Stephen T. Furlong, Ph.D.

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PROFILE

Pharmaceutical Company Director with 20+ years experience initiating, designing, leading and managing research projects and collaborations:

- Scientific expertise across multiple disciplines relevant to drug discovery and development including psychiatry, genetics, biochemistry, immunology, infectious disease, and informatics; Clinical focus on biomarkers
- Demonstrable project delivery across multiple phases of drug discovery from target identification to delivery of candidate drug to design and implementation of early development studies
- Experienced leader of project teams comprising both industry and academic scientists.
- Company leader responsible for strategy, initiation and implementation of multidisciplinary, multi-site global efforts.
- Experience organizing and leading project management training for R&D senior staff and managers.
- Co-inventor of major lipid/immunological pathway relevant to vaccine and adjuvant development that formed the basis for a start-up biotech company.

PROFESSIONAL EXPERIENCE

AstraZeneca Pharmaceuticals, Wilmington, DE

Director/Principal Scientist, Discovery Medicine (4/04 – present)
Provides the scientific leadership to project teams by providing clinical information for validation of new discovery targets and new biomarker development (for safety, broadly across disease areas; for efficacy, primarily in CNS) Designs the biomarker strategy to take emerging products to the Proof-of-Principle milestone; Develops novel, strategic clinical methodologies to permit rapid, cost-effective and high quality decision-making for candidate drugs during development; Examples include design and implementation of human metabonomic, proteomic, lipomic and transcriptomic studies to identify new biochemical biomarkers, and design and implementation of human computerized cognition batteries to assess cognition enhancement; Initiates, leads and manages collaborations with external collaborators (academic and industry); AstraZeneca representative to MIT Center for Biomedical Innovation (Placebo Project co-leader); Assess external providers for suitability for late stage trials.

Project Leader, CNS Discovery/Principal Bioscientist, Target Biology (4/00 – 3/04)
Lead US efforts to initiate human genetic and genomic approaches for discovery of new drug targets in psychiatry. Responsible for initiating and managing collaborations with academic investigators relevant to psychiatric genetics; Responsible for implementing strategies to progress candidate susceptibility genes for psychiatric disorders to drug discovery; Study leader for lipid (sterol) studies for Alzheimer's Disease and Stroke projects; Co-author of nomination document for candidate drug accepted for development (2002); Ad hoc advisor to Seroquel Global Product Team for genetics; AZ Canada /Wilmington Discovery liaison regarding external collaborations in psychiatry.

Senior Research Bioscientist (3/97 -4/00)
Lead studies in a multidisciplinary project to discover complement inhibitors; Responsible for proposing and establishing timelines, milestones, and resource allocation for biological testing required to progress projects through drug discovery; Extensive interaction with medicinal chemists to assess activity and select compounds for further study; Accomplished market analysis to find best indications for complement inhibitors; Management of laboratory staff, organizing and leading project management training exercises for all US-based Discovery senior staff and managers.

Harvard Medical School and Brigham & Women's Hospital, Boston, MA

Assistant Professor of Medicine/Associate Immunobiologist (8/88 - 3/97)
Principal Investigator studying host immunity and metabolism of human pathogens such as *Schistosoma mansoni* and *Pneumocystis carinii,* including identification of novel lipids, vaccine studies and new models for pathogen/host immune cell interaction; Co-investigator in studies establishing CD-1 presentation of lipid antigens, vaccine studies investigating adjuvants for HIV vaccines and development of novel methodology for measuring lipids recovered from human lungs; Consultant to biotech companies on adjuvants for vaccine studies; Co-inventor on CD-1 patents.

POST-DOCTORAL TRAINING

Brigham and Women's Hospital and Harvard School of Public Health, Boston, Massachusetts, 12/84 - 8/88
Conducted studies on lipid metabolism of the human parasite *Schistosoma mansoni* and investigated the role of membrane lipid in host immune cell interaction with the parasite.

