{M}$  (mean  $\pm$  SD). Among exposed individuals, individuals residing in 100-150 meter range from mobile towers showed significant high DNA damage ( $P < 0.05$ ) as compare to individuals which are residing too close ( $< 50$  meter) or far away ( $> 150$  meter).

## ii Plant and Drug Discovery

### 37. Phytochemical evaluation and antioxidant activity of *Piper nigrum* and *Piper cubeba*

**R.K. Sahu and G. Nahak**

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**Key words:** Spices, Pharmacological/therapeutic, Piperine, *Piper nigrum*

#### **Abstract:**

Indian spices that provide flavor, color, and aroma to food. Recent scientific research has established the presence of pharmacological/therapeutic active compounds. The medicinal effects of spices are validated by modern pharmacological and experimental techniques. Among the plants investigated to date, one showing enormous potential is the Piperaceae. Piperine is an alkaloid belonging to the pyridine group of Piperaceae family, such as *Piper nigrum* and *Piper cubeba*. It is used in cough syrups, anti-inflammatory, anti-malarial, anti-leukemia treatment. The present study was aimed to extract the phytochemical compounds from *P.nigrum* and *P.cubeba*. In preliminary screening and confirmatory test it was identified as alkaloid. High antioxidant activity was found in *P.cubeba* ethanol extract i.e.  $77.61 \pm 0.02\%$  in comparison to *P.nigrum* extracts with  $74.61 \pm 0.02\%$  with  $IC_{50}$  values  $10.54 \pm 0.12 \mu\text{g}/\text{mg}$  and  $140.15 \pm 0.02 \mu\text{g}/\text{mg}$  respectively.

### 38. Micropropagation of *Withania somnifera* (L.) Dunal

**A.A. Deshmukh, M .R. Kakpure<sup>1</sup>, C.S. Ukesh<sup>2</sup>, and S.P. Rothe<sup>1</sup>,**

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<sup>2</sup>Department of Microbiology, Shri Shivaji Science College, Amravati – 444606 (MS).

**Keywords:** Axillary shoot tip explants, Micropropagation, Nodal explants, *Withania somnifera*.

**Abstract:**

*Withania somnifera* (L.) Dunal is an erect, evergreen, perennial shrub belonging to family *Solanaceae*. Regeneration from nodal and axillary shoot tip explants of *Withania somnifera* (L.) Dunal was studied on Murashige and Skoog's (MS) medium supplemented with different concentrations of auxins and cytokinins. Shootlets regenerate from nodal and axillary shoot tip explants was high in MS medium supplemented with BAP 2.0 mg/l, Kn 1.5 mg/l & NAA 1.0 mg/l and BAP 1.5-2.0 mg/l, Kn 1.0-1.5 mg/l & NAA 0.5-1.0 mg/l respectively. The regenerated shootlets were best rooted on MS medium containing BAP 1.0 mg/l, Kn 0.5 mg/l & NAA 1.5 mg/l. The rooted plantlets were hardened and successfully established in soil.

**39. *Raphanus sativus* root juice – a potent antibacterial agent**

**S. Shukla, P.K. Rai, A. Mubayi and G. Watal**

Alternative Therapeutics Unit, Drug Development Division, Medical Research Lab, Department of Chemistry, University of Allahabad, India.

**Key words:** *Raphanus sativus* root juice, Antimicrobial, Minimum Inhibitory Concentration and Ampicillin.

**Abstract:**

In the present study, *R. sativus* root juice was evaluated for its antimicrobial potential against five bacterial strains, viz. *Klebsiella pneumonia*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Enterococcus faecalis* and *Escherichia coli*. The results obtained from the present study, reveal that *R. sativus* root juice exhibits considerable antimicrobial activity against all the tested microorganisms at a Minimum Inhibitory Concentration (MIC) ranging from 0.078 to 0.625 mg/mL. A reference drug, ampicillin was used for comparing the results.

**40. Screening and comparative analysis of exopolysaccharide producing *Rhizobia***

**C.D Mahalle and A. Shaikh**

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Akola 44400, Maharashtra

**Key words:** Root nodule, Rhizobium, Exopolysaccharide

**Abstract:**

The *Rhizobia* produce large amount of exopolysaccharide (EPS) which play vital role in formation of nitrogen fixing nodules. In present work a symbiont, isolated from root nodule was identified has *Rhizobium* spp. Isolates were further evaluated as EPS producer. Out of the 19 isolates 10 were found to be eminent EPS producers. It produce large amount of EPS in broth culture of yeast extract mannitol (YEM) medium, and their enhancement were studied in presence of various sugars. Symbiont produced maximum EPS was screened for its wider applications. The EPS produce *Rhizobia* can be use a potent plant growth promote. In most of the studies Rhizobial strains were used as inoculums while we attempt to utilize the *Rhizobial* EPS as an effective approach for improvement in plant growth.

**41. Induced Early Flowering Mutant in Jute (*Corchorus olitorius* L. Variety – JRO-632)**

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35, Ballygunge Circular Road, Calcutta – 700 019

**Keywords:** *Corchorus olitorius* L.; chromosome, Early flowering mutants, Ethylamine

**Abstract:**

Presoaked seeds of jute (*Corchorus olitorius* L. variety JRO-632) were treated with 2% Ethylamine for 24 hours. Early flowering mutants were screened in M3 in contrast to the normal looking fruit plants. A number of yield component

growth parameters were recorded including plant height, basal diameter, plant spread, root length, pod per plant, seeds per pod, pod length/breadth ratio, number of primary branches, number of secondary branches per plant, leaf angle, branching angle, first flowering date, 100% flowering date, total duration, % of pollen sterility and weight of 100 seeds which were found to vary from the control plant. Chromosome analysis revealed aberrations like stickiness, fragmentation, clumping, polyploidy and laggard and bridge formation etc. Multiple cropping has been possible with the availability of irrigation water and a number of early maturing varieties have introduced in case of various other crops. There should be suitable early flowering patterns.

#### **42. Phylogenetic relationship and association of AFLP markers with biochemical traits in edible bamboo species of Manipur**

**W. S. Devi and <sup>1</sup>T. N. Chandra**

<sup>1</sup>Microbial Resources Division, Institute of Bioresources Division, Imphal, Manipur

**Key words:** AFLP marker, antioxidant activity, *Dendrocalamus hamiltonii*, multiple regression analysis, total cyanide content

#### **Abstract**

Young juvenile bamboo shoots are local food delicacies in North-east India for its crispy-crunchy sweet taste and rich nutritive content. Morphologically, 15 edible bamboo species from 2 districts of Manipur with rich diversity of edible bamboos have been identified authentically by classical taxonomy. Subsequently, AFLP fingerprints were developed and analysed for 12 edible bamboo species. By this method, the 5 *Bambusa* species and the 4 *Dendrocalamus* species could be separated into 2 clusters. Cluster analysis based on Dice similarity coefficient using UPGMA differentiated the populations into two major groups. Principal coordinate analysis based on the AFLP data clearly separated the populations according to their genetic diversity and antioxidant activity. Stepwise MRA identified the 273 bp generated by EcoRI-AAG (Joc)/MseI-CTC showed high positive correlation with antioxidant activity ( $r= 0.729$ ,  $P<0.01$ ) and the 377 bp generated by EcoRI-AAC(Ned)/MseI-CTG gave high negative correlation ( $r=-0.694$ ,  $P<0.01$ ) with total cyanide content.

**43. An environmental friendly approach for mosquito control using Biotechnological methods**

**P.U. Sri, N.V. Sree, P.R. Sekhar, Y.V.V. A. Kumar**

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Acharya Nagarjuna University,  
Guntur-522510, Andhra Pradesh

**Key Words:** Environmental pollution, Larvicidal activity, Toxicological studies

**Abstract**

Mosquitoes are regarded as important vectors for the transmission of several diseases such as malaria and encephalitis. Controlling of these vectors has been attempted for a long time using synthetic chemicals. But these chemicals will cause environmental pollution and develop resistance among mosquito species. Hence there is an urgent need to develop new strategies for mosquito control. The control method should aim at the weakest link of the life cycle of the mosquito, which is the mosquito larva since killing of the larvae will terminate the life cycle and thus preventing the further multiplication of the mosquitoes. One such method is the use of plant extracts to kill the mosquito larvae in the water bodies. In light of this the present study was carried out and different plant species were selected and the extracts from various parts like leaves, bark, flowers and fruits were screened for their larvicidal activity. Thus the effectiveness of plant derivatives was studied for exploring the useful natural products in controlling mosquitoes. Toxicological studies have also shown that these are safe for human health and there is no toxic effect.

**44. The effect of heat stress on *Fusarium oxysporum f.sp. dianthi*. interaction with fungicides**

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The Burdwan University, Golapbag More-713104, Burdwan,  
West Bengal, India

**Key words:** *Fusarium oxysporum f.sp dianthi*, Resistance heat shock protein, Housekeeping protein (HKP), Fungicides

**Abstract:**

The interaction of *Fusarium oxysporum f.sp.dianthi*, with fungicides viz., copperoxychloride, metalaxylmancozeb and, mancozeb under heat-stress was studied. We evidence the pathogen eludes combined heat- and fungicides- stress by differential overexpression of a 22.9KD resistant heat shock protein (RHSP) and a 26.3KD housekeeping protein (HKP) at concentrations greater than 10mg/kg. Of the assayed fungicides, the proteome suppression was a function of temperature acting as a positive variance for copperoxychloride at 39°C; and as a negative variance for mancozeb and metalaxylmancozeb antifungal activities. We infer within the context of global warming, the sensitivity of this pathogen to some fungicides decreases and, lends credence for adaptation and resistance resurgence.

**45. Antioxidant activity of some *Curcuma* species of koraput district, Odisha, India**

**G. Nahak and R.K. Sahu**

B.J.B Autonomous College,  
Bhubaneswar, Odisha, India

**Key words:** *Curcuma longa*, *Curcuma aromatica*, *Curcuma zedoaria*, *Curcuma amada*, Antioxidant activity, Phenol content

**Abstract:**

Turmeric has acquired great importance in the present-day world with its antiaging, anticancer, anti-Alzheimer's, antioxidant, and a variety of other medicinal properties. The present work reveals that wide numbers of phytochemical constituents have been isolated from the plant which possesses activities like be bitter, astringent, aphrodisiac, purgative, anthelmintic, depurative, febrifuge and expectorant. According to DPPH assay, ethanolic extracts of showed maximum activity with 74.61±0.02% at IC<sub>50</sub> = 24µg/mL in *C.longa* followed by *C.zedoaria* (63.38±0.06%), *C.angustifolia* (58.38±0.06%), *C.aromatica* (55.38±0.06%) and *C.amada* (54.61±0.02%) when compared with standard ascorbic acid having IC<sub>50</sub> = 16.14 µg/mL. The ethanolic extracts were better free radical scavengers than the Methanolic and aqueous extracts. Our findings also showed a strong correlation of antioxidant activity with the total phenolic content. The findings indicated promising antioxidant activity of crude extracts of the above plant.

**46. Micropopagation studies of on *Ocimum basilicum* L. – a medicinal plant**

**P. Das, M.Misra, and A.N.Misra**

Department of Biosciences & Biotechnology, School of Biotechnology,  
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VyasaVihar, Balasore-756019, India.  
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Ranchi, India

**Key Words:** *Ocimum basilicum* L., medicinal plant, multiple shoot, micropropagation,

**Abstract:**

*Ocimum basilicum* is an important medicinal plant used in several Ayurvedic preparations. In the present study, a micropropagation protocol of *Ocimumbasilicum* is developed using the apical meristem explants. For direct organogenesis studies, the explants were incubated in MS medium with different combination of cytokinin (BAP), NAA or phytohormones (Kinetin+IAA), for callus induction and indirect organogenesis. Callus initiation started after 20- 30 days and Proliferated in 50-57 days. Best callus initiation as well as proliferation was in MS + 1mg/l Kn + 1mg/l IAA + 30mg/l sugar. Maximum multiple shoots were induced from these calli in the MS media with 1mg/l BAP + 30 gm/l sugar. Rooting of the shoots was induced in MS media containing IBA. A combination of 2.0 mg/l IBA + 30 gm/l sugar induced the maximum rooting efficiency.

**47. Electric field effect on wheat (*Triticum aestivum* L.) leaf**

**S. Mishra, R. Singh,\*M. Misra and \*A.N.Misra**

**Key words:** Electric current, Phytosynthesis, Pigment, Wheat leaf, *Triticum aestivum* L.

**Abstract:**

Wheat leaves subjected to electric current discharges showed gradual decrease in phytosynthetic pigment content and quatum efficiency (Fv/Fm ratio)



photosynthesis with time period of incubation and increase in electric current. Under electrophoretic conditions chlorophyll pigments migrate faster than higher mass proteins in immobilised matrix like agarose or PAGE etc. As the cellulose matrix in plant leaf cell makes the cellular contents immobilised in it and entraps it in immobilised matrix, the mobility of chlorophyll content suggesting that probably there is also protein migration. Both the components will affect the functional ability of pigment protein complexes of thylakoids. To the best of our knowledge this is the first ever study on effect of electric current on photosynthetic ability of an intact leaf system.

#### **48. Antimicrobial & antioxidant prospects of Ectomycorrhizae of central Himalayan region**

**Yogesh Lohani, Veena Pande\***

Department of Biotechnology,  
Kumaun University,  
Nainital

**Key words:** Ectomycorrhizae, Antioxidant activity, Antimicrobial activity

#### **Abstract:**

In this study, we investigated the antimicrobial and antioxidant activities of some ectomycorrhizal fungi collected from Nainital and Almora region of Uttarakhand. Antimicrobial activities these fungi were examined on various test microorganisms using disk diffusion methods. DPPH free radical scavenging, metal chelating activity and scavenging activity of hydrogen peroxide were used to test antioxidant activity. The ethanol extract of *Lacarius controversus* and *Xerocomus subtomentosus* were the most active extracts against Gram-negative bacteria (MIC between 100 µg/mL and 1 mg/mL). *Boletus luridus*, and *Hydnum repandum* were most active against Gram-positive bacteria (MIC between 100 µg/mL and 1 mg/mL). Among the four mushroom extract, *L. controversus* showed best antioxidant activity.

**49. The effect of raw banana (Plantain) extracts on sickle red blood cells**

**Y Archana<sup>1</sup>, N. Satapathy<sup>1</sup>, K. Tripathy<sup>1</sup>, M. Nayak<sup>1</sup>,  
S. K. Naik<sup>2</sup> and B.P. Dash<sup>1</sup>.**

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Ravenshaw University, Cuttack- 753003

**Key words:** Sickle cell, genetic disease, Polymorphism, Amplification

**Abstract:**

Sickle cell disease is a fatal genetic disease. The bone marrow transplantation is the only available cure for sickle cell disease, which is very expensive and limited to few selected individuals due to lack of adequate specialized centers. The gene therapy for sickle cell disease has been visualized but now is in experimental stages. A lot of efforts has been made and are still being made to get an effective treatment for sickle cell disease. However, not a single drug has been developed so far as an effective cure for this fatality. So it is highly essential to explore for an effective drug from any natural source. The present study has been done to assess in *vitro* anti-sickling effect of different extracts of raw banana on sickle red blood cell. Both the aqueous and normal saline extract of raw banana have showed the anti sickling effect where as the ethanol and methanol extract have no anti sickling effect.

**50. Potential importance of a plant letin in non-small cell lung cancer**

**Rakhee<sup>a</sup>, R. Srinivasan<sup>b</sup>, A. Chakraborti<sup>a</sup> and S. Ghosh<sup>a\*</sup>**

<sup>a</sup>Department of Experimental Medicine and Biotechnology and

<sup>b</sup>Department of Cytology & Gynaecological Pathology,

Post Graduate Institute of Medical Education & Research, Chandigarh, India

**Key word:** Maackia amurensis agglutinin, Non-small cell lung cancer, Cytotoxicity

**Abstract:**

Malignant transformation is known to be associated with aberrant glycosylation in cell surface carbohydrate architecture, which can be detected by lectins in the present study we have observed that *Maackia amurensis* agglutinin (MAA) could show strong reactivity with the cell and tissue biopsies of non small cell lung cancer (NSCLC) origin. MAA was found to induce morphological changes as well as cytotoxicity in three different subtypes of NSCLC cell lines with maximum effect seen in squamous carcinoma cells. Further, the paclitaxel induced apoptosis in these cells was enhanced in presence of MAA as also substantiated by the morphological alterations. Thus, MAA seems to have potential importance in the development of novel strategies for NSCLC treatment.

**51. In vitro protein profile of salt tolerant proteins in *Capsicum annum***

**Shalini<sup>1</sup>, Ajay<sup>2</sup> and Neeru<sup>3</sup>**

- 1) S.R.X. Muzaffarnagar, Affiliated To C.C.S. University, Meerut
- 2) S.V.C. Aligarh, Affiliated To Dr. B.R. Ambedkar Univ., Agra
- 3) Research Scholar, C.R.C. Muzaffarnagar, Affiliated To C.C.S. University, Meerut

**Key words:** Tissue culture, *Capsicum annum*, salt tolerance, protein

**Abstract:**

Different types of explants of *Capsicum annum* cv. Pusa jwala differing in salt tolerance were used in this study. Calli were initiated on MS Basal medium supplemented with salts (0, 50, 100, 150 and 200mM) also. Calli of all types of explants such as hypocotyls, cotyledonary leaf, shoot and leaf exhibited an increase in total soluble protein with salt stress compared to control. The increase was more in hypocotyl callus than others. SDS- PAGE of soluble proteins showed the synthesis of specific polypeptides in the presence of NaCl in culture medium and the synthesis of a new polypeptide of 27. kDa.

**52. Total phenolic content and antioxidant activity of apple juice (*Malus domestica*) and pomegranate juice (*Punica granatum*)**

**P. Johri<sup>1</sup>, Shalini<sup>2</sup> and Ajay<sup>3</sup>**

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<sup>2</sup>S.R.C. Muzaffarnagar affiliated to C.C.S. Univ., Meerut,

<sup>3</sup>S.V college, Aligarh affiliated to Dr. B. R. Ambedkar University, Agra.

**Keywords:** Antioxidants, Folin-Colteau Method, DPPH Method, Ferric reducing power assay, Phenolics

**Abstract:**

Antioxidant compounds are health protecting factor in food, as they trap the free radicals and each inhibit the oxidative mechanism that lead to degenerative diseases. This study investigates the total phenolic content of two fruit juices – Apple and Pomegranate by means of Folin –Colteau Method and their antioxidant capacities by DPPH and FRAP assay. The total phenolic content and antioxidant activity of juices were calculated and compared. It was found that Pomegranate juice displayed the high polyphenolic content and antioxidant activity. This work will provide the basis to investigate our findings ex vivo and will be applied in food technology and pharmaceuticals. This study supports the usefulness of phytochemicals in natural remedies of stress related ailment, their benefits provided by their antioxidant potentials.

