Cary F Opel

http://cfopel.com

Education

Massachusetts Institute of Technology
Ph.D. Chemical Engineering, Koch Institute for Integrative Cancer Research
Advisor: K. Dane Wittrup
Thesis: T Cell Mediated Combination Immunotherapy
2015

Stanford University
Professional Certificate, Product Creation and Innovative Manufacturing
2007

University of California, Berkeley
B.S. Bioengineering, Highest Honors
2004

Work Experience

Research Scientist I
September, 2015 – Present
Gilead Sciences, Oceanside CA
Develop and support cell culture manufacturing processes for clinical trials and commercial production. Run scale down experiments, generate documents, and perform data analysis in support of process characterization for commercial product launch. Manage and develop lab personal.

Graduate Student Researcher
January, 2010 – September, 2015
Wittrup Lab, Massachusetts Institute of Technology, Cambridge MA
Developed T cell based therapies in K. Dane Wittrup's Lab at MIT. Designed, expressed and purified various proteins including immunocytokines and antibodies. Developed stable cell lines expressing secreted and transmembrane proteins. Optimized various viral vector production and transduction protocols including lentivirus and retrovirus vectors. Designed and executed preclinical animal studies. Carried out adoptive cell transfer experiments in mice. Combinations of up to four different agents targeting complementary therapeutic modalities were tested in a murine model of melanoma. Cancer vaccine treatment, cytokine therapy, checkpoint blockade, and tumor targeting antibody dosing allowed various immunological mechanisms to be activated in a syngenetic mouse model. The most aggressive combinations cured large, established, subcutaneous tumors without the need for adoptive cell transfer. Extensive characterization of the immune system response to the tumor created by the combination therapy revealed a complex interplay of various cell types to mount a durable rejection of the primary tumor, as well as subsequent rechallenge.

Engineer I
August, 2006 – August, 2009
Genentech, Oceanside CA
Cell culture engineer in a cross-functional early stage process development group. Designed experiments to optimize mammalian cell culture parameters for clinical protein production. Technology development projects included the use of dielectric spectroscopy to monitor viable biomass online and optimizing a protein-retaining perfusion system to develop high titer processes. Led the setup and build-out of a new cell culture lab, which included leading a project team to design, commission, and install a 52-vessel DeltaV based bioreactor control system.

Operations Rotational Development Program Analyst
July, 2004 – August, 2006
Genentech, South San Francisco CA
Leadership development program that consisted of four six-month rotations throughout Genentech's Product Operations department.

Process Development – Late Stage Cell Culture
Evaluated new equipment for use in future cell culture processes. Set up and maintained small-scale cell culture runs. Generated experimental designs and performed data analysis. Worked with vendors to ensure equipment was functioning and used properly.

Manufacturing – Vacaville
Worked in a cGMP manufacturing facility as a technician in both cell culture and recovery operations. Learned CIP and SIP development principles. Implemented a tool to track and improve adherence to schedule.

Supply Chain Business Process Improvement
Acted as project manager for a cross-functional initiative to enhance Genentech's clinical drug supply chain. Utilized Class A / Operational Excellence principles to design and implement a process to track and verify the final disposition of drugs supplied during clinical trials. Completed basic courses in project management and meeting facilitation.

Manufacturing Science and Technology
Established and standardized best practices for pH and dissolved oxygen equipment maintenance across multiple manufacturing groups. Modified cGMP SOPs and created training procedures to support new activities. Assisted with the qualification campaign for the drug Lucentis. Participated in tank cleaning validation activities. Applied Kepner-Tregoe Root Cause Analysis procedures during process troubleshooting.

Lab Assistant/Undergraduate Researcher
May, 2002 – May, 2004
King Lab, UC Berkeley, Berkeley CA
Performed research on osteoarthritis for Professor Karen King. Tasks included microscopy, tissue processing, sectioning with a microtome, basic histology and immunohistochemistry. Carried out data analysis, established protocols, and assisted in writing publications. Wrote research funding proposals leading to several undergraduate grants.

Lab Technician
May, 2001 – May, 2004
Berkeley Microprop, Berkeley CA
Performed micro-propagation of various plants in a sterile lab environment. Performed activities independently and trained new employees on sterile technique and plant culture processes.

