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SEAN MICHAEL SULLIVAN

EDUCATION

Ph.D. in Biochemistry - Department of Biochemistry - University of Tennessee, Knoxville, Tennessee

MS in Biochemistry - Department of Biochemistry - University of Tennessee, Knoxville, Tennessee

BS in Chemistry - Maryville College, Maryville, Tennessee

MEMBERSHIPS

American Association of Pharmaceutical Science

American Society for Gene Therapy (Membership and Non-Viral Gene Therapy Committees)

CAREER HISTORY

University of Florida - Gainesville, FL - Department of Pharmaceutics, College of Pharmacy
Associate Professor

Valentis, Inc. - The Woodlands, TX - Director of Core Technologies

Valentis, Inc. (formerly GeneMedicine) - The Woodlands, TX - Director and Anti-Angiogenesis Program Head

GeneMedicine Inc. - The Woodlands, TX - Director and Program Head - Systemic Tumor Endothelium Platform

Cell Genesys (formerly Somatix Therapy Corp.) - Foster City, CA - Section Manager Synthetic Vector Development

Somatix Therapy Corporation - Alameda, CA - Section Manager - Synthetic Vector Development

Ribozyme Pharmaceuticals, Inc. - Boulder, CO - Senior Scientist in Charge of Drug Delivery

United States Biochemical Corp. - Cleveland, OH - Senior Scientist: Drug Delivery Ribozyme Project

Vestar, Inc. (Presently Gilead, Inc.) - San Dimas, CA Scientist and Project Leader

California Institute of Technology - Pasadena, CA - Postdoctoral Fellow Division of Chemistry

Roche Diagnostics - Bellville, NJ - Assistant Scientist

Hoffman La-Roche - Nutley, NJ - Associate Scientist

APPOINTMENTS:

Shands Cancer Institute - University of Florida, Gainesville, Florida
2000- present

Let There Be Hope Research Institute - (Private AIDS Research Institute) - Beverley Hill, CA
Research Director (2001-2004)

EDITORIAL BOARDS

Pharmaceutical Research - Human Gene Therapy

NIH Study Section - Full Time Member NIH GDD Study Section Project Program Review for
NCI/NIH - Adhoc Member for SBIR Oncology

Consultant - Aventis, Somerville, NJ; Paris, France, Forcon International, Atlanta, GA - Protiva
Biotherapeutics LTD, Burnaby, BC - Toucan Capital Corp, Bethesda, MD

Scientific Advisory Board Discovery Genomics, Minneapolis, MN

Journal Reviewer - J. Biological Chemistry, J. Clinical Investigation, Gene Therapy, DNA and Cell
Biology, J. Pharmaceutical Science, Human Gene Therapy, Pharmaceutical Research, Nature
Biotechnology, FEBS Letters, Macromolecules

TEACHING

- Fall Semester-Dosage Forms I-Responsible for 9 lectures and 1 Exam
- 2001 Spring Semester-Dosage Forms II-Course Coordinator and Lecturer-
Responsible for 18 lectures and 2 exams-
- 2002-Present Coordinator of Pharmaceutics Graduate Student Seminar
- 2002-Present Clinical Biochemistry-Created a new Biochemistry Course for 1st yr
Pharmacy
- Students. Responsibilities include: development of the course curriculum, implementing
the teaching of the course for the Gainesville Campus and the three distant campuses;
Coordinating team teaching for myself and two other faculty; supervision of 5 teaching
assistants; directly responsible for presenting 34 lectures, 4 review sessions, and creating
and administering 4 of 5 exams; Created and coordinated group presentations involving
the relationship between a specific lab value and a class of drugs with the mechanism
being at the biochemical level.