**53. Combined ameliorative effect of *Curcuma longa* and vitamin C on oxidative stress, protein profile and DNA fragmentation against paracetamol-induced liver damage**

**S. Darbar and T. K. Pal**

Bioequivalence Study centre, Department of Pharmaceutical Technology,  
Jadavpur University, Kolkata-700032

**Key words:** Antioxidant, Free radicals, Liver damage, Paracetamol, *Zingiber officinale*

**Abstract:**

Drug-induced liver injury is a potential complication of virtually every prescribed medication throughout the world. Free radicals cause extensive damage to DNA, proteins, lipids and carbohydrates, which leads to various acute and chronic liver injuries. The present study was conducted to evaluate the protective action of *Curcuma longa* in combination with Vit. C in an animal model of hepatotoxicity induced by Paracetamol (PARA). Paracetamol intoxication caused a reduction of serum total protein and increase levels of serum alkaline phosphatase (ALP), aspartate aminotranferase (AST) and serum alanine aminotranferase (ALT) at higher extent in the toxic group. This phenomenon was paralleled by an impaired liver redox status i.e. decrease the level of reduced glutathione (GSH), superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) and increased MDA in the PARA-administered groups.

**54. An evaluation of acute toxicity (LD<sub>50</sub>) and histopathology of crude extract of marine tunicate *Phallusia nigra* in mice**

**S. M. Hussain<sup>1</sup>, G. Ananthan<sup>1</sup> and N. Poojary<sup>2</sup>**

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<sup>2</sup> Aquatic Environment and Health Management Division, Central Institute of Fisheries Education, Mumbai

**Keywords:** *Phallusia nigra*, Acute toxicity, Intraperitoneal, Albino mice, Histopathology

**Abstract:**

Despite marine tunicates are renowned for their pharmaceutical potential to heal various ailment, the potential toxicity study of the ascidian *Phallusia nigra* has not been described broadly. Considering public health protection, in this study the acute toxicity of *P.nigra* extract was investigated in mice and injected in logerthemic concentration by intraperitoneal route. After 24 hours, the mortality percentage was calculated and converted into probit values to determain the LD<sub>50</sub>. The LD<sub>50</sub> of the acetonitrile, methanol and acetone extract was found to be (299, 273 and 246 mg/kg) respectively with 95% confidence limits of 235 – 593 mg/kg. Histopathology of vital organs revealed the test substance produced changes mainly in liver, kidney and lungs, exhibited histomorphological changes like

congestion and periportal hepatocellular necrosis in liver, tubular necrosis in kidney and congestion in lung.

**55. *In vitro* callogenesis and specific features of callus grown from three cultivars of banana in Bangladesh.**

**M. A. Bari**

Institute of Biological Sciences  
University of Rajshahi, Bangladesh.

**Key words:** Callus initiation, Immature male flower, *Musa* spp.

**Abstract:**

Three modified MS media were used for this investigation and immature male flowers were taken from 1<sup>st</sup> to 18<sup>th</sup> position in bud. Callus induction initiated within 5-8 weeks of inoculation and continued to grow for 5-6 months. Analysis of their structure, color and embryonic nature callus were categorized into six distinct types but ideal callus appeared with translucent proembryos. Among the three media used MA<sub>1</sub> (solid) was proved to be the best performer in callus induction for banana. The growth hormone 2, 4-D played a vital role in callus initiation in banana with optimum strength 4 mg/L 2, 4-D.

**56. Effect of Growth Regulators on Shoot Regeneration from Leaf Callus Cultures in Sugarcane**

**R. Chaudhary<sup>1</sup>, R.S. Sengar<sup>1</sup> and S. K. Tyagi<sup>2</sup>**

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<sup>2</sup>Dept. of Botany, D.A.V. College, Muzaffarnagar, U.P. (India)

**Key words:** Callus culture, sugarcane, shoots induction, root induction, *in vitro* micro propagation.

**Abstract:**

Sugarcane (*Saccharum spp.*) is the most valuable commercial crop of India. It holds not only sugarcane and distillery industries but also a key position in the national economy by earning foreign exchange. The contemporary sugar industry

plays many significant roles in relation to food, energy and economic security. In present investigation deals with the effect of growth hormones on in vitro morphogenetic responses of leaf sheath explants of sugarcane varieties Cos 98259 and Cos 767. Leaf sheath are suitable explants for shoot regeneration via callus for in vitro micro propagation of sugarcane varieties. In the present study high frequency callus formation was recorded in leaf sheath explants achieved on MS medium containing 3 mg/l 2, 4-D while shoot regeneration from the callus was obtained on medium supplemented with BAP, Kinetin or NAA (0.5 mg/l each). The micro propagated shoots of sugarcane were successfully rooted on half strength MS liquid medium containing NAA (5.0 mg/l) and sucrose (50 mg/l).

**57. Medicinal plant extracts as a new sterol substitute in growth and development of *Caenorhabditis elegans***

**S. C. Phulara, V. Shukla, A.K. Mishra, R.P. Patel and R. Pandey**

Microbial Technology and Nematology  
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**Keywords:** *Bacopa monnieri*, Cholesterol, *C. elegans*.

**Abstract:**

*Bacopa monnieri* is commonly known as Brahmi and rich source of saponins which used for treatment of neurodegenerative and memory booster. *C. elegans*, a free living nematode and a preferred animal model is unable to synthesize cholesterol *de novo* due to sterol auxotrophy. To decipher the effects of triterpenes on *C. elegans*, we examine the effect of *B. monnieri* extracts on the morphometric parameters and lifespan of *C. elegans* in cholesterol fed and deprived medium. Cholesterol deprivation caused reduction in morphometric parameters and lifespan *C. elegans*. Though the morphometric parameters were enhanced both by aqueous and ethanolic extract, lifespan was restored by supplementation with aqueous extract only. The cholesterol containing extracts promotes the growth and body size of worms.

**58. Phytochemical screening and antioxidant activity of *Garcinia indica* choisy fruit**

**R. Kusum, F. Pasha, H. Bommayya and H.D. Ramachandran**

Department of Biochemistry, Dr. BR Ambedkar Road,  
Bangalore University, Bangalore - 560001, India.

**Key words:** Antioxidant activity, Phytochemical screening, Soxhlet extraction, DPPH Method, *Garcinia indica* (choisy).

**Abstract:**

*Garcinia indica choisy* belongs to the family Clusiaceae. The fruits part was extracted with different solvents by Soxhlet extraction method. Phytochemical studies of all the crude extracts showed the presence of terpenoids, alkaloids, saponins, flavanoids, glycosides & carbohydrates, phenolic, tannins and phytosterols. Antioxidant activity (DPPH) has been carried out for all the crude extract of plant. It was found that the different crude extracts from the fruit part had shown potent antioxidant activity. The maximum antioxidant activity was seen in ethyl acetate, n-hexane and water extracts, whereas petroleum ether, chloroform and ethanolic extracts of the plant material had shown moderate antioxidant activity.

**59. Isolation and characterization of *Mycorrhiza* from soil and their application for seedlings of *Triticum* spp.**

**R. A. Joshi and G.D.Sartale**

**Key words:** *Mycorrhiza*, Biofertiliser, Wheat, Optimization

**Abstract:**

In this study we have isolated three different types of *Mycorrhiza* by using soil and root nodules (*Glycin max*, *Arachis hypogea*, *Cajanus cajan*, *Cicer arietinum* plants). The morphological and biochemical characteristic of these isolated *Mycorrhiza* were systematically investigated. Among these Arbuscular *Mycorrhiza* was observed in major proportion in soil as well as on the surface of root nodule. The optimization of culture conditions for these *Mycorrhiza* were



studied in detail. Finally application of Arbuscular-Vesicular mycorrhiza (Ectomycorrhiza, Endomycorrhiza & Ericoid Mycorrhiza) *Mycorrhiza* were applied for seed germination as well as on the growth (Root and Shoot) length of of Triticum species were studied. The results suggest that supplementation of Arbuskular *Mycorrhiza* induces the plant growth and this type of study will be useful for the development of Biofertiliser for production of wheat which is needed in India.

#### **60. Antimicrobial activity of some traditional medicinal plants**

**P. Bharti, S. Bai, L. Seasotiya, A. Malik and S. Dalal**

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Kurukshetra - 136 119, Haryana, India

**Key words:** Antimicrobial activity, *Klebsiella pneumoniae*, Ciprofloxacin, Minimum inhibitory Concentration

#### **Abstract:**

Traditional medicines hold a great promise as source of easily available effective therapy for various diseases, particularly in tropical developing countries. Plants used in traditional medicine contain a vast array of substances that can be used to treat chronic and infectious diseases. This article describes the antibacterial properties of aqueous, methanol and cow urine extracts of fifteen medicinal plants against Gram negative bacterium *Klebsiella pneumoniae*. Four plant extracts showed remarkable inhibitory activity against the tested organism. The methanol extracts showed better activity than the other extracts. The activity of the extracts was compared with standard antibiotic ciprofloxacin. The Minimum Inhibitory Concentration (MIC) for the extracts ranged from 30-15mg/ml.

**61. An *in vitro* study on the antioxidant potential of a partially purified *Terminalia arjuna* aqueous bark extract**

**A. K. Ghosh<sup>1</sup>, S.B. Firdaus<sup>1</sup>, M. Dutta<sup>1</sup>, E. Mitra<sup>1</sup>, D. Mukharjee<sup>1</sup>, A. Chattopadhyay<sup>2</sup> and D. Bandyopadhyay<sup>1</sup>**

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**Key words:** Cu<sup>2+</sup>- Ascorbate, TA bark aqueous extract, Oxidative stress, Antioxidant

**Abstract:**

*Terminalia arjuna* (TA) is a well known medicinal plant widely used in herbal medicine for over centuries. The antioxidant potential of crude TA aqueous bark extract on goat whole RBC and liver homogenate were examined in *in vitro* system using Cu<sup>2+</sup>- ascorbate as an inducer of oxidative stress. The present study investigated the change in antioxidant potential after ethyl acetate partitioning of this crude TA aqueous extract. This ethyl acetate partitioned fraction surprisingly showed more potency to inhibit lipid peroxidation & reduced glutathione content (in RBC & liver homogenate) 2 fold of crude aqueous extract indicating future therapeutic relevance.

**62. The effect of spice principles from red pepper and kokum powder on body composition and lipogenesis in rats.**

**R. Kusum, F. Pasha, H. Bommayya and H.D. Ramachandran**  
Department of Biochemistry, Dr. BR Ambedkar Road Veedi  
Bangalore University, Bangalore - 560001.

**Key words:** Red pepper, Kokum powder, Lipogenesis, Capsaicin.

**Abstract:**

Inclusion of a spice like red pepper fruit and kokum powder in the diet led to a lowering of total lipids, particularly triglycerides in the liver. The total body fat was lowered in animals fed red pepper or capsaicin but not in animals fed kokum powder which had less effect on the total animal body weight content. Hyperlipogenesis and hypertriglyceridemia caused by fructose feeding were significantly decreased in capsaicin-fed animals. Lipogenesis was decreased as reflected by the reduced activities of the key lipogenic enzymes observed in albino rats.

**63. *In vitro* lipid peroxidation activity of phytochemicals from *Garcinia indica***

**R. Kusum, H. Bommayya, F. Pasha and H.D. Ramachandran**

Department of Biochemistry, Dr. BR Ambedkar Road Veedi  
Bangalore University, Bangalore – 560001.

**Key words:** Ethanollic extract of *Garcinia indica*, Lipid peroxidation, Free radical scavenging activity, TBARS.

**Abstract:**

Extracts of root, stem and fruit of *Garcinia indica* were subjected to qualitative analysis for the evaluation of phytochemicals present in them. Analysis revealed the presence of alkaloids, flavonoids, phenols and steroids and the absence of saponins, glycosides and tannins. The extracts were subjected to in evaluation of antioxidant properties in mice liver lipids *in vitro*. This *in vitro* evaluation was assessed by the measurement of thiobarbituric acid reactive substances (TBARS) in the experimental mixtures of tissue homogenates. The results suggest that the ethanollic extracts of *Garcinia indica* root, stem and fruit possessed significant *in vitro* free radical scavenging activities, possibly being attributed to the lipid peroxidation inhibiting properties.

**64. Phyto-Chemical analysis, Antimicrobial and Antioxidant Activities in leaves of *Maytenus emarginata* ,(Willd.) Ding Hou-a less known ethno-medicinal plant practiced By Tribal-Soliga community at B.R. Hills, Karnataka**

**S. S. Murthy, D. Shruthi, D.R. Mamatharani, R. Harsha, H.G. Ravishankar, G. P. Murthy**

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Shridevi Institute of Engineering & Technology  
Sira Road, Tumkur – 572 106

**Key Words:** Ethno-medicinal plant, *Maytenus emarginata* (Willd.) Ding Hou, Pharmacognostic property, Phyto-chemical analysis. Antimicrobial activity

**Abstract:**

The isolation of bio-active constituents found in a particular medicinal plant and its subsequent modification is a real need towards development of an effective drug. An attempt was made for an indigenous ethno-medicinal plant, *Maytenus emarginata* (Willd.) Ding Hou practiced by tribal – Soliga of Biligirirangana Hills of Karnataka. *M. emarginata* is an evergreen tree belongs to family ‘*celastraceae*’, commonly called as ‘*Thorny staff tree*.’ The plant extracts of the *Maytenus emarginata* have been used for the treatment of plethora of medical ailments from stomach complaints, fever, inflammation, microbial infection and to rheumatoid arthritis and cancer. The study includes preparation of different extracts by successive solvent extraction, subjected for preliminary phyto-chemical and physico-chemical analysis, antimicrobial activity and antioxidant activity of leaf of *Maytenus emarginata* to justify the practice of the above tribal medicine. The extract was found to possess antibacterial activity of *E. coli*, *Pseudomonas aeruginosa*, *Citrobacter*, *Enterococcus species*, *Staphylococcus aureus* isolated from infected patients.

**65. Protective algal consortium in the sporocarp of woodrotting fungi from bacterial chitinase activity**

**A. Mal, D. Sengupta, M. Ghosh, P. Dasgupta, P. Dey, S. S. Chowdhury**

Dept. of Microbiology,  
St. Xavier's College, Kolkata

**Key words:** Chitinase, *Enterobacter spp.*, *Ganoderma Spp.*, algae, BG11 media

**Abstract:**

The woodrotting fungi grow on the bark of any tree; usually they are pigmented because of the presence of the lignin decomposing ability of these fungi. They are degraded by the chitinase activity of different bacterial pathogens. In this investigation, fruiting bodies of *Ganoderma spp.* of different ages were observed to be degraded by the chitinase activity of a Gram negative coccobacillus proved to be *enterobacter spp.* But in such a fruiting body, an algal mesh formed of *Pandorina* effectively protected the basidiocarp from the enzymatic action of the bacterial chitinase. This was further proved by the growth of bacteria and algae in collateral medium showing inhibitory action of the algae on the bacteria. Thus it can be concluded that the phenomenon of hyperparasitism on saprophytic organisms is controlled by photosynthetic algal consortium and thereby, in future, this algal consortium can be used to free the water body from coliform infestation.

**66. Evaluation of herbicide (2, 4-D) as male gametocide on urid and salgare's method of plant breeding – a critical review**

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Prathsmesh Society, Shivaji Chowk, Karjat – 401 201, Maharashtra.

**Key words:** Palynology, Toxicology, Environmental Sciences, Herbicides

**Abstract:**

Potentiality of the germinability of pollen of *Phaseolus mungo* Roxb. (var. T-9, urid) was noted in all the 4 series i.e. F, F-24, F-48, F-72 series investigated. Pollen of F-24 and F-48 series produced higher percentage of the germination

with the longer tubes than those of F series. Foliar applications of all the concentration of 2,4-Dichlorophenoxy acetic acid above 100 mg/ml suppressed the flowering. None of the concentrations (5, 10, 25, 50, 100, 200-200-1000, 1000-1000-5000 mg/ml) could bring down the fertility of pollen to zero percent which is essential for the successful plant breeding program. Hence the existing method i.e. chemical induction of pollen sterility fails here. Hence we have to find out an alternative method of plant breeding. However, all the concentration of 2, 4-D above 25 mg/ml prevented the germination of pollen of all the 4 series. When there is no germination of pollen the transfer of the male gametes to the female gametophyte and eventually seed settings cannot happen. Hence instead of suppressing the pollen fertility, the germinability of pollen should be suppressed with a low concentration which gives the birth to the new method of plant breeding – ‘Salgare’s Method of Plant Breeding’.

**67. *In vitro* seed germination and plantlet regeneration from seed explants of *Vigna mungo* var. *silvestris***

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Centre for Biotechnology

University of Allahabad Allahabad-211001, Uttar Pradesh

**Key words:** Regeneration, 2,4D, NAA, callus induction, transgenic production.

**Abstract:**

*Vigna mungo* var. *silvestris* an important edible legume plant. It is the wild ancestral form of black gram. It is considered as a protein rich pulse. The objective of the present study was to standardize a protocol for regeneration of black gram plantlet by transformation by means of *in vitro* propagation so that an improved variety of wild black gram would be obtained by transformation in different future breeding programs and transgenic production. A standard protocol was developed for rapid callus induction and plantlet regeneration from seed explants of *V. mungo*. Seed were inoculated in ½ MS basal medium for germination. The germinated plants were transferred for callus induction into MS-medium supplemented with different concentration of 2,4D or alone and in combination with Kn. The highest percentage of callus induction was observed with 2, 4D -13.5 µM. Optimum shoot formation was observed on same medium when 1.5 µM BAP + 0.5 µM NAA was added. A well developed *in vitro*

regenerated plantlet was successfully transferred to the green house for acclimatization.

**68. Anti-arthritic effect of *Centella asiatica* on collagen induced arthritis in rats**

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Jamia Millia Islamia,  
New Delhi-110025

**Keywords:** *Centella asiatica*; Antioxidant, Anti-inflammatory, Cytokines

**Abstract:**

The present study aimed to determine the efficacy of *Centella asiatica* methanol extract (CAME) against collagen induced arthritis (CIA) in female Wistar rats. *In vitro* assays in cell free system showed significant ( $p \leq 0.05$ ) free radical scavenging activities of CAME. The suppression of inflammation in CIA was observed on CAME treatment as evidenced by decreased arthritic score, joint damage and reduced levels of proinflammatory cytokines in comparison to CIA rats without treatment. Similarly, *in vivo* anti-oxidative effects of CAME were found to be significant ( $p \leq 0.05$ ) in tissues like liver, spleen, kidneys, joints and plasma. Taken together, our studies clearly indicate the potential of *C. asiatica* as an anti-arthritic agent.

**69. Ethyl methanesulphonate Induced Tall Mutants in Jute (*Corchorus olitorius* L.)**

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**Keywords:** Ethyl methanesulphonate, *Corchorus olitorius* L.; Tall Mutant, 6 hours, chromosome, concentration 1%

**Abstract:**

Presoaked seeds of jute (*Corchorus olitorius* L. variety JRO-632) were treated with 1% Ethyl methanesulphonate (EMS) for 6 hours. Tall mutants were screened in M3 in contrast to the normal plants. Tall mutants otherwise looked normal excepting the nature of palmate leaf habit. A number of yield component growth parameters were recorded like plant height, basal diameter, plant spread, root length, pod per plant, seeds per pod, pod length/breadth ratio, number of primary branches per plant, number of secondary branches per plant, leaf angle, branching angle, first flowering date, 100% flowering date, total duration, % of pollen sterility and weight of 100 seeds which were found to vary from the control plant. Chromosome analysis revealed a number of aberrations like stickiness, fragmentation, clumping, polyploidy and laggard and bridge formation etc. at very low frequency. This tall mutant plant gives more fiber yield than the control plants with superior quality.

