**Babru Samal, Ph.D.**

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Citizenship: USA

**Technical Expertise**

**Bioinformatics (1995-present)**

* 12 years experience in analysis of high throughput **gene expression data** from various array platforms (Affymtrix, Agilent, Illumina etc.) using Partek, GeneSpring, R-script/Bioconductor, in immunology, neuroscience and hematology projects.
* Experience in submitting as well as retrieving data from public databases at NCBI, EBI, (GEO, ArrayExpress), microRNA (Sanger etc.) for meta analysis and data integration.
* Promoter and cis element analysis for establishing co-regulation of genes using Genomatix, BioBase, PSCAN etc. utlizing databases such as Transfac and Jaspar.
* Analysis of high throughput sequencing data (genomic, EST)
* Integration of mRNA and microRNA expression data using TargetScan etc..
* Experience with scripting languages (Perl), in SQL (MySQL, ACCESS) , web design (PHP, HTML, Photoshop etc.) as well as in different operating systems (Windows XP and 7, Ubuntu and Mac)
* “Omics” data analysis (Pathways and Ontology (IPA, GeneGO, PathwayStudio, GOelite, DAVID, WebGestalt etc.)
* Genome and transcriptome data mining for novel gene discovery and assignment of functions to novel genes by sequence analysis and text mining .
* Analysis of **protein array** data.
* Utilization of open-source bioinformatics tools
* Annotation and mining genes from genome projects for genes encoding novel secreted proteins and other therapeutics.
* Data integration, database construction and creation and maintenance of searchable online databases.

**Molecular Biology (1973-2002)**

* Cloning of novel genes and functional studies of the recombinant proteins using bioassay and gene transfer in vitro and in vivo.
* Gene expression and isolation of gene products from E. coli, insect and mammalian cells (transient as well as stable expression with and without tags)
* Bioassays, proliferation studies, inflammation models, antisense approach for gene inactivation
* Study of the effect of cytokines on cancer cells (TNF, IFN-gamma, IL-6 etc.)
* Gene transfer (expression in mice using retroviral vectors)
* Expression of genes encoding secreted proteins in transgenic mouse

**Sub Unit vaccine development (1982-1987)**

* Purified Hepatitis B surface protein expressed in yeast, did drug formulation, carried out GLP and GMP studies as well as toxicity studies and filed patents

**Education and Training:**

 **Post-doctoral training (functional genomics)**

* Princeton University, Princeton, NJ. (1979 - 1981)
* Baylor College of Medicine, Houston, TX. (1977-1979)

 **PH.D. cellular and molecular biology (functional genomics)**

* University of Southern California, Los Angeles, CA, USA 1977

**Honors and awards:**

* Phi Sigma award for best Ph.D. thesis, USC, Los Angeles,1977
* National Scholarships from the Government of India, 1965-1971, 1973-1977

**Membership in Professional Organization**

* Society for Neuroscience

**Employment History and accomplishment**

**NIAID, NIH, Rockville, MD**

Bioinformatics Core Scientist (2011-present)

* Analyzed Affymetrix microarray data from malaria patient PBMC before and after infection using Partek, GeneSpring, GSEA etc.
* Analyzed Illumina microarray data to find out impact of TLR7 on gene expression in transgenic mice
* Analyzed Affymetrix microarray data to identify the effect of agonist antibodies on gene expression in NK cells.
* Collaborated with outside scientists on standardization of protein array normalization and statistical analysis.
* Analyzed protein array data to identify statistically significant immunogenic proteins expressed during asexual or sexual stages of Plasmodium falciparum.
* Combined microarray and MASS spec data to assign Plasmodium falciparum proteins to different life cycle stages.
* Analyzed Luminex data to identify changes in cytokine profile during malaria infection.

**NIMH, NIH, Bethesda, MD**

Bioinformatics Core Specialist (2005- 2011)

Special volunteer scientist in Bioinformatics (2003 – 2005)

* Analyzed microarray data from different gene knockout model systems in relation to their effects on neuronal differentiation and behavior.
* Designed methods for functional annotation of microarray derived significantly changing genes with unknown function and limited characterization.
* Created a neurotrauma database for Henry Jackson Foundation.
* Managed Science Signaling website for connection map for PC12 differentiation (<http://stke.sciencemag.org/cgi/cm/stkecm;CMP_8038> )
* Created and maintaining the website <http://www.molecularbrain.org> for molecular neuroscientists.
* Created and maintaining the website <http://www.genetools.us/> for molecular biologists
* Created and maintained the website <http://www.chromaffincell.org/> for the international society for chromaffin cell biology.