RESEARCH AND MANAGEMENT EXPERIENCE

- Presently direct an academic research lab of three technician and five graduate students for development of non-viral cancer gene therapy for the treatment of brain cancer.
- Managed 10 FTE (1MS, 9BS) Core Technologies Team responsible for small scale plasmid manufacture (1 gm scale), biological assay development including quantitative PCR and RT-PCR, development of analytical chemistry and plasmid formulation optimization. The team's role was to serve as a transitional team from Product Discovery to Preclinical Development.
- Managed a product discovery team of 6 FTEs (2Ph.Ds and 4 BS) at Valentis to develop a preclinical data package for IND filing of anti-angiogenic based cancer gene therapeutics using existing gene delivery technology.
- Managed a technology development team of 8 FTEs (3PhD, 1MS and 4BS) plus 2 Post Doctoral Fellows at GeneMedicine composed of Formulation, Molecular Biology and Pharmacology expertise. The team developed technology for systemic gene delivery by reformulating existing clinically approved formulations and combining that with the development of new technology. Examples of new technology development were peptide ligand targeting of gene delivery vehicles to tumor vasculature, tissue specific promoters for expression plasmids that yield selective expression in proliferating endothelium and coexpression of fusion protein transactivators for gene amplification.
- Established the non-viral gene therapy program at Somatix Therapy Corporation consisting of 2 Ph.D.s and 2 research associates. The program team developed and patented proprietary transfection reagents (cationic biodegradable polymers), and methods for manufacturing transfection complexes for therapeutic applications.
- Developed a drug delivery program at Ribozyme Pharmaceuticals (RPI) for the delivery of ribozymes. The group consisted of 1 Ph.D. and 5 technicians. Both lipid and polymer based delivery vehicles were developed.
- Successfully developed an *in vivo* ocular delivery vehicle at RPI for ribozyme delivery to the corneal epithelial layer of the eye using polyacrylic acid.
- Composed the business plan and actively participated in the spin off of the ribozyme division at United States Biochemical Corporation to form Ribozyme Pharmaceuticals.
- Principal Investigator under a National Cooperative Drug Discovery Grant between Vestar, Inc., City of Hope Hospital, Duarte, Ca and MicroProbe, Inc. Bothell, WA.

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- Discovered a patented delivery formulation and oligodeoxynucleotide for inhibition of HIV proliferation.
- Principal Investigator for Phase I SBIR to develop monoclonal antibody liposomes for delivery of daunorubicin to human B cell lymphomas at Vestar.
- Project leader at Vestar for development of liposome based Herpes Simplex Virus Vaccine in collaboration with SmithKline Biologicals, Rixensart, Brussels.
- Project leader at Vestar for developing soluble CD4 coupled liposomes for treatment of AIDS in collaboration with SmithKlineBeecham, King of Prussia, PA.
- Developed glycolipid based target recognition system for binding of liposomes to human breast carcinoma cells.
- Developed heat sensitive immunoliposomes for controlled release of cytotoxic nucleosides.

PUBLICATIONS

1. Gieseler, R.K., Marquitan, G., Hahn, M.J., Perdon, L. A., Driessen, W. H. P., **Sullivan, S. M.**, Scolaro M. J. “ DC-SIGN–Specific Liposomal Targeting and Selective Compound Delivery to Human Myeloid Dendritic Cells: Implications for HIV Disease” *Scandinavian Journal of Immunology (in press)*
2. Anwer, K., Kao, G., Rolland A., Driessen, W.H. and **Sullivan, S.M.** , “Peptide mediated Gene Transfer of Cationic Lipid/Plasmid DNA Complexes to Endothelial Cells (2004) *Journal of Drug Targeting (in press)*
3. Iyengar, A. and **Sullivan S.M.** “Development of Neutral Liposome Plasmid DNA Complexes for Gene Transfer: Non-Viral Gene Delivery Systems” In *Carrier-Based Drug Delivery, ACS Symposium Series 879, American Chemical Society, Washington, DC (Ed., S. Svenson) 2004 pp. 61-74*
4. Mandel, R.J., Velardo, M.J., **Sullivan, S.M.**, Rodriguez, E., Piercefield, E., Deng, J., Peden, C.E.S., Reier, P.J., Burger, C. “Gene Therapy for Disorders of the Central Nervous System, In *Textbook of Neurointensive Care, Saunders, Philadelphia, Pennsylvania (Eds. A.J. Layon, A. Gabrielli, W.A. Friedman) 2004 pp. 865-890*
5. **Sullivan, S.M.** “Introduction: Overview of Gene Therapy” In *Pharmaceutical Gene Delivery Systems, Marcel Dekker, NY (Eds. A. Rolland and S.M.Sullivan) 2003 pp. 1-18*
6. **Sullivan S.**, Y. Gong, J. Hughes “Cationic Liposomes in Gene Delivery” *Liposomes, A Practical Approach 2nd Edition, Oxford University Press, Oxford, UK (Eds. V. Torchilin & V. Wessig) 2003 pp.289-304*