**70. Characterization of grafted protein present in presscake:  
FTIR and Thermogravimetric analysis (TGA)**

**S.Lenka<sup>1</sup>, N.M.Misra<sup>2</sup> and S.Acharya<sup>2</sup>**

<sup>1</sup>Department of Chemistry,  
Ravenshaw University, Cuttack-3, Odisha

<sup>2</sup>Department of Botany,  
Ravenshaw University, Cuttack-3, Odisha.

**Key words:** Presscake, Protein, Grafting, FTIR, TG

**Abstract:**

Presscake obtained from sugarcane contains about 23% of protein. The soluble protein is mostly globulin which is confirmed by Fourier Transform Infrared spectroscopy. The protein in its pure form is a suitable material for grafting. A number of polymer samples were prepared by graft copolymerization of methyl acrylate onto protein using quinquevalent vanadium ion. The sample was characterized by thermogravimetric analysis. The kinetic parameters i.e. order of reaction and energy of decomposition were calculated using Freeman and Anderson method.



**71. In vitro antioxidant and free radical scavenging activity of an indigenous plant *Justicia adhatoda L.* (*Adhatoda vasica* Nees.)**

**B. Pradhan, D. Bhatta**

Department of Pharmaceutical Chemistry,  
Sri Jayadev College of Pharmaceutical Sciences, Naharkanta,  
Bhubaneswar, Odisha, India.

**Key words:** *Justicia adhatoda L.*, Free radical scavenging, Antioxidants, Alkaloids

**Abstract:**

The present study has been carried out to evaluate the anti oxidant activity of methanolic and n-hexane extracts of leaves of *Justicia adhatoda L.*, (Acanthaceae) adopting various in-vitro studies: 1,1-diphenyl picryl hydrazil (DPPH), free radical scavenging and 2,2-azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid)(ABTS), hydrogen peroxide scavenging. The potency of the fractions is compared with standard antioxidants such as ascorbic acid and butylated hydroxyanisole (BHA). The data obtained are comparable to that of standards. These activities exhibited by the fractions are attributed to presence of Quinazoline alkaloids such as vasicine, vasicinone, vasicinol, vasicol and adhavasine as the constituents.

**72. Isolation and characterization of diazotrophs from acidic lowland rice ecosystems of assam**

**B. D. Roy<sup>1</sup>, B. Deb<sup>2</sup>, G. D. Sharma<sup>1</sup>**

<sup>1</sup>Microbial Ecology Laboratory, Department of Life Science, Assam University, Silchar, Assam.

<sup>2</sup>Microbiology Laboratory, Department of Botany, Gurucharan College, Silchar, Assam

**Keywords** Diazotrophs, Rice ecosystem, Rhizosphere, Lowland

**Abstract:**

The present work has been planned to combine cultivation based method and sequencing of 16S rDNA gene to identify the active diazotrophic community of the acidic lowland rice ecosystems of Assam. Isolation and phenotypic

characterization combined with 16S rDNA analysis led to the identification of six diazotrophic bacterial strains viz., *Azotobacter chroococcum*, *Azospirillum amazonense*, *Beijerinckia indica*, *Burkholderia caribensis*, *Gluconacetobacter liquefaciens*, and *Acinetobacter johnsonii*. The viable count of isolated diazotrophs gradually increased from seedling to panicle formation stage and decreased towards the harvesting stage of the crop. *Azotobacter*, *Azospirillum*, *Burkholderia*, and *Gluconacetobacter* have shown higher cfu count in rice rhizosphere in winter (sali) season. *Beijerinckia*, and *Acinetobacter* have higher cell count in the autumn (ahu) season. These diazotrophs have shown optimum growth at wider range of temperature and pH and therefore, they have thick population in warm tropical rice ecosystems of Assam at low soil pH. Occurrence of *Burkholderia caribensis*, *Gluconacetobacter liquefaciens* and *Acinetobacter johnsonii* as nitrogen-fixing bacteria in the acidic lowland rice ecosystems of Assam has been reported for the first time in this work.

**73. Antimicrobial potential of epibionts isolated from shell surface of acorn barnacle *Balanus Amphitrite* found in mumbai harbour**

**G. Baul, P. Kumar**

Marine Biotechnology, Naval Materials Research Laboratory,  
Ambernath (E) - 421506

**Keywords:** Barnacle, Epibiont, Antimicrobial assay, Fouling bacteria and BLAST analysis.

**Abstract:**

Acorn barnacles are one of the most common fouling organisms found in Mumbai Harbour. They were explored for the presence of epibionts (shell-dwelling microbes) on them. Epibionts are accounted for the presence of antagonistic activity against several bacteria, algae, fungi, diatom, and marine invertebrate. A total of 11 epibionts were isolated from acorn barnacle *Balanus amphitrite* and subjected to molecular characterization by PCR amplification of 16S rRNA gene and BLAST analysis. . All the isolates were designated as NMGB1 to NMGB11, respectively.. Approximately 1.5 kb 16S rRNA gene could be successfully amplified in 6 isolates. Amplified 16S rDNA of these isolates was subjected to automated DNA sequencing. BLAST analysis revealed NMGB2 and NMGB8 to be novel epibionts representing *Vibrio parahaemolyticus*, NMGB3 belonged to *Vibrio harveyii* while NMGB4 and NMGB7 were found to be *Halomonas ventosae* and *Bacillus firmus*, NMGB11 belonged to be *Vibrio alginolyticus*

respectively. They were further assessed for anti-microbial activity against standard biofilm forming strains and fouling / biofilm forming bacteria isolated from Mild steel and Perspex panels immersed in Mumbai harbour. Out of 11, only 2 showed inhibitory activity against standard and fouling strains. They were *Vibrio parahaemolyticus* (NMGB8) and *Vibrio alginolyticus* (NMGB11).

#### **74. Enhancing Crop Productivity: Role of Wide Hybridization in Rice**

**L. K. Bose, D. Swain**

Central Rice Research Institute, Cuttack-753006 (Odisha)

**Key Words:** *Oryza sativa*, *Oryza glaberrima*, *Oryza brachyantha*, wide hybridization, MAALs

##### **Abstract:**

The genus *Oryza* has two cultivated and 22 wild species. Of the two cultivated species, *O. sativa* ( $2n=24$  AA), commonly referred to as Asian rice, grown worldwide, whereas *O. glaberrima* ( $2n=24$  AA), “African rice,” is cultivated in a limited area in West Africa. The wild species have  $2n=24$  or 48 chromosomes representing 10 genomic types. Several incompatibility barriers, such as low crossability, increased sterility, and limited recombination between chromosomes of wild and cultivated species, limit the transfer of useful genes. Eight MAALs of *O. brachyantha* (RN1086) having tolerance to (yellow stem borer) have been produced. These MAALs had diploid chromosome complement of *O. sativa* and a single chromosome of *O. brachyantha*. These MAALs had a striking resemblance to the primary trisomics of *O. sativa*. Like primary trisomics they differed from each other as well as from the normal disomics in several morphological and reproductive features. All had a slower growth rate. MAAL1 had narrow, light green, droopy leaves and MAAL8 had narrow, dark green, rolled leaves. The modal chromosome pairing in MAALs was  $12II+1I$ . Rarely  $11II+1III$  were observed in a few pollen mother cells of MAAL.

**75. *In vitro* antimicrobial activity of plant *Alstonia scholaris* (L.) R.Br.**

**R. R. Mahanty, D. Bhatta**

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Bhubaneswar, Odisha, India.

**Key words:** *Alstonia scholaris* (L.) R.Br, Antimicrobial activity, Disc diffusion method, MIC

**Abstract:**

The present *in vitro* antimicrobial study of n-hexane and methanolic extracts of bark of *Alstonia scholaris* (L.) R.Br. (Apocyanaceae) has been carried out by adopting disc diffusion method, using the pathogens: gram -ve bacteria (*E. coli*, *P. mirabilis*, *K. pneumoniae*, *E. fecalis*, *Micrococci*), gram +ve bacteria (*P. aeruginosa*, *S. aureus*, *S. typhi*, *S. mitis*) and fungi (*C. albicans*, *C. tropicalis*, *C. crusei*, *Cryptococcus*). The data obtained are compared with the standards: CF (Ciprofloxacin) and AC (Amoxycillin + Clavulanic acid) for bacteria and FLU (Fluconazole) for fungi. The results of methanolic extract are comparable with that of standards. Hence, the minimum inhibitory concentration (MIC) study of methanolic extract has been undertaken by the using above technique. Better values are obtained in case of bacteria: *E. coli* and *Micrococci* (3.9µg/ml) and *P. aeruginosa* and *K. pneumoniae* (15.6µg/ml). In case of fungi, the data obtained in case of *Cryptococcus* and *C. albicans* is 62.5µg/ml. These activities exhibited by the fractions are due to presence of alkaloids such as akuamidine, Picrinine and Echitamine as the constituents.

**76. Effect of Methanolic extract of corn silk on experimentally induced hyperthyroidism in albino rats**

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Avinashilingam Deemed University for Women,  
Coimbatore-43

**Keywords:** Corn silk, Hyperthyroidism, Thyroid hormones, Thyroxine

**Abstract:**

Corn silk (*Zea mays L.*) is a collection of the stigmas (fine, soft, yellowish threads) from the female flowers of the maize plant. They are relatively (4-8 inches) long with a mild sweetish taste. In the present study, hyperthyroidism was induced to male albino rats using thyroxine. The impact of methanolic extract of corn silk in different concentrations (200, 300 & 400mg/kg) for 21 days was assessed in these animals. The serum was analyzed for thyroid hormone level and lipid profile before and during the experiment. Results showed that 400mg/kg concentration of methanolic extract has the highest effectiveness which is equal to that of standard drug to revert the hyperthyroid condition in albino rats and were confirmed with the histopathological study of the thyroid gland.

**77. Cardioprotective effect of methanolic extract of *Nelumbo nucifera* flowers (MNnF) and *Allium cepa* bulbs (MAcB)**

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Avinashilingam Deemed University for Women,  
Coimbatore-43

**Keywords:** Myocardial infarction, *Nelumbo nucifera*, *Allium cepa*, Antioxidants

**Abstract:**

*Nelumbo nucifera* Gaertn, namely Lotus, is a perennial aquatic plant grown and consumed throughout Asia. All parts of *Nelumbo nucifera* have been used in oriental medicine for various medicinal purposes. *Allium cepa* commonly known as onion has hypolipidemic and hypoglycemic activities. In this study, myocardial infarction was induced intraperitoneally in male Albino rats using isoproterenol. The cardioprotective effect of methanolic extracts of *Nelumbo nucifera* flowers and *Allium cepa* bulbs were assessed in the experimental animals for 28 days. At the end of the experiment the serum was collected from the rats for analyzing the level of cardiac marker enzymes, cardiac markers and lipid profile. The heart tissue homogenate was analyzed for the levels of enzymic and non-enzymic antioxidants. Results showed that the methanolic extract of *Nelumbo nucifera* flowers have the better cardioprotective effect when compared to methanolic extract of *Allium cepa* bulbs.

### iii New Drug Development and Protein Therapeutics

#### 78. Exploration of antibacterial potential of *Microcosmus exasperatus* against human urinary tract pathogens

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Parangipettai, Tamil Nadu - 608 502

**Key words:** Urinary tract pathogens, Methanolic Extract, Bioactive compounds

**Abstract:**

Marine ascidian collected from Tuticorin, southeast coast of India, was found to be a promising source of novel bioactive compounds against human urinary tract pathogens. Methanol and ethyl acetate extracts of *Microcosmus exasperates* was tested against five human urinary tract pathogens. Streptomycin (400µg/ml) was used as a standard and normal saline as control. Notably, both methanol and ethyl acetate extract of *M. exasperates* showed activity against all the UTIs strains tested. The methanol extract displayed higher antibacterial activity than ethyl acetate extract. Antibacterial activity of ascidian extracts increased with increasing concentrations.

#### 79. Allelopathic effect of *phalaris minor* Retz. on *Triticum* sps.

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Bawana Road, Delhi 110042

**Key words:** Allelopathy, Wheat, Weed, Chemical analysis, HPLC.

**Abstract:**

Competition is used by both plants and animals to assure a place in nature. Plants will compete for sunlight, water and nutrients like animals, for territory. Allelopathy refers to the chemical inhibition of one species by another. The inhibitory chemical is released into the environment where it affects the development and growth of neighboring plants. Allelopathy is a form of chemical competition. It is impossible to see the biochemicals at work, but it is possible to see the signs and symptoms caused by the chemicals on surrounding plants. The

biochemical analysis through HPLC found Gallic, Protocatechuic, p-hydroxy benzoic and caffeic acid in the whole plant of *phalaris minor* Retz. and its supportive effect on *Triticum* sps.

## 80. RNAi treatment of HIV-1 infection

**T.Raghavendran, B.Rajasekhar, M.Anusha, and O.Santhosh**

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Tata Consultancy Services-Chennai, Pydah College of Engineering,  
Vishakapatnam

**Keywords:** RNAi; HIV-1; Gene therapy; *in vitro* and *in vivo* test systems

### **Abstract:**

RNA interference (RNAi) is a cellular mechanism that mediates sequence-specific gene silencing by cleavage or translational inhibition of the targeted mRNA. RNAi can be used as an antiviral approach to silence the human immunodeficiency virus type 1 (HIV-1). In this chapter, we will focus on the basic principles of RNAi-based gene therapy against HIV-1. Subjects that will be covered include target site selection within the viral RNA genome, viral escape, and therapeutic strategies to prevent this, such as combinatorial RNAi approaches, systems available for multiplexing of RNAi inhibitors, methods to deliver the antiviral RNAi molecules and gene therapy protocols to achieve durable HIV-1 inhibition. We will also discuss several *in vitro* and *in vivo* test systems to evaluate the efficacy and safety of an RNAi gene therapy.

## 81. N-fused imidazoles as novel anticancer agents that inhibit catalytic activity of topoisomerase II $\alpha$

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**Keywords:** Topoisomerase inhibitors, Cancer, Decatenation, Imidazopyrazine

**Abstract:**

On the basis of structures of known topoisomerase II catalytic inhibitors and initial molecular docking studies, bicyclic N-fused aminoimidazoles were predicted as potential topoisomerase II inhibitors. They were synthesized by multicomponent reactions and evaluated against human topoisomerase II $\alpha$  (hTopoII $\alpha$ ) in decatenation, relaxation, cleavage complex, and DNA intercalation in vitro assays. Among 31 compounds of eight different bicyclic scaffolds, it was found that imidazopyridine, imidazopyrazole, and imidazopyrazine with suitable substituents exhibited potent inhibition of catalytic activity of hTopoII $\alpha$  while not showing DNA intercalation. Molecular docking studies, molecular dynamics (MD) simulation analysis and ATPase-kinetics assay revealed the catalytic mode of inhibition of the title compounds plausibly by blocking the ATP-binding site.

**82. Synthesis and preformulation of N-fused imidazoles as potential topoisomerase II inhibitors**

**Gajanan S. Patil, Ashish T. Baviskar and Uttam C. Banerjee**

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National Institute of Pharmaceutical Education and Research,  
Sector-67, S.A.S. Nagar, Punjab-160062

**Keywords:** DNA topoisomerase, N-fused imidazoles, preformulation, biopharmaceutical

**Abstract:**

DNA topoisomerase inhibitors are promising antineoplastic agents as it involves the covalent binding to double stranded DNA and subsequent interference with the DNA breakage-resealing process. We synthesized N-fused imidazoles and found to be DNA nonintercalating hTopoII $\alpha$  catalytic inhibitors. The best compound from a biopharmaceutical point of view need to be evaluated with overall objective of preformulation testing to generate information of physical and chemical properties. Initially *insilico* studies were performed using Discovery studio, Chemsilico, Alogps2.1 and ACD Labs. Solid state characterisation of the same compounds was done using XRD, TGA, DSC, microscopy (Binary method, hot stage microscopy), infrared spectroscopy, scanning electron microscopy, coulter counter and Karl Fischer (hygroscopy).



**83. Mitochondrial BIOGENESIS in asthma: What to conclude**

**T. Ahmad, U. Mabalirajan, B. Gosh and A. Agrawal**

**Key words:** Mitochondrial, Asthma, Mitochondrial transcription factor A, peroxisome proliferator activated receptor –  $\gamma$  coactivator

**Abstract:**

Recently we found that there is mitochondrial dysfunction loss in bacterial epithelia of asthmatic murine lungs. In support to this view. In contrast to the loss of mitochondrial function in epithelial region, there is increased expression of key players of mitochondrial biogenesis such as mitochondrial transcription factor A (mTAF), peroxisome proliferator activated receptor – $\gamma$  coactivator (PGC) - 1 $\alpha$ , endothelial nitric oxide synthase (eNOS), and SIRT-1 in the sub-epithelial mesenchymal region of asthmatic mice lungs. Transmission electron microscopy confirmed that an increase in the number of mitochondria in sub-epithelial regions of bronchi. Increased mitochondrial biogenesis in sub-epithelial cells and loss of mitochondria function in epithelia suggest a possible differential role of mitochondria in asthmatic murine lung which can be looked in detail for the possibility of cell specific mitochondrial drug targeting in asthma.

**84. Antidiabetic effect of aqueous extract of *phoenix dactylifera* seed on experimental animals**

**S. chatterji, S. mehta, D. kumaryadav and G. watal**

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Allahabad-211002, U.P. India

**Keywords:** Antidiabetic, Glucose tolerance test, Glibenclamide and *Phoenix dactylifera*.

**Abstract:**

The present study deals with development of improved, oral antidiabetic's drug with minimal side effect. variable doses of *phoenix dactylifera* L. seed aqueous extract were administered orally to normal and STZ- induced diabetics rats to evaluate its glycemic potential. The most effective dose of 300 mg kg<sup>-1</sup>bw reduced BGL by 33.8% at 6 hrs and 18.3% at 3 hrs during FBG and GTT studies,

respectively in normal rats. Whereas, the maximum fall of 23.4, and 33.8% during GTT was observed in case of sub and mild diabetic rats, respectively, at 3 hrs. This proves that the aqueous extract possesses efficient antidiabetic activity.

#### **85. Antibiotic for Snake Bite Victims in Orissa, India**

**L. P. Padhi, S. K. Panda, R. P. Pattanayak, G. Sahoo,  
P. P. Mohapatra, N. B. Kar and S.K. Dutta**  
Department of Zoology, North Orissa University,  
Takatpur, Baripada- 757 003

**Key words:** Antibiotics, Snake bite, Epidemiology, Secondary infections, Oral microflora

#### **Abstract:**

The present investigation aimed at isolating and identifying microorganisms from the oro-pharyngeal cavity of both venomous and non venomous snakes. A total of 26 venomous and 28 non-venomous snakes were collected from the study area, swabs were collected and subjected to microbiological culture of bacteria using differential media viz. XLD, TCBS, Cetrimide, EMB, Mackonkey and Phenolepthelein agar. Several biochemical tests including TSI, MR, VP, Citrate, Indole, Nitrate reduction test, Enzymatic tests, Amino acid test and Sugar fermentation tests were performed for identification of the isolated strains. Antibiotic sensitivity test was performed with 84 antibiotics on MHA media. Among the isolates, Gram-negative (161 isolates) were more in comparison to gram-positives (119 isolates). About, 70% of isolates recorded varying degrees of resistance to various antibiotics. The sensitive antibiotics were Gentamycin, Doxycycline, Gatifloxacin, Neticillin, Streptomycin, Roxithromycin, Cefoporzone and cefoxitin. Single treatment strategy cannot be expected for complete control of infections. The results suggested that doxycycline/Roxithromycin combination could prove effective.