**Georgetown University, Washington DC**

Contract lectures on Introduction to Bioinformatics (2006-2011)

Adjunct associate professor in the department of biochemistry (2009-2011)

* Taught introduction to bioinformatics for Masters Program in Biotechnology.

 **NeuralStem Inc, Rockville, MD**

Consultant on Bioinformatics and Molecular Biology (2006-2011)

Principal Scientist, Gene Discovery (2000-2002)

* Analyzed microarray data to identify genes expressed during targeted differentiation of human neural stem cells and also as a response to specific chemicals.
* Provided molecular biology solution for gene expression in neural stem cells for various gene therapies using stable or transient gene expression.
* Developed and applied patent for a novel 5’ SAGE technology
* Identified >12000 novel brain stem cell specific transcript tags

**Henry Jackson Foundation, Rockville, MD**

Staff Scientist, Neurotrauma Gene Discovery Program (2010-2011)

* Created and maintained a neurotrauma database online
* Analyzed microarray and sequencing data for identifying impact of trauma on microRNA and transcriptome

**Johns Hopkins University, School of Medicine, Baltimore**

Staff scientist, Oncology (2004 – 2005)

* Analyzed microarray data from studies of hematopoietic stem cells undergoing differentiation.

**ISU chemicals, Seoul, Korea (**Biotechnology Division, Rockville, MD)

Consultant in bioinformatics, genomics and molecular biology (2003 – 2004)

* Analyzed more than one hundred microarray data files for identifying candidate genes for inflammation research
* Submitted two patent drafts for which the company received $25 million dollars to develop the products at their Seoul facility

**Psychiatric Genomics, Gaithersburg, MD**

Director, Neurogenomics (2002 - 2003)

* Analyzed microarray data derived from post mortem brain, cell culture and animal model systems for various psychiatric diseases (depression. Schizophrenia, bipolar)

**Imgenex Inc, San Diego, CA**

Director of Bioinformatics and Molecular Biology (1999 - 2000)

* Identified novel member of therapeutically important molecules by data mining public databases followed up by cloning and expression studies.
* Submitted R01 grants for research.

**Amgen Inc, Thousand Oaks, CA**

Research Scientist I, II and III (1981 - 1999)

* Developed a signal trap procedure and used it for screening novel clones encoding secreted proteins.
* Cloned, expressed and studied the biological functions of PBEF (Visfatin) in both in vitro and in vivo model
* Managed the process of selection of >300 genes encoding secreted proteins from genome project for functional analysis in vivoSubmitted and was granted patents on a number of novel therapeutics and chemical products (see the patents info).

**Research Management Experience:**

**NeuralStem Inc**

* Managed the gene discovery process that included bioinformatics, molecular Biology and DNA sequencing (2000-2002).

**Amgen Inc**

* Managed the committee overseeing the process of discovery and functional characterization of novel genes identified in Amgen genome project (1996-1999).
* Managed the interaction between the computational biology and molecular biology group for implementing computational tools in molecular biology research and improving computational tools by testing them in wet labs.
* Managed of collaborations with professors at UCI, UCSD etc. for delineating the biological function of different cytokines ( 1992-1999)
* Managed research in molecular and cellular biology for new therapeutic drug development (1981-1999)

**Certificates**

* German language proficiency, 1972 (Goethe Institut)
* Novel techniques in Microarray 2003-2008 (NIH, CIT sponsored classes)

**Collaborators on Research (1985-2012):**

**Bioinformatics**

* Prof. Vladimir B. Bajic Institute for Infocomm Research,, Singapore
* Prof. Padmini Srinivasan University of Iowa

**Gene transfer**

* Prof. Larry Kedes University of Southern California
* Prof. Hong Fan University of California, Irvine

**Cytokines**

* Prof. Tom Ulich University of California, San Diego
* Dr. Christian Betzel Max Planck Institute, Hamburg

