NIAB
National Institute of Animal Biotechnology

एन आई ए बी
राष्ट्रीय पशु जैव प्रौद्योगिकी संस्थान

# Annual Report
## वार्षिक प्रतिवेदन
## 2012-2013

मानव कल्याण के लिए पशु स्वास्थ्य

Animal Health for Human Welfare

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# Director's Message

Director's Message

It gives me great pleasure to present the second annual report of National Institute of Animal Biotechnology (NIAB), an autonomous institute of the Department of Biotechnology, Ministry of Science and Technology, Government of India, for the year 2012-13.

The vision of NIAB is to produce globally competitive livestock products, pharmaceuticals and biologicals for animal health and productivity through innovative technologies. A key feature of NIAB is that it will function as an incubator for start-up companies and will also act as a national repository of biotech products and processes and promote bio-entrepreneurship in the country.

The research focus is on Animal Genetics & Genomics, Bioinformatics, Transgenic and Animal Biotech Products, Reproductive Biotechnology, Infectious Diseases, and Nutrition Enrichment. Among other activities, the institute aims at research leading to the development of vaccines, diagnostics and improved therapeutic molecules for farm animals.

During the last one year, efforts were made to build the main campus in the 100 acres of land allotted by the Government of Andhra Pradesh within the campus of University of Hyderabad. HSCC has been appointed as the Project Management Consultant, which has initiated the process of building the compound wall and appointment of architect. We are hopeful that the designs will be completed and construction work starts by the end of 2013.

NIAB was located within the C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS). Currently, NIAB is moved and located in a rented building near University of Hyderabad campus. While the laboratories are being established, the scientists have been associated with the on-going collaborative projects undertaken by the faculty from University of Hyderabad, Sri Venkateswara Veterinary University & Project Directorate on Poultry.

NIAB was involved in the organization of seminars/workshops/conferences/invited lectures in the areas of relevance to livestock health and productivity. This includes the "16th ADNAT Convention", organized in collaboration with C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS) and University of Hyderabad from 6th - 19th December, 2012. The convention had 11 days of hands on workshop on “Genomics and Beyond” and 3 days of conference on “Animal Genetics and Genomics”. The convention stands as a testimony to the NIAB’s philosophy of working together. The convention could attract the leading scientists in the country and abroad from the academy and industry for imparting hands on training to the participants of the workshop and deliberate on the current developments in the area of animal genetics and genomics.

NIAB also has organized multi-stakeholders workshops in different parts of the country on various thematic areas of relevance by involving different stakeholders at field level, Universities, Institutes, NGOs, Industries and Government Bodies. The key recommendations of these workshops are being brought out in the form of a report.

The focus of the scientists recruited so far is on infectious diseases-bacterial, viral and parasitic, specifically on host – pathogen interactions, inflammation and immunity. I am hopeful that we will be able to attract the best talent to work on other areas like animal genetics and genomics, reproduction & breeding, animal nutrition, and bioinformatics. Efforts are under progress to offer M.Sc program in Quantitative Genetics and Genomics in association with University of Hyderabad and Roslin Institute, University of Edinburgh, Scotland.

I sincerely acknowledge the support and encouragement received from the Department of Biotechnology, the distinguished members of the NIAB Society, Governing Body, Scientific Advisory Committee, Finance Committee and Building Committee. The immense support received from University of Hyderabad administration, faculty of School of Life Sciences, C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS), CCMB and CDFD is deeply acknowledged. I also acknowledge the contributions of highly dedicated staff of NIAB in meeting the challenges with limited resources. I sincerely hope and wish the continued support and encouragement in the years to come in shaping the budding institute and achieve excellence.

**Prof. P. Reddanna**

## National Institute of Animal Biotechnology

NIAB is aimed to harness novel and emerging biotechnologies and take up research in the cutting edge areas for improving animal health and productivity. The Institute's focus of research will be on Animal Genetics and Genomics, Transgenic Technology, Reproductive Biotechnology, Infectious Diseases, Bioinformatics and Nutrition Enrichment. The institute aims at translational research leading to the development of novel vaccines, diagnostics and improved therapeutic molecules for farm animals. The Institute plans to promote bio entrepreneurship by providing support environment for commercial tenants involved in the development of farm animal based products.

## Mission & Vision

### Mission

Development of sustainable and globally competitive livestock industry through innovative technology.

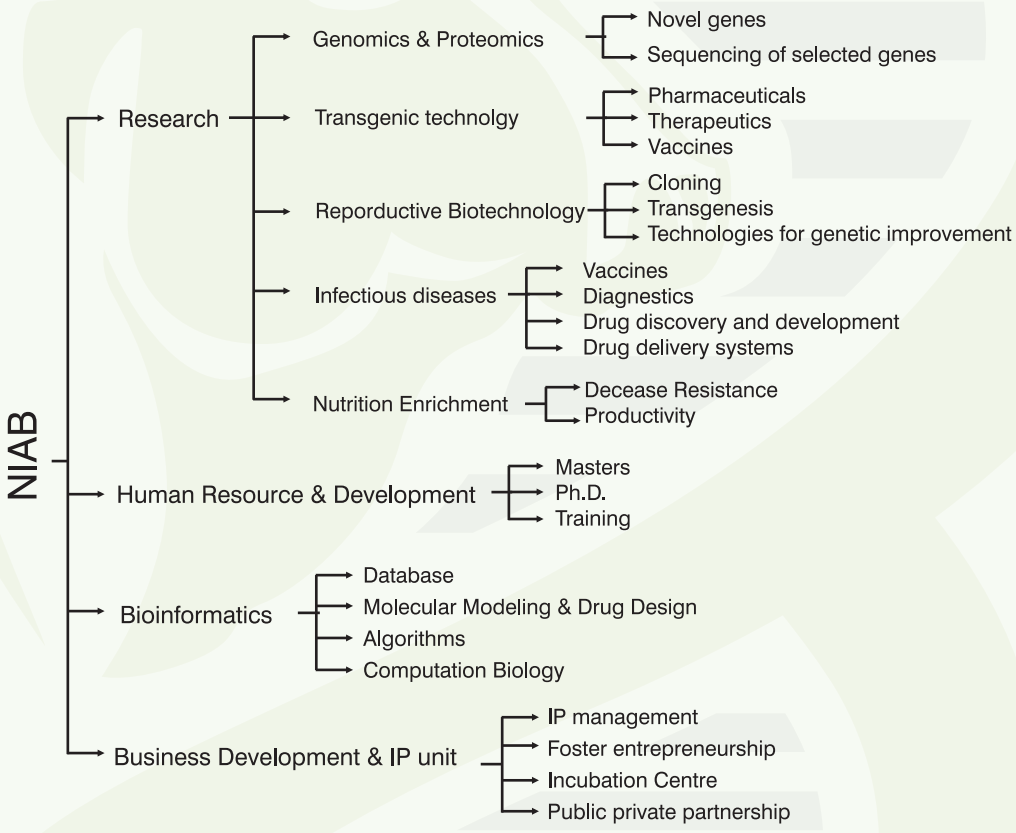
### Vision

To demonstrate excellence in promoting and commercializing leads in biotechnology and to produce globally competitive livestock products, pharmaceuticals and biologicals for animal health and productivity.

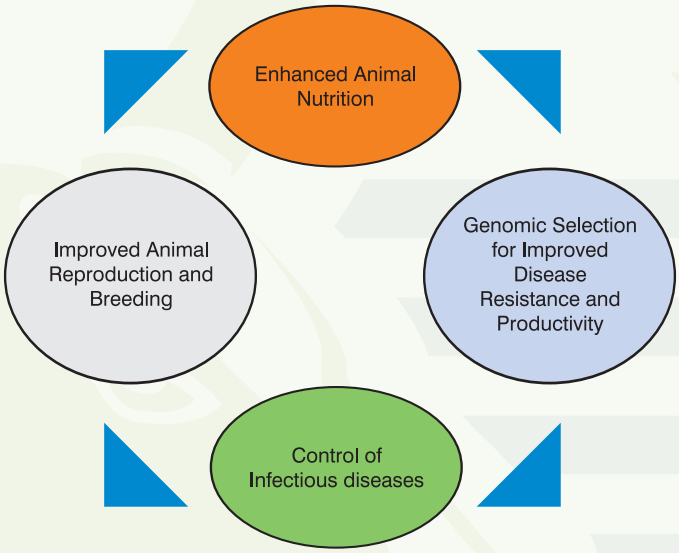
**Focus**

- To take up research in the cutting edge areas for improving animal health and productivity.
- The institute aims at translational research leading to the development of novel diagnostics, vaccines and improved therapeutic molecules for farm animals.
- The key feature is that it will function as an incubator for start-up companies and promote bio-entrepreneurship.

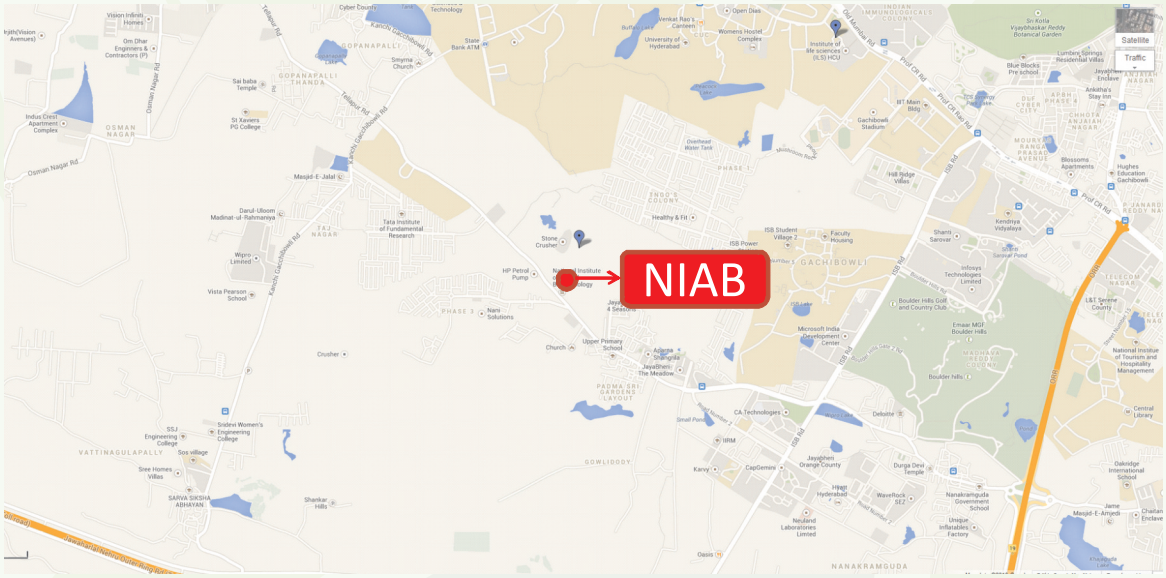
## Proposed Activities



## Research Focus




## Location of Main Facility



NIAB main facility is coming up in 100 acres of land allotted by the Government of Andhra Pradesh at Survey No. 37 of Gopanpally village, Serilingampally, R.R. District, within the campus of University of Hyderabad.

Neighbouring institutes include Tata Institute of Fundamental Research, International Institute of Information Technology, Indian Immunologicals, Acharya N.G. Ranga Agricultural University, Centre for Cellular and Molecular Biology, Centre for DNA Fingerprinting and Diagnostics and Indian Institute of Chemical Technology.

## Interim Laboratory Facility


NIAB is currently functioning from interim R&D labs and office at Miyapur, Hyderabad. NIAB's R&D laboratory facility (23,200 SFT) includes research labs for r-DNA works, culture rooms for microorganisms and animal cells, Biosafety level-2 (BSL-2) plus laboratory to work on infectious pathogens, instrumentation rooms, and a bioinformatics laboratory. This facility includes two well equipped research labs (~800 SFT each); 5 culture rooms equipped with Class II Type A2 biosafety cabinets for handling bacteria, yeast, protozoa, virus & mammalian cells; 2 autoclave & wash rooms with proper waste disposal plans. NIAB has a BSL-2 plus laboratory (~500 SFT) for handling aerosol transmitted infectious pathogens. BSL-2 plus facility constitutes 4 change rooms and 2 research labs which are under negative pressure and equipped with Class II Type B2 biosafety cabinets and HEPA filters with air quality of class 10,000 (ISO-7).

## INTERIM LABORATORY FACILITY

Instrumentation Facility at NIAB includes the following major analytical Instruments.

### Confocal Microscopy

State of the art confocal facility includes confocal microscope for advanced fluorescent sub-cellular imaging.

### Flow Cytometry Facility

### This facility includes

1) FACS Cell Sorter,
2) Cell Analyzer

### High Performance Liquid Chromatography (HPLC)

1) Analytical HPLC
2) Preparative HPLC

### Multimode Plate Reader

### Centrifuges

1) Ultracentrifuge
2) High Speed Centrifuge

### UV/VIS Spectrophotometer

### Instrumentation facility includes following other minor instruments

Centrifuge RT Table Top; Thermal Cycler; Electroporator; Thermomixer Comfort; Orbital Shaker; Centrifuge Table Top; Automated Cell Counter

# Research Programmes

## Infectious Diseases

***Eicosanoids and Inflammation in host-pathogen interactions***

**- Prof. P. Reddanna**

Inflammation is a necessary response of the host to invading pathogens to mediate removal of microbes or irritants and restore the tissue to its normal function. However, sometimes this process goes awry and the tissue fails to undergo resolution of the inflammation and results in the onset of chronic inflammatory diseases such as allergy, asthma, autoimmune diseases, rheumatoid arthritis, prostatitis, nephritis, mastitis and even in cancer.

Eicosanoids, the oxygenated metabolites of arachidonic acid formed via the cyclooxygenase (COX) and lipoxygenase (LOX) pathways, are known to be important regulators of both the onset and resolution of inflammatory processes. The main focus of our group is to understand how these compounds regulate both the development and resolution of inflammation and design safer and more effective anti-inflammatory drugs.

### Professional Contributions

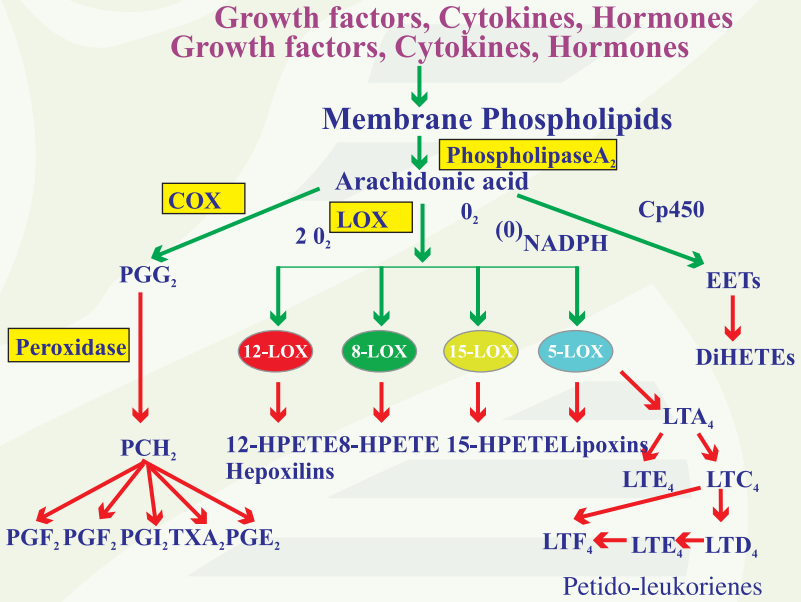
Published around 150 papers in peer reviewed journals. Guided 35 students for Ph.D and trained more than 100 students for M.Sc projects. Completed over 20 projects funded by Government agencies like DST, DBT, CSIR, UGC and ICMR and various International agencies and undertaken projects from leading Pharma and Biotech companies like Dr. Reddy's Labs, Dabur Research Foundation, Indian Immunologicals, Shantha Biotech, Natco Pharma, Onconova Therapeutics, ABL Technologies, Surya Pharmaceuticals, Celestial Labs and Laila Impex. Instrumental in the initiation of M.Sc Animal Biotechnology course in the Department of Animal Sciences, University of Hyderabad. Founder co-ordinator of Centre for Biotechnology at University of Hyderabad.

### *Host-Pathogen Interactions: Role of Eicosanoids in Inflammation*

The inflammatory response is a complex cascade of non-specific events resulting in excessive generation of inflammatory mediators such as cytokines, C-reactive protein and nitric oxide by cells of the innate (macrophages, monocytes, neutrophils) and adaptive (T lymphocytes) arms of the immune system. These occur as a result of increased blood flow, increased permeability across blood capillaries which permits large molecules (e.g. complement, antibodies, and cytokines) to leave the bloodstream and cross the endothelial wall, and increased movement of leukocytes from the bloodstream into the surrounding tissue. Uncontrolled inflammation, however, is now appreciated in the pathogenesis of many diseases that were not previously considered classic inflammatory diseases. These include atherosclerosis, respiratory diseases, cardiovascular diseases, diabetes, cancer, asthma and several neurological disorders, such as Alzheimer's disease and Parkinson's disease. Inflammation leads to several diseases in cattle such as Bovine Respiratory Disease (BRD), endotoxaemia resulting from infection of the mammary gland (mastitis), the reproductive tract (metritis), the lungs (pneumonia), etc.

Eicosanoids, the oxygenated metabolites of eicosapolyenoic fatty acids such as arachidonic acid (AA) (Fig 1), have been the most actively studied of all the physiological components contributing to inflammation.

**Fig. 1: Arachidonic acid cascade leading to the formation of Eicosanoids**

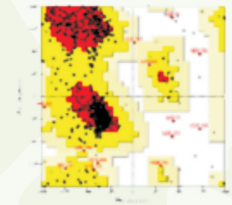


Arachidonic acid generated from cellular membrane phospholipids gets oxygenated by either the cyclooxygenase (COX) pathway that generates prostaglandins (PGs) or the 5-lipoxygenase (5-LOX) pathway that forms a hydroperoxy derivative, 5-hydroperoxy eicosatetraenoic acid (5-HPETE). The 5-LOX pathway has received much attention because of its involvement in pro-inflammatory leukotriene synthesis and its potential as a therapeutic target. It has been associated with a variety of inflammatory diseases including asthma, atherosclerosis, rheumatoid arthritis, pain, cancer and liver fibrosis. Together, eicosanoids contribute to the inflammatory reaction at all steps.

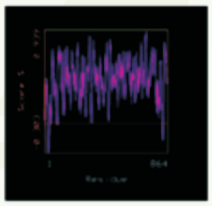
The focus of our group is to understand the role of eicosanoids in inflammation and in anti-inflammatory drug discoveries by conventional screening of natural/synthetic molecules by manual/HTS (Fig 2), as well as rational drug design approaches (Fig.3).

**Fig. 2: Natural Products as Anti- Inflammatory Agents**

## Fig. 3: Design, Synthesis and Biological Evaluation of 5-LOX Inhibitors

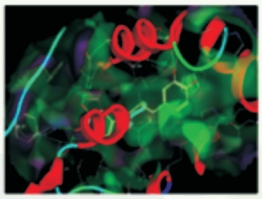


Ramachandran Plot of the 5-LOX model



Profile-3D graph of the 5-LOX model

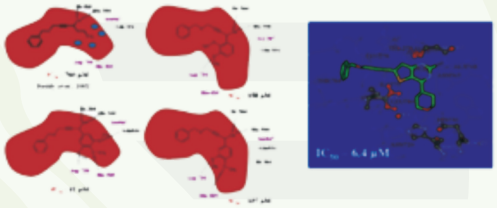
5-LOX model



Interactions of inhibitor with 5-LOX

*Scheme of site-point methods*

*The molecules designed and their molecular properties (S1-4). All the molecules follow Lipinski's rule of 5*



This study is a sucessful example reported for the inhibitor design of 5-LOX using the de novo design strategy.

A molecule of $IC_{50}$ of 760 µM was optimized to a more potential molecule with $Ic_{50}$ of 6.4 µM. Site- it can be further used in developing a very potential 5-LOX inhibitor.

*Aparoy et at. (2008) J Compur aided Mol Des 22, 611-619*

Currently we are evaluating various natural and synthetic anti-inflammatory drug candidates in overcoming antibiotic resistance and in understanding the molecular mechanisms involved.