**86. Isolation, partial purification and detection of immunoglobulins from human serum and chicken egg yolk**

**R. B. Padalia, S. A. Patil, S. G. Bhagiya, S. K. B. Swamy,  
P. S. Shete and S. P. Kamble**

**Keywords:** Immunoglobulin G, Immunoglobulin Y, Ammonium sulphate precipitation method, Ion exchange chromatography, SDS-PAGE

**Abstract:**

Immunoglobulin G is antibody from gamma immunoglobulin super family. It is most abundant class in serum constituents about 80% of the total serum Ig and IgY is found in chicken egg yolk. Aim of the present work was to isolate, purify and detect IgG from human, and IgY from chicken egg yolk. The IgG and IgY from chicken egg yolk. The IgG and IgY species isolation was done through, using ammonium sulphate precipitation solution and purified by using dialysis and ion exchange chromatography (DEAE-cellulose). The detection of IgG and IgY was done by using SDS-PAGE.

**87. Isolation and characterization of bacteriocin producing *Lactobacillus* from curd and detection of antimicrobial activity of crude bacteriocin extract and evaluation of it by coating on to medical textiles.**

**I. Privadarshini<sup>1</sup>, R. Das<sup>1</sup>, K. Nidhi<sup>1</sup>, S. Bharadwaj<sup>1</sup> and K. Shekar<sup>2</sup>**

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<sup>2</sup>Selection Grade Lecturer, Department of Microbiology, Garden city college, T.C. Palya, Bangalore

**Key words:** Bacteriocins, *Lactobacillus*, Antimicrobial, Medical textiles

**Abstract:**

Bacteriocin producing Lactic acid bacteria exert a strong antagonistic activity against many microorganisms, including food spoilage organisms and pathogens. In our work, we have isolated and characterised *Lactobacillus* sps. from curd, extracted crude bacteriocin and detected its antimicrobial activity against common pathogens infecting human beings. To emphasise the application of bacteriocins for beneficial purpose in an innovative way we coated it onto textiles to impart inhibitory properties towards common pathogens. The coated textile showed

exorbitant inhibitory effect against *E.coli*, *Staphylococcus* sps., *Enterobacter* sps., *Proteus* sps. and *Bacillus* sps. This remarkable property of the bacteriocin finds its application as an antimicrobial additive likely to be coated onto medical textiles like sutures, bandages, bed spread, patients robe etc. Furthermore, it also be the antimicrobial ingredient in face creams, tooth paste, body soaps etc.

**88. Effect of different conformation of antithrombin in angiogenesis: A paradigm**

**M. A. Azhar, Q. Rashid, A. Naseem, P. Singh, M. S. Khan and M. A. Jairajpuri**

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Jamia Millia Islamia University, New-Delhi-110025

**Keywords:** Angiogenesis, Antithrombin, Tumor, Thrombin

**Abstract:**

Angiogenesis, the formation of new capillaries from pre-existing vessels, is important for regulation of many physiological processes, including wound healing, embryogenesis, and female reproductive functions. Deregulation of angiogenesis in diseases such as cancer leads to excessive formation of new blood vessels and tumor progression. A large number of endogenous angiogenesis inhibitors, specifically inhibiting endothelial cell function and also tumor expansion, have recently been identified. Antithrombin is a member of the serpin family of proteins and functions as an inhibitor of thrombin and other enzymes involved in the clotting cascade. Antithrombin anticoagulation function is activated by binding to heparin which increases its inhibitory activity by thousand fold. Our studies have shown that the conformational change that occurs after cleavage of the antithrombin molecule confers antiangiogenic activity.

## 89. Dynamics of molecular transport through dialysis tubing

**S. Dutta, L. Simon**

Department of Chemical, Biological and Pharmaceutical Engineering  
New Jersey Institute of Technology, Newark, USA

**Key words:** Transdermal drug delivery, Semipermeable dialysis tubing, Partial Differential equation, Burst effect.

### **Abstract:**

Transdermal drug delivery continues to play a key role in Biomedicine. This contribution focuses on the analysis of molecular diffusion through a semi-permeable membrane. Experiments were conducted, using Calcium Chloride ( $\text{CaCl}_2$ ) and Sodium Hydroxide ( $\text{NaOH}$ ), to simulate drug transport through the cylindrical dialysis tube. Governing equations, based on Fick's law of diffusion, were designed to describe the initial **burst effects** observed in published drug release reports. The partition ( $K$ ) and diffusion coefficients ( $D$ ) were obtained using graphical methods and validated by comparing measured and predicted accumulated amounts of ( $\text{CaCl}_2$ ) and  $\text{NaOH}$  released. Results showed a good agreement between the observed and estimated profiles at the beginning of the experiments. However, as molecules began to accumulate in the beaker, the actual flux started to decrease and a marked discrepancy was noticed in accordance with the boundary conditions. The diffusion coefficient for sodium hydroxide and calcium chloride were  $2.94 \times 10^{-8} \text{ cm}^2/\text{s}$  and  $4.07 \times 10^{-8} \text{ cm}^2/\text{s}$ , respectively.

#### **iv. Nanosciences, Biocatalysis and Molecular Docking in Drug Development**

##### **90. Nanotechnology in drug delivery: the challenges ahead.**

**V. Chourasia**

Associate Professor, Department of Zoology,  
Government College Kota,  
Rajasthan, India,

**Key Words:** Nanotechnology, Micellar nano-particles, Nano-implants, Dendrimers, Drug Delivery

**Abstract:**

With advent of NT applications, the overall drug consumption and side-effects can be lowered significantly by targeted drug delivery at lower doses. Nanodrugs may be in the form of nanoised pockets, nano implants, micellar nanoparticles, sheath particles, dendrimer or nanoporous materials. Biological information is detected by biological sensors, system utilizes Micro- and nano-electromechanical systems technology based drug pumps, micro-pumps, micro-needles, micro-osmotic pumps and Nano-pumps. Above all these benefits the dangers of nanotoxicity is also being reported as CNTs, has found to cause lung inflammation, Quantum dots, break down in the body to release cadmium, nano-silver, nano-copper particles are highly toxic because of its high reactivity. This paper reviews the most recent investigations, interesting controversies, gaps, challenges and risk factors involving blind use of NT which is thought to revolutionize drug delivery research.

**91. Fabrication of multi-walled carbon nanotubes on carbon electrode to develop a DNA sensor for bacterial meningitis**

**Sandip K. Dash<sup>1</sup>, Minakshi Sharma<sup>2</sup>, Shashi Khare<sup>3</sup> and Ashok Kumar<sup>1</sup>**

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<sup>2</sup>Department of Zoology, M. D. University, Rohtak, Haryana-124001

<sup>3</sup>National Center for Disease Control, Sham Nath Marg, Delhi-110054

**Keywords:** DNA sensor, Carbon nanotubes, Meningitis, Diagnosis

**Abstract:**

DNA sensor is a promising technique in the field of molecular biotechnology and medical pathology. Carbon nanotubes (CNTs) are amongst the most beneficial materials in DNA biosensors. Meningitis is dreadful disease mainly caused by viruses, fungi or bacteria. Bacterial meningitis, mainly caused by *N. meningitidis* is most dangerous, may lead to death. The present methods available for the diagnosis of bacterial meningitis are time consuming and less sensitive. Our lab has developed a DNA nanosensor for bacterial meningitis detection through immobilization of amino-modified DNA probe and followed by hybridization with directly patient CSF DNA. The event of immobilization of DNA probe and hybridization with complementary DNA was detected through cyclic voltametry (CV), differential pulse voltammetry (DPV) and was characterized by Fourier transform infrared spectroscopy (FT-IR), scanning electron microscopy (SEM).

**92. Greener synthesis of metal nanoparticles and their evaluation as potential therapeutic agent**

**A. K. Mittal, A. Kaler and U. C. Banerjee**

Department of Pharmaceutical Technology (Biotechnology), NIPER Mohali,  
Sec.- 67, S.A.S. Nagar, Punjab- 160062

**Key words:** Metallic nanoparticles, Medicinal plants diversity, Polymorphism, Amplification

**Abstract:**

The synthesis of metallic nanoparticles is an active area and more importantly “application research” in nanotechnology. Silver is an ancient antimicrobial agent

to which no resistance has been reported so far. Nanoparticles of silver have been shown to exhibit better antimicrobial activity than their ionic counterpart. There is an essential need to develop environment friendly procedures for synthesis of metallic nanoparticles. A promising approach to achieve this objective is to exploit the array of biological resources in nature. The plant mediated reduction of metals has been known to affect the cycling of both inorganic and organic species of environments and if harnessed, this mode of nanoparticles biosynthesis may offer the basis for a wide range of innovative biotechnological processes. Plants during metabolism produce metabolites (alkaloids, phenolic compounds, terpenoids, etc.) which act as a strong reducing agent; this is to be responsible for the formation of metallic nanoparticles. Various plants and their parts (*Rhododendron dauricum* flowers, *Azadirachta indica* leaves, *Syzygium cumini* fruits) were evaluated for their offering to produce silver nanoparticles with controlled properties. Silver nanoparticles formation was confirmed characterized by UV-Vis, DLS, TEM, FTIR, DSC and TGA.

### **93. Biocatalysis: the green wonder world**

**R. Sharma**

Centre for Microbial Biotechnology,  
Panjab University, Chandigarh-160014, India

**Key words:** Biocatalysis, Biotransformation, Lipase, Stereoselectivity, Green technology, Nitrilase

#### **Abstract:**

Biocatalysis is considered as green technology; tremendous used by synthetic chemist for chemo-, regio- and stereo-selectivity reactions in aqueous/organic solvents. Biocatalytic reaction was carried out using the Lipase and Nitrilase enzymes. Nitrilase has received a tremendous impetus due to valuable and economical alternative towards the harsh chemical routes. Nitriles are an important precursor in the synthesis of many industrially products like acrylic acid, acrylamide, plastic fibers, herbicides, etc., they also pose severe threat to our mother planet. Microbial degradation of these toxic nitriles was achieved in economic way. Studies have been conducted wherein large number of microorganisms were screened and evaluated for their biocatalytic potential that included the capability of carrying out biotransformations of some nitriles,



resolution of racemic mixtures by lipases and authentication of respective products.

**94. Enantioselective enzymatic resolution of racemic (RS)-1-bromo-3-chloropropan-2-ol**

**L. Banoth<sup>1</sup>, B. Pujala<sup>2</sup>, A.K. Chakraborti<sup>2</sup> and U. C. Banerjee<sup>1</sup>**

<sup>1</sup>Department of Pharmaceutical Technology

<sup>2</sup>Department of Medicinal chemistry

National Institute of Pharmaceutical Education and Research

S.A.S. Nagar, Sector 67-160062, Panjab

**Key words :**  $\beta$ -blockers, Epoxides, Chiral Synthons, Lipase

**Abstract :**

The general synthesis of  $\beta$ -blockers involves synthesis of selective epoxide using chiral synthons and chiral catalysts. Chemical catalysts have high toxicity, limited efficiency, tedious multi-step reactions and differential selectivity towards different epoxides, making scale up difficult. To overcome these obstacles, attention has been turned towards biocatalysts, synthesis of single enantiomeric drugs by enzymes or whole cells. Here, we propose a method where the crucial chiral center (*S*)-1-bromo-3-chloro-2-propanol will be synthesized by the resolution of racemic alcohol (1-bromo-3-chloro-2-propanol) using selective lipase. Enantiomerically pure 1-bromo-3-chloro- 2-propanol are an important class of organic compounds whose structures are present in numerous  $\beta$ -blockers or  $\beta$ -adrenergic antagonists, natural bioactive compounds , antiviral , anticancer, antibiotics , protein tyrosine phosphatase 1 B inhibitor, cough suppressant, skeletal muscle relaxant and in antigout compounds.

**95. Hydroxyapatite biomaterial: synthesis characterization and biotechnological application**

**S. Mondal<sup>1</sup>, R. Bardhan<sup>1</sup>, S. Mukherjee<sup>1</sup>, A. Dey<sup>2</sup>, S. S. Mukhopadhyay<sup>2</sup>,  
B. Mondal<sup>1</sup>**

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<sup>2</sup>Department of Biotechnology, National Institute of Technology, Durgapur

**Key words:** Hydroxyapatite; Biomaterials; Cytotoxicity; Tissue Engineering

**Abstract:**

Hydroxyapatite  $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$  has calcium phosphate elements in its hexagonal structure. These elements are same as present in the inorganic parts of bone and teeth. This study analysed hydroxyapatite prepared from SBF. The thermogravimetric and differential thermal analysis study shows the thermal stability of HAp bio-ceramics. The structures of derived HAp were characterized by FTIR, XDR, SEM, and particle size analyser. The analytical results indicated that HAp consisted of nano-sized particles with Ca/P ratio of 1.71. In order to verify the biocompatibility of HAp powders, cytotoxicity evaluation was carried out in RAW macrophage like cell line media for an incubation period of 72 hours. The cell attachment studies were carried out on developed HAp samples. The SEM result shows a good biocompatibility nature to the attached cells. This experimental work shows the synthesized HAp biomaterials exhibit most promising chemical composition for prosthesis and tissue engineering application.

**96. Molecular modeling of *BmHSP90* gene sequence and detection of anti-hsp (anti-cancer) ligands in *Bombyx mori***

**R. Kumar<sup>1</sup>, H.B Manjunatha. <sup>2</sup> and H. S. Aparna <sup>1</sup>**

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University of Mysore, Mysore 570 006, Karnataka

**Key words:** *Bombyx mori*, BmHSP90, Molecular modeling, Docking, Anti-HSP, Anti-cancer

**Abstract:**

The silkworm, *Bombyx mori*, in recent years, has not confined mere for production of silk but in use as potential tool for production of recombinant proteins and determine the pharmacodynamics of herbal medicines. Hence, we have used native silkworm strain NB4D2 for sequencing of *HSP90* gene, comparative analysis and annotation, which possesses chaperon activity known to involve in signal transduction and play a crucial role in maintaining oncogenic protein homeostasis. Hence, inhibition of HSP90 offers great promise in the treatment of a wide variety of solid and haematological malignancies. The *BmHSP90* sequence length was 2293 bp and showed 68% similarity with human and *Drosophila hsp90* gene sequences. For automated annotation, the resultant sequence data was used that explicit its localization on Chromosome 27 of *B. mori*.

**97. An investigation on the antimicrobial, cytotoxic, and antibiofilm efficacy of starch-stabilized silver nanoparticles against Gram-positive, Gram-negative and Acid-fast bacteria**

**S. Mohanty,<sup>a</sup> S. Mishra,<sup>a</sup> R. Mallick<sup>a</sup>, B.Jacob<sup>b</sup>, B. Sarkar<sup>a</sup>, and  
A. Sonawane<sup>a</sup>**

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<sup>b</sup> Catalyz Science and Technology Solutions, Technopark TBI, Bangalore, India

**Key words:** Starch; silver nanoparticles; Antimicrobial activity; Biofilm; Macrophages; Cytotoxicity; Antimicrobial peptide

**Abstract:**

The increased emergence of drug resistant microbes creates a major challenge to the scientific community for successful development of new and effective therapeutics. The antimicrobial activities of silver ions are well known, but limited information is available on the effects of green silver nanoparticles (AgNPs) on human pathogens. We evaluated the antimicrobial activity of starch-stabilized AgNPs against a panel of human pathogens representing gram and acid-fast bacteria, commonly associated with air, water and food borne infections. The shape and size distribution of AgNPs were characterized by SEM. We show that AgNPs were more effective gram pathogens as compared to acid-fast bacteria. AgNPs are not cytotoxic to macrophages at the bactericidal concentration and can augment intracellular killing potential of macrophages. Furthermore, we show that

AgNPs disrupt biofilms formed by gram bacterial pathogens and exhibit better anti-microbial activity compared to human cationic antimicrobial peptide LL-37. In summary, our data suggest AgNPs as a promising template for the design of novel antibacterial agents.

**98. Biocatalysis: bioconversion of quinic acid to shikimic acid by *Bacillus megaterium* MTCC 428**

**S. Ghosh and U.C. Banerjee,**

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National Institute of Pharmaceutical Education and Research,  
Sector-67, S.A.S. Nagar, Punjab-160062

**Key Words:** Shikimic acid, Tamiflu, *Bacillus megaterium*

**Abstract:**

Shikimic acid is a key intermediate for synthesis of aromatic amino acids as well as for large numbers of antibiotics, alkaloids, and herbicides. Its importance as a drug intermediate has been enhanced in the pharmaceutical industries since it has been used as the sole precursor for the synthesis of the neuraminidase inhibitor GS4104 (Tamiflu) for the treatment of pandemic flu infection. The limited availability of precursor, shikimic acid is a major problem for the Tamiflu (Oseltamivir) production. We tried biocatalytic production of shikimic acid for developing an efficient and cost-effective method using *Bacillus megaterium* MTCC 428. Different physicochemical parameters and biocatalytic parameters like temperature, pH, cell mass concentration, substrate concentration, cofactor recycling, reaction time etc. have been optimized Up to 80% bioconversion.

**99. Foldit: protein structure prediction through a multiplayer game**

**B.Rajasekhar, J.santosh, T.Raghavendran and T.Ashish**

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Unisys Global Services India-Bangalore, GMR Institute of Technology, Pydah  
College of Engineering, Vishakapatnam

**Keywords:** Proteins, Protein Folding, Crowdsourcing, Foldit

**Abstract:**

Scientists know the pieces that make up a protein but cannot predict how those parts fit together into a 3-D structure. And since proteins act like locks and keys, the structure is crucial. At any moment, thousands of computers are working away at calculating how physical forces would cause a protein to fold. But no computer in the world is big enough, and computers may not take the smartest approach. So a team tried to make it into a game that people could play and compete. Fold it turns protein-folding into a game and awards points based on the internal energy of the 3-D protein structure, dictated by the laws of physics.

**100. *In-silico* investigations on root knot nematode on few species of genus *Ditylenchus***

**C. Sharma<sup>1</sup>, S. Singh<sup>2</sup> and P.V. Arya<sup>3</sup>**

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<sup>2</sup>AIB, AMITY University Noida, Uttar Pradesh

<sup>3</sup>Dept. of Zoology, DS College, New Delhi-3

**Keywords:** Root Knot Nematodes, *Ditylenchus*, Nematode, Phylogeny, *in-silico*

**Abstract:**

During present study a combination of different Phylogenetic tools of were employed in inferring phylogenetic relationship between some species of genus *Ditylenchus*. Some of the well known species of this genus include *D. adasi*, *D. africanus endoglucanase*, *D. angustus*, *D. askenasyi*, *D. brevicauda*, *D. cf. microdens*, *D. destructor*, *D. dipsaci*, *D. halictus*, *D. myceliophagus* and *D. phyllobius*. These were selected for the detailed Phylogenetic studies. Sequences such as rRNA, ITS etc. representing various species of selected genus have been retrieved and analysed along with selected outgroup taxa. Clustal-X was employed in sequence alignment and for phylogenetic Tree preparation NJ as well UPGMA approaches were followed. Present investigation brings about molecular evidences of the phylogenetic relationships among the selected members of the genus *Ditylenchus*.