**Protein Array**

* Prof. Phil Felgner University of California, Irvine
* Johanna Baily University of Columbia, New York
* Mr. Joe Campo Barcelona Center for International

 Health Research (CRESIB)

**PUBLICATIONS (selected from >50)**

**Tran TM, Samal B, Kirkness E and Crompton PD** Systems immunology of human malaria*Trends in Parasitology, in press 2012*

**Ait-Ali D, Samal B, Mustafa T and Eiden LE** Neuropeptides, growth factors and cytokines: A cohort of informational molecules whose expression is up-regulated by the stress-associated slow transmitter PACAP in chromaffin cells. *J. Neurochemistry 30:1441-1449, 2010*

**Eiden  LE., Samal B, Gerdin MJ, Mustafa T, Vaudry D and Stroth N.** Discovery of Pituitary Adenylate Cyclase-Activating Polypeptide–Regulated Genes through Microarray Analyses in Cell Culture and In Vivo  *Annals of New York Acad Sci.* 1144: 6-20. 2008

**Samal BB, Eiden LE.** pathFinder: a static network analysis tool for pharmacological analysis of signal transduction pathways.  *Sci Signal.*1(31):pt4. 2008 Review.

**Samal B, Gerdin MJ, Huddleston D, Hsu CM, Elkahloun AG, Stroth N, Hamelink C, Eiden LE.**  Meta-analysis of microarray-derived data from PACAP-deficient adrenal gland in vivo and PACAP-treated chromaffin cells identifies distinct classes of PACAP-regulated genes. *Peptides.* 28:1871-82 , 2007

**Chen Y, Samal B, Hamelink CR, Xiang CC, Chen Y, Chen M, Vaudry D, Brownstein MJ, Hallenbeck JM, Eiden LE.**  Neuroprotection by endogenous and exogenous PACAP following stroke. *Regul Pept.* 137:4-19, 2006

**Ognjanovic S, Bao S, Yamamoto SY, Garibay-Tupas J, Samal B, Bryant-Greenwood GD.** Genomic organization of the gene coding for human pre-B-cell colony enhancing factor and expression in human fetal membranes. *J Mol Endocrinol.* 26:107-17. 2001

**Narhi LO, Philo JS, Li T, Zhang M, Samal B, Arakawa T.**  Induction of alpha-helix in the beta-sheet protein tumor necrosis factor-alpha: acid-induced denaturation. *Biochemistry*. 35:11454-60. 1996

**Narhi LO, Philo JS, Li T, Zhang M, Samal B, Arakawa T.**  Induction of alpha-helix in the beta-sheet protein tumor necrosis factor-alpha:thermal- and trifluoroethanol-induced denaturation at neutral pH.  *Biochemistry.* 35:11447-53. 1996

**Samal B, Boone T, Karan B, Chen K, Sachdev R, Arakawa T.**  Cloning and expression of the gene encoding a novel proteinase from Tritirachium album limber. *Adv Exp Med Biol*. 379:95-104. 1996

**Chang** **MS**, **McNinch J**,  **Basu R**,  **Shutter J**,  **Hsu R-Y**,  **Perkins C**,  **Mar V**,  **Suggs S**,  **Welcher A**,  **Li  L**,  **Lu H**,  **Bartley B**,  **Hunt P**,  **Martin M**,  **Samal B**,  **Bogenberger J.** Cloning and Characterization of the Human Megakaryocyte Growth and Development Factor (MGDF) Gene*J Biol Chem*270:511-514, 1995

**Estrov Z, Samal B, Lapushin R, Kellokumpu-Lehtinen P, Sahin AA, Kurzrock R, Talpaz M, Aggarwal BB.**  Leukemia inhibitory factor binds to human breast cancer cells and stimulates their proliferation.  *J Interferon Cytokine Res*. 15:905-13. 1995

**Hamamori Y, Samal B, Tian J, Kedes L.**  Myoblast transfer of human erythropoietin gene in a mouse model of renal failure. *J Clin Invest*. 95:1808-13. 1995

**Ulich TR, del Castillo J, Shin SS, Yin S, Duryea D, Tarpley J, Samal B.** Hematologic effects of stem cell factor (SCF) and leukemia inhibitory factor (LIF) in vivo: LIF-induced thrombocytosis in SCF-primed mice.  *Eur J Haematol.* 54:217-25. 1995

