

Casim A. Sarkar

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- Research & Teaching Interests** Molecular cell engineering; rational design and directed evolution of proteins; cytokine/receptor binding and trafficking; cell signaling and decision-making; computational, synthetic, and systems biology
- Education**
- Massachusetts Institute of Technology** Cambridge, MA
PhD in Chemical Engineering, September 2002
Thesis title: Cytokine engineering through ligand/receptor dynamics: a study on granulocyte colony-stimulating factor
Thesis advisor: Prof. Douglas A. Lauffenburger (Bioengineering/Chemical Engineering)
In collaboration with Prof. Bruce Tidor (Bioengineering/Electrical Engineering, MIT)
and Dr. David N. Brems (Pharmaceutics, Amgen)
Minor in Computational Biology
- The University of Texas** Austin, TX
BS in Chemical Engineering, May 1997
Project title: Characterization of affinity and selectivity resulting from mutations in the 26-10 scFv antibody binding pocket
Research advisor: Prof. George Georgiou
- Professional Experience**
- University of Pennsylvania** Philadelphia, PA
Assistant Professor, Department of Bioengineering (01/2006 – present)
Assistant Professor, Department of Chemical & Biomolecular Engineering (01/2006 – present)
Member, Institute for Translational Medicine and Therapeutics (09/2006 – present)
Member, Institute for Regenerative Medicine (02/2008 – present)
Member, Biochemistry and Molecular Biophysics Graduate Group (09/2008 – present)
- University of Zurich** Zurich, Switzerland
Postdoctoral Research Fellow, Department of Biochemistry (09/2002 – 12/2005)
Research advisor: Prof. Andreas Plückthun
- Amgen** Thousand Oaks, CA
Internship, Pharmaceutics (06/2000 – 08/2000)
Supervisors: Dr. David N. Brems and Dr. Margaret Speed Ricci
- Massachusetts Institute of Technology** Cambridge, MA
Graduate Research Fellow, Department of Chemical Engineering (09/1997 – 08/2002)
Research advisor: Prof. Douglas A. Lauffenburger
- Procter & Gamble** Cincinnati, OH
Internship, Research & Development (06/1996 – 08/1996)
Supervisor: Dr. Gene Park
- The University of Texas** Austin, TX
Undergraduate Researcher, Department of Chemical Engineering (01/1996 – 05/1997)
Research advisor: Prof. George Georgiou

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Teaching Experience	University of Pennsylvania Philadelphia, PA BE/CBE 440/540 – Biomolecular & Cellular Engineering (<i>developed course; taught course in Spring 2006, Spring 2007, Fall 2007, Fall 2008</i>) BE 210 – Bioengineering Lab II (<i>taught course in Spring 2008</i>) BE 100 – Introduction to Bioengineering (<i>guest lecturer, Fall 2006, Fall 2008</i>) BE 513 – Molecular and Cell Biology (<i>guest lecturer, Fall 2006, Fall 2007, Fall 2008</i>)
Selected Distinctions	American Heart Association Scientist Development Grant (2008 – 2012) Perfect Instructor Rating for BE/CBE 440 (<i>Spring 2007</i>) NIH NRSA Postdoctoral Fellowship (2003 – 2005) MIT \$50K Entrepreneurship Competition Semifinalist (1999) Fannie and John Hertz Foundation Graduate Fellowship (1997 – 2002) Howard Hughes Graduate Fellowship (1997, <i>declined</i>) National Science Foundation Graduate Fellowship (1997, <i>declined</i>) Whitaker Foundation Graduate Fellowship (1997, <i>declined</i>) NSPE – Ashland Oil Scholarship [one awarded nationwide] (1993 – 1997)
Professional Societies	Biomedical Engineering Society American Institute of Chemical Engineers Society for Biological Engineering Biophysical Society
Patents	<u>C.A. Sarkar</u> , D.A. Lauffenburger, and B. Tidor. “Methods of using G-CSF analog compositions.” United States Patent #7,402,304. (2008) <u>C.A. Sarkar</u> and D.A. Lauffenburger. “Methods of using G-CSF analog compositions.” United States Patent #7,371,370. (2008) <u>C.A. Sarkar</u> , D.A. Lauffenburger, and B. Tidor. “G-CSF analog compositions and methods.” United States Patent #6,946,548. (2005) <u>C.A. Sarkar</u> and D.A. Lauffenburger. “Method for screening analogs of G-CSF.” United States Patent #6,790,628. (2004)
Publications	<u>C.A. Sarkar</u> [†] , I. Dodevski [†] , M. Kenig, S. Dudli, A. Mohr, E. Hermans, and A. Plückthun. “Directed evolution of a G-protein coupled receptor for expression, stability, and binding selectivity.” <i>Proceedings of the National Academy of Sciences USA</i> , 105 :14808-14813. (2008) ([†] <i>contributed equally</i>) S. Palani and <u>C.A. Sarkar</u> . “Positive receptor feedback during lineage commitment can generate ultrasensitivity to ligand and confer robustness to a bistable switch.” <i>Biophysical Journal</i> , 95 :1575-1589. (2008) S. Kubetzko [†] , <u>C.A. Sarkar</u> [†] , and A. Plückthun. “Protein PEGylation decreases observed target association rates via a dual blocking mechanism.” <i>Molecular Pharmacology</i> , 68 :1439-1454. (2005) ([†] <i>contributed equally</i>) <u>C.A. Sarkar</u> , K. Lowenhaupt, P.J. Wang, T. Horan, and D.A. Lauffenburger. “Parsing the effects of binding, signaling, and trafficking on the mitogenic potencies of granulocyte colony-stimulating factor analogues.” <i>Biotechnology Progress</i> , 19 :955-964. (2003)