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7. **Sullivan S.M.** "Vectors for Gene Delivery" Biotechnology and Biopharmaceuticals: Transforming Proteins and Genes into Drugs, J.Wiley, NY (Eds. R.Ho & M.Gibaldi) **2003** pp.412-426
8. Boomer JA, Thompson DH, **Sullivan SM**, "Formation of Plasmid-Based Transfection Complexes with an Acid-Labile Cationic Lipid: Characterization of *In Vitro* and *In Vivo* Gene Transfer" **(2002)** Pharm. Res. 19: 1292-1301
9. Anwer K., Kao G., Proctor B., Anscombe I., Florack V., Earls R., Wilson E., McCreery T., Unger E., Rolland A., **Sullivan S.M.** "Ultrasound enhancement of cationic lipid mediated gene transfer to primary tumors following systemic administration" **(2000)** Gene Therapy 7: 1833-1839.
10. Bailey A., **Sullivan S.M.** "Ethanol and calcium mediated plasmid entrapment in neutral liposomes Biochim Biophys Acta **(2000)** 1468:239-252
11. Anwer K., Meaney C., Kao G., Hussain N., Shelvin R., Earls R.M., Leonard P., Rolland A.P., **Sullivan S.M.** "Cationic lipid-based delivery system for systemic cancer gene therapy" Cancer Gene Ther. **(2000)** 7(8): 1156-64
12. Anwer K., Meaney C., Kao G., Shelvin R., Earls R.M., Leonard P., Rolland A.P., **Sullivan S.M.** "Optimization of cationic lipid/DNA complexes for systemic gene transfer to tumor lesions" J. DrugTarget. **(2000)** 8(2): p. 125-35.
13. Anwer K., Bailey A., **Sullivan S.M.** "Targeted Gene Delivery: A Two-Pronged Approach" Critical Reviews in Therapeutic Drug Carrier Systems **(2000)** 17: 377-424
14. **Sullivan S.M.** "Non-viral cancer gene therapy: an industrial perspective" Curr. Opinion in Drug Discovery & Development **(1999)** 2: 129-133
15. Roland, A. **Sullivan, S.** and Petrak, K. **(1999)**. Pharmaceutical gene medicines for non-viral gene therapy. In "Biopharmaceuticals, an Industrial Perspective". (Eds. G. Walsh, and B. Murphy), pp471-504. Kluwer academic publishers, the Netherlands.
16. Anwer K., Szymanski P., Kao G., Ziang Q., Shelvin R., **Sullivan S.M.** "In vivo gene transfer by targeted non-viral gene delivery" Division of Polymer Chemistry, Inc., American Chemical Society, **(1999)** 40:299-300
17. Blezinger P., Wang J., Gondo M., Quezada A., Mehrens D., French M., Singhal A., **Sullivan S.**, Ralston R., Min W. "Systemic inhibition of tumor growth and tumor metastases by intramuscular administration of the endostatin gene" **(1999)** Nat. Biotechnology. 17: 343-348

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18. Hofland, H.E.J., Nagy, D., Liu, J.-J., Spratt, K., Lee, Y.-L., Danos, O. and **Sullivan, S.M. (1997)** "In vivo gene transfer by intravenous administration of stable cationic lipid/DNA complex" Pharm. Res. 14: 742-749
19. Hofland, H.E.J. and **Sullivan, S.M. (1997)** "Stable lipid/DNA complexes for intravenous delivery of genes" J. Liposome Res. 7: 187-205
20. Hofland, H.E.J., Shepard, L. and **Sullivan, S.M. (1996)** "Formation of stable cationic lipid/DNA complexes for gene transfer" Proc. Natl. Acad. Sci. 93: 7305-7309
21. Ayers D.,Cuthbertson J.M.,Schroyer K. and **Sullivan S.M. (1995)** "Polyacrylic acid mediated ocular delivery of ribozymes" J. Controlled Release 38: 167-175
22. **Sullivan, S.M. (1994)** "Development of ribozymes for gene therapy" J. Invest. Dermatology 103: 85S-89S
23. Brown D.A.; Kang S.H.; Gryaznov S.M.; DeDionisio L.; Heidenreich O.; **Sullivan S.**, Xu X., Nerenberg M.I. **(1994)** "Effect of phosphorothioate modification of oligodeoxynucleotides on specific protein binding" J. Biol. Chem. 269: 26801-5
24. **Sullivan, S.M. (1993)** "Liposome-mediated uptake of ribozymes" Methods: A Companion to Methods in Enzymology 5: 61-66
25. **Sullivan S.M.**, Gieseler R.K.H., Lenzner S., Ruppert J., Gabrysiak T.G., Peters, J.H. Cox, G. Richer L., Martin W.J. and Scolaro M.J. **(1992)** "Inhibition of human immunodeficiency virus-1 proliferation by liposome encapsulated sense DNA to the 5' tat splice acceptor site" Antisense Res. & Devel. 2: 187-197
26. Rossi J.J., Elkins D., Zaia J.A. & **Sullivan S. (1992)** "Ribozymes as anti-HIV-1 therapeutic agents: principles, applications and problems" AIDS Res.& Human Retroviruses 8: 183-189
27. Rossi J.J.; Elkins D.; Taylor N.; Zaia J.; **Sullivan S.**; Deshler J.O. **(1991)** Exploring the use of antisense, enzymatic RNA molecules (ribozymes) as therapeutic agents. Antisense Res Dev 1: 285-8
28. Roerdink F.H. Regts J., Handel T., **Sullivan S.M.**, Baldeschwieler J.D., Scherphof G.L. **(1989)** "Effect of cholesterol on the uptake of intracellular degradation of liposomes by liver and spleen" Biochim. Biophys. Acta 980:234-240
29. **Sullivan S.M.** and Huang L. **(1986)** "Enhanced delivery to target cells by heat sensitive immunoliposomes" Proc. Natl. Acad. Sci. (USA) 83: 6117-6121