Department of Physiology and Biophysics, Harvard Medical School, Boston, Massachusetts, 9/82 - 12/84
Studied membrane biogenesis in model eucaryotic cell (*Acanthameoba casstellanii*) and identified a novel lipid from this organism.

EDUCATION

Michigan State University, Ph.D., Cell Biology/Zoology, 1982.
Southeastern Mass. University (UMass Dartmouth), M.S., Biology, 1980.
Saint Michael's College, B.A, Biology, 1974.

PATENTS

US5679347: Methods of isolating CD1-presented antigens, vaccines comprising CD1-presented antigens, and cell lines for use in said methods.Inventor(s): Porcelli, Steven A, Brenner, Michael B, Beckman, Evan M, Furlong, Stephen T.

WO9612190A3:Presentation of hydrophobic antigens to T-cells by CD1 molecules. Inventor(S): Modlin, Robert L, Sieling, Peter A, Brenner, Michael B, Brennan, Patrick J, Porcelli, Steven A, Furlong, Stephen T.

AU694299B2:Presentation of hydrophobic antigens to T-cells by CD1 molecules. Inventor(S): Modlin, Robert L, Sieling, Peter A Brenner, Michael B, Brennan, Patrick J, Porcelli, Steven A, Furlong, Stephen T

CA2202680AA:Presentation of hydrophobic antigens to T-cells by CD1 molecules. Inventor(S): Brennan, Patrick J, Sieling, Peter A. Porcelli, Steven A., Furlong, Stephen T, Brenner, Michael B, Modlin, Robert L.

PUBLICATIONS

Corradi JP, Ravyn V, Robbins AK, Hagan KW, Peters MF, Bostwick R, Buono RJ, Berrettini WH, Furlong ST. Alternative transcripts and evidence of imprinting of GNAL on 18p11.2. Mol Psychiatry. 2005 Nov;10(11):1017-25.

Zacco A, Togo J, Spence K, Ellis A, Lloyd DM, Furlong ST, Piser TM. HMG-CoA reductase inhibitors protect cortical neurons from excitotoxicity. J. Neurosci 2003; 23(35):11104-11.

Nes WD, Zhou W, Dennis AL, Li H, Jia Z, Keith RA, Piser TM, Furlong ST. Purification, characterization, and catalytic properties of human sterol 8-isomerase. Biochem J. 2002; 367(Pt 3):587-99.

Furlong S, Mauger R, Strimpler A, Liu Y, Morris F, Edwards P. Synthesis and physical characterization of a P(1) arginine combinatorial library, and its application to the determination of the substrate specificity of serine peptidases. Bioorg. Med. Chem. 2002 10 (11):3637-47.

Hiromatsu K, Dascher CC, LeClair KP, Sugita M, Furlong ST, Brenner MB, Porcelli SA. Induction of CD1-restricted immune responses in guinea pigs by immunization with mycobacterial lipid antigens. J Immunol 2002 Jul 1;169(1):330-9.

Grant EP, Beckman EM, Behar SM, Degano M, Frederique D, Besra GS, Wilson IA, Porcelli SA, Furlong ST, Brenner MB. Fine specificity of TCR complementarity-determining region residues and lipid antigen hydrophilic moieties in the recognition of a CD1-lipid complex. J Immunol 2002 Apr 15;168(8):3933-40

Edwards PD, Mauger RC, Cottrell K, Pine KK, Sylvester MA, and Furlong, ST. Methodology for the construction of P1 arginine aminocoumarin substrate libraries for trypsin-like serine proteases. Bioorg. Med. Chem. Letters 2000;10(20):2291-4.

Furlong ST, Dutta AS, Coath MM, Gormley JJ, Hubbs SJ, Lloyd D, Mauger RC, Strimpler AM, Sylvester MA, Scott CW, Edwards PD. C3 activation is inhibited by analogs of compstatin but not by serine protease inhibitors or peptidyl alpha-ketoheterocycles. Immunopharmacology 2000;48(2):199-212.

