

# Dr. SELVAKUMAR EDWARDRAJA

## Specialization : Protein Engineering / Bioinformatics

Male / 20<sup>th</sup> Jan 1979 / Indian

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## Education

**Ph.D. in Chemical Engineering** (Brain Korea-21 Fellowship) Sep/2006 - Jun/2010

Thesis: "Engineering of Antibody Variable Domains Based on Stable Human Frameworks"  
Advisor: Prof. Sun-Gu Lee - Biomolecular Engineering Lab, Pusan National University, Korea (Republic of)

**Advanced PG Diploma in Bioinformatics** (DBT National Fellowship, Govt. of India) Jul/2002 - May/2003

Thesis: "Identification of drug/vaccine targets responsible for parasitic life:  
Comparative genomics of lymphatic filarial parasite (*B. malayi*) and free-living nematode (*C. elegans*)"  
Advisor: Prof. PP Mathur & Dr. SL Hoti – COE in Bioinformatics, Pondicherry University, India

**M.S. in Botany (Splz. in Microbiology)** Jul/2000 - Apr/2002

Thesis: "Arboratics - Web Tool Development for Identification, Location and Documentation of Higher Plants through Internet"  
Advisor: Dr. D. Stephen – The American College, Madurai Kamaraj University, India

**B.S. in Industrial Microbiology** Jul/1997 - Apr/2000

Thesis: "Studies on Cultivation Aspects of Milky Mushroom (*Calocybe indica* P&C)"  
Advisor: Dr. P. Suresh, Thiagarajar College, Madurai Kamaraj University, India

## Appointments

**EMBO-Postdoctoral Fellow**, Technische Universität München, Freising, Germany Sep/2012 – Mar/2015

Project: "Engg. of 2<sup>nd</sup> Gen. Antibody Scaffold by Introducing Non-natural Amino Acids for targeting pathogenic sugars"

**Postdoctoral Associate**, Arizona State University, AZ, USA Oct/2011 – May/2012

Project: "Structure Based Design and Engineering of Metal Binding Peptides for Photobiological Hydrogen Production"

**Postdoctoral Associate**, SUNY Buffalo, University at Buffalo, NY, USA Sep/2010 – Aug/2011

Project: "Heterologous Synthesis and Engineering of Bacterial Protein-Based Organelles / Micro-Compartments into Yeast"

**Bioinformatics Assistant**, COE in Bioinformatics, Pondicherry University, India Nov/2004 - Aug/2006

Tasks: RedHat/Fedora Linux server setup and maintenance with Bioinformatics tools, Website and Network administration, TA/Hands on Training for M.S. students to use Bioinformatics tools.

**Research Studentship**, COE in Bioinformatics, Pondicherry University, India May/2004 - Oct/2004

Project: Prediction of Protein-Protein Interactions in *Deinococcus radiodurans* using computational methods

**Adjunct Faculty**, COE in Bioinformatics, Pondicherry University, India Dec/2003-Apr/2004

Courses: Sequence Analysis in Bioinformatics & Practical

## Selected Publications

- Flores M, Olsen T, Wang D, [Edwardraja S](#), Shinde S, Williams J, Ghirlanda G and Allen J. *The Copper Environment in Artificial Metalloproteins Probed by EPR Spectroscopy*. **Journal of Physical Chemistry B** **2015**; DOI: 10.1021/acs.jpcc.5b04172
- Muppidi A, Doi K, [Edwardraja S](#), Pulavarti S, Szyperski T, Wang HG, Lin Q. *Targeted Delivery of Ubiquitin-Conjugated BH3 Peptide-Based Mcl-1 Inhibitors into Cancer Cells*. **Bioconjugate Chemistry** **2014**;25(2):424-432; 2014
- Muppidi A, Doi K, [Edwardraja S](#), Drake E, Gulick AM, Wang HG, Lin Q. Rational Design of Proteolytically Stable, Cell-Permeable Peptide-Based Selective Mcl-1 Inhibitors. **J. Am. Chem. Soc.**, **2012**;134(36):14734-7
- [Edwardraja S](#), Sriram S, Govindan R, Budisa N, Lee SG. *Enhancing the thermal stability of a single-chain Fv fragment by in vivo global fluorination of the proline residues*. **Molecular BioSystems**. **2011**;7(1):258-65