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30. **Sullivan S.M.**, Conor J. and Huang L. (1986) "Immunoliposomes: preparation, properties and characterization" J. Medicinal Reviews 6: 171-195
31. Conor J., **Sullivan S.M.** and Huang L. (1985) "Monoclonal antibodies and Liposomes" Pharmac. Ther. 283: 341-365
32. **Sullivan S.M.** and Huang L. (1985) "Preparation and characterization of heat sensitive immunoliposomes" Biochem. Biophys. Acta 812: 116-126

PATENTS

1. Lipid mediated screening of drug candidates for identification of active compounds. **S.M. Sullivan** and Robert A. Copeland US patent application 3/29/02 WO 03/083443 A2 US Anti-angiogenesis plasmids and delivery systems, and methods of making and using the same. W. Min, R. Ralston, **S.M.Sullivan** US Patent Application 60/094,375 Filed July 1998.
2. Encapsulation process: A process for the encapsulation of oligonucleotides in liposomes includes the suspending of liposomes containing a divalent cation in a solution containing oligonucleotides and having an osmolarity of a less than that of the internal aqueous phase. **S.M.Sullivan** US 5,227,170
3. Phospholipid analogue vesicle: Delivery vehicle formulations comprising active agents encapsulated within microparticles which include a succinimidyl moiety extending externally from a lipid molecule therein are capable of the cytoplasmic or nuclear cell delivery of intact encapsulated active agents. **S.M. Sullivan** US 5,419,914
4. Intracellular delivery of DNA oligonucleotides(s) for inhibiting viral proliferation in infected cells, and for treating retroviral infections, HIV, adenovirus, herpes simplex virus etc. **S.M. Sullivan** and M. Scolaro US 595253 (901009)
5. Pharmaceutical compositions containing nucleic acid and polyacrylic acid- especially for treating herpes simplex infections by ocular delivery of ribozyme. **S. M. Sullivan** US 54722 (930428)
6. Permeability enhancers for negatively charged polynucleotides: This invention features permeability enhancer molecules, and methods, to increase membrane permeability of negatively charged polymers thereby facilitating cellular uptake of such polymers. S.M. Sullivan US 5,583,020
7. Stable synthetic nucleic acid delivery vehicle containing amphipathic cationic lipid conjugate-useful as vectors for gene therapy, have low toxicity and retain transfection activity for at least 2 days after preparation **S.M. Sullivan** and H.E.J. Hofland US 450142 (950526)

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8. Enzymatic RNA molecules which cleave mRNA-used to treat or prevent inflammatory, arthritic, stenotic or cardiovascular diseases or conditions
9. KG Draper and **SM Sullivan** US 916763 (920717)
10. Cationic polymers for delivery of nucleic acids S.M. Sullivan
11. Intercellular adhesion molecule-1 (ICAM-1) ribozymes Inventors: S. Grimm; D.T. Stinchcomb ; J. McSwiggen; **S. Sullivan**; K. G. Draper;. US 5,837,542
12. Enzymatic RNA molecules that cleave TNF-.alpha. mRNA. Enzymatic RNA molecules that cleave TNF-alpha. mRNA; **S. Sullivan**; K.Draper; K. Kisich; D.T. Stinchcomb; J. McSwiggen; US 5,811,300
13. Ribozymes targeted to TNF-.alpha. RNA: An enzymatic RNA molecule that cleaves mRNA associated with development or maintenance of an inflammatory disease. **S. M. Sullivan**;. K.G. Draper; US 5,616,490
14. IL-5 targeted ribozymes: Enzymatic RNA molecules which cleave IL-5 mRNA. **S. Sullivan**; K.G. Draper; J. McSwiggen; D.T. Stinchcomb; US 5,616,488