Rosat J P, Grant EP, Beckman EM, Dascher CC, Sieling PA, Frederique D, Modlin RL, Porcelli SA, Furlong ST, Brenner MB. CD1-restricted microbial lipid antigen-specific recognition found in the CD8+ alpha beta T cell pool. *J.Immunol.* 1999; 162:366-371.

Moody DB, Reinhold BB, Guy MR, Beckman EM, Frederique DE, Furlong ST, Ye S, Reinhold VN, Sieling PA, Modlin RL, Besra GS, Porcelli SA. Structural requirements for glycolipid antigen recognition by CD1b- restricted T cells. *Science* 1997; 278:283-286.

Furlong ST, Koziel H, Bartlett MS, McLaughlin G, Shaw MW, Jack RM**.** Lipid Transfer from human epithelial cells to *Pneumocystis carinii* in vitro. *J. Infect. Dis.* 1997; 175:661-8.

Bosch I, Dunussi-Joannopoulos K, Wu RL, Furlong ST, Croop J. Phosphatidylcholine and phosphatidylethanolamine behave as substrates of the human MDR1 P-glycoprotein. *Biochemistry* 1997; 36:5685-5694.

Beckman EM, Melian A, Behar SM, Sieling PA, Chatterjee D, Furlong ST, Matsumoto R, Rosat JP, Modlin RL, Porcelli SA. CD1c restricts responses of mycobacteria specific T cells: Evidence for antigen presentation by a second member of the human CD1 family. *J. Immunol.* 1996; 157:2795-2803.

Furlong ST, David JR. Adjuvants. **In**, Textbook of Therapeutic Immunology. F. Rosen, T. Strom, S. Burakoff and K.F. Austen (eds). Blackwell, 1995.

Harn DA, Reynolds SR, Chikunguwo S, Furlong ST, Dahl C. Synthetic peptide Vaccines for Schistosomiasis. *Pharm. Biotechnol.* 1995; 6:891-905.

Furlong ST, Thibault KS, Morbelli LM, Quinn JJ, Rogers RA. Uptake and compartmentalization of fluorescent lipid analogs in larval *Schistosoma mansoni*. *J. Lipid Res.* 1995; 36: 1-12.

Beckman EM, Porcelli SA, Morita CT, Behar SM, Furlong ST, Brenner MB. Recognition of a lipid antigen by CD1 restricted ab+ T cells. *Nature* 1994; 372:691-694.

Furlong ST, Samia JA, Rose RM, Fishman JA. Phytosterols are present in *Pneumocystis carinii*. *Antimicrobial Agents and Chemotherapy* 1994; 38:2534-2540.

Rose RM, Catalano PJ, Koziol H, Furlong ST. Abnormal lipid composition of bronchoalveolar lavage fluid from individuals with AIDS-related lung disease. *Am. J. Respir. Crit. Care Med.* 1994; 149:332-338.

Rogers RA, Jack RM, Furlong ST. Lipid and membrane protein transfer from human neutrophils to schistosomes is mediated by ligand binding. *J. Cell Sc*i. 1993; 106:485-492.

Thatte HS, Kasschau MR, Furlong ST, Byam-Smith MP, Williams DF, Golan DE. *Schistosoma mansoni*: Membranes from adult worms reversibly perturb shape, volume, and membrane organization of intact human red blood cells. *Exp. Parasitol*. 1993; 76:13-22.

Furlong ST, Thibault KS, Rogers RA. Transport and localization of fluorescent phospholipids in *Schistosoma mansoni*. *J. Cell Sci.* 1992; 103:823-830.

Furlong ST, Mednis A, Remold HG. Interferon stimulates phospholipid synthesis in human monocytes. *Cell. Immunol.* 1992; 143:108-117.

Furlong ST, Gorti R, Catalano PJ, Rose RM. Lipid content of alveolar lining material collected by brochoalveolar lavage: Improved methods for measuring the major lipid classes. *Am. Rev. Resp. Dis.*1992; 145:383-387.

Furlong ST, Caulfield JP. Head group precursors modify phospholipid synthesis in *Schistosoma mansoni*. *J. Lipid Res.* 1991; 32:703-712.