**Samal BB, Arakawa T, Boone TC, Jones T, Prestrelski SJ, Narhi LO, Wen J, Stearns GW, Crandall CA, Pope J, et al.** High level expression of human leukemia inhibitory factor (LIF) from a synthetic gene in Escherichia coli and the physical and biological characterization of the protein.  *Biochim Biophys Acta.* 1260:27-34. 1995

**Hamamori Y, Samal B, Tian J, Kedes L.** Persistent erythropoiesis by myoblast transfer of erythropoietin cDNA. *Hum Gene Ther*. 5:1349-56. 1994

**Ulich TR, Fann MJ, Patterson PH, Williams JH, Samal B, Del Castillo J, Yin S, Guo K, Remick DG.** Intratracheal injection of LPS and cytokines. V. LPS induces expression of LIF and LIF inhibits acute inflammation. *Am J Physiol*. 267:L442-6. 1994

**Yan XQ, Briddell R, Hartley C, Stoney G, Samal B, McNiece I.** Mobilization of long-term hematopoietic reconstituting cells in mice by the combination of stem cell factor plus granulocyte colony-stimulating factor.  *Blood.* 84:795-9. 1994

**Bartley TD, Bogenberger J, Hunt P, Li YS, Lu HS, Martin F, Chang MS, Samal B, Nichol JL, Swift S, et al.** Identification and cloning of a megakaryocyte growth and development factor that is a ligand for the cytokine receptor  Mpl. *Cell*. 77:1117-24. 1994

**Samal B, Sun Y, Stearns G, Xie C, Suggs S, McNiece I.**  Cloning and characterization of the cDNA encoding a novel human pre-B-cell colony-enhancing factor.  *Mol Cell Biol*. 14:1431-7. 1994

**Aggarwal BB, Graff K, Samal B, Higuchi M, Liao WS.**  Regulation of two forms of the TNF receptors by phorbol ester and dibutyryl cyclic adenosine 3',5'-monophosphate in human histiocytic lymphoma cell line U-937.  *Lymphokine Cytokine Res*. 12:149-58. 1993

**Samal BB, Stearns GW, Boone TC, Arakawa T.**  Comparative analysis of the effects of recombinant cytokines on the growth and differentiation of ML-1, a human myelogenous leukemic cell line.  *Leuk Res*. 17:299-304. 1993

**Samal BB, Karan B, Parker C, Stabinsky Y.** Isolation and thermal stability studies of two novel serine proteinases from the fungus Tritirachium album Limber. *Enzyme Microb Technol*. 13:66-70. 1991

**Samal BB, Karan B, Boone TC, Osslund TD, Chen KK, Stabinsky Y.** Isolation and characterization of the gene encoding a novel, thermostable serine proteinase from the mould Tritirachium album Limber.  *Mol Microbiol*. 4:1789-92. 1990

**Samal B, Stearns G, Crandall C, Arakawa T, Boone T.** Identification of interleukin 6 as a synergistic factor for the differentiation-inducing effect of TNF on leukemic ML-1 cells. *Leuk Res*. 14:575-80. 1990

**Samal BB, Karan B, Boone TC, Chen KK, Rohde MF, Stabinsky Y.**  Cloning and expression of the gene encoding a novel proteinase from Tritirachium album limber. *Gene*. 85:329-33. 1989

**Burnette WN, Samal B, Browne J, Ritter GA.**  Properties and relative immunogenicity of various preparations of recombinant DNA-derived hepatitis B surface antigen. *Dev Biol Stand.* 59:113-20. 1985

**Samal B, Worcel A, Louis C, Schedl P.** Chromatin structure of the histone genes of D. melanogaster. *Cell*. 23:401-9. 1981

**Louis C, Schedl P, Samal B, Worcel A.** Chromatin structure of the 5S RNA genes of D. melanogaster. *Cell.* 22:387-92. 1980

**Ballal NR, Samal B, Choi YC, Busch H.**  Studies on the specificity of preribosomal RNA transcription in nucleoli after selective deproteinization.  *Nucleic Acids Res.* 7:919-34. 1979

**Samal B, Bekhor I.** Kinetic estimation of the base sequence complexity of poly(A)-containing mRNA in Ehrlich-ascites-tumor cells and its abundance in nuclear RNA.  *Eur J Biochem****.*** 94:51-7. 1979