## Brucellosis

**Dr. Girish K. Radhakrishnan**
Scientist D
Email: girish@niab.org.in

Dr. Girish K Radhakrishnan received his PhD in Biotechnology from School of Biotechnology, Madurai Kamaraj University in 2006. He did his postdoctoral research at the University of Wisconsin-Madison in the areas of microbiology and immunology. He joined the National Institute of Animal Biotechnology in December 2012 as Scientist D. His research interests include understanding the virulence mechanisms of the infectious intracellular bacterial pathogen, Brucella, analysis of host immune responses to Brucella infection and development of novel vaccines and diagnostic tools for animal and human brucellosis.

### Recent Publications

Radhakrishnan G, and Splitter G (2012) Modulation of host microtubule dynamics by pathogenic bacteria. Biomolecular Concepts 3 (6), 571–580.

Gupta VK, Radhakrishnan G, Harms J, Splitter G (2012) Invasive *Escherichia coli* vaccines expressing *Brucella melitensis* outer membrane proteins 31 or 16 or periplasmic protein BP26 confer protection in mice challenged with B. melitensis. Vaccine 30, 4017-4022.

Durward M, Radhakrishnan G, Harms J, Bareiss C, Magnani D and Splitter G (2012) Active evasion of CTL mediated killing and low quality responding CD8+ T Cells contribute to persistence of Brucellosis. PLoS ONE 7(4): e34925.

Radhakrishnan G, Harms J and Splitter G (2011) Modulation of microtubule dynamics by a TIR domain containing protein from an intracellular pathogen Brucella. Biochemical Journal 439 (1) 79-83.

Radhakrishnan G and Splitter G (2010) Biochemical and functional analysis of TIR domain-containing protein from *Brucella melitensis.* Biochemical and Biophysical Research Communications 397(1) 59-63.

Radhakrishnan GK, Yu Q, Harms J S and Splitter GA (2009) Brucella TIR domain-containing protein mimics properties of the toll-like receptor adaptor protein TIRAP. Journal of Biological Chemistry 284(15): 9892-9898.

## Host- Parasite-Vector interactions

**Dr. Anand Srivastava**

Scientist C

Email: anand@niab.orgin

Dr. Anand Srivastava received his PhD (2008) in Parasitology (Biochemistry and Molecular biology) from Jawaharlal Nehru University (worked at International Centre for Genetic Engineering and Biotechnology). He did his first post-doctoral work in Parasitology at Institut Pasteur, Paris, from 2008-2011. In 2011, he joined Institut National de Transfusion Sanguine, Paris, for second post-doctoral work. He joined the National Institute of Animal Biotechnology in January 2013 as Scientist C.

Dr. Anand Srivastava is interested in understanding the molecular mechanisms involved in Host-Parasite-Vector interactions. Understanding of such molecular mechanisms would provide insight into the key events required for survival of parasite. Furthermore, targeting these interactions would help in developing strategies for vaccine and diagnostic kits. Presently, the focus of his group is on Babesiosis (or tick fever) caused by the parasite Babesia which requires cattle as a host and tick as a vector. Dr. Anand aims to develop vaccine and diagnostic kits against Babesia and tick vaccine against the vector (tick).

### Recent Publications

Srivastava A, Gangnard S, Dechavanne S, Amirat F, Lewit-BentleyGA, Bentley GA and Gamain B (2011) Var2CSA minimal CSA binding region is located within the N-terminal region. PLoS One 6(5):e20270.

Rathore S, Jain S, Sinha D, Gupta M, Asad M, Srivastava A, Narayanan MS, Ramasamy G, Chauhan VS, Gupta D and Mohmmed A (2011) Disruption of a mitochondrial protease machinery in *Plasmodium falciparum* is an intrinsic signal for parasite cell death. Cell Death and Disease2:e231.

Avril M, Hathaway MJ, Srivastava A, Dechavanne S, Hommel M, Beeson JG, Smith JD and Gamain B (2011) *antibodies to a full-length var2csa immunogen are broadly strain-transcendent but do not cross-inhibit different placental-type parasite isolates.* PLoS ONE 6(2):e16622.

Srivastava A, Singh S, Dhawan S, Alam MM, Mohmmed A and Chitnis CE (2010) Localization of Apical Sushi Protein in *Plasmodium falciparum* merozoites. Mol Biochem Parasitol 174(1):66-9.(Contributed to cover pager image)

Srivastava A, Gangnard S, Round A, Dechavanne S, Juillerat A, Raynal B, Faure G, Baron B, Ramboarina S, Singh SK, Belrhali H, England P, Lewit-Bentley A, Scherf A, Bentley GA and Gamain B (2010) Full-length extracellular region of the var2CSA variant of PfEMP1 is required for specific, high-affinity binding to CSA. PNAS 107(11):4884-9.

## Animal Viruses and Reverse Genetics Technology

**Dr. Madhuri Subbiah**

Scientist C

Email: madhuri@niab.org.in

Dr. Madhuri Subbiah is a veterinarian by profession and received her Ph.D. in Molecular Virology from University of Maryland, College Park in Maryland, USA, in 2010. During her doctoral studies, she characterized Avian Paramyxovirus serotype 2 (APMV-2) strains and also established reverse genetics system for APMV-2 prototype strain Yucaipa. Dr. Madhuri had previously worked as Deputy Manager, Platform Technologies, Anthem Biosciences Pvt. Ltd., Bangalore, where she and her team developed novel cell based high throughput enabled assays for drug screening. She joined the National Institute of Animal Biotechnology (NIAB) in November 2012 as Scientist C.

Her research interests are to understand the molecular mechanisms of viral pathogenesis, to comprehend host-pathogen interactions and virus evasion of host immune response. Her major focus at NIAB will be to use reverse genetics as a tool to understand host-pathogen interaction and apply this knowledge for developing on-farm viral diagnostics and novel vaccines.

### Recent Publications

Rajakrishna L, Krishnan Unni S, Subbiah M, Sadagopan S, Nair AR, Chandrappa R, Sambasivam G and Sukumaran SK (2013) Validation of a human cell based high-throughput genotoxicity assay 'Anthem's Genotoxicity screen' using ECVAM recommended lists of genotoxic and non-genotoxic chemicals. Toxicol In Vitro pii: S0887-2333(13)00179-3. Doi: 10.1016/j.tiv.2013.06.027.

Xiao S, Khattar SK, Subbiah M, Collins PL and Samal SK (2012) Mutation of the F protein cleavage site of avian paramyxovirus-7 results in furin cleavage, fusion promotion and increased replication in vitro, but not increased replication, tissue tropism, or virulence in chickens. Journal of Virology 86(7): 3828-3838.

Kim SH, Subbiah M, Samuel AS, Collins PL and Samal SK (2011) Roles of the fusion and hemagglutinin-neuraminidase proteins in replication, tropism, and pathogenicity of avian paramyxoviruses. Journal of Virology 85(17):8582-8596.

Subbiah M, Khattar SK, Collins PL and Samal SK (2011) Mutations in the fusion protein cleavage site of avian paramyxovirus serotype 2 increase cleavability and syncytium formation but do not increase viral virulence in chickens. Journal of Virology 85(11):5394-5405.

Samuel AS, Subbiah M, Shive H, Collins PL and Samal SK (2011) Experimental infection of hamsters with avian paramyxovirus serotypes 1 to 9. Veterinary Research 42(1):38.

## Genetic basis of diseases in domestic animals

**Dr. Paresh Sharma**

Scientist C

Email: paresh@niab.org.in

Dr. Paresh Sharma received his PhD (2010) in Molecular Parasitology from BITS Pilani, Rajasthan (worked at National Institute of Pathology). He did his post-doctoral work in Malaria Biology at NIAID, National Institute of Health, USA from 2010-2013. He joined the National Institute of Animal Biotechnology in January 2013 as Scientist C.

Dr. Paresh's research interest is in understanding the livestock genome that will allow to understand the genetic basis for disease in domestic animals and could result in healthier production of milk and meat while reducing producers' dependence on antibiotics. His focus is also on developing tools for diagnosis and cure of major protozoan disease like Babesiosis and Theileriosis in Indian cattle. He is also keen to develop rapid diagnostic kit for various livestock diseases.

### Recent Publications

Pillai AD, Addo R, Sharma P, Nguitragool W, Srinivasan P and Desai SA (2013) Malaria parasites tolerate a broad range of ionic environments and do not require host cation remodeling. Mol Microbiol doi: 10.1111/mmi.12159.

Nguitragool W, Bokhari AAB, Pillai AD, Rayavara K, Sharma P, Turpin B, Aravind L, and Desai SA (2011) Malaria parasite clag genes determine nutrient uptake channel activity on infected red blood cells. Cell 145: 665–677.

Gannavaram S, Sharma P, Duncan RC, Salotra P and Nakhasi HL (2011) Mitochondrial associated ubiquitin fold modifier-1 mediated protein conjugation in Leishmania donovani. PLoS ONE 6(1): e16156.

Sharma P, Gurumurthy S, Duncan R, Nakhasi HL and Salotra P (2010) Comparative *in vivo* expression of amastigote up regulated Leishmania genes in three different forms of Leishmaniasis. Parasitology International 59(2):262-4.

# On-going Collaborative Research Programmes

**Project 1**

Studies on Epigenetic Regulation during Lactation and its Impact on Milk Biosynthesis.

Sreenivasulu Kurukuti[1] (PI), Manavathi Brahmanandam[1] (Co-PI), Paresh Sharma[2] & Sailu Yellaboina[3]

1. School of Life Sciences, University of Hyderabad,
2. National Institute of Animal Biotechnology,
3. C.R. Rao Advanced Institute of Mathematics, Statistics & Computer Science (AIMSCS).

**Background:**

Genome wide expression profiling unravels epigenetic regulation of all the gene in HC11 normal, primed and Prolactin-induced cells. From the literature, it is found that numerous genes and pathways (both regulatory and functional) are involved in differentiation of mammary epithelial cells (MEC). Around 20,000 genes are compared between differentiated and un-differentiated cells from which 998 genes showed two fold changes in differentiated state. Gene expression profiling will cluster the up/down regulated genes during lactogenic differentiation based on hormones, transcription factors and regulators. It is revealed from proteomic study in HC11 cells that differential expression of several transcription factors, having the potential to regulate MEC differentiation/development as well as proteasome subunits, hnRNPs and HSPs, depends on nuclear protein changes in HC11 cells. It has been identified that expression pattern of approximately 60 proteins has been changed in undifferentiated and differentiated cells. Hence DNA methylation/acetylation pattern and histone modification studies will uncover the details in epigenetic regulation during lactation. It is shown that Connective Tissue Growth Factor (CTGF/CCN2) enhances lactogenic differentiation of MEC which is evidenced by five-fold increase in expression level confirmed by DNA-Microarray. Spatial organization of β-Casein and Wap gene loci will show its genome wide intra and inter chromosomal interactions. Ramp3–Wap–Tbrg4 locus along with the three MAR (Matrix Attachment Regions) and TSS site (near Tbrg4) regulates the expression of Wap gene during lactation.

**Work carried out so far**

- Establishment of HC11 cell lactogenic differentiation system by Prolactin treatment (Fig 1).
- Gene expression profiling in mammary epithelial cells (HC11) in response to Prolactin signaling (Fig. 2 & 3).
- Spatial organization of β-Casein and Wap gene loci in normal and Prolactin induced cells (Fig 5).
- Bioinformatic and computational pipeline for the analysis of RNA-seq, 4C-Seq, HiC and ChIP-seq data sets (Fig 6, 7, 8, 9).
- Optimization and generation of ChIP-seq/3C/4C/HiC libraries from normal, primed and PRL induced cells.

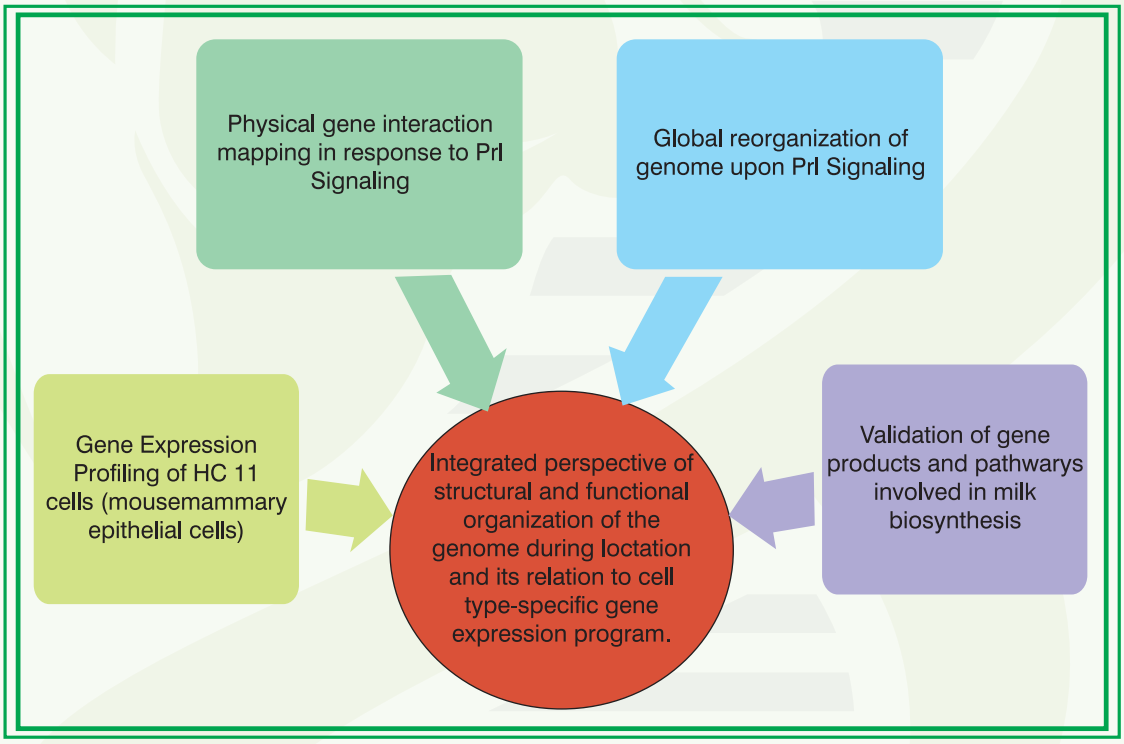


**Fig 1: Establishment of HC11 Cell Culture System (Ms. Swetha Kumari A)**

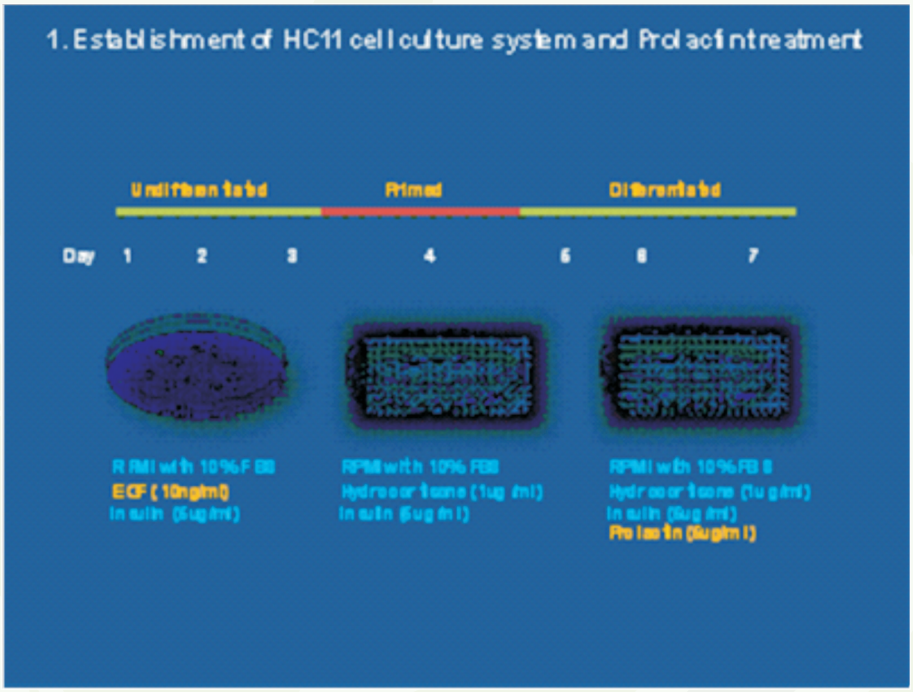



**Fig 2: Gene expression profiling in HCII cells in response to prl signalling (Mr. Trinadha Roa Sornapudi)**

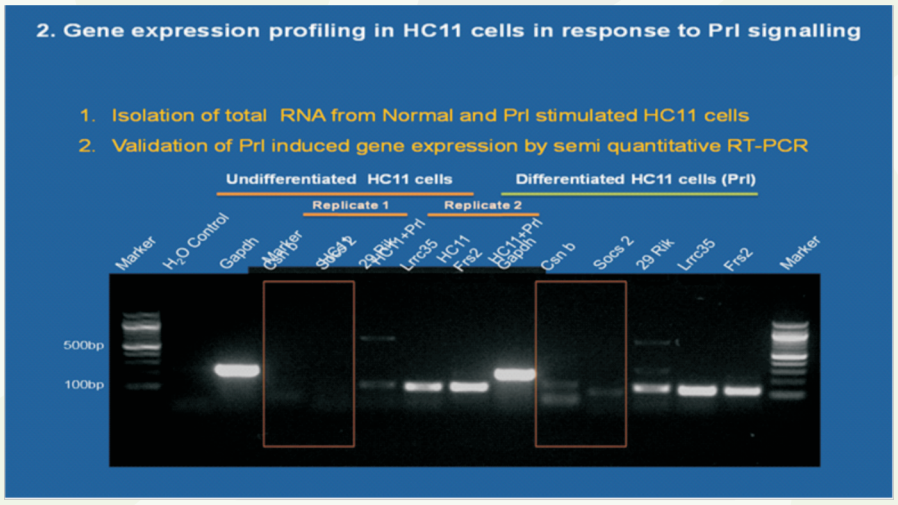


**Fig 3: Casein gene expression in response to prl signalling (Mr. Trinadha Roa Sornapudi)**

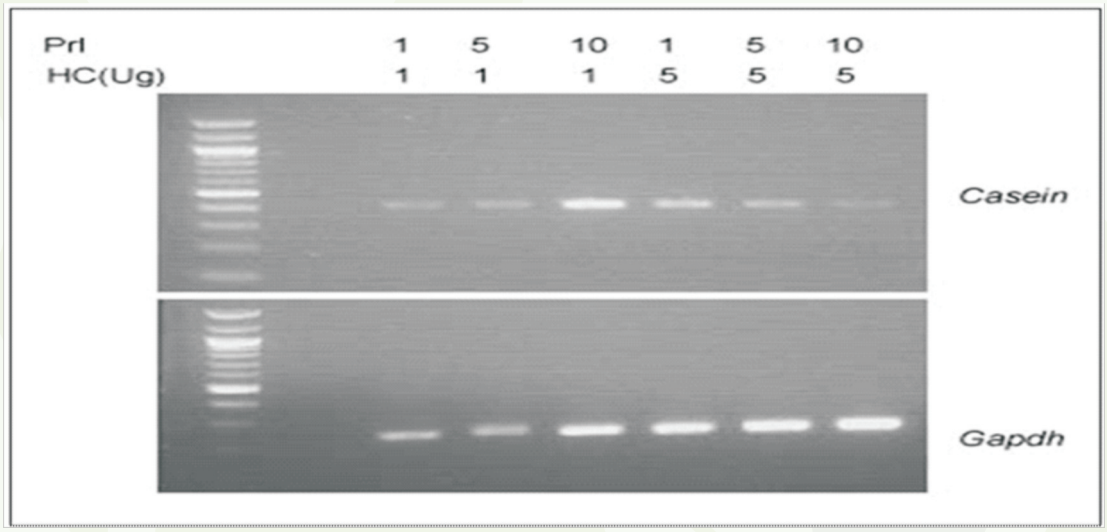



**Fig 4: Immunofluorescence for RNA-Pol-II in Hc11 cells (Ms. Swetha kumari A)**

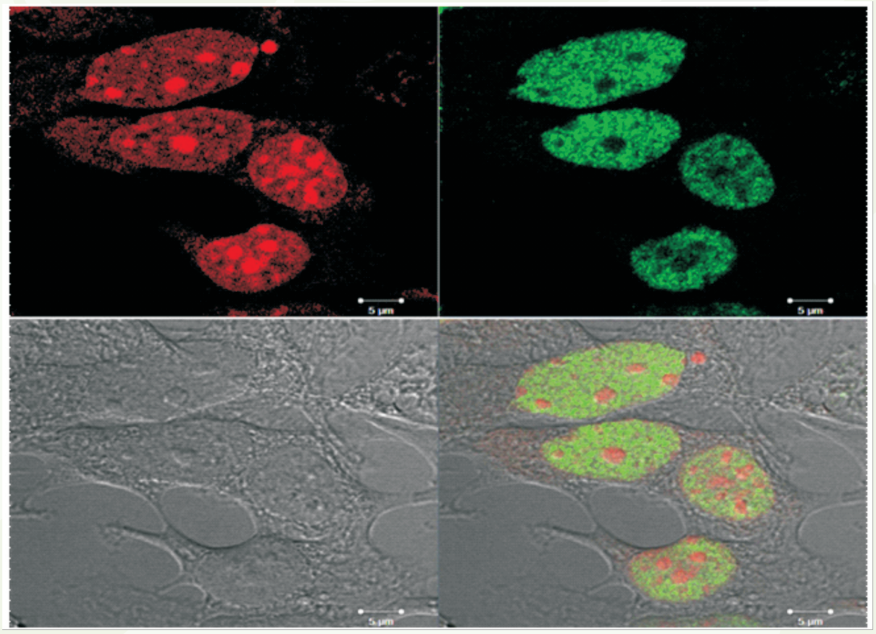
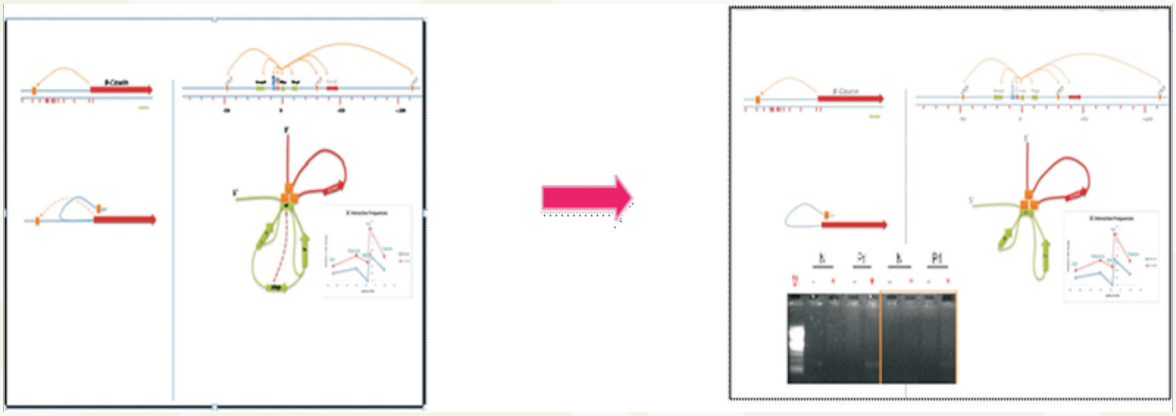