Furlong ST. Unique roles for lipids in *Schistosoma mansoni. Parasitology Today* 1991; 7:59-62.

Furlong ST, Caulfield JP. *Schistosoma mansoni:* synthesis and release of phospholipids, lysophospholipids and neutral lipids. *Exp. Parasitol*. 1989; 69:65-77.

Furlong ST. Sterols of Parasitic protozoa and helminths. *Exp Parasitol*. 1989; 68:482-485.

Furlong ST, Caulfield, JP. *Schistosoma mansoni*: sterol and phospholipid composition of cercariae, schistosomula and adults. *Exp. Parasitol*. 1988; 65:222-231.

Golan DE, Furlong ST, Brown CS, Caulfield JP. Monopalmitoylphosphatidylcholine incorporation into human erythrocyte ghosts causes protein and lipid immobilization and cholesterol depletion. *Biochemistry* 1988; 27:2661-2667.

Furlong ST, Chaney WG, Heidemann MK, Bromley SC. Altered pattern of prolactin binding accompanies morphological change in the wound epithelium of regenerating newt limbs. *Cell Tissue Res*. 1987; 249:411-419.

Furlong ST, Leary J, Costello C, Dawidowicz EA. Isolation and identification of 1,2-diacylglyceryl-3-0-4'-(N,N,N- trimethyl) homoserine from the protozoan, *Acanthamoeba castellanii. J. Lipid Res.* 1986; 27:1182-1189.

Golan DE, Brown CS, Furlong ST, Cianci CM, Caulfield JP**.** Schistosomula of *Schistosoma mansoni* uses lysophosphatidylcholine to lyse human erythrocytes and immobilize erythrocyte membrane components. *J. Cell Biol.* 1986; 103:819-828.

Furlong ST, Heidemann MK, Bromley SC. Fine structure of the regenerate of the African Clawed Toad, *Xenopus laevis*. *Anat. Record* 1985; 211:444-449.

Mills JT, Furlong ST, Dawidowicz EA. Plasma membrane biogenesis in eucaryotic cells; translocation of newly synthesized lipid. *Proc. Natl. Acad. Sci. (USA)* 1984; 81:1385.

Letters and Abstracts

Hugh Salter, Maria Orr, Stephen Furlong, Guang He, Guo-Ying Feng, Lin He, the AZ/SJTU project team. Mechanistic and positional candidate genes for schizophrenia in a large Han Chinese cohort. *Psych. Genet.* 2005 (in press).

Maria Orr, Hugh Salter, Stephen Furlong, Guo-Ying Feng, Guang He, Lin He, AZ/SJTU Project Team. A Linkage Disequilibrium Map of Chromosome 5q in a Large Han Chinese Schizophrenia Cohort. *Psych. Genet.* 2005 (in press).

Guang He, Hugh Salter, Maria Orr, Stephen Furlong, Guo-Ying Feng, Lin He, AZ/SJTU Project Team. Candidate genes for schizophrenia on chromosomes 1 & 2 in a large Han Chinese cohort. *Psych. Genet.* 2005 (in press).

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Bosch I, Dunussi-Joannopoulos K, Wu RL, Furlong ST, Croop J. Phosphatidylcholine and phosphatidylethanolamine behave as substrates for the human MDR1 P-glycoprotein. *Mol. Biol. Cell* 1996; 7:1502.

Beckman EM, Porcelli, SA, Furlong S, Brenner MB. CD1 molecules- A 3rd pathway of antigen presentation. *J. Cell Biochem.* 1995; Suppl 21A.

Furlong S, Thibault K, Samia J, Fishman, JA. Lipids characteristic of fungi in *Pneumocystis carinii*. *FASEB J*. 1994; A908.

Jack RM, Furlong ST. Differential agonist effects on fatty-acid uptake by human neutrophils (PMN). *FASEB J*. 1995; 9:A1042.

Rogers RA, Jack RM, Furlong ST. Lipid and membrane-protein transfer from human neutrophils to schistosomes is mediated by ligand binding. *J. Cell Sci*. 1994; 107:U2.