Glassware/Media Prep Technician
May, 2001 – May, 2002
Arriva Pharmaceuticals, Alameda CA
Cleaned and organized lab glassware. Stocked lab supplies and prepared media. Repaired and maintained laboratory equipment. Installed equipment and set-up stockrooms in a new laboratory facility.

Research Skills

In-vivo Cancer Models: Isogenic, xenogenic, and inducible murine models of cancer; adoptive cell transfer; survival surgery; husbandry
Molecular Biology: Vector design and construction; cloning; DNA isolation and purification; PCR
Flow Cytometry: 9 color panel design and analysis; Flowjo; BD FACS Diva; Accuri; Fortessa; LSR
Mammalian Cell Culture: Transient protein expression; stable cell line development; cytotoxicity assays; T cell culture and expansion; Bioreactor Operations; cGMP processes; perfusion; optical density; dielectric spectroscopy
Protein Analysis and Purification: SDS-PAGE; Western Blot; ELISA; GE AKTA; affinity chromatograph; SEC
Viral Vectors: Lentiviral/retroviral expression and transduction
Computer: Excel; Word; Powerpoint; Matlab; R; SigmaPlot; Prism

Publications

Synergistic Innate and Adaptive Immune Response to Combination Immunotherapy with Anti-Tumor Antigen Antibodies and Extended Serum Half-Life IL-2. Zhu EF*, Gai SA*, **Opel CF***, Kwan BH, Surana R, Mihm MC, Kauke MJ, Moynihan KD, Angelini A, Williams RT, Stephan MT, Kim JS, Yaffe MB, Irvine DJ, Weiner LM, Dranoff G, Wittrup KD. Cancer Cell. 2015. ***Co-First Authors**

Antigen Specificity Can Be Irrelevant to Immunocytokine Efficacy and Biodistribution. Tzeng A, Kwan BH, **Opel CF**, Navaratna T, Wittrup KD. PNAS. 2015.

A graphene-based physiometer array for the analysis of single biological cells. Paulus GL, Nelson JT, Lee KY, Wang QH, Reuel NF, Grassbaugh BR, Kruss S, Landry MP, Kang JW, Vander Ende E, Zhang J, Mu B, Dasari RR, **Opel CF**, Wittrup KD, Strano MS. Scientific Reports, 2014.

Emergent properties of nanosensor arrays: applications for monitoring IgG affinity distributions, weakly affined hypermannosylation, and colony selection for biomanufacturing. Reuel NF, Grassbaugh B, Kruss S, Mundy JZ, **Opel CF**, Ogunniyi AO, Egodage K, Wahl R, Helk B, Zhang J, Kalcioglu ZI, Tvrdy K, Bellisario DO, Mu B, Blake SS, Van Vliet KJ, Love JC, Wittrup KD, Strano MS. ACS Nano. 2013.

Quantitative modeling of viable cell density, cell size, intracellular conductivity, and membrane capacitance in batch and fed-batch CHO processes using dielectric spectroscopy. **Opel CF**, Li J, and Amanullah A. Biotechnology Progress. 2010.

Cyclical articular joint loading leads to cartilage thinning and osteopontin production in a novel in vivo rabbit model of repetitive finger flexion. King KB, **Opel CF**, Rempel DM. OsteoArthritis and Cartilage. 2005.

Presentations and Posters

Enhanced Combination Immunotherapy Using Anti-PD-1 Antibodies and in Conjunction with Tumor Targeting Therapies. **Opel CF**, Moynihan KD, Irvine DJ, Wittrup KD. Presentation. PEGS. Boston. May, 2015.

Combined Treatment Using Adoptive Cell Therapy, IL-2, and Tumor-Specific Antibodies. **Opel CF**, Moynihan KD, Irvine DJ, Wittrup KD. Presentation. ImVacS. Boston. August, 2014.

Combined treatment using adoptive cell therapy, extended pharmacokinetic IL-2, and tumor-specific antibodies leads to cures of established B16F10 tumors and extended in vivo T cell survival. **Opel CF**, Wittrup KD. Poster. SITC Annual Meeting. National Harbor. November, 2013.