Total Articles in Publication List: 16

Articles With Citation Data: 13

h-index: 7

Source: THOMSON REUTERS - <http://www.researcherid.com/rid/E-3948-2010>

## Honors / Awards / Fellowship

<b>Long-Term Postdoctoral Fellowship</b>	European Molecular Biology Organization (EMBO), Germany	<u>2012-2014</u>
<b>Graduate Fellowship</b>	<i>Brain Korea-21</i> , Govt. of Korea	<u>2006 - 2010</u>
<b>Student Poster Scholarship Program</b>	<i>Antibody Engineering &amp; Antibody Therapeutics</i> , San Diego, US	<u>Dec / 2009</u>
<b>Best Oral Presentation</b>	<i>KSBB Meeting and International Symposium</i> , Daejeon, Korea	<u>Nov / 2009</u>
<b>ETS-TOEIC L: 83 R: 88 (Percentile)</b>	<i>Test of English for International Communication</i>	<u>Nov / 2009</u>
<b>Best Poster Presentation</b>	<i>KSBB Meeting and International Symposium</i> , Jeju, Korea	<u>Oct / 2008</u>
<b>Advanced PG Diploma Fellowship</b>	<i>Dept. of Biotechnology</i> , Govt. of India	<u>2002 - 2003</u>
<b>Student Project Scheme</b>	<i>TN State Council for Science and Technology</i> , Govt. of India	<u>2001 - 2002</u>

## Trainings / Workshops

<b>Accelrys Discovery Studio software training</b> , <i>University of Pune</i> , Pune, India	2006
<b>Machine Learning Techniques in Functional Proteomics</b> , <i>Institute of Microbial Technology</i> , India	2005
<b>Basic Techniques in Molecular Biology, Bioinformatics and Pharmacogenomics</b> , <i>JIPMER</i> , India	2005
<b>Workshop on Molecular Modeling</b> , <i>Anna University</i> , India	2004
<b>South East Asian Training Course on Bioinformatics</b> , <i>ICGEB</i> , New Delhi, India ( <i>WHO Sponsored</i> )	2003

## Research Skills (Wet Lab and Computational)

<b>DNA stuffs</b>	Genome & Gene sequence analysis, Gene/homologous Finding, Motif analysis, Gene Designing for optimal expression, Codon optimization, mRNA 2ndry structure analysis, Gene synthesis - Assembly PCR / Overlap PCR, Site Directed Mutagenesis, Saturation Mutagenesis, Drop Dialysis...	
<b>Protein stuffs</b>	Expression and Yield optimization, Autoinduction / High Cell Density Expression, HPLC / FPLC (AKTA) Column Purifications (Affinity, Size Exclusion, Ion Exchange, hydrophobic), PD10-Desalting, Ultra-centrifugation, PEG-Precipitation, In-Gel / Solution Digestion, Western Blot, Quantifications ...	
<b>Characterization</b>	Biacore, Fluorescence Spec, CD Spec, ELISA, Immuno Precipitation, Protein-Protein Interactions by Pull down, Homology Modelling, Structure Analysis, Active Site mapping, Protein-Substrate docking, Protein-Protein interaction analysis (sequence/structural context), Motif based Functional Annotations...	
<b>Crystallization</b>	Protein-Peptide complex, Mother Liquor screening, hanging / sitting drop, crystal CryoProtection	
<b>Bioinformatics</b>	Accelrys Discovery Studio Package & Chimera for Protein Modeling, EMBOSS / GCG Package for basic sequence analysis, Motif search / Pattern finding, Sequence comparison (Global / Local / Pairwise / Multiple), Scoring functions, Phylogenetic analysis, Genome annotation, Gene finding, Operon prediction, AutoDock for Protein-Protein/Ligand Docking	
<b>Protein Engg.</b>	Protein/Peptide Designing, Peptide-Synthesis (Solid Phase), Structure based Rational Modifications, Stability & Solubility improvement, Consensus Sequence Guided Mutagenesis, Active site Mapping & Alterations, Unnatural Amino Acid Incorporation (site specific - AMBER suppression system / global - Auxotrophic system)...	
<b>Directed Evolution</b>	Targeted/Random Protein Library, Bacterial Surface Display, Protein labelling, FACS cell sorting...	
<b>Antibody Engg.</b>	Designing Chimeric Proteins, CDR-Grafting, Antibody Variable Domain Engineering, scFv / diabody / Nanobodies design, Humanization, Stable Human Frameworks (from HuCAL) / Scaffold, Kabat Numbering Conversions	
<b>Computational</b>	<b>OS:</b>	Linux family (Unix, Linux, Irix), Windows 8.1 / NT Server Administration
	<b>Programming:</b>	C, Perl, VB/Java scrip, Client/Server side script, Shell scripting
	<b>RDBMS:</b>	MySQL, MS-Access
	<b>Networking:</b>	LAN, WAN, Routing, Web Design & Administration, Apache
	<b>Web-Tech:</b>	One/Multi page, Static/Dynamic, Responsive, CSS