**Fig 5: Spatial organization of Casein and Wap gene locI**
**(Mr. Anandha Rao Ravula, Ms.Y.A.S.Tulasi)**



Development of NGS Pipeline: It assembles all the next generation sequencing tools (NGS) through a web interface which helps in comprehensive analysis of NGS data. Command line interpretation of NGS tools along with extensive PERL programming and R package results in development of this tool which can be used by researcher without having computational skill and tedious individual data processing. It analyses the raw reads by compiling five steps to analyze the raw reads as Pre-processing, Processing, Post-processing, Integration and Visualization. Pre-processing and Post-processing has been done by command line execution of available NGS tools. Binning of interactome is done by considering RPKM, FPKM, Z-Score, and FDR to find the other interactome with respect to your gene of interest. Post processing of the reads screens the genic and intergenic genes into different files. Further integration of the genic genes with transcriptomics data (Microarray/RNA-seq/ChIP-seq/RNA-Pol-II) has been done to understand the detail expression profile of the gene of interest. Finally visualization of the huge data is done by various plots like spider (Cis), circos (Trans), domainogram (interactome). It requires less memory occupancy and execution time with a complete user friendly interface for NGS data analysis.

Fig 6: Pipeline for NGS data analysis (Ms. Subhalaxmi Mohanty, Mr. L. Aditya)

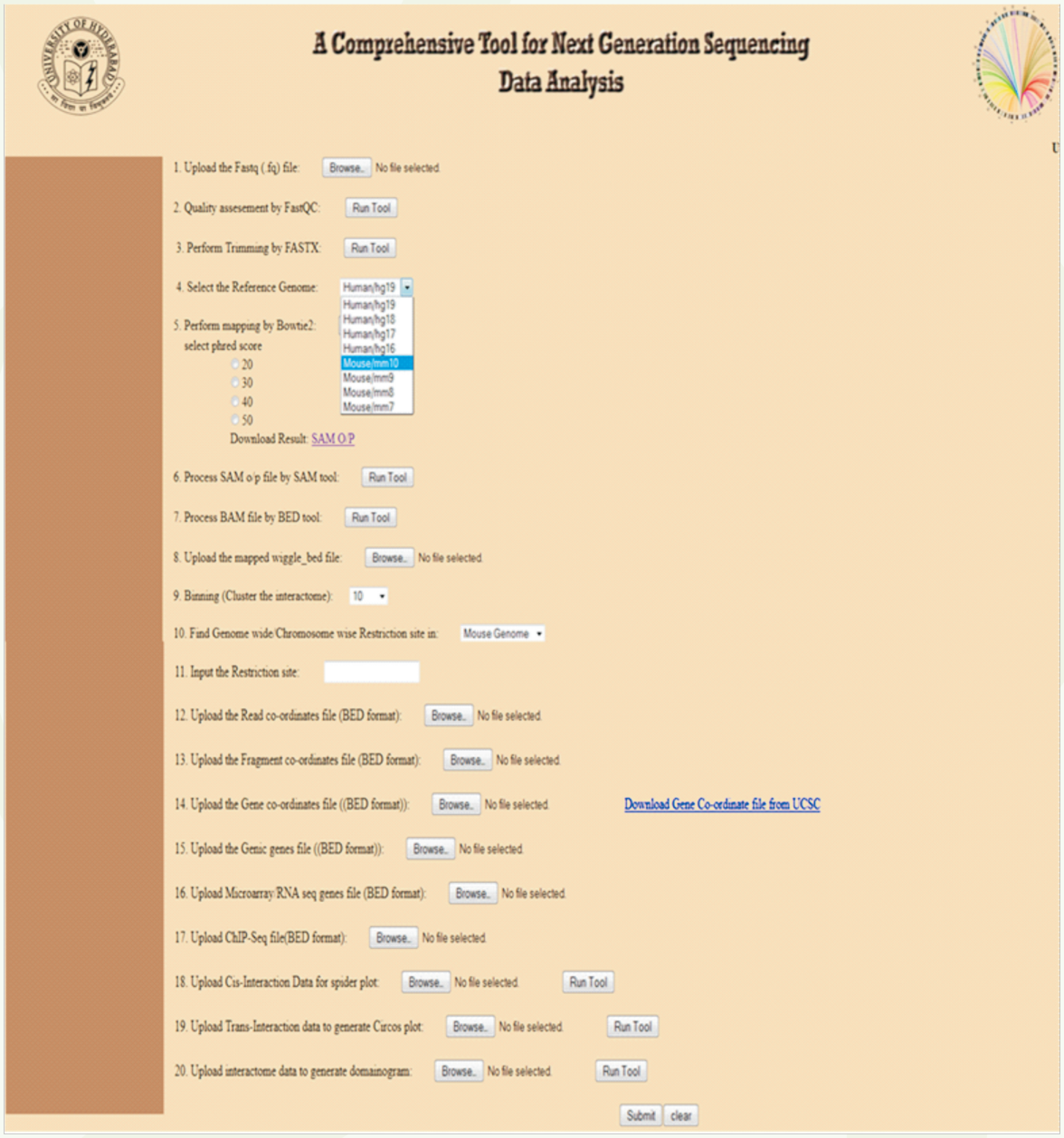


Fig 7: Visualization of 4C-seq data by Spider plot: Gene specific intra chromosomal intreactions data integaration with RNA-seq, chIP-seq datasets

Fig 8: Genome-wide gene specific inter chromosomal intreactions by Cirecos plot

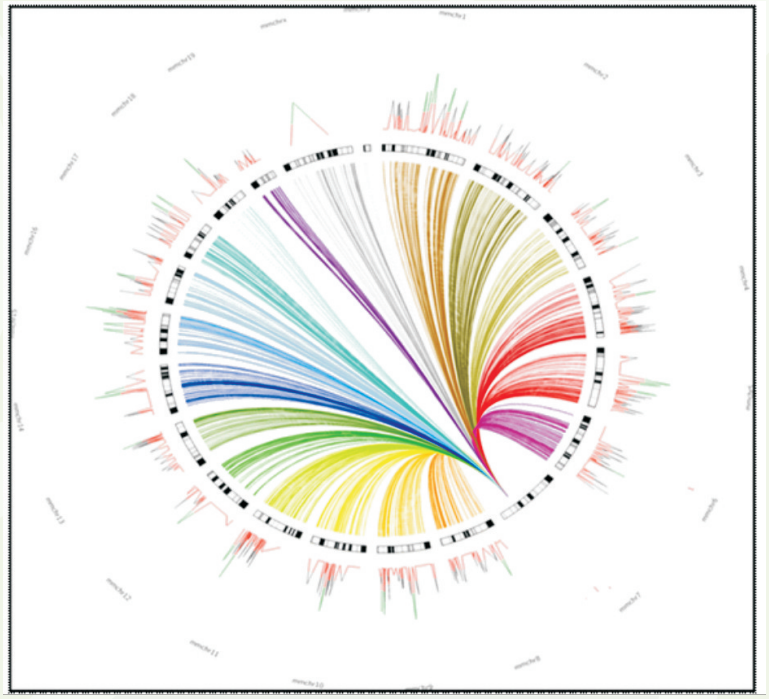
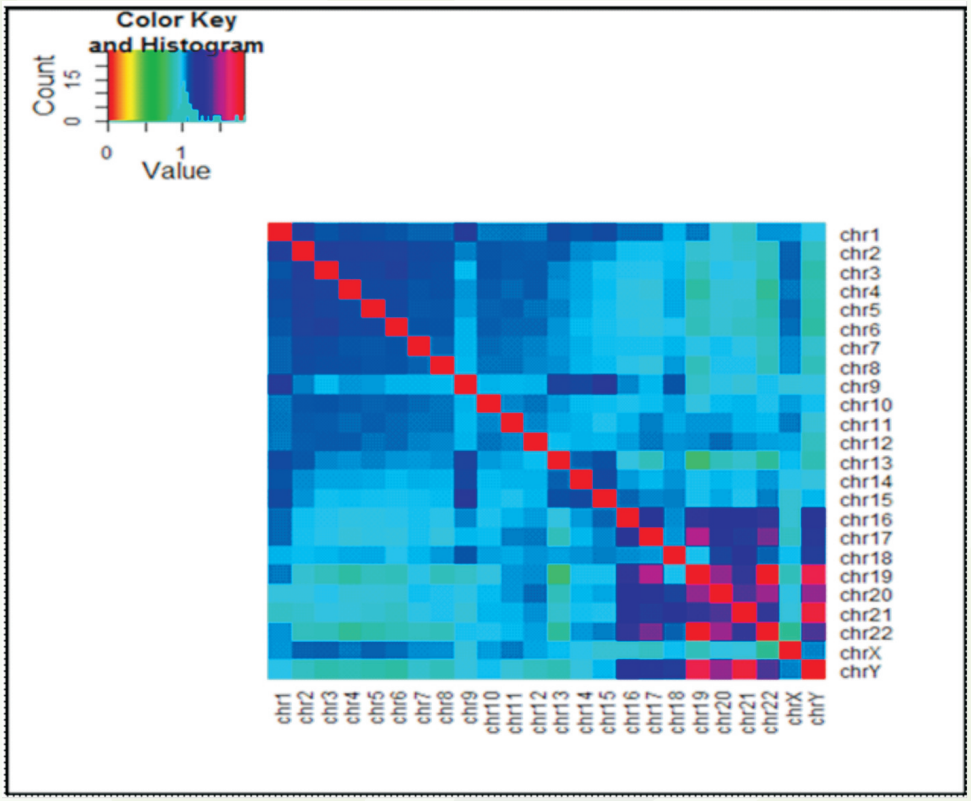


Fig 9: Visualization of genome-wide
Hic contact matrix by heatmap




## Project 2

### Development and Validation of an Immunoassay for the Screening of Leptospirosis

Reetika Chaurasia[1], Subha Sivakolundhu[1], Manjula Sritharan[1] and Anand Srivastava[2]

1. Department of Animal Sciences, University of Hyderabad
2. National Institute of Animal Biotechnology (NIAB)

### Background

- Leptospirosis is a zoonotic disease caused by spirochetes of the genus Leptospira
- Clinical spectrum: ranges from mild flu like illness to the severe fatal form called 'Weil's disease'
- Limitation: lack of laboratory diagnostic tests

- Gold standard is the microscopic agglutination test that cannot be performed in all routine labs. It is laborious, time-consuming and requires the maintenance of a broad range of Leptospira serovars for live antigen preparations

**The need of the hour: an economical, easy-to-perform diagnostic test that can be done in all routine clinical laboratories**

**Objectives**

1. Development of a lateral flow system using "Hemin-binding protein A (HbpA)" as antigen for the detection of anti-HbpA antibodies in the serum of suspected cases of leptospirosis
2. Development of an ELISA-based system for screening of leptospirosis using HbpA and Sphas antigen
   a. B-cell epitope mapping of HbpA and Sph
   b. Cloning, expression and purification of HbpA and Sph protein
   c. ELISA- based screening of serum sample using HbpA and Sph cocktail protein.

**Hemin-binding protein HbpA: observations in our lab**

**Sritharan et al., 2005**

First report on direct acquisition of iron by leptospires.

Putative 81 kDa iron-regulated hemin binding protein,

HbpA (LB191) in L. interrogans serovar Lai using bioinformatic tools.

**Asuthkar et al., 2007**

Experimental evidence to show that HbpA is a hemin-binding protein.

It is expressed on the cell surface by low iron cells of serovar Lai.

**Velineni et al., 2008**

PCR based detection of hbpA in clinical isolates.

Anti - HbpA antibodies in serum of patients suffering from systemic leptospirosis

**Sivakolundu et al., 2011**

ELISA-based screening of bovine samples: Anti - HbpA antibodiescorrelated with MAT and LipL32/41 ELISA

Sensitivity was 100% and specificity was 63%.

**Sivakolundu et al., 2012**

ELISA-based validation of screening of human samples: Both MAT positive (93%) and negative (90%) MAT leptospiral uveitis samples were positive by HbpA ELISA.

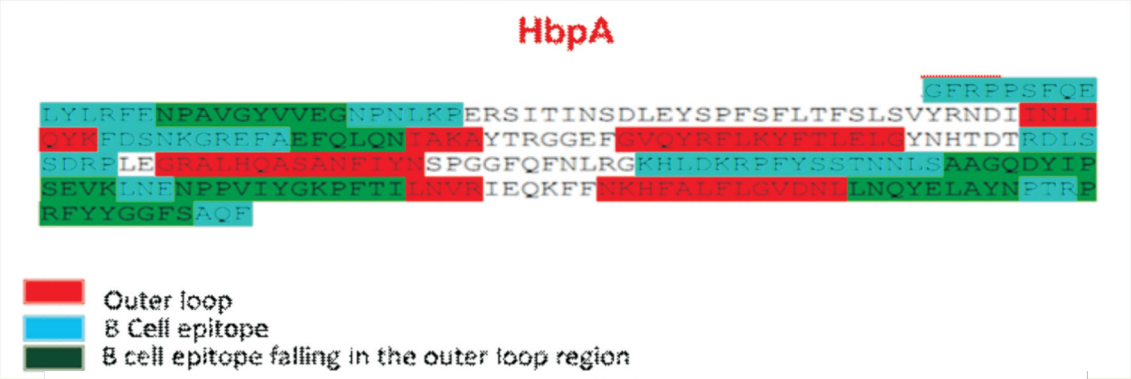
Sensitivity was 93% and specificity was 58%.

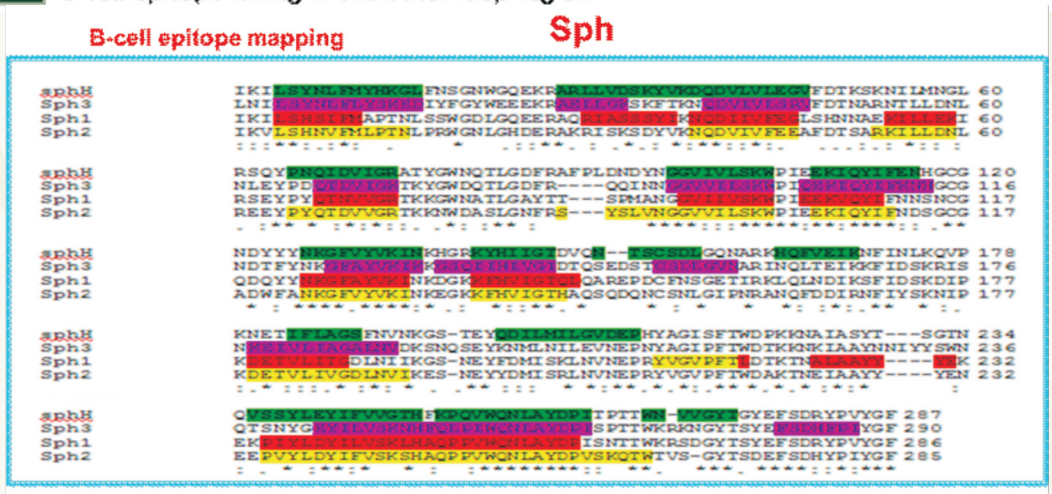
**Virulence Factors Sphingomyelinases (Sph)**

Pathogenic Leptospira spp. elaborate several sphingomyelinases.