**101. Docking studies of tryptic peptides from colostrum  $\beta$ -lactoglobulin to matrix metalloproteinase 9 (MMP-9)**

**R.A.Chougule and H. S. Aparna.**

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Mysore- 570 006 Karnataka, India

**Key words:** Lipocalin,  $\beta$ -lactoglobulin, LC-MS/MS, Matrix metalloproteinases

**Abstract:**

Development of inhibitors of MMP-9 is a challenging task which can have therapeutic benefit for patients suffering from various cancers.  $\beta$ -lactoglobulin, a core member of lipocalin family have shown to possess protease inhibitory activity. Tryptic peptides of  $\beta$ -LG were verified for the inhibitory effect on MMP-9.  $\beta$ -LG was purified from buffalo colostrums, tryptic peptides were separated and analyzed by LC-MS/MS. Sequence information for singly charged peptide ions, m/z-573 IIAEK (P1), m/z-673 GLDIQK (P2), m/z-916 IDALNENK(P3) and m/z-933 IIVTQTMK (P4) were deduced by *in silico* analysis. To study interaction of these peptides on MMP-9, docking analysis was performed into a well validated target of Matrix metalloproteinase-9 (PDB: 1GKC) using MolDock. A good correlation was observed in binding affinity of hypocholesterolemic peptides (IIAEK, P1 & GLDIQK, P2) along with other two peptides (IDALNENK, P3 & IIVTQTMK, P4) of  $\beta$ -LG implicating its utilization in functional foods.

**102. Data mining for structural templates analogous to saquinavir-an HIV Protease inhibitor, for anti-retroviral drug design**

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Institute of Environment and Sustainable Development,  
Banaras Hindu University, Varanasi

**Keywords:** Bioinformatics, Docking, HIV-Protease, Saquinavir, Structural analogue

**Abstract:**

Hydrolysis of Viral Poly Protein (pdb: 2CB7) is mediated by HIV Protease (pdb: 1ODW) an aspartate rich enzyme essential for the functionality of Human Immunodeficiency Virus. A structural analogue X (CID: 23167493) having similarity with a widely used HIV-PR Inhibitor, Saquinavir (pdb: 3EKQ) was selected from PubChem and studied for its potential binding with enzyme HIV-PR. Comparative docking of HIV-PR to Saquinavir and X based on binding free energy calculations, estimated  $K_i$ , van der Waals interactions, Hydrogen bonding and Docking frequency suggest molecule X to act as a potential inhibitor against HIV-PR that binds more strongly to HIV-PR than Saquinavir.

**103. Beneficial role of conjugated linolenic acid isomers against induced oxidative stress, inflammation and aberration in erythrocyte fluidity and integrity**

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Department of Chemical Technology,  
University of Calcutta, Kolkata- 700009

**Keywords:** Conjugated linolenic acid, Alpha-eleostearic acid, Punicic acid, Cytokines

**Abstract:**

The study was aimed to evaluate the effect of alpha-eleostearic acid and punicic acid, two isomers of conjugated linolenic acid (CLnA) present in bitter gourd (*Momordica charantia*) and snake gourd oil (*Trichosanthes anguina*) respectively, against arsenite induced oxidative stress, inflammatory challenge and aberration in erythrocyte membrane fluidity. Male albino rats were divided into six groups and administered 0.5%  $\alpha$ -eleostearic acid, 0.5% of punicic acid, 0.5% and 1.0% of mixture of two isomers (50:50 ratio) of total lipid given along with arsenite (10 mg/kg BW) respectively by oral gavage once per day. CLnA isomers significantly reduced oxidative stress, lipid peroxidation and restored level of proinflammatory cytokines in plasma, expression of hepatic nuclear transcription factor NF-kappaB (p65) and antioxidant enzymes level in liver, blood and erythrocyte lysate.

**104. Transdermal delivery of metformin from solid lipid nanoparticles in diabetic Rats: *in vitro* Studies**

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**Keywords:** Solid lipid Nanoparticles, Metformin *in vivo* studies, Entrapment efficiency

**Abstract:**

Transermal patches loaded with Solid Lipid Nanoparticles has been used as a suitable dosage to maintain the blood glucose level in diabetic patients. Metformin was taken as model antidiabetic drug get incorporated in Solid lipid Nanoparticles (SLNs) by a hot homogenization method using trimyristin and tripalmitin as lipids and Tween 80 as stabilizer. The prepared nanoparticles evaluated for particles size measurement, poly dispersity index, Zeta potential, entrapment efficiency, and In vitro- In vivo release studies so as to ensure the quality Solid lipid Nanoparticles.

**105. Anti-arthritis effect of *Centella asiatica* on collagen induced arthritis in rats**

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Centre for Interdisciplinary Research in Basic Sciences, Jamia Millia Islamia,  
New Delhi – 110 025

**Keywords:** *Centella asiatica*, Antioxidant, Anti-inflammatory, Cytokines

**Abstract:**

The present study aimed to determine the efficacy of *Centella asiatica* methanol extract (CAME) against collagen induced arthritis (CIA) in female Wistar rats. *In vitro* assays in cell free system showed significant ( $p \leq 0.05$ ) free radical scavenging activities of CAME. The suppression of inflammation in CIA was observed on CAME treatment as evidenced by decreased arthritic score, joint damage and reduced levels of proinflammatory cytokines in comparison to CIA rats without treatment. Similarly, *in vivo* anti-oxidative effects of CAME were found to be significant ( $p \leq 0.05$ ) in tissue like liver, spleen, kidneys, joints and



plasma. Taken together, our studies clearly indicate the potential of *C. asiatica* as an anti-arthritis agent.

**106. Characterization of amniotic fluid, source as stem cells by multiple programming analysis in buffalo (*Bubalus bubalis*)**

**K. Dey, S.K. Giri, A. Kumar, A. Yadav and S.K. Gautam**

Animal Biotechnology Lab, Deptt of Biotechnology,  
Kurukshetra University-136119 (Hr)-India

**Keywords:** - Amniotic fluid, Stem cells, FACS, Transcriptional profiling, PCR, Immunocytochemistry.

**Abstract:**

The aim of this study was to characterize amniotic fluid derived cells by FACS, transcriptional profiling, real-time-PCR and immunofluorescence. Amniotic fluid cells are obtained from amnion for prenatal analysis and can be cultured *in vitro*. Heterogeneous amniotic fluid contains various cell types and it is believed that some of these cells possess the stem cell properties. Amniotic fluid stem cells were cultured feeder-independent with different morphology on 6<sup>th</sup> days of culturing. The expression of various transcription factor genes of POU family was observed from the amniotic fluid stem cells in different passages by FACS, quantitative real time, RT-PCR. Amniotic fluid stem cells strongly expressed Oct-4, Nanog, Sox-2, SSEA-1, SSEA-4, TRA-1-60, TRA-1-81 and ALP markers by immunofluorescence staining. The cells were found to have a normal karyotype at different passages.

**107. Bioadhesive properties of *Garcinia indica***

**R. Kusum, H. Bommayya, F. Pasha and H.D. Ramachandran**

Department of Biochemistry, Dr. BR Ambedkar Road  
Bangalore University, Bangalore - 560001

**Key words:** Bioadhesion, Tensile studies, Work of adhesion, Garlic.

**Abstract:**

Natural polymeric materials that act as adhesives are termed *bioadhesives*. The term is sometimes used more loosely to describe glue formed synthetically from

biological monomers such as sugars, or to mean a synthetic material designed to adhere to biological tissue and should not be confused with the natural polymer. Bioadhesive properties of kokum, garlic and onion, processed under low pH conditions were investigated. To determine bioadhesive properties of the extracts, tensile studies were performed and work of adhesion ( $W_a$ ) was measured. The bioadhesive property was found to be more pronounced in kokum and garlic extracts ( $W_a > 9\mu\text{J}$ ).

**108. Molecular modeling and molecular dynamic simulation of the TLR3 protein: an *in silico* approach in identification of potential ligands for TLR3 signaling in *Labeo rohita***

**B.R. Sahoo, B. Swain, M. Basu, and M. Samanta**  
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Fish Health Management Division.  
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**Key words:** *Labeo rohita*, TLR3, comparative modeling, molecular docking

**Abstract:**

Toll-like receptor triggers innate immunity by recognizing pathogens or their products. TLR3 recognizes dsRNA, the genetic material or replicative intermediate of many RNA viruses through its ecto-domain (ECD). However, there is not much information of key domains in TLR3 that potentially recognize and bind dsRNA. In rohu (*Labeo rohita*) TLR3, we generated 3D-structure of TLR3-ECD by comparative modeling, followed by energy minimization, and 4 nanosecond molecular dynamics simulation. The model was validated by SAVES, WHATIF, PSVS and MolProbity servers. In the TLR3-ECD, motif search by SMART, Pfam and manual (LXXLXLXXNXL) search revealed 25 LRR (leucine rich repeats) regions in addition to the LRR at N-terminal and C-terminal. Molecular docking of synthetic dsRNA (poly I:C) and TLR3-ECD by Auto Dock 4.0 and GOLD 4.0.1 predicted LRR13 and LRR21 as key binding domains. *In silico* site-directed mutagenesis followed by docking ascertained LRR21 comprising of ASN516, ASN518, HIS540, ASN522 and TYR572 as the essential region, and LRR13 comprised of LYS332, LEU334, HIS338, SER341 and THR364 as the additionally significant region of poly I: C recognition and binding.

**109. Nanorobots in cancer treatment: An application of nanotechnology**

**T. Raghavendran, B. Rajasekhar, M. Anusha, O. Santhosh**

GMR Institute of Technology,  
Anil Neerukonda Inst of Tech and sciences,  
Tata Consultancy Services-Chennai,  
Pydah College of Engineering, Vishakapatnam

**Keywords:** Nanorobots, Cancer treatment, Mutation, Specific

**Abstract:**

Nanorobots are bacteria sized, highly efficient, skilled, accurate and specific robots which may prove a weapon to fight cancer. They can easily permeate through the cell wall and are capable of detecting cancerous cells in the early stage by analyzing the mutation from the normal genetical and molecular structure. Once they trace the cancerous cell they starts to destroy them by using various tools of nanotechnology. Nanorobots does not harm the healthy cells, avoid side effects as like in the contemporary chemotherapy. In this paper lighten the basic structural outline of a nanorobot, various tools used by a nanorobot to trace and cure cancer, challenges faced by a nanorobot and future hope of nanorobotics in cancer treatment.

**110. Antimicrobial property of silver nanoparticle along with its fabrication capacity**

**A. Samanta, A. Mondal, B. Bandyopadhyay**

Department of Biotechnology, Oriental Institute of Science and Technology,  
Dewandighi, Mirjapur, Burdwan – 02, West Bengal

**Key Words:** Nanoparticles, Antimicrobial property, Reducing substance, Silver.

**Abstract:**

Silver is one of the most universal antimicrobial substances. Nano-technology enables us to expand the surface area of silver particles markedly. A few data are available for the exact mechanism of the antimicrobial effects of silver. Therefore,

the antimicrobial activities and mechanisms of silver nanoparticles for bacteria were investigated. In this work, a silver nanoparticle was synthesized using various reducing substance such as formaldehyde, glucose and trisodium citrate. Antimicrobial activities of the nanoparticles of different concentrations were compared. Fabrication was done with the nanoparticles and antimicrobial property of the fabrics were also observed so that, we could use it to specific medical clothing's and apparels where contamination is the biggest threat.

**111. Rational mutagenesis approach lead to the identification of residue that induces enhanced stability in nitrilase**

**S. Kaushik, A. Kubetkar and U.C. Banerjee**

Department of Pharmaceutical Technology,  
National Institute of Pharmaceutical Education and Research  
Sector 67, SAS Nagar-160 062, Punjab, India

**Key words:** Stability, Nitrilase, Rational mutagenesis, Residues

**Abstracts:**

Nitrilases are important class of enzyme having wide applications as they provides mild, effective, regio- and stereoselective conversion of nitrile derivatives to pharmaceutically important intermediates and key drugs. They have a unique capability to catalyse the nitriles to corresponding acid with the concomitant release of ammonia. In present study, the rational scanning approach was employed to reveal the putative role of rationally selected residues. The scan leads to the identification of mutation regulating the thermo and oxidative stability of nitrilase. This variant with improved thermo and oxidative stability could be explored for development of industrially viable nitrilase mediated bioprocesses.

## v. Enzymes and Drug Discovery

### 112. Optimization of $\beta$ -galactosidase production by response surface methodology

**R. Raghunath<sup>1</sup> and K.R. Siddalingamurthy**<sup>2</sup>

<sup>1</sup>Dept. of Biochemistry, Center for PG Studies, Jain University, Bangalore-560011, Karnataka, <sup>2</sup>Dept. of Biochemistry, Central College Campus, Bangalore University, Bangalore-560001

**Keywords:**  $\beta$ -galactosidase, Tamarind kernel powder, Response surface methodology

**Abstract:**

Statistical optimization of medium components for production of  $\beta$ -galactosidase using tamarind seed polysaccharide as substrate by *Aspergillus terreus* was attempted. Screening for the effects of eleven medium components on enzyme activity was carried out by Plackett-Burman design which showed that  $(\text{NH}_4)_2\text{SO}_4$ , lactose and  $\text{MgSO}_4$  has significant ( $p < 0.001$ ) positive influence and pH, yeast extract, maltose and  $\text{NaNO}_3$  has significant negative influence. Optimal levels of positively influencing parameters were determined by ridge analysis and found to be 2.97, 2.88 and 2.67 g/L of  $(\text{NH}_4)_2\text{SO}_4$ , lactose and  $\text{MgSO}_4$  respectively. In the optimized medium, enzyme activity increased three folds in comparison with basal medium.

### 113. Prevention of antithrombin polymerization based thrombosis by using chemical chaperones

**M. S. Khan, P. Singh, Q. Rashid, A. Naseem, M. A. Azhar and M. A. Jairajpuri**

Protein Conformation and Enzymology Lab, Department of Biosciences, Jamia Millia Islamia University, New-Delhi-110025

**Keywords:** Antithrombin, Thrombosis, Gamma-aminobutyric acid, Heparin

**Abstract:**

Antithrombin is the main inhibitor of enzymes involved in blood coagulation pathway, mainly thrombin and factor Xa. Antithrombin anticoagulation function is activated by binding to heparin which increases its inhibitory activity by thousand fold. Heparin is used universally as an antithrombotic drug. Antithrombin inhibition mechanism involves large scale conformation change and transformation to a more stable form. Antithrombin is prone to polymer formation with many naturally occurring point variants. This work mainly focuses on the biophysics and thermodynamics of the structure and function of antithrombin, whose structural defect results in its insoluble oligomers and polymers/aggregates that exert toxic activity on the cell that as a whole lead to antithrombin deficiency mediated thrombosis (thrombophilia) .

**114. Improvement of L-asparaginase for the treatment of childhood acute lymphatic leukemia (ALL)**

**R..K.Mehta<sup>1</sup>, S. Verma<sup>2</sup>, K. Rohm<sup>2</sup> and Avinash Sonawane<sup>1</sup>**

<sup>1</sup>School of Biotechnology, KIIT University, Bhubaneswar, India,

<sup>2</sup>Department of Enzymology, University of Marburg, Germany

**Keywords:** Leukaemia, Chemotherapy, L-asparaginase, Asparaginase mutants

**Abstract:**

Acute lymphoblastic leukaemia (ALL) affects lymphocytes and lymphocyte producing cells in the bone marrow. Childhood ALL is the most common cancer in children, representing 23 % of cancer diagnosis among children under 15 years. Today, as many as 80 % of ALL patients can be cured by a combined chemotherapy that includes the enzyme L-asparaginase from *E. coli* as a crucial component. Unfortunately, as a bacterial protein L-asparaginase causes undesired effects in many children, including serious allergic reactions due to antibody formation. In addition, the administered enzyme is often inactivated prematurely by the patients, which renders the therapy ineffective. The major goal of this work is to develop more stable and less immunogenic variants of the therapeutic enzyme L-asparaginase by a directed protein evolution approach. By mutating the specific amino acids by site directed mutagenesis approach we have generated a library of asparaginase mutants.

**115. Lead induced overactivation of phagocytes and variation in enzymatic and non-enzymatic oxidative stress in intestinal macrophages of *Channa punctatus*.**

**N. Paul, M. Sengupta and G. D. Sharma**

Department of Biotechnology,  
Assam University, Silchar

**Keywords:** Lead, *Channa punctatus*, Antioxidant, Oxidative stress

**Abstract:**

The aim of this study was to assess the adverse effects of lead, a well-documented non-essential element that occurs naturally in the environment, on *Channa punctatus*, in relation with ROS production and oxidative stress. Fish were sampled, acclimatized and kept treated or untreated with lead (9.43 mg/L) under observation for 4 days. At day 4, respiratory burst activity, lipid peroxidation activity and superoxide dismutase level increased significantly in treated group as compared to the control. On the contrary, CAT and GSH activity decreased on treatment with lead. These results suggest that pollutants like lead influences the immune system and may lead to physiological disorders rendering the health and survival of exposed fish to an immunocompromised state.

**116. GSTT1, GSTM1 polymorphism in sylheti population of barak valley, assam**

**N. Nath and M. Kumar**

Department of Biotechnology,  
Assam University, Silchar, Assam

**Key words:** Genetic Polymorphism, Multiplex, PCR, Sylheti

**Abstract:**

Glutathione S-transferases are activated by GSTM1, GSTT1 and GSTP1 gene. In the present study the role of GSTM1, GSTT1 gene polymorphism is examined among Sylheti populations. Sample was collected, DNA was isolated and quantified. Multiplex PCR was performed. Genetic polymorphism was analyzed in 15 normal Sylheti individual originated from Barak Valley, Assam.

Frequencies of GSTM1 (null), GSTT1 (null) and both (null) were found to be 42.85%, 0%, 0%. The present study demonstrates that the frequencies of GSTM1 (null) of Sylheti population are lower with respect to East and North Indian population but it is higher with respect to South Indian population.

#### **117. Preparation of yoghurt from soyabean by thermophilic bacteria**

**A.S Pethe, K.V. Kothale, M.K Ramteke and M.T.Rokade**

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P.G.Department of Botany, Govt. Vidarbha Institute of Science and Humanities,  
Amravati (M.S.)

**Keywords:** Thermophilic bacteria, Soya Yoghurt, SNF, Proteolytic activity

#### **Abstract:**

The fermented yoghurt was produced from soyabean by using two thermophilic *Streptococcus thermophilus* and *Lactobacillus bulgarius*. In soya yoghurt various solid nonfat(SNF) like powder, tapioca powder, rice flour and corn powder was used. This yoghurt was supplemented with (8% w/v) glucose and fruit pulp. Proteolytic activity and organoleptic changes were investigated. Yoghurt which was produced had a very pleasant flavour and acidic taste.