## Publications

- Olsen T, Eduardo E, [Edwardraja S](#), Chad RS, Williams J, Ghirlanda G and Allen J. *Design of dinuclear manganese cofactors for bacterial reaction centers*. **BBA Bioenergetics** **2015**; under review
- Flores M, Olsen T, Wang D, [Edwardraja S](#), Shinde S, Williams J, Ghirlanda G and Allen J. *The Copper Environment in Artificial Metalloproteins Probed by EPR Spectroscopy*. **Journal of Physical Chemistry B** **2015**; DOI: 10.1021/acs.jpcc.5b04172
- Muppidi A, Doi K, [Edwardraja S](#), Pulavarti S, Szyperski T, Wang HG, Lin Q. *Targeted Delivery of Ubiquitin-Conjugated BH3 Peptide-Based Mcl-1 Inhibitors into Cancer Cells*. **Bioconjugate Chemistry** **2014**; 25(2):424-432 (SCI, SCIE)
- Lee P, Mohan Raj S, Zhou S, Ashok S, [Edwardraja S](#), Park S. *3-hydroxyisobutyrate dehydrogenase-I from Pseudomonas denitrificans ATCC 13867 degrades 3-hydroxypropionic acid*. **Biotechnol. Bioprocess Eng.** **2014**; 19(1):1-7 (SCIE)
- Zhou S, Mohan Raj S, Ashok S, [Edwardraja S](#), Lee SG, Park S. *Cloning, Expression and Characterization of 3-Hydroxyisobutyrate Dehydrogenase from Pseudomonas denitrificans ATCC 13867*. **PLOS ONE** **2013**;8(5):e62666 (SCIE)
- [Edwardraja S](#), Sriram S, Govindan R, Hwang BY, Lee SG. *Generation of anti-c-Met single domain antibody fragment based on human stable frameworks*. **Biotechnol. Bioprocess Eng.** **2012**;17(6):1120-27 (SCIE)
- Muppidi A, Doi K, [Edwardraja S](#), Drake E, Gulick AM, Wang HG, Lin Q. *Rational Design of Proteolytically Stable, Cell-Permeable Peptide-Based Selective Mcl-1 Inhibitors*. **J. Am. Chem. Soc.** **2012**;134(36):14734-7 (SCI, SCIE)
- Li N, Lim RK, [Edwardraja S](#), Lin Q. *Copper-Free Sonogashira Cross-Coupling for Functionalization of Alkyne-Encoded Proteins in Aqueous Medium and in Bacterial Cells*. **ChemInform.** **2012**;43(13)
- Soundrarajan N, [Edwardraja S](#), Lee S, Yun H, Ayyadurai N. *Enhancing the productivity of soluble green fluorescent protein through methionine-residue specific consensus approach*. **Afr. J. Biotechnol.** **2012**;11(5):1059-64
- Li N, Lim RK, [Edwardraja S](#), Lin Q. *Copper-Free Sonogashira Cross-Coupling for Functionalization of Alkyne-Encoded Proteins in Aqueous Medium and in Bacterial Cells*. **J. Am. Chem. Soc.** **2011**;133(39):15316-9 (SCI, SCIE)
- [Edwardraja S](#), Sriram S, Govindan R, Budisa N, Lee SG. *Enhancing the thermal stability of a single-chain Fv fragment by in vivo global fluorination of the proline residues*. **Mol. BioSyst.** **2011**;7(1):258-65 (SCI, SCIE)
- [Edwardraja S](#), Rameshkumar N, Lee S, Lee S, Park H. *In vivo Production of Functional Single-Chain Fv Fragment with an N-Terminal-Specific Bio-orthogonal Reactive Group*. **Chembiochem.** **2010**;11(4):498-501 (SCI, SCIE)
- Raj S, Rathnasingh C, Jung W, [Edwardraja S](#), Park S. *A Novel NAD(+)-dependent Aldehyde Dehydrogenase Encoded by the puuC Gene of Klebsiella pneumoniae DSM 2026 that Utilizes 3-Hydroxypropionaldehyde as a Substrate*. **Biotechnol. Bioprocess Eng.** **2010**;15(1):131-8 (SCIE)
- [Edwardraja S](#), Neelamegam R, Ramadoss V, Venkatesan S, Lee S. *Redesigning of Anti-c-Met Single Chain Fv Antibody for the Cytoplasmic Folding and Its Structural Analysis*. **Biotechnol. Bioeng.** **2010**;106(3):367-75 (SCI, SCIE)
- Ayyadurai N, Neelamegam R, Nagasundarapandian S, [Edwardraja S](#), Park H, Lee S, Yoo T, Yoon H, Lee S. *Importance of expression system in the production of unnatural recombinant proteins in Escherichia coli*. **Biotechnol. Bioprocess Eng.** **2009**;14(3):257-65 (SCIE)
- Kim Y, Neelamegam R, Heo M, [Edwardraja S](#), Paik H, Lee S. *Improving the productivity of single-chain Fv antibody against c-Met by rearranging the order of its variable domains*. **J. Microbiol. Biotechnol.** **2008**;18(6):1186-90 (SCIE)
- Jo J, Raj S, Rathnasingh C, [Edwardraja S](#), Jung W, Park S. *Cloning, expression, and characterization of an aldehyde dehydrogenase from Escherichia coli K-12 that utilizes 3-Hydroxypropionaldehyde as a substrate*. **Appl. Microbiol. Biotechnol.** **2008**;81(1):51-60 (SCI, SCIE)