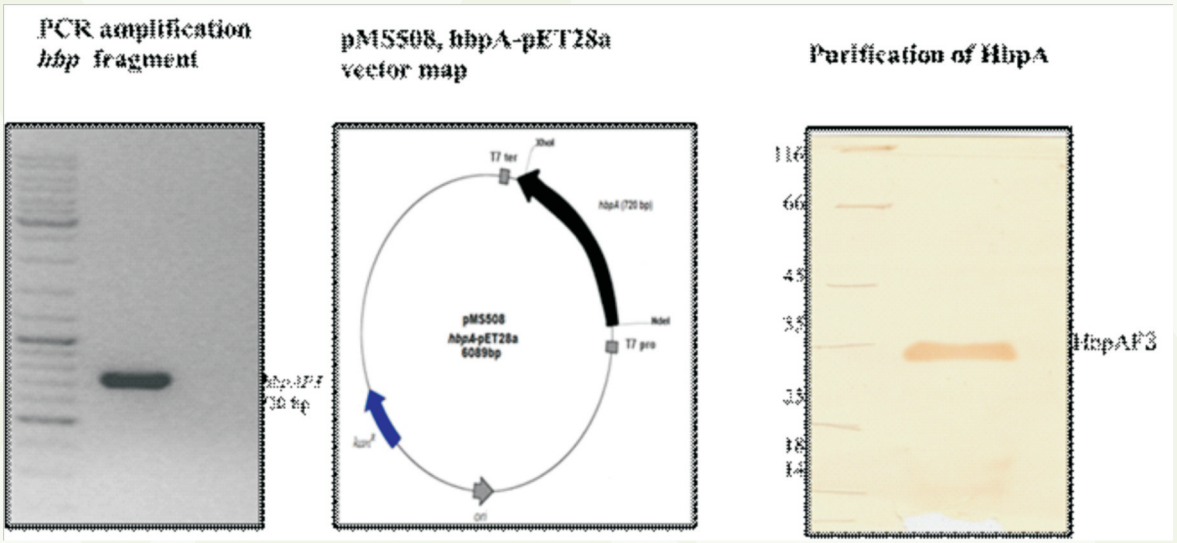
**Studies in our lab**

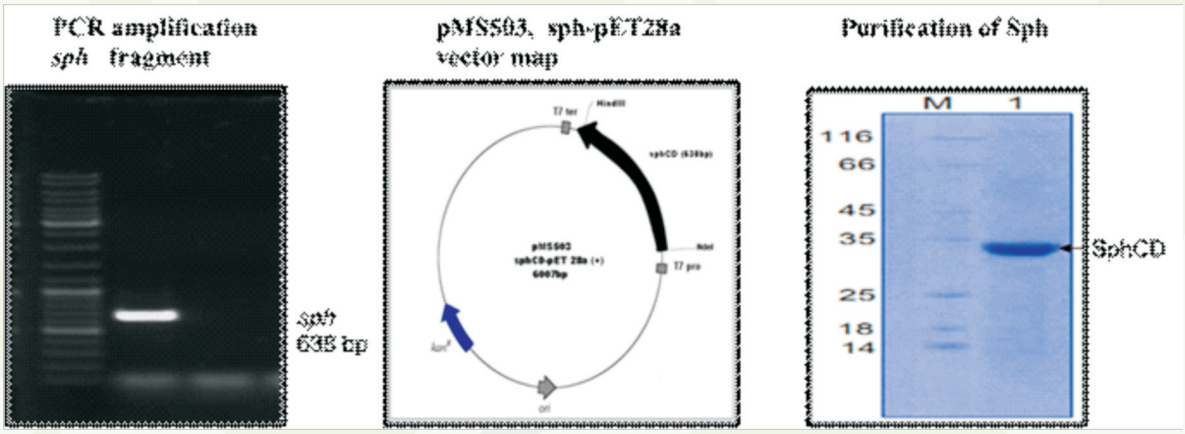
Iron limitation up-regulated a 42 kDa Sph molecule (Velineni et al., 2009, Online J Bioinformatics). We characterised Sph2 to be a true sphingomyelinase (Narayanavari et al., 2012 J Mol Micro Biotech; Microbiology).




| Protein | No. of predicted B cell epitopes |
|---|---|
| Sph1 | 13 |
| Sph2 | 11 |
| Sph3 | 12 |
| SphH | 14 |




**Work accomplished so far**

- ✓ Collection of serum samples
- ✓ Cloning and expression of HbpA-F3 fragment
- ✓ Optimisation of expression of the protein
- ✓ Purification of the protein by AKTA – optimisation of the process
- ✓ ELISA-based detection of anti-sphingomyelinase antibodies

## Project 3

## Role of Toll-like Receptor-4 (TLR-4) Signalling Mediated Bacterial Disease Resistance in Indian Poultry

PI: G. Ravi Kumar (University Of Hyderabad)

Co-PIs: Madhuri Subbiah (National Institute of Animal Biotechnology), T.R. Kannaki (Project Directorate on Poultry)

### Background

Indian poultry industry is world's 2nd largest market growing at the phenomenal rate of 12 to 15% every year.

In India, more than 55.6 billion poultry eggs are produced per year. The annual chicken meat production in India was around 2.2 million tons and the value of poultry exports was around Rs. 441 crore (FAO, 2008).

The strategies to control the endemic economically important diseases in India will be to boost poultry sector growth.

The molecular mechanisms underlying the bacterial disease resistance have not been completely elucidated, and lack of such knowledge has significantly impaired our ability to understand and eradicate the infections effectively in Poultry.

Earlier studies by Hoshino et al. (1999) showed that TLR4 knock-out mice are hyporesponsive to Lipopolysaccharide (LPS).

Bacterial infections: Salmonellosis (Fowl typhoid), Pasteurellosis (Fowl cholera), E.coli septicaemia, Staphylococcosis, Streptococcosis.

There are more than 2,000 species or serotypes of bacteria belonging to genus Salmonella *(S.Enteritidis, S.Typhimurium, S.Infantis, S.Hadar, S.Agona, S.saint-paul, S.bovis-morbificans)*; all are potential pathogens of poultry.

Pathogen Associated Molecular Patterns (PAMPs): Macrophage recognizes bacteria by Pattern Recognition Receptors (PRRs) and thereby destroy bacteria by phagocytosis.

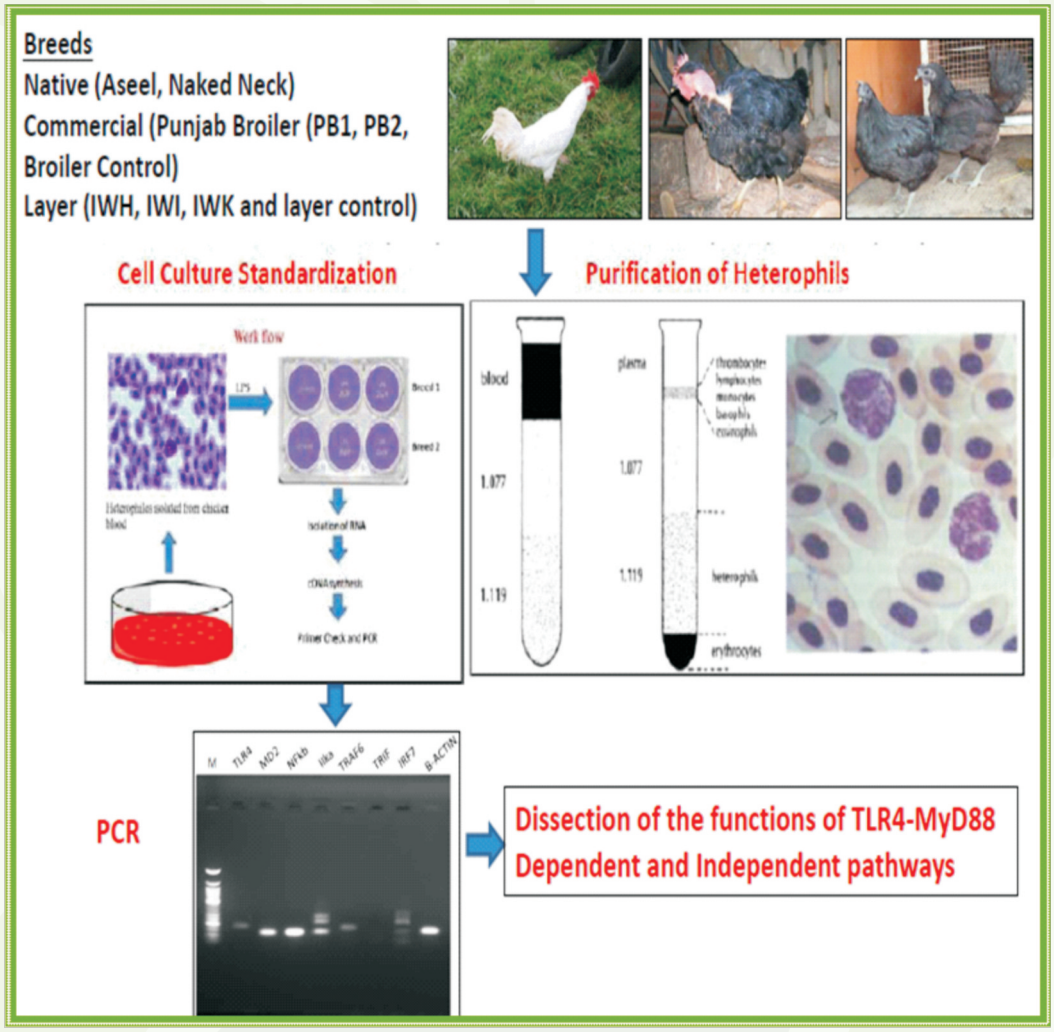
Objectives

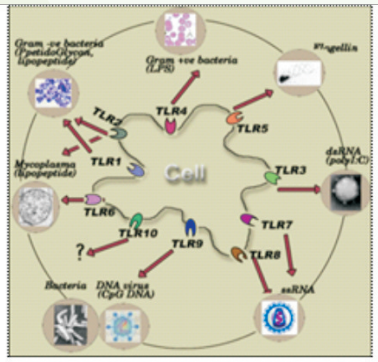
- TLR activation addresses and reinforces both arms of immune response, innate and adaptive, leading to prompt and specific response against bacteria.
- In this study, non-specific immune mechanisms will be studied because they include the innate or inherent ways in which the chicken resists disease. This protective system is often not considered when designing a poultry health program. Many programs tend to rely primarily on vaccinations and/or antibiotics to maintain flock health.

- The narrowing base of the genetic stock may lead to a sensitivity of the remaining stock to new diseases that could destroy a genetically uniform population. The importance of non-specific immune mechanisms should be realized.

**Aims**

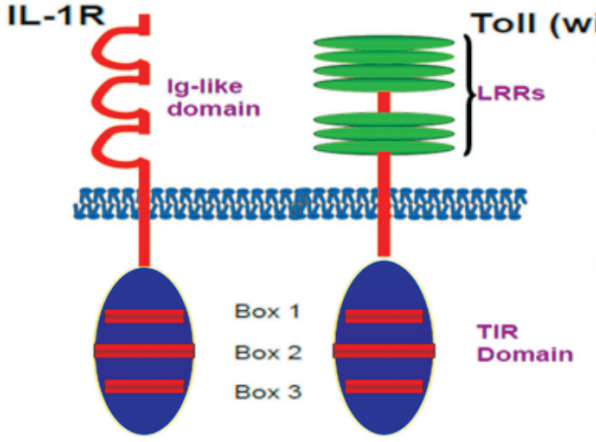
1. To use a comparative approach to investigate the importance of TLR4 and TLR4-related genes in comparison with other immunologically relevant genes for bacterial resistance traits using Real-time PCR approach.
2. Dissection of the functions of TLR4-MyD88 dependent and independent pathways that poultry innate immune cells activate in distinct signaling pathways.






Bacteria
- LPS (Gram negative)
- Lipoteichoic acids (LTA) (Gram positive)
- Peptidoglycan (Gram positive)
- Mannose-containing carbohydrates
- Flagellin
- Unmethylated CpG

## TLR-4




Toll (will become TLRs)

- Type I transmembrane protein
- Toll receptor has an extracellular region which contains leucine rich repeats motifs (LRRs)
- Toll receptor has a cytoplasmic tail which contains a Toll interleukin-1 (IL-1) receptor (TIR) domain
- Bruce Buetler and colleagues in 1998 showed that defective LPS signaling in C3H/HeJ and C57BL/10ScCr mice was a consequence to mutation in *Tlr4* .

•The present study might provide insights into the role of TLR4 (Toll-like receptor 4) in the molecular regulation of bacterial disease resistance.

**Work done so far**

✓ Blood sample collection from native Indian chicken breeds.

✓ Optimized primer sequences for amplification of TLR4 related downstream genes.

✓ Optimized Real Time PCR conditions with the above primers.

## Project 4

## Antibiotic Resistance of Bacterial Pathogens and Cytokines Mediated Mammary Tissue Damage in Bubaline Mastitis: Role of Polyphenols and NSAIDs

*P. Anand Kumar[1*], G. Srinivasa Rao[2*], M.K. Aruna Sree[2$], Girish Radhakrishnan[2#]*

1. Principal Investigator, 2. Co-Investigator

* NTR College of Veterinary Science, Sri Venkateswara Veterinary University, Gannavaram

$ Dept. of Animal Sciences, University of Hyderabad, Hyderabad

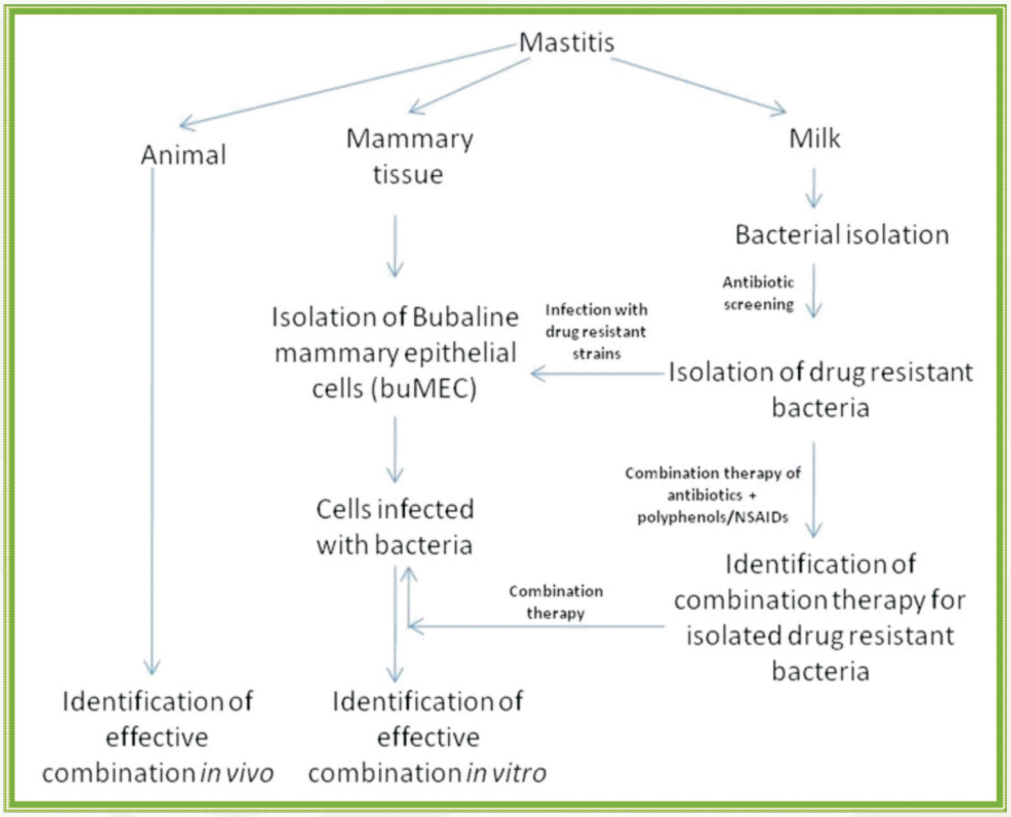
# National Institute of Animal Biotechnology , Hyderabad

### Introduction

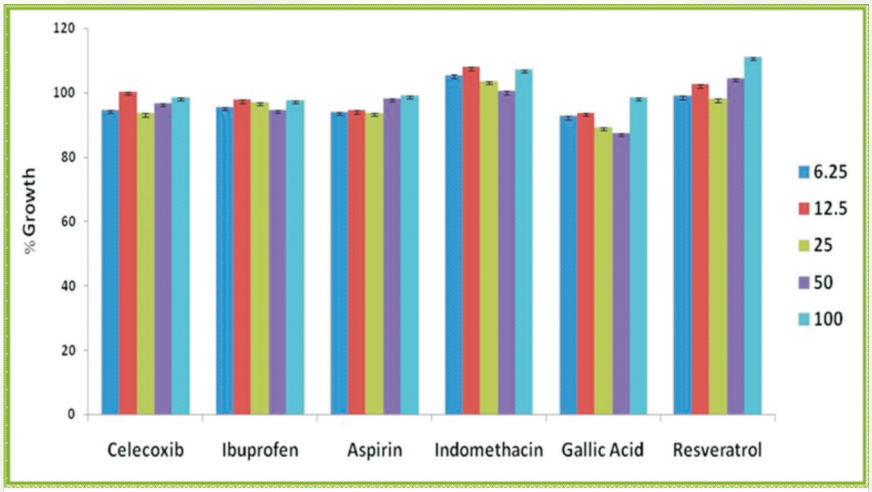
- ✓ Bubaline mastitis, usually caused due to bacterial infection, is responsible for heavy economic losses to Indian dairy industry.
- ✓ Inflammatory cytokines produced during host immune response to the invading bacteria are responsible for damage to the mammary tissue in mastitis.
- ✓ Emergence of drug resistance is a major worldwide problem.
- ✓ Evolution of "Superbugs" challenged both scientific and clinical community.
- ✓ Discovery of a new drug is not an easy task .
- ✓ Identifying alternate use of existing drugs is required.
- ✓ COX-2 inhibitors (natural and synthetic) have been shown to overcome MDR1-mediated drug resistance.
- ✓ Hence COX-2 inhibitors may have potential application in overcoming MDR in bacteria.

Objectives

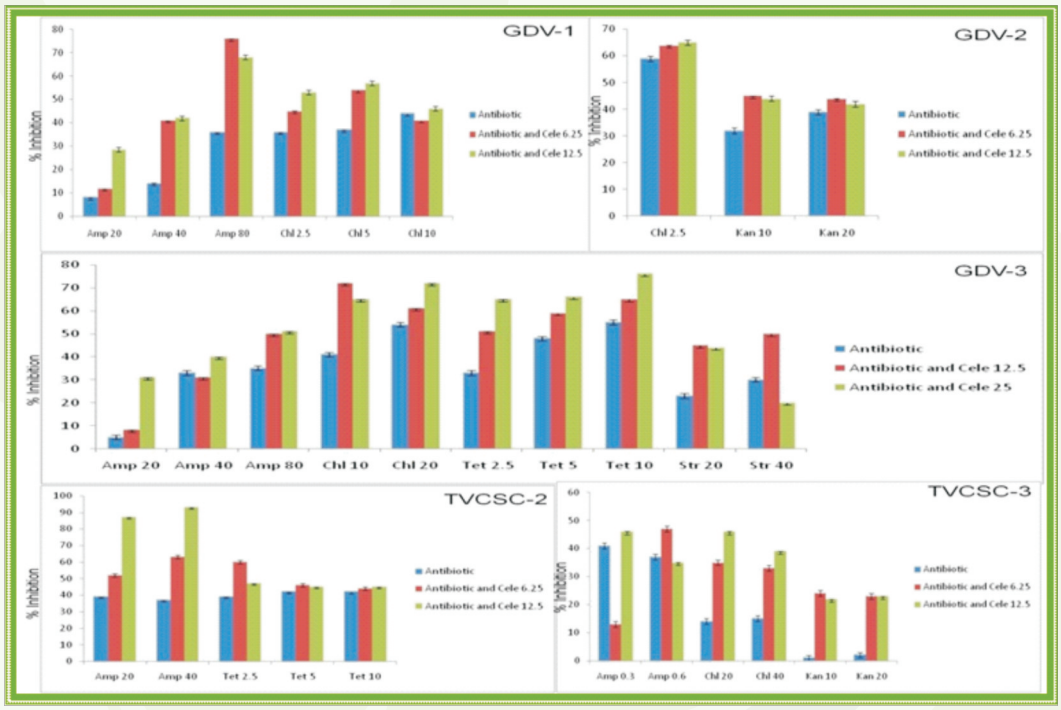
- ✓ To isolate and identify the major pathogens of mastitis *(S. aureus and E. coli)* from bubaline mastitic milk samples and their antibiotic profiling
- ✓ To identify the drug resistant bacteria by identifying the antibiotic resistance genes in PCR test.
- ✓ To assess the immunomodulatory and anti-inflammatory activities of the selected polyphenols (Quercetin, Gallic acid, Cinnamic acid)
- ✓ To study the activity of selected antibiotics in combination of certain NSAIDs against the bacterial pathogens of mastitis *(S. aureus and E. coli).*