Furlong ST, Thibault, KS, Jack RM, Rogers RA. Neutrophil mediate lipid transfer to schistosomula of the human parasite *Schistosoma mansoni*. *Mol. Biol. Cell* 1992;3:A86.

Furlong ST. Role of lipids in *Schistosoma mansoni* - Reply. *Parasitol. Today* 1991; 7:204.

Furlong ST, Thibault KS. Utilization of fluorescent fatty acid and phospholipid analogs by schistosomula of *Schistosoma mansoni*. *Am. J. Trop. Med. Hyg*. 1991; 45(3):242-3.

Weiser WY, Furlong ST, David JR. Human recombinant migration-inhibitory factor (RMIF) encapsulated in liposomes activates monocye-derived macrophages to kill *Leishmania donovani* and potentiates immune response to soluble protein antigen. *FASEB J.* 1991; 5:A627.

Furlong ST, Golan DE, Caulfield, JP. Parasite lipids alter membrane properties of host cells. *FASEB J.* 1988; 2:A678.

Furlong ST, Mills JT, Dawidowicz EA. Intracellular translocation and sorting of newly synthesized polar lipids. *J. Cell Biol.* 1984; 99:A97.

Mills JT, Furlong ST, Dawidowicz EA. Biogenesis of plasma membrane in *Acanthamoeba castellanii*- transfer of newly synthesized lipid. *Fed. Proc.* 1983; 42:1804.

Furlong ST, Mulcare DJ. Stages of forelimb regeneration in bullfrog *Rana catesbiana*. *Am. Zool.* 1975.

COMPUTER PROGRAMS

Furlong, S.T. Hyperlab Laboratory Management software ©1991.

Furlong, S.T. Catalist Laboratory Management Software ©1992.

SELECTED PROFESSIONAL MEMBERSHIPS

1998-	Society for Neuroscience
1998- 2000	Member of Project Management Institute (Also member Pharmaceutical Special Interest Group)
1988-1996	New England Chromatography Council
1988-1994	American Society for Cell Biology
1990-1996	American Society of Tropical Medicine and Hygiene Chairman, Education Committee; Reponsible for writing and maintaining the society home page;on the internet; Organized and chaired symposium for educators at the 1996 annual meeting

CONSULTING

1994 -1995	Consultant to Biotek, Inc., Woburn, MA 01801
1992 – 1993	Consultant to Dynagen. Inc., Cambridge, MA 02139

SELECTED INVITED PRESENTATIONS

October 2003	CNS Clinical Trials, Center for Business Intelligence Meeting Philadelphia, Pennsylvania
February 2006	Biomarkers Discovery & Development Congress, Manchester, UK
August 2006	CNS Biomarkers, MIT Biobash, Cambridge, Massachusetts

COMMUNITY ACTIVITIES

2004-	Member, Board of Directors, Delaware Foundation for Math and Science Education, Program Committee co-chair
2004-5	Member, Board of Directors, Shipley Heights Civic Association
2002-	Photographic Society of America

2001-	Delaware Photographic Society – Webmaster and member of Executive Committee
2001-2003	Member of Steering Committee and Volunteer Mentor in AstraZeneca sponsored program for Wilmington Charter School
2000-2002	Volunteer Mentor in AstraZeneca sponsored program for Red Clay School District
1998-2003	Volunteer for AstraZeneca Sponsored Adopt-a-School program at PS duPont Middle School
1997	Coach, Concord Soccer Association. Wilmington, Delaware
1996-1997	President, Randolph Youth Soccer Association
1992-1997	Executive Board member Randolph Youth Soccer Association
1989-1997	Coach, Randolph Youth Soccer Association
1995-1996	Member, Randolph Public Schools Technology Assessment Committee (Chair, communications and access subcommittee)
1994	Coach, South Randolph Little League
1990-1994	Mentor, Summer undergraduate research program for minority students, Harvard Medical School
1990	Mentor, Boston Latin School/Harvard Medical School collaborative project for high school students