#### **118. Gstm1 And Gstt1 Polymorphism In Manipuri Population Of North East India.**

**J. H. Choudhury, M. kumar , S. K.Ghosh .**

Department of Biotechnology,  
Assam University

**Key words-** GSTM1, GSTT1, Polymorphism, Cancer.

#### **Abstract:**

GSTM1 and GSTT1 are important phase II enzymes in the metabolism of xenobiotics and whose polymorphisms have been related to individual cancer risks. The objective of the study was to determine genotype frequency of GSTM1



and GSTT19 by using Multiplex PCR) in the Manipuri population of North East India. Result- GSTM1 homozygous deletion (null genotype) of has been found to be 78.57%, whereas the frequency of GSTT1 deletion is 0%. On comparison with data of other population of India, there is significant variation observed. Also the frequencies of the GSTM1 and GSTT1 deletion genotypes differed significantly among different ethnic community.

**119. Antioxidant and eicosanoid enzyme inhibition properties of pomegranate seed oil and fermented juice flavonoids**

**A. Parashar**

Department of Chemistry,  
Hardayal Technical Campus,  
Farah, Mathura

**Keywords:** Pomegranate, Cyclooxygenase, Lipoxygenase, Antioxidant

**Abstract:**

The antioxidant and eicosanoid enzyme inhibition properties of pomegranate (*Punica granatum*) fermented juice and seed oil flavonoids were studied. The pomegranate fermented juice (pfj) and cold pressed seed oil (pcpso) showed strong antioxidant activity close to that of butylated hydroxyanisole (BHA) and green tea (*Thea sinensis*), and significantly greater than that of red wine (*Vitis vitifera*). Flavonoids extracted from pcpso showed 31 - 44% inhibition of sheep cyclooxygenase and 69 - 81% inhibition of soybean lipoxygenase. Flavonoids extracted from pfj showed 21 - 30% inhibition of soybean lipoxygenase though no significant inhibition of sheep cyclooxygenase. The pcpso was analyzed for its polyphenol content and fatty acid composition. Total polyphenols in pcpso showed a concentration by weight of approximately 0.015%.

**120. Isolation and Production of Laccase enzyme by Novel Wood Degrading Fungal Microorganisms under Different Nutritional Conditions**

**N.Vijaya Sree<sup>1</sup>, P.Udaya Sri<sup>1</sup>, Y.V.V.Aswani Kumar<sup>1</sup> and**

**N.Rama Rao<sup>1</sup>**

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<sup>2</sup>Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur-34,  
Andhra Pradesh

**Key words:** Laccase enzyme, Bioremediation, Wood degrading fungi, Environmental pollution.

**Abstract:**

One of the most promising groups of enzyme, Laccases, is used in many biotechnological applications, in the polymerization of lignin and lignosulphonates, oxidation of dyes and dye precursors, in the preparation of musts and wines and in fruit juice stabilization.. It has a wide application in industrial processes, such as bioremediation, bio-bleaching of denims, in processing of beverages, as bio-analytical tool in biosensors to estimate the quantity of phenols in natural juices or the presence of other enzymes. Keeping in mind the potential applications of laccase in various bioprocesses, the present study was undertaken to explore the laccase production ability from Novel Marine Wood Degrading Fungal Samples and the role of laccases in control of environmental pollution and the possibility for its use in large scale operations. Various physicochemical parameters were tried to optimize laccase production.

### 121. Nitrile hydrolyzing enzyme from a novel strain

**S. Sharma and R. Sharma**

Centre for Microbial Biotechnology,  
Panjab University, Chandigarh, India

**Keywords :** Nitrilase, Screening, High nitrile concentration, Biotransformation

**Abstract:**

The nitrile hydrolyzing enzymes (nitrilase and nitrile hydratase/amidase) offers a cost-effective and valuable route for selective biotransformation of toxic nitriles to industrially important and optically pure carboxylic acids and amides. Keeping the potential of microorganisms in view, we screened a large number of microorganisms for their nitrile hydrolyzing activity from the library available in our laboratory. The cultures were grown and enriched on a very economical medium in the presence of different concentrations of nitrile substrates. Few cultures were found to show promising results at very high concentrations of nitrile and organic solvent. The cultures were also evaluated for their biotransformation capabilities and the products were authenticated with the aid of mass spectrometry.

### 121. Cellulase Enzyme Extraction from Isolated Yellow-Pigmented Bacteria from Goat Intestine

**C. Bhattacharjee<sup>1</sup>, S. Bhattacharyya<sup>1</sup>, A. Dutta<sup>1</sup>, S. D. Gupta<sup>2</sup>**

<sup>1</sup>Department of Chemical Engineering, Jadavpur University, Kolkata)

<sup>2</sup>Department of Biotechnology, Heritage Institute of Technology, West Bengal  
University of Technology, Kolkata

**Key words:** Rumen, Bacteria, Extracellular cellulase, Bagasse.

**Abstract:**

There are different protozoans dwelling in the rumen of cattle which are responsible for the breakdown of cellulose. The bacteria which reside in those protozoans produce *extracellular cellulase* which breaks the cellulose into glucose. In order to isolate the bacteria producing cellulase, different procedures and techniques are followed. The main objective is to isolate the novel bacterium

which produces cellulase from the intestine of the goat and make them feed on different low cost raw material such as Bagasse to yield reducing sugars like glucose which can be further converted to ethanol by normal fermentative process.

**123. A cysteine protease, nivulian isolated from Euphorbia nivulia Buch.-Ham. Latex: characterization and application in laundry detergent formulation**

**R. T. Mahajan<sup>1\*</sup>, S. B. Badgujar<sup>2</sup> and A. P. Manekar<sup>3</sup>**

<sup>1</sup>Department of Biotechnology, KCE Society's, Moolji Jaitha College, Jalgaon: 425001, Maharashtra.

<sup>2</sup>Department of Nutrition, Food and Exercise Science, Florida State University, P.O. Box 3061493, Tallahassee, FL 32306-1493, USA.

<sup>3</sup>Department of Zoology, Institute of Science, Mumbai 400 032, Maharashtra.

**Key words:** Cysteine protease; Euphorbia nivulia; Euphorbiaceae; Latex; Nivulian

**Abstract:**

A new cysteine protease was partially characterized from the latex of Euphorbia nivulia Buch.-Ham., a member of Euphorbiaceae family. The enzyme, named nivulian, exhibits maximum proteolytic activity at broad optimum pH range i.e. 6.5-7.5 and temperature 40-50<sup>0</sup>C. Enzyme activity of nivulian was strongly inhibited by mercuric chloride and iodoacetamide but not by EDTA, PMSF and Pepstatin A, suggesting that the enzyme belongs to the class of cysteine protease. It had good stability in the presence of local detergents viz., Tide<sup>®</sup>, Ujalla<sup>®</sup> and Nirma<sup>®</sup> at 37<sup>0</sup>C. The protein stains (blood) were removed within 10 – 15 min from the test fabric (cotton) cloth by the treatment of this enzyme. Thus this application of plant origin 'nivulian' demonstrates feasibility for inclusion in laundry detergent formulation.

**124. Survey of isozyme polymorphism in laboratory population of *C. megacephala* (Diptera, Calliphoridae)**

**K. Singh and S. Thakur**

Department of Biology Sciences, Sam Higginbottom Institute of Agriculture,  
Technology & Sciences, Deemed University, Allahbad- 211007, India

**Keywords:** Isozyme polymorphism, glucose-metabolizing enzymes, non glucose metabolizing enzyme, *C. megacephala*

**Abstract:**

A survey of isozyme polymorphism among glucose and glucose-metabolizing enzymes was carried out in the laboratory population of *Chrysomya megacephala*. Polymorphic levels were found to be within the range recorded for other dipterans. Polymorphism among glucose-metabolising enzymes were found to be on average less variable ( $H_o=0.112$ ;  $H_e=0.098$ ) than the glucose metabolizing enzymes ( $H_o=0.228$ ;  $H_e=0.258$ ). Out of ten loci, three (APH-2, APH-3 and ACPH-2) were found to be polymorphic and these displayed significant deficiency of heterozygotes. These results supported the findings of Yamazaki (1977) and Gojabori (1982) that the substrate-specific enzymes with functional constraints have lower heterozygosity than the non specific enzymes. They also added the evidence obtained from other animals like *Drosophila*, echinoderms and some fish species.

**125. Polyphenol Oxidase from Potato (*Solanum tuberosum* L.) peel: Isolation, purification and characterization**

**S. Mukherjee<sup>1</sup>, S. Mondal<sup>1</sup>, B. Bandyopadhyay<sup>2</sup>, R. Bardhan<sup>1</sup>, A. Dey<sup>3</sup> and B. Mondal<sup>1</sup>**

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<sup>2</sup>Department of Biochemistry Oriental Institute of Science and Technology,

<sup>3</sup>Department of Biotechnology National Institute of Technology, Durgapur, West Bengal,

**Key words:** *Polyphenol Oxidase (PPO)*; *potato peel*; *HPLC*; *SDS-PAGE*

**Abstract:**

PPO was extracted from potato (*Solanum tuberosum* L.) peel using 0.1 M phosphate buffer (PH-4.5) and purified by salting out, dialysis and column chromatography employing phenyl sepharose, ion exchange and hydroxyapatite column. Purity of the enzyme was determined by HPLC. Enzyme activity was assayed in each step of purification by UV-Visible spectrophotometry. Substrate specificity, optimum temperature and PH, Km and Vmax values of PPO were also determined. The molecular weight of isolated PPO was determined by SDS-PAGE. Finally, it was concluded that potato peel can be utilized as a good source of PPO which can be used in both research and other biotechnological purposes.

**126. Production of protease by solvent tolerant isolated fungal strain in solid-state fermentation using *Pongamia pinnata* seed cake as substrate**

**T. Pankajam, Amitabha Das, Vinoda Kulkarni, Somashekhar Ghanti and Geetha Bali**

Department of Biotechnology, Karnataka State Womens' University  
Torvi, Bijapur 586109, Karnataka

**Key words:** Protease, *Pongamia* seed cake, solid state fermentation, detergent, organic Solvent

**Abstract:**

Deoiled *Pongamia pinnata* seed cake (DPSC) was assessed for its suitability as substrate for economic production of protease by solid-state fermentation (SSF). A fungal strain (KSWUAD) isolated from DPSC was found to support good fungal growth and a protease activity of 42.23 U/ml was observed after 106 hours of incubation with 63.5% moisture at 30 °C. The protease activity was enhanced by supplementing culture media with 1% starch (55.56 U/ml) followed by glucose and 100 mmole of sodium nitrate (103.34 U/ml). Maximum activity was obtained at pH 12 and 13 at 50 °C indicating the enzyme is an alkaline protease. The enzyme was stable at higher temperature (40-80 °C), organic solvents, surfactants and commercial detergents and may be used in detergent formulation and for enzymatic peptide synthesis.

**127. Biocompatible ionic liquids as convenient solvents for enzyme stability**

**P. Venkatesu**

Department of Chemistry, University of Delhi, Delhi – 110 007, India

**Key words:** Ionic liquid, Enzyme stability, Biocompatible, Solvents

**Abstract:**

Ionic liquids (ILs) had shown their application in chemical and biochemical interactions and reaction compatibility. We have explored the stability and activity of  $\alpha$ -chymotrypsin (CT) in the presence of five ILs from different families, such as triethyl ammonium acetate, triethyl ammonium phosphate from ammonium salts, 1-benzyl-3-methylimidazolium chloride, 1-benzyl-3-methylimidazolium tetrafluoroborate from imidazolium salts and tetra-butyl phosphonium bromide from phosphonium families. Circular dichroism (CD) and UV-VIS spectrophotometer experiments have been used to study the CT stabilization by ILs, related to the associated structural changes and enzyme activity studies, respectively. We observed that all ILs have a dominant contribution to the stabilization of CT while not enhancing its enzyme activity. Our CD and NMR measurements reveal that TEAA is a refolding additive for CT from a quenched thermal unfolded of enzyme structure.

**128. Isolation and antibiotic resistance pattern of indigenous bacterial isolates from urinary tract infections**

**D. L. Barate<sup>1</sup> and C. S. Ukesh<sup>2</sup>**

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Commerce and Science, Akola-444001(MS)

<sup>2</sup>Department of Microbiology, Shri Shivaji Science College,  
Amravati-444606(MS)

**Keywords:** Urinary tract infections, Uropathogens, Multiple drug resistance

**Abstract:**

Urinary tract infections (UTI) are amongst the most prevalent infectious diseases, affecting approximately 150 million people worldwide. All individuals are susceptible to UTI; however prevalence differs with age, sex and certain predisposing factors. Women are more prone to UTI, in present study 71 (67.61%) women get affected by UTI while that of men the no. is 34 (32.38%). The *Escherichia coli* were found to be the predominant organism (50; 49.52) followed by the *Klebsiella pneumoniae* (22; 20.95), *Pseudomonas aeruginosa* (16; 15.23), *Proteus* spp. (10; 9.52) and *Staphylococcus aureus* (07; 6.66). Most of the uropathogens were highly resistant to Ampicillin and Amoxyclav while resistance pattern to the other antibiotics vary with the organisms, most of the uropathogens showed multiple drug resistance.

**129. Optimization of physiological and physicochemical conditions for lipase production from Bacillus species**

**D. R.Hajgude**

Department of Biotechnology

New Arts Commerce and Science College Ahmednagar, Maharashtra.

**Key words:** Lipase, Bacillus species, Carbon source, Nitrogen sources.

**Abstract:**

Lipase enzyme has wide range of applications. In the present study, a soil microorganism was isolated that has been found to produce lipase during submerged fermentation. It was found to be of Bacillus genus on the basis of morphological and biochemical characterization. The Physiological and physicochemical conditions such as temperature, Ph, Carbon and nitrogen sources, etc were optimized for lipase production. Mannitol and NH<sub>4</sub>NO<sub>3</sub> were found to be the best carbon and nitrogen source respectively for lipase production (848 U/ml) at pH 7.4 and temperature 36.5<sup>0</sup>C.



**130. Study of glutathione s-transferases (gstt1 and gstm1) polymorphism in dimasa population of northeast india**

**S. Nath, S. K. Ghosh and M. Kumar**

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Assam University, Silchar-788011, India

**Keywords:** Glutathione-S-transferases, Genetic polymorphism, Dimasa and Multiplex PCR

**Abstract:**

Glutathione-S-transferases (GSTs) are a class of phase-II xenobiotic metabolising enzymes which plays an important role in cellular detoxification system and, possibly, evolved to protect cells against reactive oxygen metabolites. Genotypic frequencies of these genes are geographically and ethnically variable. This study explores the role of genetic polymorphism of GSTM1 and GSTT1 in the Dimasa population of northeast India. Genotypic analysis was performed by multiplex PCR in 15 Dimasa individuals. The frequency of GSTM1 and GSTT1 null genotype was found to be 71.42% and 14.28% respectively which showed variability with other populations suggesting the risk of developing several metabolic disorders and cancer.

## vi. Microbes and Drug Discovery

### 131. Study on antibacterial property of microbial cultures by agar well diffusion assay

**P. Mishra, U.C. Banerjee**

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S.A.S. nagar, Mohali, Punjab-160062

**Keywords:** Antibacterial, lactic acid bacteria, Agar well diffusion assay

**Abstract:**

Antibacterial activity of 15 cultures from Microbial Type Culture Collection was assayed for their antibacterial potential against *E. coli* by using agar well diffusion assay. Overnight cultures in their respective media were grown and their supernatants were concentrated to obtain the respective aqueous extracts which were used for antibacterial assay. Chloramphenicol was used as positive control and distilled water was negative control. Out of 15 cultures three species of lactic acid bacteria showed good antibacterial activity against indicator organism *E. coli* as observed by zone of inhibition compared to positive control. The physical characterization of the antibacterial compound was done by studying the effect of pH stability, heat stability, acid inhibition, peroxide inhibition, and enzymes treatment.

### 132. Antimicrobial activity of pigments isolated from milk sample

**R. Kumar, S. Jain and A. Mehta**

Molecular Biology Lab, Department of Botany, School of Biological and  
Chemical Sciences, Dr. Hari Singh Gour University,  
Sagar – 470003, (MP)

**Keywords:** Pigment, Inhibition and antimicrobial activity, Pasteurized milk

**Abstract:**

Different pigment producing micro-organisms were isolated from different forms of milk samples (i.e. Fresh milk, Pasteurized milk, Curd). All these pigments were used to perform antimicrobial activity by disk diffusion method. *E. coli*, *M.*

*variants* and *B. subtilis* have shown significant inhibition in growth. All these micro-organisms were biochemically identified by using Bergey's Manual. They belong to the Genus *Aerococcus viridians*, *Enterococcus mundtii*, *Lactococcus sps.* *Enterococcus sps.* *Gemella morbillorum*.

**133. Isolation and characterization of pigment producing micro-organism isolated from milk samples**

**S. Jain, R. Kumar and A. Mehta**

Molecular Biology Lab, Department of Botany, School of Biological and Chemical Sciences, Dr. Hari Singh Gour University, Sagar – 470003, (MP)

**Keywords:** Pigment, Pasteurized milk, Growth curve, Bergey's Manual

**Abstract:**

Different pigment producing micro-organisms were isolated from milk samples (i.e. Fresh milk, Pasteurized milk, Curd). All these pigments are produced intracellularly by micro-organisms. Micro-organisms were biochemically identified by using Bergey's Manual. They belong to the Genus *Aerococcus viridians*, *Enterococcus mundtii*, *Lactococcus sps.* *Enterococcus sps.* *Gemella morbillorum*. Growth curve of these organisms were performed to correlation the growth and pigmentation.

**134. Probiotic role of bacteria isolated from shrimp to control pathogenic bacteria and characterization**

**A. Selvaprabhu<sup>1</sup>, G. Ananthan<sup>1</sup> and M. Michael Babu<sup>2</sup>**

<sup>1</sup>Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai-608 502,

<sup>2</sup>Centre for Marine Science and Technology, MS University, Rajakkamangalam-629 502, Tamil Nadu

**Keywords :** Probiotics, Marine Shrimp, Bio-chemical methods, Pathogens

**Abstract:**

The present finding deals the, isolation and identification of probiotic bacteria from the healthy shrimp to control the shrimp pathogens. The bacterial flora present in gut, gill and slime were isolated and they were tested against the shrimp

pathogen. The gut of probiotics bacteria fed shrimp had minimum count of  $14.89 \pm 0.964$  was observed in *Pseudomonas* sp. fed shrimp followed by *Bacillus* sp. ( $25.5 \pm 0.408$ ) and a high count was observed in *Aerobacterium* sp. ( $26.16 \pm 0.849$ ). The minimum count  $20.16 \pm 0.429$  was observed in the gill of shrimp which were with in *Acetobacterium* followed by *Bacillus* sp ( $21.66 \pm 0.408$ ) and a high count was observed in *Pseudomonas* sp ( $23.5 \pm 0.408$ ). The minimum count  $1.70 \pm 0.504$  was observed in the slime of shrimp which were fed with *Pseudomonas* followed by *Acetobacterium* sp. ( $2.466 \pm 0.410$ ) and the maximum count was observed in *Bacillus* sp. ( $3.95 \pm 0.732$ ).