**Combinatorial effect of NSAIDs and antibiotics on MRSA Bovine Isolates**



## Combinatorial effect of Celecoxib and antibiotics on MRSA Bovine Isolates




## % Inhibition of growth of S.aureus from 5 clinical bovine mastitis samples

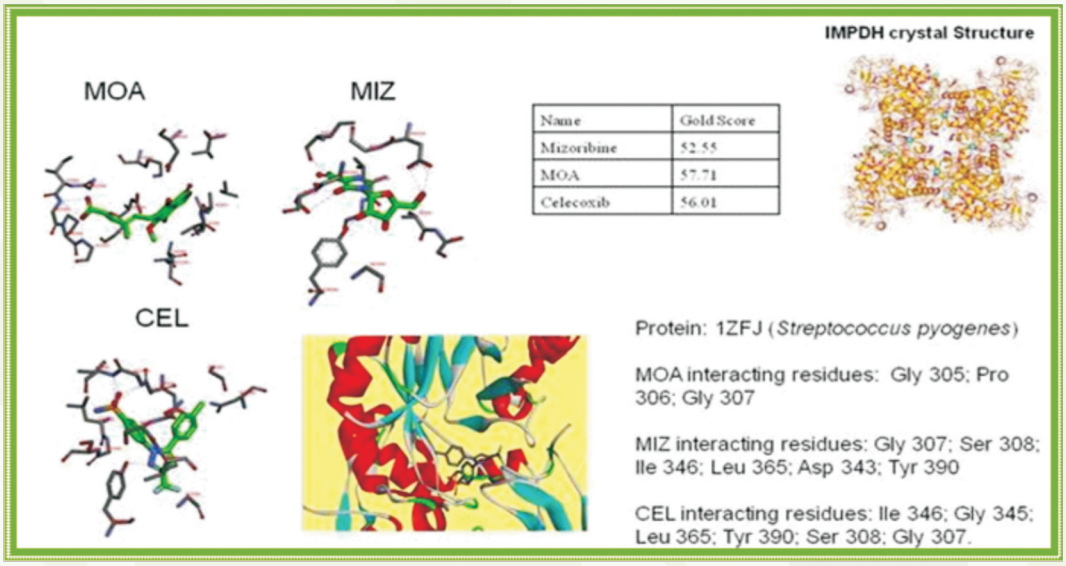
### *A. In presence of antibiotics alone*

| Antibiotic | TVCSC2 | TVCSC4 | GDV1 | GDV2 | GDV3 |
|---|---|---|---|---|---|
| Amplicillin 2.5µg/ml | 70 | 90 | 0 | 80 | 0 |
| Chloremphenicol 20 µg/ml | 0 | 30 | 80 | 85 | 45 |
| Kanamycin 40 µg/ml | 70 | 80 | 20 | 80 | 0 |
| Tetracycline 20 µg/ml | 75 | 90 | 20 | 90 | 80 |
| Gentamycin 20 µg/ml | 80 | 88 | 20 | 80 | 23 |
| Streptomycin 20 µg/ml | 75 | 50 | 30 | 85 | 20 |

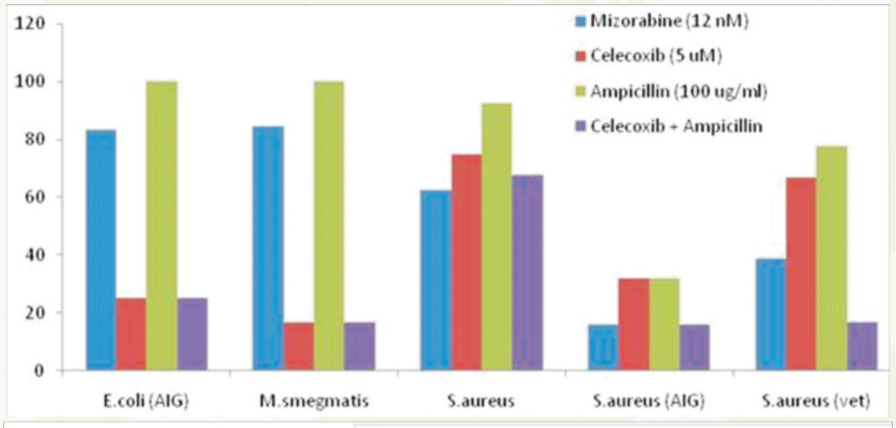
### *B. In Presence of combination of antibiotics and celecoxib*

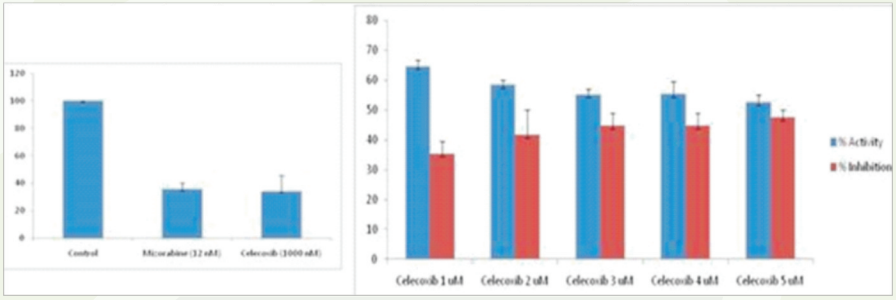
| Antibiotic | TVCSC2 | | TVCSC4 | | GDV1 | | GDV2 | | GDV3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % Inhibition | | % Inhibition | | % Inhibition | | % Inhibition | | % Inhibition | |
| Celecoxib (µ.m) | 6.25 | 12.5 | 6.25 | 12.5 | 6.25 | 12.5 | 6.25 | 12.5 | 6.25 | 12.25 |
| Amplicillin 2.5 µg/ml | 89 | 91 | 95 | 95 | 50 | 65 | 90 | 95 | 40 | 42 |
| Chlorempherical 20 µg/ml | 0 | 57 | 75 | 86 | 97 | 99 | 85 | 86 | 49 | 58 |
| Chlorempherical 20 µg/ml | 81 | 90 | 93 | 95 | 95 | 96 | 85 | 89 | 0 | 5 |
| Kanamycin 40 µg/ml | 80 | 80 | 94 | 94 | 86 | 95 | 98 | 98.5 | 88 | 92 |
| Tetracycline 20 µg/ml | 80 | 81 | 94 | 95 | 52 | 72 | 95 | 98 | 63 | 64 |
| Gentamycin 20 µg/ml | 89 | 90 | 94 | 96 | 59 | 78 | 95 | 95 | 70 | 74 |
| Streptomycin 20 µg/ml | | | | | | | | | | |

## In silico analysis of binding of celecoxib to IMPDH




## Inhibition of IMPDH activity by celecoxib



**Research Outcomes**

- About 25 isolates of *S. aureus* and 2 isolates of *E. coli* were isolated.
- Polyphenols, cinnamic acid and quercitin showed equal potency of antibacterial activity as conventional antibiotics against certain isolates of *S. aureus*.
- NSAIDs alone did not inhibit growth of bacteria but in combination with antibiotics significantly reduced the growth.
- Combination of antibiotic with Celecoxib increased bacterial sensitivity to the antibiotic in 5 MRSA isolates.
- Celecoxib either decreased the MIC of antibiotic or increased the percentage of death of the bacteria in presence of antibiotic.
- Transcriptomics and proteomics analysis of *S.aureus* (ATCC 29213) identified IMPDH as a potential target of Celecoxib.
- Insilico analysis and biochemical enzymatic assays clearly demonstrated inhibition of IMPDH with Celecoxib.

## Project 5
## Integrative approach for identifying host-pathogen interactions

Sailu Yellaboina, CR RaoAdvanced Institute of Mathematics, Statistics & Computer Science, University of Hyderabad

Zoonotic diseases are the major causes of mortality and have devastating effect on livestock and human health globally. They pose a significant impact on national and international trade and welfare. Globally 60% and in India 75% of the human diseases come from animals [Jones et al.,2013]. Despite their importance, we have a very little knowledge about the common pathogenic mechanisms across human and animals. The goal of our project was to collect and integrate the publically available genomic data of important pathogenic bacteria and their cellular environments to understand the host-pathogen interactions. Presently, we focused on *M. tuberculosis* and *M. Bovis*, which lives inside macrophages and causes tuberculosis in humans and wide range of animals. We have done large scale meta-analysis of publically available gene expression data in mycobacterium species as well as infected macrophages to identify the potential interactions between host and pathogen. We have generated the ranked list of differentially expressed genes in each data of infected macrophages and finally combined the ranked list from 15 different studies and over 200 samples. Enrichment analysis of biological process showed that the toll-like receptor 3 and 4 signalling pathways are highly enriched in macrophages infected by *M. tuberculosis*. The gene expression signatures of host/pathogen could be potential targets for therapeutics, vaccines and biomarkers. Following is the detailed description of the work done between May, 2012 and May, 2013.

Microarray data sets were downloaded from two major public repository databases: Gene Expression Omnibus and Array Express (http://www.ebi.ac.uk/microarray-as/ae/). To remove the redundancy in the gene expression data, we have included the datasets from Array Express database, if they are not found in GEO database. Table 1. shows the details of the series and platforms the expression data. To facilitate the data comparison across the different platforms analysis, microarray features were mapped to Entrez Gene IDS. Mapping information from gene names, refseq IDs, Ensembl IDs, Clone IDS, GeneBank IDS to Entrez Gene IDS were obtained from various platform annotation files and also from various databases. The databases includes NCBI (Sayers, Barrett et al. 2009), BIOMART (Smedley, Haider et al. 2009), (Bult, Kadin et al. 2009) and NIA Array (Sharov, Dudekula et al. 2005).

**Differential expression analysis**

Differential expression analysis of microarray data was done using R software called 'RankProd' (Hong, Breitling et al. 2006). The software uses a method called rank product (Breitling, Armengaud et al. 2004; Hong, Breitling et al. 2006) to identify up-regulated or down-regulated genes under one condition against another condition. Rank Product is a non-parametric statistic that detects genes that are consistently found among the most strongly up-regulated genes in a number of replicate experiments. It is based on the assumption that under the null hypothesis, when the order of all items is random, the probability of finding a specific item among the top roof n items in a list is r/n. Multiplying these probabilities leads to the definition of the rank product. Smaller the rank product value, the smaller the probability that the observed placement of the item at the top of the lists is due to chance. Rankprod generates P-values from 0 to 1. We have made a small correction to the RankProd package to avoid 0 and 1 P-values. We have used 10,000 permutations to calculate the P-values. In case of the multiple probes for same gene, we have selected the probe that gives maximum response.

**Meta-analysis**

Initially the P-values were transformed using the cumulative distribution function (CDF). CDF transformed P-values were combined using the following equation, where $p_i$ is CDF of the $i^{th}$ P-value and $w_i$ is weight to be given to $i^{th}$ P-value. Since we did not give any weight to the P-values, weight for the each P-value is taken as 1. The combined P-value is obtained using the inverse CDF of the result. CDF and inverse CDF were calculated based on methods described previously (Wichura 1988; Cody 1993).

$$\sum_{i=1}^{n} p_i * w_i \Big/ \sqrt{\sum_{i=1}^{n} w_i^2}$$

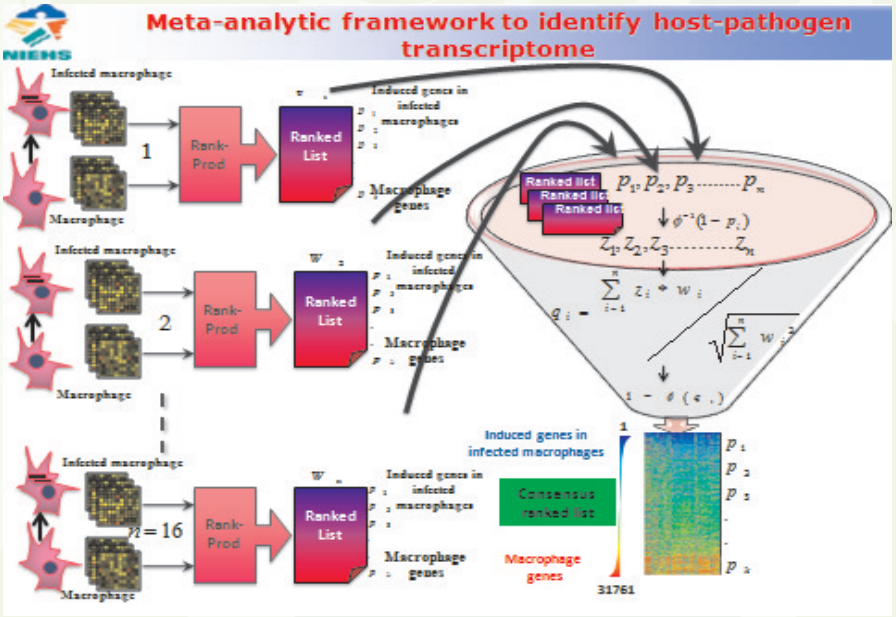
## Table1. Expression data from Infected Macrophages:

•Expression data of macrophages infected with Mycobacteria

| | Human | Mouse | Cattle |
|---|---|---|---|
| No. of series | 6 | 4 | 4 |
| No. of platforms | 3 | 4 | 3 |
| Number of samples | 121 | 37 | 45 |

•Expression data of Pathogenic Mycobacteria inside macrophages

| | M. tub. CDC551 | M. tub. H37Rv | M. Avium Paratub. |
|---|---|---|---|
| No. of series | 2 | 1 | 1 |
| No. of platforms | 1 | 1 | 1 |
| Number of samples | 68 | 6 | 4 |



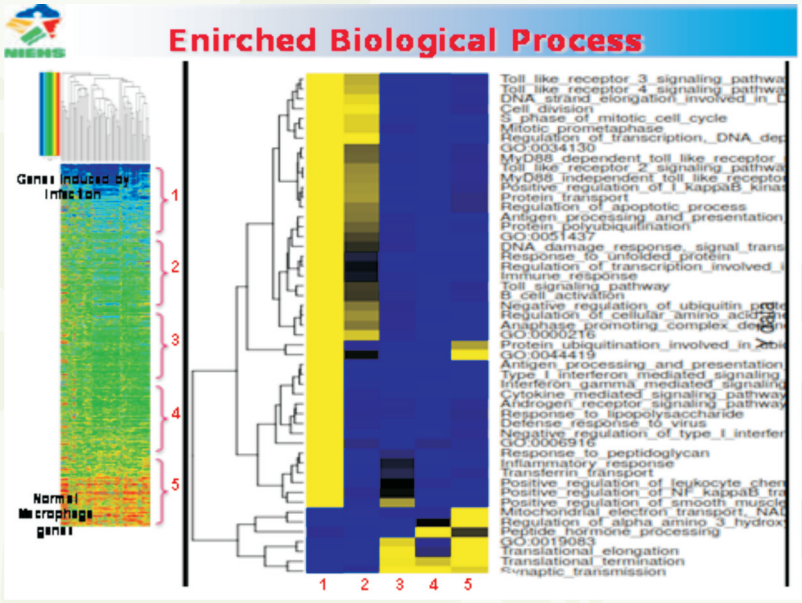
**Previously, we have developed a meta-analytic approach to mine the publically available gene** expression datasets. The approach is used to identify the induced genes in host macrophages during the infection. In each microarray dataset, we identified differentially expressed genes in infected macrophages in comparison to uninfected cells. An R package called RankProd was used for differential expression analysis. The RankProd generates the ranked list of differentially expressed genes, in two different conditions. Here the genes at the top ranks are highly expressed in ES cells or they could be specific to ES cells. And the genes in the bottom ranks could be highly expressed in differentiated cells or they could be specific to differentiated cells.

Similarly we analyzed all microarray experiments and generated the ranked list of the genes for each experiment. Finally the ranked list from all the experiments were combined to generate a single consensus ranked list, using a novel meta-analytic method. The method involves conversion of P-values to z-scores using inverse CDF. Then we took the weighted sum of the z-scores, which is divided by the square root of sum of the weights to generate the q value. Here the weights are equivalent to number of replicates in the microarray experiments. And finally the q value is converted to P-value by using CDF. Since we are analyzing the each microarray experiment independently and combining the data by a meta-analytic method, we don't need to normalize the data across different platforms. Here there are 76 different columns in the heat map and each column belongs to the ranked list of genes from one experiment. The 76 different columns were ordered according to the combined or/consensus ranked list.

## Table 2. Topranked genes expressed in macrophages

| GENE NAME | Gene ID | P-Value | Function |
|---|---|---|---|
| CARD16 | 114769 | 4.90E-34 | Caspase recruitment domain family, member 16 |
| SLFN5 | 162394 | 1.82E-31 | Schlafen family member 5 |
| Cd80 | 941 | 2.88E-28 | CD80 molecule |
| RBBP6 | 5930 | 4.16E-28 | Retinoblastoma binding protein 6 |
| PTGS2 | 5743 | 4.53E-28 | Prostaglandin-endoperoxide synthase 2 (prostaglandin G/H synthase and cyclooxygenase) |
| IFIH1 | 64135 | 4.00E-27 | Interferon induced with helicase C domain 1 |
| MCOLN2 | 255231 | 5.05E-27 | Mucolipin 2 |
| ACSL1 | 2180 | 6.43E-27 | Acyl-CoA synthetase long-chain family member 1 |
| Mx1 | 4599 | 1.20E-26 | Myxovirus (influenza virus) resistance 1, interferon-inducible protein p78 (mouse) |
| ZNF697 | 90874 | 1.93E-25 | Zinc finger protein 697 |
| CXCL11 | 6373 | 2.27E-25 | Chemokine (C-X-C motif) ligand 11 |
| XRN1 | 54464 | 3.51E-25 | 5'-3' exoribonuclease 1 |
| OASL | 8638 | 3.63E-25 | 2'-5'-oligoadenylate synthetase-like |
| NAMPT | 10135 | 4.40E-25 | Nicotinamide phosphoribosyltransferase |
| HERC5 | 51191 | 5.47E-25 | Hect domain and RLD 5 |
| TNFSF10 | 8743 | 1.16E-24 | Tumor necrosis factor (ligand) superfamily, member 10 |
| IFITM1 | 8519 | 2.24E-24 | Interferon induced transmembrane protein 1 (9-27) |
| IFI44L | 10964 | 9.85E-24 | Interferon-induced protein 44-like |
| GBP1 | 2633 | 9.85E-24 | Guanylate binding protein 1, interferon-inducible, 67kDa |
| IFIT3 | 3437 | 9.85E-24 | Interferon-induced protein with tetratricopeptide repeats 3 |

**Figure 2. Highly enriched biological process in top ranked genes**




The ranked list was divided into five sets. In each set, we have carried out enrichment analysis of biological process. The yellow color denotes the high enrichment , where as the blue color denotes the low enrichment. As expected many of the toll like receptor signaling pathways, Mydd dependent and independent pathways are highly enriched.

The study will be extended to other zoonotic pathogens and parasites. We will also identify the interacting pairs of host and pathogen proteins by integrating the expression data with protein and domain interactions. The study will be focused initially on *M. tuberculosis* which will be compared with *M. bovis*. In future, the predictions made in the study will be validated by wet lab experiments as a proof of concept. The difference in macrophage expression patterns between normal cells and infected cells will be addressed and studied. The cytokine expression profile will be interpreted and represented as (i) pro-inflammatory cytokine responses and (ii) anti-inflammatory cytokine responses. This will be further be extended to study parasitic infections such as leishmaniasis and toxoplasmosis.

# OTHER EVENTS

## NIAB Seminar Series

1. Finding new molecules for the treatment of TB-trials and tribulations' by Dr. T.S. Balganesh (CSIR Centre for Mathematical Modelling and Computer Simulation [C-MMACS], Bangalore) on June 13, 2012.

2. Structural and Biochemical Studies on Nucleosome Positioning and Dynamics' by Dr. Dileep Vasudevan (Novartis Institute for Tropical Diseases, Singapore) on June 26, 2012.

3. Functional Genome-Wide Association Studies: A New Way to Analyze Genetic Data' by Dr. Kiranmoy Das (Department of Statistics, Temple University, USA) on July 11, 2012.

4. Biochemical and Genomic Approaches to Improve Food Animal Productivity' by Dr. Suneel K. Onteru (Dept. of Animal Sciences, Iowa State University, USA) on July 11, 2012.

5. Wound Healing and Inflammation' by Dr. Amit Ghosh (University of Illinois at Chicago, USA) on July 18, 2012.

6. Functional Analysis of Mutant Tyrosine Kinases involved in Cancer Pathogenesis' by Dr. Rama Krishna Kancha (Klinikum rechts der Isar, Germany) on August 01, 2012.

7. Molecular abnormalities of T-Cells' by Dr. B. Obul Reddy (Molecular Medicine Partnership Unit, EMBL-University of Heidelberg, Germany) on August 14, 2012.

8. Biochemistry of Methanogenesis at the Intersection of the Domains Bacteria and Archaea' by Dr. James G. Ferry (Director, Stanley Person Professor Center for Microbial Structural Biology, Penn State, USA) on February 12, 2013.

9. Influzenza Pathogenesis' by Dr. Teluguakula, Telugu Narasaraju (Assistant Research Professor, Oklahoma State University - Stillwater, Department of Physiological Sciences , USA) on February 15, 2013.

10. Dissecting survival mechanisms of pathogenic bacteria using high throughput next generation sequencing' by Dr. Niyaz Ahmed (Associate Professor and Group Leader, Pathogen Biology, Laboratory Dept. of Biotechnology & Bioinformatics, University of Hyderabad) on March 15, 2013.

# WORKSHOPS & CONFERENCES

## 16th ADNAT Convention

National Institute of Animal Biotechnology (NIAB) in association with C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS) and University of Hyderabad (UoH) organized 16th Convention of ADNAT (The Association for the Promotion of DNA Fingerprinting and Associated DNA Technologies) in Hyderabad, India, from 6-19th December, 2012.