**Samal B, Ballal R, Choi YC, Busch H.** Effect of Sarkosyl on the fidelity of preribosomal RNA synthesis in isolated nucleoli.  *Biochem Biophys Res Commun*. 84:328-34. 1978

**Bekhor I, Samal B.** Nonhistone chromosomal protein interaction with DNA/histone complexes.Transcription.  *Arch Biochem Biophys.* 179:537-44. 1977

**Samal B, Bekhor I.** Nonhistone chromosomal protein interaction with dna/histone complexes. Circular dichroism. *Arch Biochem Biophys.* 179:527-36. 1977

**Books or Monographs**

**Samal B. 1979, 1980, 1984**

Transcription of the eukaryotic genome (Gene expression in higher organisms, Transcription). *An annual research review series*, Eden Press, Montreal (monograph) Volume 1, (1979), Volume *2*, (1980) Volume *3,* (1984)

**Presentations at conferences**

**Samal B, Samal N and Sahu S. (2010)** Creation of a mouse brain transcriptome database from meta analysis of microarray data deposited at gene expression omnibus. (oral presentation)

**Samal, B.B.,(2008)**  pathFinder: a static network analysis tool for pharmacological analysis of signal transduction pathways. Sci Signal 1, pt4.(oral presentation)

**Samal, B.,(2005)**  Bioinformatics tools for gene expression analysis, 7th International Symposium of VIP, PACAP, and Related Peptides, Rouen, Normandy, France, September 11–14, 2005 (.(oral presentation)

**Eiden, L. E., Samal, B., Mustafa, T., Hamelink, C., and Gerdin, M. (2005)**. Neuropeptide signaling via specific and canonical pathways in diverse neuroendocrine cells. Regulatory Peptides 130, 184-184.(oral presentation)

**Samal, B., Sun, Y. H., Stearns, G., Xie, C. S., Suggs, S., and McNiece, I. (1993)**Cloning And Characterization Of The Complementary-Dna Encoding A Novel Human Pre-B-Cell Colony Enhancing Factor. Blood 82, A318-A318 poster presentation

**Samal, B., (1981)** Nucleosome phasing of histone genes in Drosophila melanogaster:Gordon, New Hampshire. (oral presentation)

**Patents**

**Samal B** Submitted two patents on *the role of BST2 in osteogenesis and inflammation,* ISU Biochemicals   2004

**Altar CT, Samal, B et al,** *Drug signature genes in depression*. (Submitted for USA patent 2002).

**Samal B, Li Y, Hermida L and Johe K.** *Method of generating five prime biased tag libraries of cDNAs* (Submitted for USA patent 2002).

**Samal, B.Wu,C. Dias, P. and Singh, S.** *Nucleic Acid Molecules Encoding Angiopoietin, Angiopoietin Polypeptides and Methods of Using Same* (Submitted for USA patent 2000).

**Bartley; TD., Bogenberger; JM. Bosselman; RA., Hunt; P, Kinstler; Olaf B. and Samal; BB.** US05795569 Issues 08/18/1998 *Mono-pegylated proteins that stimulate megakaryocyte growth  and differentiation*

**Bartley; TD., Bogenberger; JM. Bosselman; RA,Hunt; P, Kinstler; O. and Samal; BB.**US05766581 issued 06/16/1998 *Method for treating mammals with monopegylated proteins that stimulates megakaryocyte growth and ifferentiation*

**Bartley; TD., Bogenberger; JM. Bosselman; RA., Hunt; P, Kinstler; OB. and Samal; BB.**EP00690127B1, EP00755263A1EP00690127A1, WO09526746A1, EP00675201A1*Compositions and methods for stimulating megakaryocyte growth and differentiation*

**Samal; BB** US05580754, issued 12/03/1996 *Nucleic acid encoding the progenitor B cell stimulating factor*

**Samal, BB. Hamamori, Y. Kedes, LH** EP00737252A1, WO09513376A1*Gene therapy vectors for the treatment of low or defective red blood cell production*

**Samal, BB., Stabinsky, Y.** US05278062, EP00309550B1, EP00309550A1, WO08807581A1*Novel proteolytic Enzymes*