Engineering Chimeric Antigen Receptors Targeting an Endogenous Murine Tumor Associated Antigen. **Opel CF**, Stephan MT, Wittrup KD. Presentation. AIChE Annual Meeting. Pittsburgh. October, 2012.

Advanced Applications of DeltaV in Cell Culture Process Development. Najmi Z, **Opel CF**. Workshop. Emerson Global Users Exchange. Orlando. October, 2009.

Monitoring and Control of Cell Culture Bioreactors Using on-Line Scanning Dielectric Spectroscopy. **Opel CF**, Amanullah A. Presentation. AIChE Annual Meeting. Philadelphia. November, 2008.

Application of on-line scanning dielectric spectroscopy to monitor CHO cell cultures. **Opel CF**, Amanullah A. Poster. ACS National Meeting. Philadelphia. August, 2008.

On-line viable cell density measurements using scanning dielectric spectroscopy. **Opel CF**, Li F, Amanullah A. Poster. Cell Culture Engineering XI. Queensland, Australia. April, 2008.

In Vivo Cyclical Joint Loading Decreases Unmineralized Cartilage Mean Thickness in the Rabbit Metacarpophalangeal. **Opel CF**, Portnoy A, King KB. Poster. Annual ORS Meeting. Washington DC. February, 2005.

Analysis of an Animal Model Studying the Mechanobiology of Joint Loading. **Opel CF**, Portnoy A, King KB. Presentation. UC Systemwide Annual Bioengineering Symposium. San Diego. June, 2003.

Patents

U.S. Provisional Application No. 62/036,947
Title: SYNERGISTIC TUMOR TREATMENT WITH IL-2, A THERAPEUTIC ANTIBODY, AND AN IMMUNE CHECKPOINT BLOCKER. Filing Date: August 13, 2014.

U.S. Provisional Application No. 62/036,595
Title: SYNERGISTIC TUMOR TREATMENT WITH IL-2, A THERAPEUTIC ANTIBODY, AN IMMUNE CHECKPOINT BLOCKER, AND A CANCER VACCINE. Filing Date: August 12, 2014.

U.S. Provisional Application No. 62/036,588
Title: SYNERGISTIC TUMOR TREATMENT WITH IL-2, A THERAPEUTIC ANTIBODY, AND A CANCER VACCINE. Filing Date: August 12, 2014.

U.S. Provisional Application No. 62/036,577
Title: SYNERGISTIC TUMOR TREATMENT WITH IL-2, A THERAPEUTIC ANTIBODY, AND AN IMMUNE CHECKPOINT BLOCKER. Filing Date: August 12, 2014.

U.S. Patent Application No. 14/304,438
Title: SYNERGISTIC TUMOR TREATMENT WITH EXTENDED-PK IL-2 AND ADOPTIVE CELL THERAPY. Filing Date: June 13, 2014.

Graduate Fellowships

NSF Graduate Research Fellow	2010-2013
Edward Walsh Memorial Presidential Fellow for Chemical Engineering	2009-2010

Undergraduate Research Scholarships

Nathan and Violet David Research Scholar	2003-2004
Guidant Research Scholar	2002

Honor Societies and Student Organizations

Chemical Engineering Graduate Student Council	2010-2011
Bioengineering Honor Society	2003-2004
Phi Beta Kappa	2003-2004
Golden Key Honor Society	2002-2004
Tau Beta Pi	2002-2004
Pre-Med Honor Society	2001-2004
Cal Lightweight Crew	2001-2002
Kappa Sigma	2000-2004

Awards

Edward W Merrill Outstanding Teaching Assistant Award	2012
Tau Beta Pi Scholar	2003-2004
Kappa Sigma Scholarship-Leadership Award	2003
Robert C Byrd Scholar	2000-2004
Cal Alumni Leadership Award	2000-2003

Professional Memberships

SITC	2013-Present
AIChE	2008-Present
ACS	2008-Present

Volunteer Work

Veterans Upward Bound Tutor
2011-2012
Tutored military veterans in college preparatory math skills through the Suffolk University Veterans Upward Bound Program.

Junior Achievement High School Volunteer
2005
Designed and taught a course on basic business management. Assisted the students in forming their own one-day business venture.

Berkeley High School Tutor
2003
Individually tutored students with learning disabilities. Acted as a teaching assistant for an introductory chemistry class.