## Conference Publications (Selected)

- Biopolymers**, 100 (3), 306-306, May/2013  
*Conformationally Rigidified Peptide Helices Through Cysteine-Based Side Chain Cross-Linking*. Avinash Muppidi, Xiadong Li, Kenichiro Doi, Eric Drake, Zhiyong Wang, [Selvakumar Edwardraja](#), Jiandong, Hong-Gang Wang, Andrew Gulick, Qing Lin
- Gordon Conference: Photosynthesis**, Davidson, NC; Jul/2012  
*Designing metal binding peptides to catalyze water oxidation*. Tien Olson, [Selvakumar Edwardraja](#), Dong Wang, Shandip Shinde, Marco Flores, Giovanna Ghirlanda, and James P. Allen
- Antibody Engineering & Antibody Therapeutics**, San Diego, CA; Dec/2009  
*Cytoplasmic production of functional single chain Fv fragment with N-terminal specific unnatural modification*. [Selvakumar Edwardraja](#), Rameshkumar Neelamegam and Sun-Gu Lee (POSTER)
- Antibody Engineering & Antibody Therapeutics**, San Diego, CA; Dec/2009  
*Generation of fluorinated scFv and investigation on its stability*, Sriram Sokalingam, Govindan Raghunathan, [Selvakumar Edwardraja](#) and Sun-Gu Lee (POSTER)
- Enzyme Engineering XX**, Groningen, Netherlands; Sep/2009  
*Engineering of GFP through combinatorial mutagenesis of methionine residues based on consensus sequence*, Niraiakulam Ayyadurai, [Selvakumar Edwardraja](#), Soundrarajan Nagasundarapandian, and Sun-Gu Lee (POSTER)
- Peptides, Chemistry & Biology Of**, Ventura, CA USA; Feb/2008  
*Engineering of anti-c-Met scFv for high expression and efficient folding in the cytoplasm of Escherichia coli*, [Edwardraja Selvakumar](#) and Sun-Gu Lee (POSTER)