The ADNAT convention consisted of 11 days of workshop on "Genomics & Beyond" from 6-16th December, 2012 and 3 days of conference from 17-19th December, 2012 on thematic areas of "Animal Genetics and Genomics". The convention also discussions and brainstorming session aimed at developing genotype and phenotype resources for improved animal breeding.

## Workshop on Genomics & Beyond

6th to 16th December, 2012

The objective of this workshop was to narrow the gap between the genomic data generation and the ability to process and analyze the resulting data. This workshop introduced the essential tools and strategies for practicing 21st century biology and medicine. The workshop covered wide range of topics in genomic data analysis and emerging role of genomics in understanding the basic biology, disease processes and drug discovery. The purpose of the workshop was to train graduate students, postdoctoral fellows, young investigators and industry representatives involved in genomic data generation, data analysis, and drug discovery process. The workshop had lectures and extensive hands on training with latest experimental and computational techniques.

The workshop consisted of two parts. The first part was on experimental genomics and the second was on computational genomics. The first part covered data generation using Microarrays and NGS. And the second part covered topics on analysis of data coming from different technological platforms, inference of gene networks from genomic data and linking the networks with genetic diseases and drugs.


Prof. Reddanna addressing the gathering


Release of the workshop manual


Dr. Lalji Singh addressing the participants


16th ADNAT workshop participants

**Conference on Animal Genetics and Genomics**
17th to 19th December, 2012

The main focus of this conference was to combine traditional genetics with modern sequencing and Omics technologies to improve animal productivity and health. The conference brought distinguished national and international experts in the area of veterinary and livestock research from reputed institutes such as National Institute of Food & Agriculture (NIFA), Roslin Institute, International Livestock Research Institute (ILRI), University of Iowa, Indian veterinary Research Institute (IVRI), National Dairy Research Institute (NDRI) and Anand Agricultural University (AAU). The conference had presentations by eminent scientists in the fields of genomics, genetical genomics, genomic selection, Transgenic technologies, Systems Biology, host-microbe interactions and Vaccine & Drug Development.

Prof. David Hume, director of the Roslin Institute, UK, presented the keynote speech on macrophage biology (http://www.macrophages.com) and its importance in innate immune response, as the first line of host-defence against the infection. Dr. Laxmi Kumar Matukumalli, Dr. James Reecy, Dr. John McEwan and Prof. Dave Burt spoke about the importance of combining genetics and genomics to identify the genetic pathways responsible for complex traits and its importance in genomic selection of cattle, sheep and chicken. Dr. Sheshagiri presented on stem cell technologies while Dr. M S Chauhan spoke about transgenic technologies in cattle and buffaloes. Dr. Satish Kumar gave his presentation on novel gene WDR13 and it's possible role in epigenetic modifications. Dr. Sami Mukhopadhyaya spoke on combining multiple docking scores in identifying the suitable lead drug.

Dr. Jayaram spoke about using genomic information in identifying right combination of target and lead compound. Dr. Vish Nene from ILRI, Kenya, spoke about host-parasite interactions and use of immuno informatics in epitope prediction.

In host-microbe interaction side, Dr. Palok Aich presented the work on influence of stress on host susceptibility to infection. Dr. Dipti Pitta has demonstrated the importance of nutrient value to have host friendly gut-microbiome in ruminants. Dr. Chittur V Sreekanth has elegantly described emerging role of post-translational modifications in host-pathogen interactions.

Dr. Sarath Chandra Janga beautifully described basics of network theory and its application in understanding the design principles of transcriptional networks and also use of network principles in identifying competition and co-operation in microbial communities. He has presented the data on presence and absence profile of different microbes in primate veginal samples. The correlation and anti-correlation between the presence and absence profile was used to identify the interactions among the co-operation and competition in microbes. Further he has applied network based concepts such as cliques / modules to identify the tightly co-operating microbes.

MoU between NIAB, India and Roslin Institute, UK

Release of 16th ADNAT conference abstract book

Participants

## SNAPSHOTS from the Conference:

## Brain Storming Session

**Improvement of livestock productivity through conventional breeding and using emerging technologies in changing global scenario.**

A brainstorming session was organized to discuss improvement of livestock productivity through conventional breeding and using emerging technologies in changing global scenario. It was conducted on November 22, 2012, as a side event at the venue of national symposium organized by Indian Society of Animal Genetics and Breeding (ISAGB 2012) with active support of Sri Venkateswara Veterinary University in collaboration with Agri-Biotech Foundation, Hyderabad.

Dr. V. Prabhakar Rao, Vice-chancellor of Sri Venkateswara Veterinary University, chaired the session with Prof. P. Reddanna, Director of NIAB as vice-chairman of the session. Prof. P. Thangaraju, former Vice-Chancellor of Tamil Nadu Veterinary & Animal Sciences University (TANUVAS), Chennai and President of ISAGB and Dr. K. R. Trivedi of NDDB were also present. The participants included scientists from different parts of India, members from state veterinary universities, state Animal husbandry departments, private entrepreneurs and livestock development cooperatives.

Brain Storming session at ANGRAU

Presentation by Dr. K R Trivedi, NDDB

Dr. K. R. Trivedi presented an overview of livestock production in the country vis- a- vis global scenario. Dr. K. R. Trivedi elucidated the progress made in livestock production in India over the years and the need for modern infrastructure facilities. He emphasized on the National Dairy Plan coterminous with 12th Five Year Plan and beyond with focus on improvement of milk production in the country. He mentioned about the support from NDDB to Institutes to establish semenproduction stations and pedigree selection centres. All the SOPs related to the same are available in NDDB's website. He presented about semen production facilities, cattle breeding facilities and future challenges like production of adequate number of proven bulls, quick sire evaluation to achieve the goals. He discussed the need for SNP based chips for sire evaluation in Buffaloes and embryo transfer technologies as the means for achieving faster genomic selection. Following Dr. Trivedi's presentation, the participants discussed on the need for sire selection and available technologies for genomic selection of sires and sexed semen for improving livestock productivity.

**Multi-Stakeholder Consultative Workshop onOpportunities, Challenges and Strategies in Animal Biotechnology**

In order to set research priority areas for NIAB, a bottom up approach was envisaged and the assignment was entrusted to Agri Biotech Foundation (ABF). ABF is an autonomous academic institute located in Acharya N G Ranga Agricultural University campus, Rajendranagar. With 18 years of experience in the promotion of agricultural biotechnologies, particularly targeting rainfed areas ABF has set up about 80 research projects in agriculture and animal biotechnology involving different stakeholders including end users of technology. Presently it is handling projects funded by the Department of Biotechnology, Government of India; Department of Agriculture, Government of Andhra Pradesh, National Bank for Agriculture and Rural Development, National Institute for

Agricultural Extension Management, Indian Council for Agricultural Research and European Commission.

ABF accomplished this task by organizing three regional workshops in different parts of the country and involving as many as 176 persons drawn from farmers (25.56%), field veterinarians (34%), scientists from public and private scientific organizations (40.34%), administrators including ICAR, DBT, State Animal Husbandry Departments etc. The multistake holders workshop organized in Kochi, Kerala, covered three major South Indian states. The Hyderabad workshop had participants from Andhra Pradesh and from Central Indian states. The third workshop in Karnal, Haryana, covered as many as 12 North and North Eastern states. The stakeholders meetings thus captured the national picture with local / regional specificities.

Participants: Farmers, field level veterinarians, extension agencies, livestock development agencies, policy implementers, scientists from State Universities, ICAR institutes, Private Companies and NGOs associated with livestock development activities.

| Multistake holders workshop | Venue | States covered |
|---|---|---|
| First Multi-Stakeholder Consultative Workshop | Agri Biotech Foundation, Hyderabad on 18th and 19th January, 2013 | Andhra Pradesh, Chhattisgarh, Maharashtra, Madhya Pradesh and Orissa |
| Second Multi-Stakeholder Consultative Workshop | Kochi, Kerela on 19th and 20th February, 2013 | Kerala, Tamil Nadu, Karnataka, Goa and Pondicherry |
| Third Multi-Stakeholder Consultative Workshop | NDRI, Karnal, Haryana on 18th and 19th March, 2013 | 11 Northern states |

The consultations focused on three major themes, viz.,(1) infectious diseases and animal health, (2) animal reproduction and breeding and (3) regulatory, ethical and social aspects relating to genetically modified animals. While the first two themes were intended to arrive at a set of priorities on which NIAB can focus in the coming years, the third theme was primarily meant for sensitizing the participants on the complexities associated with GM technology.

The proceedings were structured in such a way that experts provided the current status in each of the theme areas and highlighted the future possibilities. Then intensive deliberations took place on each of the themes and different stakeholders expressed their opinion and a consensus was built on the priorities. The entire process led to identification of the following problems and possible solutions.

**Infectious Diseases**

Problems Although more than thirty problems were identified in animal diseases, the stakeholders listed five major diseases as priorities. Mastitis and Foot and Mouth Diseases emerged as the most important problems in view of the economic loss that they are causing and non-availability of viable solution so far. Brucellosis, HS and PPR are other three important problems identified by the stakeholders.

(Solutions: The solutions that emerged during these consultations include:)

| S.No. | Problem | Solution |
|---|---|---|
| 1 | Mastitis | - Development of molecular diagnostic methods for subclinical mastitis.<br>- Development of specific vaccines against mastitis.<br>- Selection of breeds for higher production and disease resistance.<br>- Simpler diagnostic tools on farm level. |
| 2 | Foot-and-Mouth disease | - Development of FMD vaccine with higher potency with longer duration of immunity.<br>- Development of improved pen-side diagnostic kits.<br>- Timely seromonitoring.<br>- Development of combo / multivalent vaccines. |
| 3 | Brucellosis | - Development of effective vaccines.<br>- Isolation / destruction / culling of the infected animals. |
| 4 | Haemorrhagic Septicaemia | - Development of vaccines triggering longer duration of immunity.<br>- Development of pen-side diagnostic kits. |
| 5 | Peste des petits ruminants (PPR) | - Rapid diagnostic tools.<br>- Development of thermostable vaccines. |

## Animal Reproduction and Breeding

Although the importance of animal industry is growing in India in view of economic prosperity, rapid urbanization, changing life style and export potential, the animal productivity levels in terms of milk and meat yields are poor and far below the averages of emerging economies like China and Brazil. India also lags behind in breed improvement programme vis-à-vis its counterparts in developed and emerging economies. A number of factors, including social, cultural, religious, economic, breeding policy etc., are responsible for this status. The multi-stakeholders consultations helped in pinpointing at some major problems which can be addressed through biotechnological interventions. These include:

1) Repeat breeding
2) Lack of technology for heat detection
3) Lack of technology for early pregnancy detection
4) Infertility arising out of a number of factors
5) Absence of technology for sexed semen production

Participants at the workshop in Hyderabad

Participants at the workshop in Cochin

Participants at the workshop in Karnal

**Workshop on 'Eradication of Peste Des Petits Ruminants Virus in India'**

A comprehensive one-day workshop on 'Eradication of Peste Des Petits Ruminants Virus (PPRV) in India' was organized by NIAB in collaboration with the Pirbright Institute, UK and College of Veterinary Sciences, Sri Venkateswara Veterinary University at Rajendranagar, Hyderabad on the March 4, 2013. The workshop focused on efficient ways to eradicate PPRV. The workshop was attended by scientists from NIAB, PPRV research specialists from India and UK, scientists and students from College of Veterinary Science, Hyderabad, and Scientists from Veterinary Biological and Research Institute, Hyderabad, and officials from the Directorate of Animal Husbandry, Andhra Pradesh government.

Dr. Satya Parida, Head of Vaccine Differentiation, Institute of Animal Health, Pirbright, UK presented his talk on 'What next after Rinderpest eradication? PPR marker vaccine and DIVA test using Reverse Genetics Technique'. He spoke about reverse genetics technique as the fastest approach to generate marker vaccines and thus target eradication of the virus. Dr. G. Dhinakar Raj, Director, TRPVB and Professor, Madras Veterinary College, Chennai, presented his research study on 'Genetic resistance to PPRV – receptor expression Vs innate immune responses'. His research suggested the expression patterns of SLAM receptor and TLR7 as factors contributing to virus replication in susceptible hosts. Dr. Parimal Roy, Professor and Head, TANUVAS, Chennai spoke about 'Field outbreaks of PPR'. Dr. V. Balamurugan, Senior Scientist from PD_ADMAS, Bangalore, presented his talk on 'Epidemiology of PPR in India' highlighting the importance of sensitive diagnostics and the need for a proper and channelized disease reporting systems.

Dr. R. P. Singh, Principal Scientist from IVRI, Bareilly gave 'an overview of PPR diagnostics and Vaccine developed by IVRI'. IVRI has developed sandwich ELISA, competitive ELISA kits, PCR-ELISA techniques for diagnosis of PPRV and Sungri/96 as the vaccine strain. Dr. Krishna Jyothi Yadlapati, Assistant Director of VBRI, Hyderabad presented her talk on 'Status of PPR in Andhra Pradesh'. She spoke about pulse vaccination practised in Andhra Pradesh which has significantly brought down the incidences of PPRV outbreaks in this state. She suggested some smart ways to control the disease spread such as vaccinating the kids and lambs, vaccinating the flock during winter to improve the herd immunity and providing vaccination certificates to migrating flocks especially near the state borders.

The workshop concluded with a panel discussion moderated by Dr. Satya Parida. The following were discussed (i) age at which kids/lambs must be vaccinated - it was concluded that they must be vaccinated at 4 months when their maternal antibodies no longer exist (ii) the route of vaccination - currently only the subcutaneous route of vaccination is being practised (iii) control of disease spread and monitoring need to be followed throughout India similar to the strict monitoring practised in Andhra Pradesh (iv) 100% vaccination coverage needs to be ensured and vaccine failures due to break in cold chain should be addressed -

need for a thermostable vaccine (v) why PPRV infection sometimes causes subclinical infection in sheep and reverts to virulence upon passages in sheep; also why there is a difference in the host susceptibility to PPRV between two states for example goats are predominantly infected in Tamil Nadu while it is the sheep population which is mostly infected in Andhra Pradesh? - research needs to be done to understand the molecular basis of such viral pathogenesis and to study global gene expressions in sheep and goat (vi) the need for DIVA vaccines (vi) feasibility of subunit vaccines (vii) other hosts for PPRV such as wild animals and concerns about carrier status of infected animals (viii) any need for therapeutic interventions in infected animals using natural compounds that could serve as antivirals. Scientists from Industries, however, were sceptical about business profitability in such research areas and few other scientists suggested that if vaccination is successful then there will be no need for antiviral screening. The day-long workshop was indeed comprehensive and covered several aspects of control and eradication of PPRV in India.

Workshop speakers

Workshop participants


Panel Discussion

# Memorandum of Understanding

(From April 2012-March 2013)

**MoU between NIAB and Tuskegee University, Alabama, USA on 06/06/2012**

MoU with Tuskegee University, USA

NIAB and Tueskegee University, USA have agreed to collaborate and coordinate their activities for the purpose of carrying out the goal of institution building to enhance the capacity to conduct high quality research and education. The Institutions shall establish cooperative linkages through the exchange of faculty and students; short term and long term training; and development of joint proposals and applied research, curriculum design, technology, education, etc.

**MoU between NIAB and C. R. Rao Advanced Institute of Mathematics, Statistics and Computer Sciences, Hyderabad on 22/06/2012**

MoU with C. R. Rao Advanced Institute of Mathematics, Statistics and Computer Sciences, India

Both NIAB and C.R. Rao AIMSCS entered into agreement to contribute to the project on “Integrated data resource centre for livestock pathogenic bacteria”.
The objective is to coordinate and collaborate in research activities pertaining to statistics, computational genomics and other related fields.

## MoU between NIAB and Roslin Institute, UK on 16/12/2012


MoU with Roslin Institute, UK

Both NIAB, India and Roslin Institute, UK, wish to establish a framework for cooperative research and training in the broad area of Animal Biotechnology directed towards the improvement of animal health and productivity and the vision is to establish a tangible, multi-focussed research partnership in which the outcomes are greater than either organisation can achieve alone, and which aims to contribute to the generation of wealth and sustainable improvements in livestock productivity in the UK and India.

# Publications

**(2012-2013)**

1. Hofheinz K, Kakularam KR, Adel S, Anton M, Polymarasetty A, Reddanna P, Kuhn H and Horn T (2013) Conversion of pro-inflammatory murine Alox5 into an anti-inflammatory 15S-lipoxygenating enzyme by multiple mutations of sequence determinants. Arch Biochem Biophys. 530(1):40-7.

2. Dorababu P, Naushad SM, Linga VG, Gundeti S, Nagesh N, Kutala VK, Reddanna P and Digumarti R (2012) Genetic variants of thiopurine and folate metabolic pathways determine 6-MP-mediated hematological toxicity in childhood ALL. Pharmacogenomics. 13(9):1001-8.

3. Aparoy P, Reddy KK and Reddanna P (2012) Structure and ligand based drug design strategies in the development of novel 5- LOX inhibitors. Curr Med Chem. 19(22):3763-78. Review.

4. Bhujade AM, Talmale S, Kumar N, Gupta G, Reddanna P, Das SK and Patil MB (2012) Evaluation of Cissus quadrangularis extracts as an inhibitor of COX, 5-LOX, and proinflammatory mediators. J Ethnopharmacol. 141(3):989-96.

5. Soumya SJ, Binu S, Helen A, Anil Kumar K, Reddanna P and Sudhakaran PR (2012) Effect of 15-lipoxygenase metabolites on angiogenesis: 15(S)-HPETE is angiostatic and 15(S)-HETE is angiogenic. Inflamm Res. 61(7):707-18.

6. Chandramohan Reddy T, Bharat Reddy D, Aparna A, Arunasree KM, Gupta G, Achari C, Reddy GV, Lakshmipathi V, Subramanyam A and Reddanna P (2012) Anti-leukemic effects of gallic acid on human leukemia K562 cells: downregulation of COX-2, inhibition of BCR/ABL kinase and NF-κB inactivation. Toxicol In Vitro. 26(3):396-405.

7. Reddy NP, Chandramohan Reddy T, Aparoy P, Achari C, Sridhar PR and Reddanna P (2012) Structure based drug design, synthesis and evaluation of 4-(benzyloxy)-1-phenylbut-2-yn-1-ol derivatives as 5-lipoxygenase inhibitors. Eur J Med Chem. 47(1):351-9.