**135. Biodiversity of Actinomycetes in hypersaline soils of Kolhapur district and their screening as potential antibiotic producer**

**D. B. Nakade**

Department of Microbiology, Govt. Rajaram college, Vidyanagar, Kolhapur-416004(maharashtra).

**Key words:** Hypersaline Soil, Actinomycetes, Agaroverlay, Screening, Antibacterial

**Abstract:**

Soil samples from different sites in Kolhapur district of Maharashtra were analysed over a period of one year for actinomycetes population. They were isolated on Glycerol asparagine agar, Bennets agar, Sucrose nitrate agar, Yeast extract sucrose agar, and coconut milk agar. All the media inoculated with Nystatin 50 mg/ml and 15% NaCl, and analysed for microscopic, cultural, biochemical characters, pigmentation, cell wall analysis and spore morphology by inclined coverslip technique and identified by MICRI-IS software. The actinomycetes species identified are Streptomyces (20), Streptoverticillum (12), Micromonospora (10), Nocardia (8), Microbispora (5), Actinoplanes (3), Planomonospora, Kitasatosporia (1). Isolates were screened for antibacterial and antifungal activity by Agar overlay technique. Results indicated that the hypersaline soils are rich in biodiversity of actinomycetes, 4 species showed antibacterial activity and 2 showed antifungal activity.

**136. Transcriptome analysis of *Enterobacter aerogenes* KCTC 2190 in response to elevated salt stress**

**B.K. Behera, P. Das, A. Patra and A.P. Sharma**

Central Inland Fisheries Research Institute,  
Barrackpore, Kolkata-700120

**Keywords:** Salt tolerant microbes, Transcriptome profiling, Salt tolerant gene

**Abstract:**

A novel microbe, *Enterobacter aerogenes* KCTC 2190, isolated from the salt crystals collected from West Bengal was identified on the basis of physiological and biochemical tests and 16S rRNA gene sequence analysis. The salt physiology study revealed that, it can grow in 15% NaCl concentration in Tryptone Soya Broth (TSB) medium. Whole genome transcriptome sequencing of *Enterobacter aerogenes* KCTC 2190 grown at 15% salt stress conditions was performed to identify key genes in the regulation of salt tolerance. Using NCBI ORF finder tool, 22 candidate salt tolerant genes were identified out of 6922 genes and 130 non-annotated ORFs were found in response to salt stress. Based on in silico analysis, all the 22 salt tolerant transcripts lies within eight CDD domains.

**137. Biodegradation of trichloroethylene by an isolated bacterium**

**P. Mukherjee<sup>1</sup> and P. Roy<sup>2</sup>**

Department of Biotechnology,  
University of Burdwan.

**Key words:** Trichloroethylene, Degreasing, Polychlorinated hydrocarbons, Biodegradation

**Abstract:**

Trichloroethylene is an industrial solvent widely used but biodegradation of TCE is more difficult.. WHO has declared TCE as one of the major ground water pollutant through the world? Three different bacteria have been isolated from soil samples, obtained from Asansol and Dhanbad industrial belt where the use of TCE is abundant. All these isolates are capable of growth in minimal media with

only TCE as the carbon source. The isolates have been identified by 16S rDNA amplification and sequencing. BLAST n was performed with these sequences and one of them has been found to be novel sp. (giving only 91% maximum sequence similarity with known sequences) .TCE degradation by this bacterium was monitored by two methods: Fujiwara test and Chlorinated release. Total protein profile of the bacterium was studied by SDS PAGE. TCE inducible bands were observed between 70 KDa. The bacteria isolate was found to be highly resistant to different antibiotics. Efforts are being made to minimize rabbits with the TCE inducible proteins for raising specific antibody. Also, the genes responsible for TCE degradation will be isolated and studies in future.

**138. Antibiotic activity of mangal actinobacteria: a novel approach towards drug discovery**

**K. Sahoo<sup>1</sup>, N. K. Dhal<sup>1</sup>, R. Das<sup>2</sup> and K. Sivakumar<sup>3</sup>**

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<sup>2</sup>Utkal University, Vanivihar, BBSR-13, Orissa

<sup>3</sup>Center of Advanced Study in Marine Biology, Annamalai University,  
Parangipettai,  
TamilNadu

**Key word:** Mangal, Antagonistic, Actinobacteria, MIC, Compounds, Industries

**Abstract:**

The mangal environment is a virtually untapped source of novel actinomycetes diversity and thereby of new metabolites. In the present study, the antagonistic activities of actinobacteria, isolated from three different mangrove sediments of Bhitarkanika, Dhamra and Mahanadi delta of Odisha, were studied against various clinical pathogens. The screening procedure was carried out by both primary and secondary screening and out of twenty isolates, the potent strain i.e. MSA-6 was found to possess maximum antibacterial as well as antifungal activity against *E.coli* and *S.roflsii* respectively. The MIC was found to be less than 6mg/ml and structure of the bioactive components was determined by UV/VIS, FTIR, and TLC analysis. Two spots observed having R<sub>f</sub> values 0.71±0.02, 0.89±0.01 and the presence of aliphatic primary amides and primary aliphatic alcohol groups in the potent strain, which was identified as *Streptomyces sampsonii*.

**139. Studies on antimicrobial activity of different toothpastes on the mouth flora.**

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<sup>2</sup>U.G Department of microbiology, G.N.A College Barshitakli Dist. Akola 444002

**Key words:** Mouth flora, Toothpaste, *Staphylococcus*

**Abstract:**

Dental care is one of the important aspects of human sanitation which unfortunately receives scanty information of dental carries, dental plaque and periodontal diseases, so the study was carried with the isolation and identification of mouth flora, five to six different isolates were obtained in which *E.coli*, *Lactobacillus* species and *staphylococcus* species was most predominant organism. Antimicrobial efficacy of different toothpaste and toothpowder was studied by well agar diffusion method, the comparative study between the herbal and other toothpaste was don and quit promising result was observed.

**140. Isolation and identification of nitrogen fixing bacteria from wild legume, *Cassia alata* of assam university.**

**K. Deb and P. B. Majumder**

Dept. of Biotechnology, Assam University, Silchar.

**Keywords:** Nitrogen Fixation, Legumes, *Cassia alata*.

**Abstract:**

In the present study, roots of *Cassia alata* were collected for isolating different bacterial strains which might be useful in fixing nitrogen. After doing different biochemical test it was observed that the bacterium is Rhizobium, though many other microorganisms might also be present. By studying the legumes of North East Assam, many diazotrophs may be identified which will be useful in future and will help to reduce the use of chemical fertilizers.

**141. Optimization of different parameter for the production of Fructo-oligo saccharide (FOS) using Marine source**

**A.K. Pandey, A.S. kumar, B. Das and K. Raja**  
CAS in Marine Biology, Faculty of Marine Sciences,  
Annamalai University, Tamilnadu.

**Keywords:** Fructo oligosaccharide , Fermentation, Immobilization, *Aspergillus niger*

**Abstract:**

FOS is fructose oligomers with a terminal glucose group are produced from sucrose by the catalytic action of fructosyltransferase (EC 2.4.1.9). Production by marine source gives a potential approach. Isolation of microorganism *Aspergillus niger* from marine sediment, scale up to large scale using batch fermentation technology, microfiltration, for find of intra cellular enzyme activity immobilize hole cell and the optimal condition for fructosyltransferases activity occur in the pH range between 5.5-8.0, optimize temperature is 45° C - 60° C, rpm 150-200, time 16- 20 hrs, low concentration of sucrose for rapid conversion. Marine source shows highly stability on pH and temperature that influence their conversion in compare to tradition.

**142. Determination of Susceptibility Rates and Patterns in *Pseudomonas aeruginosa* Related with Nosocomial Infection**

**A.A. Gawali, V.D. Nanoty**  
Department of Microbiology, R.L.T. Science College  
Akola. – 444001 (M.S.)

**Key Words-** *Pseudomonas aeruginosa*, Nosocomial infection, Antibiotics Resistance.

**Abstract:**

Nosocomial infection, an infection acquired in hospital, is usually caused by *Pseudomonas aeruginosa*. Clinical and non clinical samples were collected from hospitals of Akola City, *Pseudomonas aeruginosa* was isolated and identified using selective medium. Antibiotics susceptibility of isolated cultures was checked. Of the fluoroquinolones, ciprofloxacin showed least resistance (24%),



levofloxacin 27.5% and ofloxacin 37.5%. Of the aminoglycosides, amikacin was most potent (10.5% resistance), followed by tobramycin (19.5%) and gentamycin (23.5%). Of the Carbapenem, imipenem (12%) resistance and meropenem was the most active (9.5% resistance). Of the  $\beta$ -lactam antibiotics; piperacillin 24%, ceftazidime 28.5%, cefepime 29.5%, and aztreonam 55.5%. And tetracycline (46%) resistance and chloramphenicol 52.7% resistance were found. Finding of the study will be useful in understanding the prevalence of *Pseudomonas aeruginosa* in hospital.

**143. Citric acid Production from areca husk by *A. niger* employing SSF**

**T. R. Patil and M.N. Shinde.**

Department of Biotechnology,

New Arts, Commerce and Science College, Ahmednagar 414001

**Key words:** Areca husk, *A. niger* SSF, citric acid

**Abstract:**

The production of citric acid from Areca husk collected from Korhade village located in Surgana Taluka of Nashik District was done under solid state fermentation (SSF) using isolate of *A.niger*. During fermentation *A.niger* produces citric acid from areca husk in the presence of 3% w/w menthol at optimum pH 5.0 moisture content at 30°C incubation temperature within 3 days. This citric acid has large commercial value in industries and the production of citric acid from waste material like areca husk which reduces cost factor.

**144. Statistical optimization of process parameters for amylase production from thermophile strain AS02a using Plackett–Burman and response surface methodology**

**Jetendra Kumar Roy, Debashree Saikia, Rupamoni Thakur and Ashis Kumar Mukherjee**

Microbial Biotechnology and Protein Research Laboratory

Department of Molecular Biology and Biotechnology,

Tezpur University, Tezpur-784028, Assam

**Keywords:** Plackett–Burman design, response surface methodology,  $\alpha$ -amylase, thermophile

**Abstract:**

A strain AS02a was isolated from soil sample of Assam, India; it was capable of growing in thermophilic condition (45-65 °C), and under wide range of pH (6-10). Through molecular characterization it was identified as *Geobacillus thermodenitrificans* strain AS02a. To attain the maximum  $\alpha$ -amylase production, the process parameters influencing the enzyme production were identified using Plackett–Burman design. Among the various variables screened, the starch concentration, yeast extract and pH of the medium were most significant. The optimum levels of these significant parameters were determined employing the response surface methodology which resulted in three-fold increase in amylase production.

**145. Screening of agro wastes as substrates for lignolytic enzyme production by the newly isolated fungal species**

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<sup>2</sup>Center for Environmental and Nuclear Research, directorate of Research, SRM University, Chennai, Tamilnadu, India.

**Key words:** Agro waste, Lignolytic enzymes, Fungi, Substrate

**Abstract:**

The lignolytic enzyme production by fungi depends on the substrate apart from temperature and pH of the medium. Any variation with reference to the chemical composition may result in increased or decreased production of enzymes. The trend now-a-days is to use agro based media for enzyme production. This not only reduces the cost involved in the usage of synthetic media, but also forms a easiest means of solid waste disposal from agriculture. The ability of various lignolytic fungi to use Rice bran, wheat bran, sugarcane bagasse, cotton seed, green gram husk, ground nut shell and sapota seeds for the production of various lignolytic enzyme viz., laccase, manganese peroxidase and lignin peroxidase is being studied with an aim of finding the best substrate for lignolytic enzyme production.

**146. Patterns and magnitude of defaulting from leprosy treatment in Kolfe-Keranio sub-city, Kebele 02/03 clinic, Addis ababa, Ethiopia.**

**B. Sarthak<sup>1</sup>, G.V. Prakash<sup>1</sup>, M. Vijay<sup>1</sup>, F. Hagos<sup>2</sup>, S. Suleiman<sup>2</sup>,  
Z. Mekonen<sup>2</sup>, C. A. Singh<sup>3</sup>, S. Kohli<sup>4</sup>**

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<sup>4</sup>Dept. of Pharmacy, Kolaniketan Polytechnic, Jabalpur, India

**Key Words:** Leprosy, MDT, WHO, Prevalence rate, Ethiopia.

**Abstract:**

Introduction: Leprosy, one of the oldest scourges of mankind, WHO, in 1981, recommended multiple drug therapy (MDT). The WHO elimination strategy based on the wide spread implementation of multi-drug therapy (MDT), has led to on 87% reduction of leprosy prevalence to reach 1.3 per 10,000 global prevalence rate. The purpose of this study was to assess the pattern and magnitude of defaulters from leprosy treatment.

**147. Studies on the biochemical constituents of selected wetland plants.**

**A.P. Shahid and K.N. Remani**

Environmental Studies Division

Centre for Water Resource Development and Management

Kozhikode, Kerala

**Keywords:** Wetland plants, Carbohydrate, Reducing sugar, Starch, Protein and Phenolics.

**Abstract:**

Ten wetland plants were subjected to quantitative phytochemical screening such as total carbohydrate, reducing sugar, starch and protein. Among plant studied, high content of total carbohydrate present in *Cerbera odollum*, reducing sugar in *Derris trifoliata*, starch in *Rhizophora mucronata*, *Avicennia officinalis*,

*Syzygium travancoricum*, protein in *Clerodendron inerme*, *Cerbera odollum* and phenolics in *Nymphaea cerulean*.

**148. Cultivation of bacterial biomass to remove heavy metal from waste water**

**A.D. Deshmukh, Asim Shaikh, and M. Musaddiq**

Department of Microbiology,  
Shri Shivaji College, Akola 444001. (M.S)

**Key Words:** Heavy metals, Biosorption, dried biomass.

**Abstract:**

The presence of heavy metals in the environment is of major concern because of their toxicity, bioaccumulating tendency, and threat to human life and the environment. In present study heavy metal resistant Gram negative bacteria were isolated from the waste water. The biomass of isolates was cultivated on shaker, which could be applied for the biosorption process. In recent years, many low cost sorbents such as algae, fungi bacteria and lignocellulosic agricultural byproducts have been investigated for their biosorption capacity towards heavy metals. Experimental results reveal that dried bacterial biomass have potential application for the the removal of heavy metals from waste water.

**149. Analysis of bacteriological contamination of drinking water**

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<sup>1</sup>Shri Shivaji Science College, Amravati - 444 602 (M.S.)

**Key Words:** - MPN, SPC, drinking water.

**Abstract:**

Water sources must be protected from contamination by human and animal waste which can contain variety pathogenic microorganisms. The present study was carried out to analyze the drinking water samples from the most crowded places. About 30 water sample analyzed for MPN, standard plate count and for the presence of other bacteria on selective media. Results showed most of the sample were positive for Most Probable Number and significant count by SPC. The further identification showed that *E. coli* found to be present in most of the

samples. *Pseudomonas* was the prominently found in samples as common contaminant. Apart from this *Klebsiella pneumonia*, *Proteus* spp., *S. typhi* and *Bacillus* spp. were also found to be present.

**150. Antimicrobial activity of Clove oil against *E.coli* and *Klebsiella* Species**

**D.V. Khelkar, Naushad Zubair, M. Musaddiq**

Department of Microbiology, Shri. Shivaji Collage of Arts,  
Commerce & Science Akola. 444001(M.S)

**Keywords:** Antimicrobial activity, Clove oil, E.coli, Klebsiella.

**Abstract:**

Clove oil can be used as an antimicrobial agent as it contains eugenol as agent which shows very high antimicrobial activity. The present study was carried out to check the antimicrobial activity of clove oil against the two members of *Enterobacteriaceae* family, *E.coli* and *Klebsiella* spp isolated from the clinical samples, total 43 samples of urine and blood were examined, out of which 10 isolates of *Klebsiella* spp and 12 isolates of *E.coli* were found. Out of 12 *E.coli* isolates 7 isolates shows very high susceptibility to the clove oil. While out of 10 isolates of *Klebsiella* 6 isolates shows susceptibility to clove oil.

**151. Comparative evaluation of different sources of nitrogen on the phototropic growth of *Chlorella ellipsoidea***

**A. Bora, J. Purkayastha and H. K. Gogai**

Defence Research Laborartry  
P.B.No.2, Tezpur-784001, Assam

**Key words:** Microalgae, Nitrogen, Chlorella, Growth

**Abstract:**

Nitrogen is an essential component needed for growth and division of green microalgae. An experiment was conducted to study the effect of different sources of nitrogen on the phototropic growth of the green microalgae *Chlorella ellipsoidea*. Sodium nitrate, sodium nitrite, urea, ammonium sulphate, ammonium nitrate and ammonium nitrite was added to BG11 medium as the sole source of nitrogen and culture were maintained under *in vitro* condition. Good phototropic growth was observed in BG11 medium containing sodium nitrate.

**152. Preparation of yoghurt from soyabean by thermophilic bacteria**

**A.S. Pethe, K.V.Kothale, M.K Ramteke, and M.T Rokade.**

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P.G. Department Botany, Govt. Vidarbha Institute of Science and Humanities,  
Amravati (M.S.) 444 602

**Keywords:** Thermophilic bacteria, Soya Yoghurt, SNF.

**Abstract:**

The fermented yoghurt was produced from soyabean by using two thermophilic *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. In soya yoghurt various solid nonfat (SNF) like powder, tapioca powder, rice flour and corn powder was used. This yoghurt was supplemented with (8% w/v) glucose and fruit pulp. Proteolytic activity and organoleptic changes were investigated. Yoghurt which was produced had a very pleasant flavor and acidic taste.

**153. In Vitro studies on Isolation, Identification and Characterization of Chlorpyrifos degrading bacterium from agricultural soil**

**Manojkumar Shinde & Tushar Patil**

Department of Biotechnology

New Arts, Commerce and Science College, Ahmednagar, Maharashtra.

**Keywords:** Pesticides, Chlorpyrifos, Ecological imbalance

**Abstract:**

India is an agro based country; and insecticides are widely used in the agriculture to control pests. Pesticides have been a potential source of ecological imbalance. In this study, a unique approach of the degradation of Chlorpyrifos in aqueous media with degrading microorganisms was investigated. A soil bacterium capable of utilizing Chlorpyrifos [o,o-diethyl o-(3,5,6-trichloro-2-pyridyl) phosphorothioate] as sole Carbon source was isolated by selective enrichment on Mineral salt medium containing Chlorpyrifos. The bacterial isolate was identified and characterized as a strain of *Staphylococcus aureus* based on biochemical characteristics. The isolate was found to degrade 10 to 40 mg/L of Chlorpyrifos. Also growth kinetic was studied against different concentrations of 10 to 40 mg/L.