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M.S. Ricci, C.A. Sarkar, E.M. Fallon, D.A. Lauffenburger, and D.N Brems. "pH dependence of structural stability of interleukin-2 and granulocyte colony-stimulating factor." *Protein Science*, **12**:1030-1038. (2003)

C.A. Sarkar and D.A. Lauffenburger. "Cell-level pharmacokinetic model of granulocyte colony-stimulating factor: implications for ligand lifetime and potency *in vivo*." *Molecular Pharmacology*, **63**:147-158. (2003)

C.A. Sarkar, K. Lowenhaupt, T. Horan, T.C. Boone, B. Tidor, and D.A. Lauffenburger. "Rational cytokine design for increased lifetime and enhanced potency using pH-activated 'histidine switching.'" *Nature Biotechnology*, **20**:908-913. (2002)

- Presentations** "Modeling intracellular processes mediated by cytokines." Biomedical Engineering Society, Annual Meeting, Los Angeles, CA. Invited platform. (2007)
- "Directed evolution of a G-protein coupled receptor." International Conference on Biomolecular Engineering, Biennial Meeting, Coronado Island, CA. Poster. (2007)
- "Directed evolution of a G-protein coupled receptor." American Institute of Chemical Engineers, Annual Meeting, San Francisco, CA. Platform. (2006)
- "Directed evolution of a G-protein coupled receptor." Biomedical Engineering Society, Annual Meeting, Chicago, IL. Platform. (2006)
- "Engineering opioid receptors with enhanced biophysical properties." COST Meeting on 'Principles of membrane protein folding and stability', Lisbon, Portugal. Poster. (2005)
- "Designing proteins in receptor-mediated processes." Biomedical Engineering Society, 'Penn: Past, Present, and Future' Symposium, Annual Meeting, Philadelphia, PA. Invited platform. (2004)
- "Selection of novel binding proteins to a G-protein coupled receptor." Structural Biology National Center for Competence in Research, Annual Symposium, Zurich, Switzerland. Poster. (2003)
- "A rational approach to improving cytokine-receptor binding properties in the context of cellular trafficking dynamics." American Chemical Society, National Meeting, Orlando, FL. Invited platform. (2002)
- "A novel systems engineering approach to rational cytokine design." Pacific Symposium on Biocomputing, Annual Meeting, Kauai, HI. Poster. (2002)
- "Histidine switching: a new approach to rational cytokine design for enhanced potency." American Institute of Chemical Engineers, Annual Meeting, Reno, NV. Platform. (2001)
- "Increased structural stability of 4-helix cytokines at low pH." American Institute of Chemical Engineers, Annual Meeting, Reno, NV. Platform. (2001)
- "Histidine switching: a new approach to rational cytokine design for enhanced potency." Biomedical Engineering Society, Annual Meeting, Durham, NC. Platform. (2001)

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“Implication of trafficking mechanisms in enhanced potency of granulocyte colony-stimulating factor.” American Institute of Chemical Engineers, Annual Meeting, Los Angeles, CA. Platform. (2000)

“Enhanced potency of covalently modified granulocyte colony-stimulating factor.” Biomedical Engineering Society, Annual Meeting, Seattle, WA. Poster. (2000)

“Structural basis for altered trafficking of granulocyte colony-stimulating factor mutants.” Amgen, Pharmaceuticals Department, Thousand Oaks, CA. Invited seminar. (2000)

“Differential ligand depletion and cell proliferation responses with granulocyte colony-stimulating factor conjugated with polyethylene glycol.” American Society for Cell Biology, Annual Meeting, Washington D.C. Poster. (1999)