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|---|---|---|
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| 7 | Shri V. H. Rao<br>Convener<br>Senior Consultant, NIAB<br>Hyderabad | Member |

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| 4 | Dr. Jagan Pongubala<br>Department of Animal Sciences<br>School of Life Sciences, University of Hyderabad<br>Hyderabad | Member |
| 5 | Shri B. J. Acharyulu<br>Head-F&A, CDFD and Finance Officer, NIAB<br>Hyderabad | Member |
| 6 | Shri V. H. Rao<br>Convener<br>Senior Consultant, NIAB<br>Hyderabad | Member |

## Staff of NIAB as on March 31, 2013

**Administration and Management**
Dr. P. Reddanna, Director

**Administration**
Mr. Harjit Singh, Senior Manager
Mrs. K. Krishna Priya, PA to Director
Mr. B. Raghava Rao, Consultant

**Finance and Accounts**
Mr. B.J.Acharyulu, Finance Officer I/C
Mr. I. Jagadeesh, Manager Office (Accounts)
Mr. V. Lachaiah, Consultant
Mr. P.S.G.S. Pavan Kumar, Junior Office Assistant

**Stores and Purchase**
Mr. Santosh Namdeo Mhadeshwar, Manager (Stores & Purchase)
Mr. Mohammed Zaheeruddin, Junior Office Assistant

**Management Support Services**
Mr. V. Ramesh Babu, SM Engineer
Mr. V.H. Rao, Sr. Consultant
Mr. HariKrishna A, System Administrator
Mr. NSV Prasad Reddy, Liaising Officer
Mr. Ratneesh Chandra, Junior Office Assistant
Mr. D. Nagesh, Office Attendant
Mr. P. Shivram, Office Attendant
Mr. Jahid Hussain Md, Driver
Mr. Kiran, House-Keeping
Mr. E. Kumar, House-Keeping

**Scientists and Technical Officers**
Dr. Girish K Radhakrishnan, Scientist D
Dr. Madhuri Subbiah, Scientist C
Dr. Anand Srivastava, Scientist C
Dr. Paresh Sharma, Scientist C
Mrs. G. Rama Devi, Technical Officer
Mr. Shashikant Dasharath Gawai, Technical Officer
Mr. C. S. Murthy, Consultant (Instrumentation)

# Photo Gallery

**Governing Body Meeting on 27th August, 2012 at C. R. Rao Advanced Institute of Mathematics, Statistics and Computer Science, Hyderabad**


**Third Scientific Advisory Committee on 17th January, 2013 at C. R. Rao Advanced Institute of Mathematics, Statistics and Computer Science, Hyderabad**

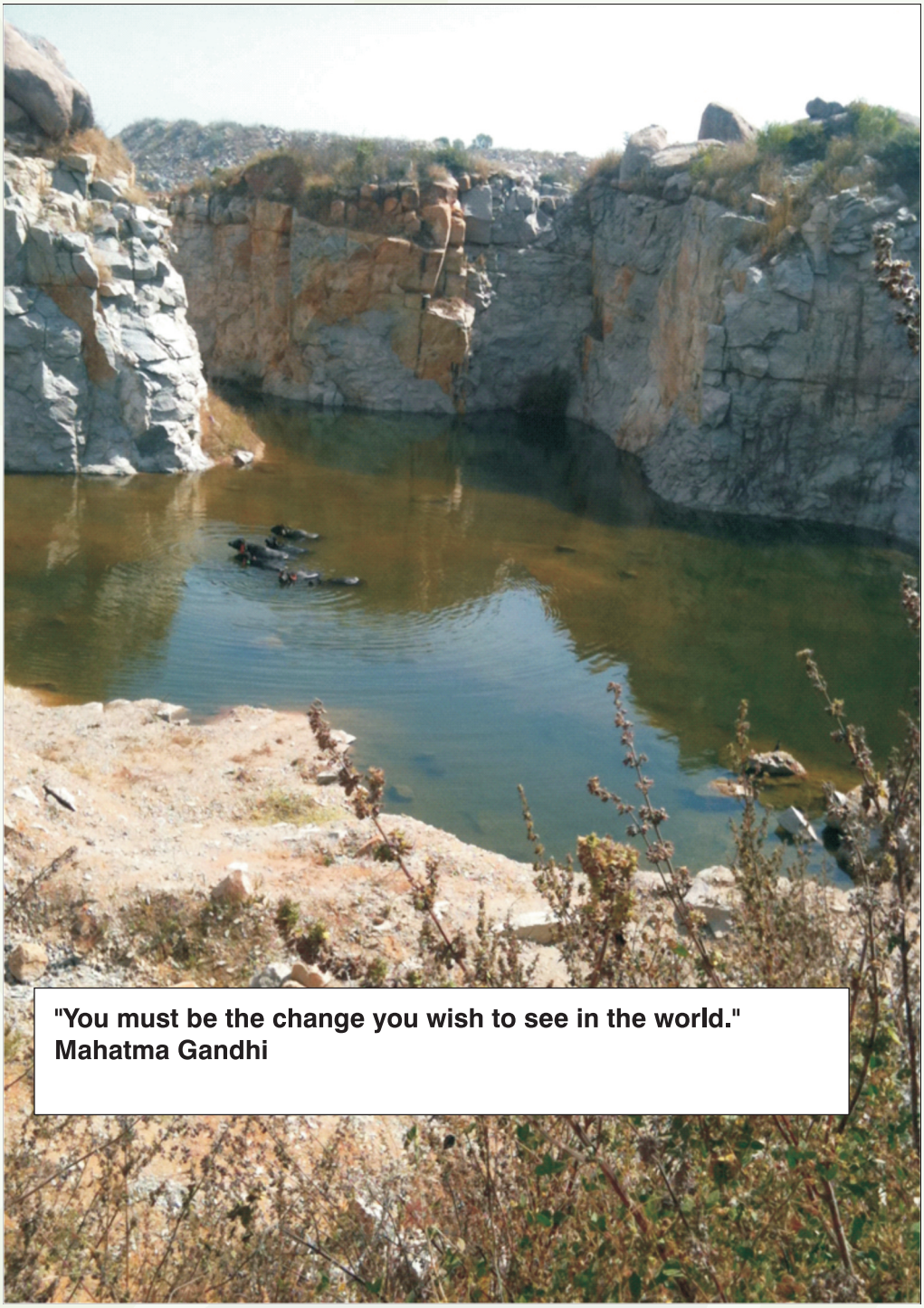
## Fifth Building Committee Meeting held on 25th January, 2013 at NIAB

NIAB Site

NIAB Staff

Dussehra Celebrations

Interim Facility at Miyapur



"You must be the change you wish to see in the world."
Mahatma Gandhi

# AUDITOR'S REPORT

Date: 24 July 2013

The Director,
National Institute of Animal Biotechnology,
Gachibowli,
Hyderabad – 500 046

We have audited the attached Balance Sheet of NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY, Hyderabad, as on 31st March 2013 and also the Income & Expenditure Account for the year ended on that date annexed there to. These financial statements are the responsibility of the organization management. Our responsibility is to express an opinion on these financial statements based on our audit.

We report that:

1. We have obtained all the information and explanations, which are to the best of our knowledge and belief, were necessary for the purpose of our audit.

2. In our opinion, the organization has kept proper books of account as required by law so far, as appears from our examination of those books.

3. The Balance sheet and Income & Expenditure account dealt with by this report is in agreement with the books of account.

4. The centre has maintained accounts on Accrual basis.

5. In our opinion and to the best of our information and according to the explanations given to us, the said Balance sheet and the Income & Expenditure account read together with the notes thereon gives the required information in the manner so required and give a true and fair view.

   (a) In so far it relates to the Balance sheet as at 31st March 2013 and
   (b) In so far as it relates to the Income & Expenditure account excess of expenditure over income for the year ended on 31st March 2013.

for B Purushottam & Co
Chartered Accountants
Reg.No. 002808S

Sd/-
[CH SATYANARAYANA]
Partner M No. 019092

Place: Hyderabad
Date: 24 July 2013

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY, HYDERABAD
## BALANCE SHEET AS ON 31st MAR 2013

| CORPUS/CAPITAL FUND AND LIABILITIES | Schedule | Current Year | Previous Year |
|---|---|---|---|
| Corpus / Capital Fund | 1 | 181,103,125.00 | - |
| Reserves and Surplus | 2 | 4,395,564.22 | - |
| Earmarked / Endowment funds | 3 | 632,518.00 | - |
| Secured Loans & Borrowings | 4 | - | - |
| Unsecured Loans & Borrowings | 5 | - | - |
| Deffered Credit Liabilities | 6 | - | - |
| Current Liabilities and Provisions | 7 | 1,190,534.00 | - |
| **TOTAL** | | **187,321,741.22** | **-** |
| **ASSETS** | | | |
| Fixed Assets | 8 | 88,058,157.00 | - |
| Investments- From Earmarked/ Endowment Funds | 9 | - | - |
| Investments - Others | 10 | 146,087.00 | - |
| Current Assets, Loans, Advances etc. | 11 | 99,117,497.22 | - |
| Miscellaneous Expenditure | | | |
| Internal & External Electrification | | | |
| **TOTAL** | | **187,321,741.22** | **-** |
| Significant Accounting Policies | 24 | - | |
| Contingent Liabilities and Notes on Accounts | 25 | - | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY,HYDERABAD
## Income And Expenditure Statement as on 31st MAR 2013

| INCOME | Schedule | Current Year | Previous Year |
|---|---|---|---|
| Income from Sales/Services | 12 | - | - |
| Grants/Subsides | 13 | 15,000,000.00 | - |
| Fees/Subscriptions | 14 | - | - |
| Income from Investments | 15 | 3,087,735.00 | - |
| Income from Royalty, Publications etc. | 16 | - | - |
| Interest Earned | 17 | - | - |
| Other Income | 18 | 427,384.22 | - |
| Increase/(decrease) in stock of Finished goods and works-in-progress | 19 | - | - |
| **TOTAL (A)** | | **18,515,119.22** | |
| **EXPENDITURE** | | | |
| Establishment Expenses | 20 | 7,639,648.00 | - |
| Administrative Expenses | 21 | 13,250,395.00 | - |
| Expenditure on Grants, Subsides etc. | 22 | - | - |
| Interest | 23 | - | - |
| Depreciation (Net Total at the year-end - corresponding to Schedule 8) | 677,324.00 | | |
| Less: Transferred to Grants-in-Aid | 677,324.00 | | |
| Provision For Salaries | | 992,699.00 | - |
| **TOTAL (B)** | | **21,882,742.00** | **-** |
| Balance being excess of Expenditure over Income (B-A) | - | 3,367,622.78 | - |
| Transfer to Special Reserve (Specify each) | | | |
| Transfer to/from General Reserve | | | |
| "balance Being Surplus/(deflict) Carried To Corpus/capital Fund" | 24 | | |
| Significant Accounting Policies | 25 | | |
| Contingent Liabilities And Notes On Accounts | | | |

# NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31st MAR 2013

| RECEIPTS | Current Year | Previous Year | Payments | Current Year | Previous Year |
|---|---|---|---|---|---|
| 1.Opening Balances | | | 1. Expenses | | |
| a) Cash in hand | - | - | a) Establishment Expenses (corresponding to Schedule 20) | 7,639,648.00 | - |
| b) Bank Balances | - | - | b) Administrative Expenses (corresponding to Schedule 21) | 13,250,395.00 | - |
| i) In current accounts | - | - | | | - |
| ii) In deposit accounts | - | - | | | |
| iii) Savings accounts | 50,182,973.00 | | | | |
| 2. Grants Received | | - | 2. Payments made against funds for various projects | | |
| a) From Government of India | 150,000,000.00 | - | (Name of the fund or project should be shown along with | | |
| b) From State government | - | - | the particulars of payments made for each project) | | |
| c) From other sources (details) | - | | Projects (Annexure F) | 567,482.00 | - |
| (Grants for capital & revenue exp. To be shown separately) | | | 3. Investments and deposits made | | |
| | | | a) Out of Earmarked/Endowment funds | - | - |
| Projects (Annexure - C) | 1,200,000.00 | - | b) Out of Own Funds (Investments-Others) | 40,000,000.00 | - |
| 3. Income on Investments from | | | 4. Expenditure on Fixed Assets & Capital Work-in-Progress | | |
| a) Earmarked/Endow. Funds | 3,087,735.00 | - | a) Purchases of Fixed Assets: Books & Journals | - | - |
| b) Own Funds (Oth. Investment) | | | Equipment -Lab/Office/Furniture | 1,677,424.00 | - |
| Investments Encased | 40,000,000.00 | - | b) Expenditure on Capital Work-in-Progress: | 82,697,394.00 | - |
| 4. Interest Received | | - | 5. Refund of surplus money/Loans | - | - |
| a) On Bank deposits | - | - | a) To the Government of India | - | - |
| b) Loans, Advances etc | - | | b) To the State Government | - | - |
| | | | c) To other providers of funds | - | - |
| 5. Other Income(Specify) | - | - | 6. Finance Charges (Interest) | | |
| | | - | 7. Other Payments (Specify) | | |
| 6. Any Other Receipts(Give Details) | | - | Advances (Annexure-D) | 98,089,157.00 | - |
| I-Remittances (Annexure-A) | 671,873.00 | - | I-Remittances (Annexure-E) | 671,873.00 | - |
| CPF-SUB, Arrears and adv.Refund | 146,087.00 | - | CPF A/c | 146,087.00 | - |
| Sundry Receipts | 190,260.00 | - | New Pension Schema | 87,778.00 | - |
| Application Fee | 237,124.22 | - | Analysis Charges Paid/Refund | | |
| Provident Fund Salvage | - | - | | | |
| Free Gifts - Donations | - | - | 8. Closing Balances | - | - |
| Sale OF Tender Forms | - | - | a) Cash in hand | - | - |
| Leave Salary-Pension Contribution Balances | - | - | b) Bank | - | - |
| License Fee | - | - | i) In current accounts | - | - |
| Welfare Fund | - | - | ii) In deposit accounts | - | - |
| NPS | 87,778.00 | - | iii) Savings accounts | 4,953,618.22 | - |
| Advance/Refunds/Recovery/ Adj(Annexure-B) | 3,977,026.00 | - | | | |
| **TOTAL** | **249,780,856.22** | **-** | **TOTAL** | **249,780,856.22** | **-** |

NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
SCHEDULES FORMING PART OF BALANCE SHEET Pn AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 1 - CORPUS/CAPITAL FUND | Current Year | | Previous Year | |
|---|---|---|---|---|
| Balance as at the begining of the year | | 46,312,967.00 | | |
| **Add :** Contribution towards Corpus/Capital Fund | | | | |
| NIAB Core - Plan (Non-Recurring) | 135,000,000.00 | | 47,000,000.00 | |
| Capitalised portion of Capital Expenditure of projects | 467,482.00 | 135,467,482.00 | - | 47,000,000.00 |
| **Less :** Lump Sum Depreciation | - | - | | |
| **Less :** Depreciation For the Year 2012-2013 | 677,324.00 | 677,324.00 | 687,033.00 | 687,033.00 |
| **Add :** Balance of net income/(Expenditure) transferred from the income and Expenditure Account | | | | |
| **BALANCE AS AT THE YEAR - END** | | **181,103,125.00** | | **46,312,967.00** |

NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 2 - RESERVES AND SURPLUS | Current Year | | Previous Year | |
|---|---|---|---|---|
| **1. Capital Reserve** | | | | |
| As per last Account | - | - | - | - |
| Addition during the year | - | - | - | - |
| **Less :** Deductions during the year | - | - | - | - |
| **2. Revolution Reserve** | | | | |
| As per last Account | - | - | - | - |
| Addition during the year | - | - | - | - |
| **Less :** Deductions during the year | - | - | - | - |
| **3. Special Reserves** | | | | |
| As per last Account | - | - | - | - |
| **Less :** Deductions during the year | - | - | - | - |
| **4. General Reserve** | | | | |
| As per last Account | 7,763,187.00 | | | |
| Addition during the year | -3,367,622.78 | | 7,763,187.00 | |
| **Less :** Deductions during the year | - | 4,395,564.22 | - | 7,763,187.00 |
| **Total** | | **4,395,564.22** | | **7,763,187.00** |

National Institute of Animal Biotechnology

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 3 - EARMARKED/ENDOWMENT FUNDS | Current Year | | Previous Year | |
|---|---|---|---|---|
| (Refer Annexures) | | | | |
| **(a) Opening balance of the Funds** | | | | |
| **(b) Additions to the Funds :** | | | | |
| i. Donations /grants | 1,200,000.00 | | | |
| ii. Income from investments made on account of funds | - | | | |
| iii. Other additions | - | 1,200,000.00 | - | - |
| **TOTAL (a+b)** | | **1,200,000.00** | | **-** |
| **(c) Utilisation/Expenditure towards objective of funds** | | | | |
| (i) Capital Expenditure (Refer Annexures I & II) | | | | |
| - Fixed Assets | 467,482.00 | | | |
| - Others | - | 467,482.00 | - | - |
| - Total | | | | |
| (ii) Revenue Expenditure (Refer Annexures I & II) | | | | |
| - Salaries, Wages and allowances etc. | - | - | - | - |
| - Rent | - | - | - | - |
| - Other Expenses | 100,000.00 | 100,000.00 | - | - |
| Total | | | | |
| **TOTAL (C)** | | **567,482.00** | | **-** |
| **NET BALANCE AS AT THE YEAR-END [(a + b)-c]** | | **632,518.00** | - | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 4 - SCHEDULE LOANS AND BORROWINGS : | Current Year | | Previous Year | |
|---|---|---|---|---|
| **1. Central Government** | | - | | - |
| **2. State Government (Specify)** | | - | | - |
| **3. Financial Institutions** | | | | |
| a) Term Loans | - | | - | |
| b) Interest accured and due | - | - | - | - |
| **4. Banks** | | | | |
| a) Terms Loans | - | - | - | - |
| -Interest accured and due | | | | |
| b) Other Loans | - | | - | - |
| -Interest accured and due | | | | |
| **5. Other Institutions and Agencies** | | - | | - |
| **6. Debentures and Bonds** | | - | | - |
| **7. Others (Specify)** | | - | | - |
| **TOTAL** | - | | | - |
| Note: Amount due within one year | | | | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 5 - SCHEDULE LOANS AND BORROWINGS | Current Year | | Previous Year | |
|---|---|---|---|---|
| **1. Central Government** | | - | - | |
| **2. State Government (Specify)** | | - | - | |
| **3. Financial Institutions** | | | | |
| a) Term Loans | - | | - | |
| b) Interest accured and due | - | - | - | - |
| **4. Banks** | | | | |
| a) Terms Loans | - | | | |
| b) Other Loans | - | - | - | |
| **5. Other Institutions and Agencies** | - | | - | |
| **6. Debentures and Bonds** | - | | - | |
| **7. Fixed Deposits** | - | | - | |
| **8. Others (Specify)** | - | | - | |
| **TOTAL** | - | | - | |
| Note: Amount due within one year | | | | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 6 - DEFFERED CREDIT LIABILITIES | Current Year | | Previous Year | |
|---|---|---|---|---|
| **a) Acceptances secured by hypothecation of capital equipment and other assets** | - | | - | - |
| **b) Others** | - | | - | - |
| **TOTAL** | - | | - | |
| Note: Amount due within one year | | | | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 7 - CURRENT LIABILITIES | Current Year | | Previous Year | |
|---|---|---|---|---|
| **AND PROVISIONS** | | | | |
| **A. CURRENT LIABILITIES** | | | | |
| 1. Acceptances | - | | | |
| 2. Sundry Creditors | - | | | |
| 3. Advances Received | - | | | |
| 4. Interest accured but not due on | - | | | |
| 5. Statutory Liabilities | | | | |
| 6. Other current Liabilities | | | | |
| NIAB.CP Fund A/C(Annexure-G) | 146,087.00 | | | |
| EMD | 5,000.00 | | | |
| Security Deposit | 46,748.00 | 197,835.00 | | |
| **TOTAL (A)** | | **197,835.00** | | |
| **B.PROVISIONS** | | | | |
| 1. For Taxation | - | - | | |
| 2. Gratuity | - | - | | |
| 3. Superannuation/Pension | - | - | | |
| 4. Accumulated Leave Encashment | - | - | | |
| 5. Trade Warranties/Claims | - | - | | |
| 6. Others (Specify) Provision for March 2013 Salaries | 992,699.00 | 992,699.00 | | |
| **TOTAL (B)** | | **992,699.00** | | |
| **TOTAL (A+B)** | | **11,90,534.00** | | |

# NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 8 - FIXED ASSTES | GROSS BLOCK | | | | DEPRECIATION | | | | NET BLOCK | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cost/valuation As at begining of the year | Addition during the year | Deductions during the year | Cost/valuation at the year end | As at the begining of the year | On additions during the year | On Deductions during the year | Total up to the year end | As at the Current year end | As at the Previous year end |
| **A. FIXED ASSETS** | | | | | | | | | | |
| **1. LAND** | - | - | - | - | - | - | - | - | - | - |
| a) Freehold | - | - | - | - | - | - | - | - | - | - |
| b) Leasehold | | | | | | | | | | |
| **2. BUILDINGS** | - | - | - | - | - | - | - | - | - | - |
| a) On Freehold Land | - | - | - | - | - | - | - | - | - | - |
| b) On Leasehold Land | - | - | - | - | - | - | - | - | - | - |
| c) Ownership Flats/Premises | - | - | - | - | - | - | - | - | - | - |
| d) Superstructures on Land | | | | | | | | | | |
| not belongs to the entity | 3,327,157.00 | 41,265.00 | - | 3,368,422.00 | 499,074.00 | 430,402.00 | - | 929,476.00 | 2,438,946.00 | 2,828,083.00 |
| **3. PLANT MACHINERY & EQUIPMENT** | 1,253,057.00 | 3,450.00 | - | 1,256,507.00 | 187,959.00 | 163,214.00 | - | 351,173.00 | 905,334.00 | 1,065,098.00 |
| **4. VEHICLES** | - | 293,623.00 | - | 293,623.00 | - | 16,113.00 | - | 16,113.00 | 277,510.00 | - |
| **5. FURNITURE, FIXTURES** | - | 843,293.00 | - | 843,293.00 | - | 67,595.00 | - | 67,595.00 | 775,698.00 | - |
| **6. OFFICE EQUIPMENT** | - | 495,793.00 | - | 495,793.00 | - | - | - | - | 495,793.00 | - |
| **7. COMPUTER/PERIPHERALS** | - | - | - | | - | - | - | - | | |
| **8. ELECTRIC INSTALLATIONS** | - | - | - | - | - | - | - | - | - | - |
| **9. LIBRARY BOOKS** | - | - | - | | - | - | - | - | - | - |
| **10. TUBEWELLS & WATER SUPPLY** | - | - | - | - | - | - | - | - | - | - |
| **11. OTHER FIXED ASSETS** | - | - | - | - | - | - | - | - | - | - |
| Airconditioning works | - | - | - | - | - | - | - | - | - | - |
| Aluminium partition work | - | - | - | - | - | - | - | - | - | - |
| DG Set | - | - | - | - | - | - | - | - | - | - |
| Paintings | - | - | - | - | - | - | - | - | - | - |
| Typewriters | - | - | - | - | - | - | - | - | - | - |
| Miscellaneous non consumables | - | - | - | - | - | - | - | - | - | - |
| Other Assets | - | - | - | | - | - | - | - | - | - |
| EMB Net | - | - | - | | - | - | - | - | - | - |
| **TOTAL** | 4,580,214.00 | 1,677,424.00 | | 6,257,638.00 | 687,033.00 | 677,324.00 | | 1,364,357.00 | 4,893,281.00 | 3,893,181.00 |
| **B. CAPITAL WORK-IN-PROGRESS** | - | 83,164,876.00 | | 83,164,876.00 | - | - | | - | 83,164,876.00 | - |
| **TOTAL** | 4,580,214.00 | 84,842,300.00 | | 89,422,514.00 | 687,033.00 | 677,324.00 | | 1,364,357.00 | 88,058,157.00 | 3,893,181.00 |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 9 - INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS | Current Year | Previous Year |
|---|---|---|
| 1. In Government Securities | - | - |
| 2. Other approved securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. Others (to be specified) - STDRs (Annexure-J) | - | - |
| **TOTAL** | **-** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 10 - INVESTMENTS - OTHERS | Current Year | Previous Year |
|---|---|---|
| (Annexure-K) | | |
| 1. In Government Securities | - | - |
| 2. Other approved securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds : UTI Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. Others (to be specified) - STDRs,(CPF), NIAB CP FUND A/C | 1,46,087.00 | - |
| **TOTAL** | **1,46,087.00** | **-** |

# NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 11 - INVESTMENTS - OTHERS : | Current Year | | Previous Year | |
|---|---|---|---|---|
| **A. CURRENT ASSETS** | - | | | |
| **1. Inventors** | | | | |
| a) Stores and Spares | - | | - | |
| b) Loose Tools | - | | - | |
| c) Stock-in-trade | | | | |
| Finished Goods | - | | - | |
| Work-in-progress | - | | - | |
| Raw Materials | - | - | - | - |
| **2. Sundry Debtors:** | | | | |
| a) Debts Outstanding for a period exceeding six months | | - | | |
| b) Others-Life Membership Fees | - | | | - |
| **3. Cash balances in hand (including cheques/drafts and imprest)** | | | | |
| **4. Bank Balances:** | | | | |
| a) With Scheduled Banks: | | | | |
| -On Current Accounts | - | | | |
| -On Deposit Accounts (includes margin money) | - | - | | |
| -On Savings Accounts | 4,953,618.22 | 4,953,618.22 | 50,182,973.00 | 50,182,973.00 |
| b) With non-Schedules Banks: | | | | |
| -On Current Accounts | - | - | | |
| -On Deposit Accounts | - | | - | |
| -On Savings Accounts | - | - | - | - |
| **5. Post Office-Savings Accounts** | | | | |
| **TOTAL (A)** | | **4,953,618.22** | | **50,182,973.00** |
| **B.LOANS,ADVANCES AND OTHER ASSETS** | | | | |
| **1. Loans:** | | | | |
| a) Staff | - | - | | |
| b) Other Entities engaged in activities/objectives similar to that of the Entity | - | - | - | - |
| **2. Advances and other amounts recoverable in cash or in kind or for value to be received** | | | | |
| a) On Capital Account (Annexure-H) | 93,573,732.00 | | | |
| b) Prepayments - Deposits (Annexure-I) | 90,147.00 | | | |
| c) Others | 500,000.00 | 94,163,879.00 | - | - |
| **3. Income Accured:** | | | | |
| a) On Investments from Earmarked/Endowments Funds | - | - | | |
| b) On Investments - Others | - | | - | |
| c) On Loans and Advances | - | | - | |
| d) Others | - | - | - | - |
| **4. Claims Receivable** | - | | | |
| **TOTAL (B)** | | **94,163,879.00** | | **-** |
| **TOTAL (A+B)** | | **99,117,497.22** | | **50,182,973.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 12 - INCOME FROM SALES/SERVICES | Current Year | Previous Year |
|---|---|---|
| **1) Income from sales** | | |
| a) Sale of Finished Goods | - | - |
| b) Sale of Raw Material | - | - |
| c) Sale of Scraps | - | - |
| **2) Income from Services** | | |
| a) Labour and Processing Charges | - | - |
| b) Professional/Consultancy Services (Analysis Charges) | - | - |
| c) Agency Commission and Brokerage | - | - |
| d) Maintenance Services (Equpiment/Property) | - | - |
| e) Others (Specify) | - | - |
| **TOTAL** | **-** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 13 - GRANTS/SUBSIDES | Current Year | Previous Year |
|---|---|---|
| (Irrevocable Grants & Subsides Received) | | |
| 1) Central Government (DBT Plan Grant-in-Aid) | 15,000,000.00 | - |
| 2) State Government(s) | - | - |
| 3) Government Agencies | - | - |
| 4) Institutions/Welfare Bodies | - | - |
| 5) International Organisations | - | - |
| 6) Others (Specify) | - | - |
| **TOTAL** | **15,000,000.00** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 14 - FEES/SUBSCRIPTIONS | Current Year | Previous Year |
|---|---|---|
| 1) Entrance Fees | - | - |
| 2) Annual Fees/Subscriptions | - | - |
| 3) Seminar/Program Fees | - | - |
| 4) Consultancy Fees | - | - |
| 5) Others (Specify) | - | - |
| **TOTAL** | **-** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 15 - INCOME FROM INVESTMENTS | Current Year | | Previous Year | |
|---|---|---|---|---|
| (Income on Invest from Earmarked/Endowment Funds transferred to Funds) | | | | |
| 1) Interest: | | | | |
| a) On Govt. Securities | - | - | | |
| b) Other Bonds/Debentures | - | - | - | - |
| 2) Dividends: | | | | |
| a) On Shares | - | - | - | - |
| b) On Mutual Fund Securities | - | - | - | - |
| 3) Rents | - | - | - | - |
| 4) Others (Specify) STDRs | 3,087,735.00 | - | - | - |
| **TOTAL** | **3,087,735.00** | **-** | **-** | **-** |
| **TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS** | | | | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 16 - INCOME FROM ROYALITY, PUBLICATION ETC | Current Year | Previous Year |
|---|---|---|
| 1) Income from Royality | - | - |
| 2) Income from Publications | - | - |
| 3) Others (Specify) | - | - |
| **TOTAL** | **-** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 17 - INTEREST EARNED : | Current Year | Previous Year |
|---|---|---|
| (Income on Invest from Earmarked/Endowment Funds transferred to Funds) | | |
| 1) On Term Deposits | - | - |
| a) With Schedule Banks | - | - |
| b) With Non-Scheduled Banks | - | - |
| c) With Institutions | - | - |
| d) Others | | |
| 2) On Saving Accounts | - | - |
| | - | - |
| a) With Schedule Banks | - | - |
| b) With Non-Scheduled Banks | - | - |
| c) post Office Savings Accounts | | |
| d) Others | - | - |
| 3) On Loans | - | - |
| a) Employees/Staff | - | - |
| b) Others | - | - |
| 4) Interest on Debtors and Other Receivables | | |
| **TOTAL** | **-** | **-** |
| Note :- Tax deducted at source to be indicated | | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 18 - OTHER INCOME : | Current Year | Previous Year |
|---|---|---|
| 1) Profit on Sale/disposal of Assets: | - | - |
| a) Owned assets | - | - |
| b) Assets acquired out of grants, or received free of cost | - | - |
| 2) Export Incentives realized | - | - |
| 3) Fees for Miscellaneous Services | | |
| 4) Miscellaneous Receipts | - | - |
| 5) Other Receipts | - | - |
| Sundry Receipts | 1,90,260.00 | - |
| Application Fee | 2,37,124.22 | - |
| Sales Of Tender Forms | - | - |
| Licence Fee | - | - |
| Interest On Computer Advance,Conveyance Advance And HBA | - | - |
| Leave Salary-Pension Contribution | - | - |
| Provident Fund Salwage | | |
| Free.Gifts-Donations | | |
| **TOTAL** | **4,27,384.22** | |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 19 - INCREASE/(DECREASE) IN STOCK OF FINISHED GOODS & WORK IN PROGRESS : | Current Year | Previous Year |
|---|---|---|
| a) Closing stock | | |
| -Finished Goods | - | - |
| -Work-in-progress | - | - |
| **Total** | - | - |
| b) Less: Opening stock | | |
| -Finished Goods | - | - |
| -Work-in-progress | - | - |
| **Total** | - - | |
| **NET INCREASE/(DECREASE) [a-b]** | - | - |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 20 - ESTABLISHMENT EXPENSES : | Current Year | Previous Year |
|---|---|---|
| a) Salaries and Wages | 5,151,201.00 | |
| b) Allowances and Bonus | 2,331,976.00 | - |
| c) Contribution to Provident Fund | - | - |
| d) Contribution to Other Fund (NPS) | 87,778.00 | |
| e) Staff Welfare Expenses - Medical charges | 68,693.00 | - |
| f) Expenses on Employees Retirement and Terminal Benefits | - | - |
| g) Others (specify) - Staff leased House | - | - |
| **TOTAL** | **7,639,648.00** | - |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 21 - OTHER ADMINISTRATIVE EXPENSES : | Current Year | Previous Year |
|---|---|---|
| a) Purchases | 109,950.00 | - |
| b) Electricity and power | - | - |
| c) Water charges | 5,150.00 | - |
| d) Insurance | 5,020.00 | - |
| e) Repairs and maintenance | 591,943.00 | - |
| f) Rent, Rates and Taxes | - | - |
| g) Vehicles Running and Maintenance | 1,044,669.00 | - |
| h) Postage, Telephone and Communication Charges | 285,248.00 | - |
| i) Printing and Stationary | 673,891.00 | - |
| j) Travelling and Conveyance Expenses | 1,769,416.00 | - |
| k) Expenses on Seminar/Workshops | 2,741,116.00 | - |
| l) Subscription Expenses | 13,557.00 | - |
| m) Expenses on Fees | 79,250.00 | - |
| n) Auditors Remuneration | - | - |
| o) Hospitality Expenses | 823,047.00 | - |
| p) Professional Charges | - | - |
| q) Advertisement and Publicity | 329,815.00 | - |
| r) Bank Charges | 15,784.00 | - |
| s) Security & Cleaning Contract Charges | 248,189.00 | - |
| t) Training Course /Symposia | - | - |
| u) Other Contingencies | 1,346,633.00 | - |
| v) Liveries & Blankets | - | - |
| w) Other Research Expenses | 3,167,717.00 | - |
| x)Office Books | - | - |
| **TOTAL** | **13,250,395.00** | - |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 22 - EXPENDITURE ON GRANTS, SUBSIDES ETC. : | Current Year | Previous Year |
|---|---|---|
| a) Grants given to Institutions/Organisations | - | - |
| b) Subsidies given to Institutions/Organisations | - | - |
| **TOTAL** | **-** | **-** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## SCHEDULES FORMING PART OF BALANCE SHEET AS ON 31st MAR 2013

(Amount - Rs.)

| SCHEDULE 23 - INTEREST : | Current Year | Previous Year |
|---|---|---|
| a) On Fixed Loans | - | - |
| b) On Other Loans (including Bank Charges) | - | - |
| c) Others | - | - |
| **TOTAL** | **-** | **-** |

## Schedule 24: Significant Accounting Policies & Schedule 25: Contingent Liabilities & Notes On Account For The Period Ended 31/03/2013

1. **Method of Accounting:**

   (a.) The accounting system adopted by the organization is on "Accrual basis".
   (b.) The organization has been allocating plan grant-in-aid under the "Non-recurring" & "Recurring" heads.

2. **Revenue recognition:**

   Income comprises of Grant-in-Aid, Internal Resources through services and interest from short term deposits. Income accounted on the basis of the Cash/DD/Cheques/Cr notes received.

3. **Fixed Assets:**

   (a) Fixed assets are stated at cost. Cost includes freight, duties, and taxes etc.,
   (b) Depreciation: Account on Fixed Assetshas been prepared at the rate prevailing to the concerned Fixed Assets as specified in the Income Tax Act, 1961 on Written Down Value Method of Depreciation.The has been set off against the Grant in Aid (Non Recurring) in the concerned account.

   (c) Capital work in progress has been entered to the extent of the last running account bills paid.

   (d) Realization on sale of obsolete/surplus fixed assets which is not required for the purpose of research activities are adjusted against capital cost.

4. **Inventories:**

   All purchases of chemicals, glassware and other consumables have been charged to consumption at the time of purchase.

5. **Foreign Currency transactions:**

   Foreign Currency transactions are recognized in the books at the exchange rates prevailing on the date of transaction.

6. **Investments:**

   Investments in STDR's are stated at book values.

7. **Advances:**
   It is observed from the objection book register that advances to suppliers for consumables &Equipments are to be reconciled and adjustment entries are to be passed in the books of accounts.

8. The previous year balances have been regrouped/rearranged, wherever necessary.

for B Purushottam & Co
Chartered Accountants
Reg.No.0028080S

| | | |
|---|---|---|
| Sd/- | Sd/- | Sd/- |
| Director, NIAB | Finance Officer, NIAB | [CH SATYANARAYANA] |
| | | Partner M No. 019092 |

Place: Hyderabad
Date: 24 July 2013

## Details of Closing balances of various Earmarked / Endowement Funds (Refer Sch-3)
## For the Year Ended 31st MAR 2013

Annexure-I (Amount in Rs.)

| Previous year | Proj No | Particulars | Current Year |
|---|---|---|---|
| - | SP001 | NMMP MODEL NURSERY | 632,518.00 |
| - | | **Total** | **632,518.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## Details of Closing balances of various Earmarked / Endowement Funds (Refer Sch-3)
## For the Year Ended 31st MAR 2013

Annexure-II (Amount in Rs.)

| Previous year | Proj No | Particulars | Current Year |
|---|---|---|---|
| - | SP001 | NMMP MODEL NURSERY | 467,482.00 |
| - | | **Total** | **467,482.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## For the Year Ended 31st MAR 2013
## Annexure: A Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **I-Remittances** | |
| - | TDS | 187,372.00 |
| - | Income Tax | 385,275.00 |
| - | Works Tax | 33,244.00 |
| - | GSLI | 1,450.00 |
| - | Professional Tax | 19,730.00 |
| - | Service Tax | 44,802.00 |
| - | **Total** | **6,71,873.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
## For the Year Ended 31st MAR 2013
## Annexure: B Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **Advance refunds/recovery/Adjst.** | |
| - | General Deposits and Advances | 3,925,278.00 |
| - | EMD | 5,000.00 |
| - | Security Deposit | 46,748.00 |
| - | **Total** | **3,977,026.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: C Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **Projects - Receipts** | |
| - | SP001 | 1,200,000.00 |
| - | **Total** | **1,200,000.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: D Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **Advances** | |
| - | General Deposits And Advances | 4,015,425.00 |
| - | Workshop & Conference | 500,000.00 |
| - | Equipment | 92,817,633.00 |
| - | Vehicles | 756,099.00 |
| - | **Total** | **9,80,89,157.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: E Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **I-Remittances** | |
| - | TDS | 187,372.00 |
| - | Income Tax | 385,275.00 |
| - | Works Tax | 33,244.00 |
| - | GSLI | 1,450.00 |
| - | Professional Tax | 19,730.00 |
| - | Service Tax | 44,802.00 |
| - | **Total** | **6,71,873.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: F Forming part of Receipts and Payment a/c

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **Projects - Expenditure** | |
| - | SP001 | 567,482.00 |
| - | **Total** | **567,482.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: G Forming part of Balance sheet

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **NIAB C.P.F ACCOUNT** | |
| - | Opening Balance | - |
| - | Add: | |
| - | Employee subscription/ refunds | 146,087.00 |
| - | Transfer from other departments | - |
| - | Institute contribution (inc. Projects staff) | - |
| - | Interest received | - |
| - | Less Advances/withdrawals/Transfer/Adjst | - |
| | **Total** | **146,087.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: H Forming part of Balance sheet

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **LOANS AND ADVANCES** | |
| - | Equipment [Advance] | 92,817,633.00 |
| - | Vehicles [Advance] | 756,099.00 |
| - | **Total** | **93,573,732.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: I Forming part of Balance sheet

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **DEPOSITS** | |
| - | General Deposits And Advances | 90,147.00 |
| - | GDA[Others] | - |
| - | **Total** | **90,147.00** |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: J Forming part of Balance sheet

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **INVESTMENT A/C** | |
| - | Investments | - |
| - | Other Investments | - |
| - | **Total** | - |

## NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY
### For the Year Ended 31st MAR 2013
### Annexure: K Forming part of Balance sheet

| Previous Year | Particulars | Current Year |
|---|---|---|
| | **NIAB C.P.F INVESTMENT A/C** | |
| - | Deposit with Banks | - |
| - | Employee subscription | 146,087.00 |
| - | Less Transfer To Bank A/C | - |
| - | **Total** | **146,087.00** |

## NIAB
## Hyderabad
## SP001: NMMP MODEL NURSERY
## P.I: Prof. P Reddanna
## Receipts and Payments Account from 01/04/2012 to 31/03/2013

Amount in Rs.

| Previous Year | Receipts | Current Year | Previous Year | Payments | Current Year |
|---|---|---|---|---|---|
| 0.00 | Opening Balance | 0.00 | | | |
| 0.00 | Grant In Aid | 1,200,000.00 | 0.00 | Salaries - Manpower | 0.00 |
| 0.00 | | 0.00 | 0.00 | Consumables | 0.00 |
| 0.00 | | 0.00 | 0.00 | Contingencies | 100,000.00 |
| 0.00 | | 0.00 | 0.00 | Travel | 0.00 |
| 0.00 | | 0.00 | 0.00 | Overheads | 0.00 |
| 0.00 | | 0.00 | 0.00 | Equipment | 467,482.00 |
| 0.00 | | 0.00 | 0.00 | Books | 0.00 |
| 0.00 | | 0.00 | 0.00 | AMC | 0.00 |
| 0.00 | | 0.00 | 0.00 | Others | 0.00 |
| 0.00 | | 0.00 | 0.00 | Transfer of Funds | 0.00 |
| **0.00** | | **1,200,000.00** | **0.00** | | **567,482.00** |
| 0.00 | Excess of Expenditure over Income | 0.00 | 0.00 | Closing Balance | 632,518.00 |
| **0.00** | | **1,200,000.00** | **0.00** | | **1,200,000.00** |

*Man is the only creature that consumes without producing. He does not give milk,he does not lay eggs, he is too weak to pull the plough, he cannot run fast enough to catch rabbits. Yet he is lord of all the animals.*

- George Orwell, Animal Farm

मनुष्य ही ऐसा एक मात्र प्राणी है जो उत्पादन किए बिना उपभोग करता है, वह दूध नहीं देता है, वह अंडे नहीं सेता है, वह हल खींचने के लिए कमजोर है, वह खरगोशों को पकड़ने लायक तेजी से भी नहीं दौड सकता, फिर भी वह सभी पशुओं का मालिक है।

- जॉर्ज ऑरवेल, ऐनिमल फार्म

NIAB
National Institute of Animal Biotechnology

D. No. 1-121/1, 4th & 5th Floors, Axis Clinicals Building
Opp. to Talkie Town, Miyapur, Hyderabad - 500 049, A.P., INDIA
Tele : +91 40 2304 2740. Telefax : 040 2304 2740
Email: director@niab.org.in, admin@niab.org.in
**website : www.niab.org.in**