**154. Effect of UV-B Radiation on Two Species of Cyanobacteria from Odisha Coast**

**I. Priyadarshani and B. Rath**

Department Of Biotechnology North Orissa University,  
Sriram Chandra Vihar, Takatpur, Baripada-757003

**Key words:** Cyanobacterium, Growth, Pigment, Protein, Ultraviolet radiation,

**Abstract:**

In the present investigation attempt was taken to evaluate the effect of shortwave ultraviolet radiation, most common UV-B on growth, pigment and protein content of two marine cyanobacteria (*Oscillatoria boryana* and *Phormidium tenue*) isolated from Odisha coast. The organisms found to have differential response to UV-B radiation. *Phormidium tenue* can withstand higher exposure period of radiation as compared to *Oscillatoria boryana*. Moreover after UV exposure and subsequent culture for seven days in normal culture condition results in reducing the lethal effect of the radiation on low exposure time though recovery was found to be insignificant on higher exposure time. Among both the species *Phormidium tenue* found to regain better growth and pigment than *Oscillatoria boryana* to radiation exposure for different time.

**155. Inhibitory efficiency of different toothpastes, powder & Natural agents on *Streptococcus mutans***

**A.Rohinkar<sup>1</sup>, M.S Kadam<sup>2</sup>**

<sup>1</sup>MGM's College of Computer Science & Information Technology, Parbhani

<sup>2</sup>Department of Zoology, Yeshwant Mahavidyalaya, Nanded

**Keywords:** Medicinal extracts, *Streptococcus Mutans*, Tricosan, Dental caries, Ingredients of toothpaste

**Abstract:**

The different toothpaste companies promote their toothpastes as germ fighter inhibitor. In the project work the view was to check the effect of different toothpastes on *Streptococcus mutans*. *Streptococcus mutans* is considered to be one of the most important pathogens in the development of dental caries in human. The different toothpastes, powder and natural ingredients were selected

and checked. Among all the toothpastes Colgate, Dantkanti, Anchor were found to be effective.

**156. Microbial production of a solvent, metal ion, detergent and oxidizing agent tolerant amylase using *Pongamia pinnata* cake meal as substrate by solid state fermentation**

**V. Kulkarni, T. Pankajam, A. Das, S. Ghanti and G. Bali,**

Department of Biotechnology

Karnataka State Womens' University, Torvi Bijapur 586109, Karnataka

**Key words:** Amylase, Deoiled *Pongamia* seed cake, Thermostability, Solid state Fermentation

**Abstract:**

*Pongamia pinnata* oil is a strong candidate for biodiesel production. Extracellular amylase production by an isolated fungal strain (KSWUAD) cultivated solely on deoiled *P. pinnata* seed cake (DPSC) as nutrient source was found to be 3500 U/ml after 90 h of incubation at 30°C. The optimum pH and temperature of protease was 13 and 60°C. The enzyme was thermostable retaining about 70% of maximum at 100°C. The compatibility of amylase with certain commercial detergents such as wheel, ariel and surfexcel was shown to be excellent. Moreover, it was active in presence of 1% SDS and 3% Tween 80. Increased enzyme activity and stability was exhibited in presence of ethanol, methanol, toluene, ethylacetate, hexane and acetone. All these results indicate the potentiality of the enzyme in various industrial applications.

**157. Microbial analysis of indian currencies**

**D. Borah, Aradhana**

Center of studies in Biotechnology and Bio informatics, Dibrugarh University,  
Department of Zoology, Dibrugarh Hanumanbux Surajmall Kanoi College,  
Dibrugarh- 786001 (India)

**Keywords:** Pathogenic microorganisms, Paper currencies, Mouth skin disease, Pneumonia, Respiratory track disease.



**Abstract:**

Microbial analysis of 500 Indian currencies collected from people of different categories across the state Assam (India) has shown the presence of various pathogenic microorganisms. The study has shown the presence of various pathogenic microorganisms i.e., *E.coli*, *Pseudomonas sp.*, *Klebsiella sp.*, *Staphylococcus sp.* on Indian paper currencies which are responsible for diarrhea, mouth skin disease, pneumonia, respiratory tract disease.

**158. Uro-Pathogen resistance: a challenge for today**

**S.Husain, Shafique, Y. Mir, M. Rishi**

Department of Microbiology, Guru Nanak Dev University, Amritsar, India  
143005

**Keywords:** Urinary tract infection, *Staphylococcus*, *Pseudomonas sp.* and Chloramphenicol

**Abstract:**

Most commonly occurring uropathogens are *E.coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Staphylococcus* and *Pseudomonas sp.* Most of the isolates from UTI patients examined in our study were found to be resistant to ceftazidime, cefipime, cefixime, ampicillin, aztreonam, oxacillin, lincomycin, trimethoprim, chloramphenicol, and fluoroquinolones. Antibiotic resistance is becoming an alarming problem, is creating new obstacles to effective treatment. This study concludes that present *E.coli* isolate was more sensitive to tobramycin, streptomycin, gentamycin, amikacin, nitrofurantoin, cefoperazone / sulbactam, meropenem, amoxicillin/sulbactam, and nitrofurantoin compared to other antibiotics tested and therefore these drugs may be used in the treatment of UTIs very judiciously.

**159. Comparison of two methods of preparation of bacterial assay stocks and coloring colonies in pneumococcal opsonophagocytic assay**

**M. Kumar, V. Gavade, S. Sargar and S. V. Kapre**

Serum Institute of India Ltd.,  
Pune, Maharashtra, India-411028

**Key words:** Opsonophagocytic assays, effector HL-60, coloring colonies

**Abstract:**

Opsonophagocytic assays (OPA) presents challenges for assay standardization and assay precision due to the multiple biologically active and labile components involved in the assay, including effector HL-60 cells, bacteria and complement. Control of these biologically labile components is critical for consistent assay performance. We tested two methods of bacterial stock preparation referred by two different scientific groups for use in OPA and found similar results when tested by using the monoplex OPAs. Further, we incorporated the coloring colonies in the monoplex assay in order to ease the tedious and cumbersome manual counting of colonies, which we found to give comparable results.

**160. Effect of tannic acid concentration on the bioconversion percentage of tannic acid to gallic acid by *Aspergillus aureus***

**P. Mishra, B. K. Mishra, S.K.Singh and P.K. Singh**  
Department of Environment and Water Management

**Key words:** Tanneries, Tannase, Gallic acid, *Aspergillus aureus*

**Abstract:**

In the present work tannin tolerant fungal strain, *Aspergillus aureus* has been isolated from tannery soil and evaluated for its tannase activity. The strain has the potentiality to produce the enzyme Tannin acyl hydrolase (E.C.3.1.1.20) in presence of the substrate tannin as carbon source in the medium. Minimal medium containing 0.2% tannic acid as the sole carbon source was used for the isolation of the fungal strain. Tannase is an inducible and regulatory enzyme. With the increase in the concentration of tannic acid in the culture broth the production of the enzyme tannase by the *Aspergillus aureus* strain is accordingly enhanced. The enzyme tannase (TAH) catalyses the hydrolysis of ester and depside bonds of hydrolysable tannins to liberate gallic acid and glucose. Gallic acid has undisputed commercial importance. It is a phenolic compound (3,4,5, trihydroxy benzoic acid) and is used mainly in pharmaceutical industries for manufacturing trimethoprim (TMP). The bioconversion in the medium upto 90 mgml<sup>-1</sup>. At this concentration the present conversion is 82. Any further increase in tannic acid concentration results in the decline of percent conversion. This may be either due to toxic nature of tannic acid or due to end product repression. High tannin tolerant *A. aureus* strains can also be used for bioremediation of tannins from tannery effluents and tannin contaminated soils.

**161. Soil microbial consortium in bio-remediation of iron from sponge iron effluent**

**A. Basu, P. Bhattacharyya, R. Mishra,**

**T. Majumdar and A. K. Mitra**

Department of Microbiology,

St. Xavier's College, Kolkata

**Keywords:** Heavy metals (HM), Metal-uptake, Siderophores

**Abstract:**

Soil samples were collected from a sponge iron plant site located at Angadpur road, putatively contaminated with sponge iron effluent. Three locations at distances – 5 m, 10 m and 250 m from the plant were selected for studies of soil micro flora. These showed major differences in physic-chemical characteristics. The Dissolved Oxygen value (in part per million) is highest for the soil sample collected from a distance of 250 meters, while the E.C. value is relatively highest for sample collected from 5 meter distance. Also, it is observed that the iron content of all three samples is high, without any definite correlation. This indicates a multipoint source. Three different colonies of bacteria were isolated, one each from the plates of the three samples of soil (S1, S2, S3). All three colonies were found to be moderately to highly tolerant to iron, and a 100 ppm iron concentration was found to be most suitable for the growth of the organisms. Organisms from S1 showed maximum percentage of iron uptake, with a final residual concentration of 5.2 ppm. This organism was identified by 16s rDNA sequencing and found to be *Bacillus antracis*. This bacterium is a potential pathogen.

**162. Effect of Prebiotics on the Growth and Antibiotic Sensitivity of Probiotics**

**A. Mitra, A. Das, S. Bera, S. Ghosh, R. Chakraborty and K. Sarkar**

Department of Microbiology, St. Xavier's College,

30, Park Street Kolkata – 700 019, West Bengal, India

**Keywords:** Probiotic, Prebiotic, *Lactobacillus*, *Saccharomyces boulardii*

**Abstract:**

Effects of prebiotic molecules FOS, inulin and maltodextrin were determined on growth of the probiotics *Lactobacillus spp.* (*L. casei*, *L. rhamnosus* and *L. plantarum*) and *S. boulardii* *in vitro*. The results showed that Inulin acts as a prebiotic for *S. boulardii* when used at a concentration of 5 x (10% w/v) whereas it has inhibitory effect on the growth of all the three strains of lactobacilli. Maltodextrin has a little effect on the growth of *S. boulardii* but it increases the growth of lactobacilli strain at a concentration of 2x (4% w/v). The prebiotic FOS showed beneficial effect on the growth of *S. boulardii* at a concentration of 1 x (2% w/v) but had no or very little effect on the growth of lactobacilli. The MIC values of the antibiotics Ampicillin, ciprofloxacin and azithromycin were checked against *Lactobacillus spp.* and *Saccharomyces boulardii* both in the presence and absence of a common prebiotic maltodextrin.

**163. Physiochemical Microbial and Pharmacological studies of Zn (II) – Melphalan complex**

**B. Singh<sup>1</sup> J. Mishra<sup>1</sup> and A. Pardhan<sup>2</sup>**

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<sup>2</sup> Department of Chemistry, MVM College, Bhopal (MP)

**Keywords:** Bioinorganic, Anticancer drug, Zinc complex, Polarography, Pharmacology

**Abstract:**

The anticancer drug melphalan and its complex with Zn(II) have been qualitative and quantitative analysed spectrometrically and electrochemically. All the studies has been done in both phase i.e. solid and liquid. On the basis of elemental analysis, IR spectrometry, Polarography and Amperometric methods the probably formula of the compex has been worked out to be 1:2 (M:L). Antimicrobial activity of complex has been determined using Disc diffusion method against various pathogenic bacteria and fungi. Obtained results is in increased inhibition efficiency against the prepared complex, it is presumed that the complex may prove to be more potent as compared to melphalan drug. Pharmacological studies (In-vitro and In-vivo) of prepared drug complex were done on B16F10 myeloma cell and C57BL mice. The observed results revealed that the complex is more potent as compared to the pure drug in all above mentioned activities.

**164. Study of Microbial Biodiversity of Soil from Eight Different Ecosystems: Morphological, Biochemical and Molecular Aspects**

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**Keywords:** Soil biodiversity, Culturable microfauna, Non-culturable microfauna, gDNA, PCR

**Abstract:**

With an aim to isolate and identify new microbial strains producing industrially important enzymes, several morphological studies including microscopic study of the population, enzymatic assay and molecular analysis of the soils by isolating genomic DNA both from the culturable and non-culturable soil microorganism and PCR analysis with 16srRNA primers were done. These studies were done from eight different soils samples, six from highly fertile agricultural ecosystem and two from contaminated region. In morphological and functional studies, traditional microbiological techniques were applied including Gram staining procedure IMViC test and different enzyme assay. To study the non-culturable microorganisms, DNA analysis techniques were applied. Here, we have been able to isolate good quality gDNA by kit. The DNA is also PCRable as strong bands were obtained after the MgCl<sub>2</sub> concentration was standardized.

**165. High content of aflatoxin among the indigenous foods as possible risk factor for liver cancer? An experience from assam**

**S. Medhi,<sup>1\*</sup> M. P Sarma,<sup>2</sup> M. Bhattacharjee,<sup>2</sup> Md. G.. Idris,<sup>2</sup> M. Deka<sup>1</sup> and G. Ahmed<sup>2</sup>**

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**Key Words:** Aflatoxins, Mycotoxins, Food, *A. flavus*

**Abstract:**

Aflatoxins are naturally occurring mycotoxins produced mainly by *A. flavus* and *A. parasiticus* in which aflatoxins B1 is the most potent. Seasonal variation and climatic condition of Assam has been found to be favourable for aflatoxins producing fungi. To analyze total aflatoxins content in various indigenous food item from commercial market of Assam as well as AFB-N7 guanine levels among healthy population. A total of thirty food samples consumed by indigenous people of Assam is been analyzed for aflatoxins content during the rainy season. The highest aflatoxins were detected in *Colocasia esculenta* (L.) >6500 ppb followed by *Houttuynia cordata* (Thumb) > 5600 ppb and *Oxalis corniculata* (L.). In urine 8% of the healthy population has been detected for AFB-N7 guanine levels above the permissible limit of 30 ppb as prescribed for India. High content of aflatoxins in some of the commonly used food item and urine sample of assam need further evaluation as possible risk factor in liver disease patients.

## vii. Biomedical

### 166. The oxidant challenge faced by erythrocytes during storage

**S. Khatai, K. Kumari, V. Kumar K, A. K. Koushik and V. Rajashekhariah**

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**Key words:** Stored blood, Erythrocytes, Malondialdehyde, Protein oxidation products.

**Abstract:**

Effective, prolonged *in vitro* storage of red blood cells is an essential requirement for inventory management of each nation's blood supply. Blood undergoes metabolic and structural deterioration during storage. The current study was conducted to determine the changes in erythrocytes during the storage. Different reliable markers were used to determine the changes during the storage- i.e. lipid peroxidation and protein oxidation. The oxidant markers have statistically shown insignificant differences as observed in our study. This clearly indicates that the erythrocytes are capable of attenuating ROS with two weeks of storage. Therefore blood stored for two weeks under blood bank conditions may be safe for transfusion.

### 167. Haemoglobinopathies in Odisha, India

**N. Satapathy<sup>1</sup>, Y. Archana<sup>1</sup>, S. Mishra<sup>2</sup>, N.C. Dash<sup>2</sup> and B.P. Dash<sup>1</sup>**

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**Key words:** Molecular markers, Medicinal plants diversity, Polymorphism, Amplification

**Abstract:**

525 suspected cases of different haemoglobinopathies belonging to both sexes, from different regions of the state of Orissa, were investigated to know the spectrum, distribution, and biology of these health problems. The various types of haemoglobinopathies such as Sick cell trait, homozygous sickle cell anaemia, sickle cell- $\beta$  thalassaemia have been observed. About 75% of the total numbers of patients were below 30 years of age. A large proportion of these anomalies were found among the general caste people rather than among the tribal population. The mean foetal haemoglobin of sickle cell disease patients of Sundergarh region has been observed to be higher than the similar patients of other regions of Odisha. The mean values of total haemoglobin in beta thalassaemia patients of Bhubaneswar and Balasore have been found to be 5.6g/dl and 5.2g/dl respectively. This study provides comprehensive information on haemoglobinopathies in the state.

**168. Abnormality in body fluid level and its relative to the onset of various health problems**

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**Key words:** Animal health problem, Body fluid, pH, Infection

**Abstract:**

Acids/metals of various nature regulate level of cellular pH. A significant change in their concentration modifies pH level and adversely effect structure, function and nutrition level of specific cell systems. A nutritionally deficient cell attracts environmental infection during onset of a health problem. The onset of a health problem depends upon (i) nature of level of change in concentration of Acid/metal (ii) Nature of cell system involved (iii) Characteristic of invading infection. The restoration of normalcy in abnormal level of body fluid pH during clinical management of a sufficient disease is errespective of any nature of disease causing factor



**169. Circulating angiogenic factors and their association with birth outcomes in preeclampsia**

**Asmita Kulakarni, Savita Mehendale\*, Hemlata Yadav, Anitha Kilari, Sadhana Joshi**

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**Key words:** VEGF, sFlt-1, birth outcome, oxidative stress, preeclampsia

**170. Pregnancy through assisted reproductive techniques: Challenge to infertile women**

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5. Indian Institute for Medical Technology, Calcutta

**Key words:** Assisted reproductive technology, Ovum pick-up, Embryo transfer

**Abstract:**

Published literatures and findings from different studies have confirmed that the use of ART has become a reasonable solution of infertile women but current practice of ART worldwide is not continued in counseling and treating couples in prognosis of the disease rather it offers a better technological service to overcome the childlessness. Improve the quality of treatment in achieving pregnancy in women with the usage of the reproductive technology for e.g. ovum pick-up, embryo transfer, cryopreservation of embryo to name a few in the background of invitro fertilization. The present paper analyses the effect of treatment protocol followed by the day of using ovum-pick-up technique which seems plausible to have a relation with the BMI. Technology further opens the possibility in

cryopreserving the gametes and embryos as well which benefits many infertile women to conceive followed by the live birth.

### **171. Assistive Technology for Visually Impaired Persons**

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**Keywords:** Visually Impaired Persons, Thermoform Brailon Duplicator, Braille Translation, Index braille printer

**Abstract:**

Technology has removed many barriers to education and employment for visually impaired individuals offering tremendous range of careers because of the use of computers and other devices. Students who are visually impaired access a computer using a screen reader and speech synthesizer. Braille Translation and Editing Software with Index braille printer automatically transforms electronic text files into electronic braille files, and braille editing or word processing software is used to edit these files. CCTV is a television video camera combination used by visually impaired students to magnify the print in books and newspapers into 25 times. It can also be used to write letters, and checks, and do different types of crafts like needlepoint. The vacuum-forming machine “Thermoform Brailon Duplicator produces inexpensive and durable copies of braille and other tactile originals on solid plastic film. This paper highlights a range of technological devices and equipment used for visually impaired persons.

**172. Amyloidogenesis of A $\beta$  and its poly-N-methylated peptide inhibitors**

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**Keywords:** Amyloid  $\beta$ -peptide, Aggregation, Alzheimer, *Drosophila melanogaster*

**Abstract:**

Aggregation of the amyloid  $\beta$ -peptide (A $\beta$ ) into different oligomeric forms and amyloid-like fibrils is associated with toxic events of Alzheimer's disease. We used hexapeptides with varying extents of N-methylation, to target regions that constitute  $\beta$ -strands in the A $\beta$  fibrils, i.e. residues 16-21 and 32-37, and compared their ability to reduce fibril formation. The peptides' effects were also monitored by oligomer-specific ELISA, CD spectroscopy, cell viability assay and on the longevity and locomotor activity of *Drosophila melanogaster*, expressing human A $\beta$ 1-42 in their central nervous system. The results show that peptides, designed to target both these regions, inhibited fibril formation and attenuated toxicity.

*Section XII : New Biology*



**99<sup>th</sup> Indian Science Congress**

**January 3-7, 2012, Bhubaneswar**

**VI**

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## PAST SECTIONAL PRESIDENTS

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P R Sudhakaran	(2008)	P K Ray	(1998)
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