GRANT HISTORY

- J.S.McDonnell Foundation "Development of Non-Viral Gene Therapy to Treat Glioma. PI- S.M.Sullian, Co-PI R. Mandel - January 02-December 05 \$425,401
- NIH/NEI "Increased INOS and reactive oxygen species in diabetic retinopathy" PI-Dr. Maria Co-PI S.M. Sullivan 10% effort-12/01/01-11/31/05 \$331,845
- NIH/NEI "Targeting the IGF-1 System in Retinal Angiogenesis" - PI-Dr. Maria Grant Co-PI S.M.Sullivan - 15% effort 12/01/03-11/31/06 \$272,564
- NIH-"Regulation of Superoxide Dismutase in the Lung-" PI-. Harry Nick Co-Investigator- S.M. Sullivan 5% effort 8/01/02-7/31/07 \$324,803
- Let There Be Hope Foundation, Beverley Hills, CA \$65,000 3/01/03 "Antibody Targeted Antiviral Delivery to HIV infected Dendritic Cells"
- "Targeted Non-Viral Gene Delivery" " NIH SBIR Phase I 1997-6 month award \$100,000
- "Anti-HIV Ribozyme Development" Core Facility, NIH/NIAID 1993-1996, NCDDG with Dr. T. Cech, University of Colorado, Boulder, CO and Dr. Chip Schooley, Department of Infectious Disease, University of Colorado Health Sciences Center, Denver, CO \$354,192

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- Development of Anti-HIV Therapeutics", NIH/NIAID 1987-1990, NCDDG with Research Institute of the City of Hope, Duarte CA and MicroProbe, Inc., Bothell, WA \$660,000.

RESEARCH CONTRACTS

Genzyme Corporation 7/02-1/03 \$68,000

AWARDS

3M New Faculty Award 8/03-7/04 \$15,000

3M New Faculty Award 8/02-7/03 \$15,000

3M New Faculty Award 8/01-7/02 \$12,000

MEETINGS

- 2001 **American Society for Gene Therapy** -S.M. Sullivan- "Gene Transfer to Brain Tumor Vasculature for Treatment of Glioblastoma"
- 2002 **American Society for Gene Therapy** -H. Zhu and S.M.Sullivan "Development of small, uniform, lipoplexes for gene transfer to brain tumor cells and brain tumor endothelium"
- 2003 **American Society for Gene Therapy** -H.Zhu and S.M. Sullivan (Podium Presentation) "Development of Decomplexation Enhancer to Increase Non-Viral Gene Transfer Efficiency."
- 2004 **American Society of Gene Therapy** - Y.P.R. Jarajapu, J. Baltunis, H.J. Knot1, and S.M. Sullivan "Modeling and Expression of Chimeric Penetration Domain/ Killing Domain Gene Product for Treatment of Brain Cancer".
- 2004 **American Society for Gene Therapy** - N. Toussaint, S. Kearns, R. Mandel, A. Yachnis, D. Steindler and S.M.Sullivan "Development of Brain Tumor Organotypic Cultures Characterizing Polymer/Plasmid DNA Mediated Gene Transfer."

INVITED SEMINARS

- 2004 Florida Research Council Technology Transfer Conference, St. Petersburg, FL
- 2004 Shands Cancer Institute Seminar Series
- 2003 Genethon, Evry, France-Invited Seminar on Non-Viral Gene Transfer
- 2002 AAPS 37th Annual Pharmaceutical Technologies Conference on Parenteral Products
- 2001 Western Regional Eye Conference, Lake Tahoe, CA
- 2001 Gene Therapy Center, University of Minnesota, St. Paul, MN
- 2000 Gene Therapy Mini symposium, Controlled Release Society, Paris, France
- 2000 8th Annual Liposome Research Days, Napa, California
- 1999 IIR 2nd Annual Angiogenesis Meeting, Washington, DC
- 1999 Department of Pharmaceutics, University of Florida, Gainesville, Florida

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- 1999 Drug Delivery in the 21st Century, American Chemical Society, Anaheim, California
- 1998 IIR London Conference-Evaluating Novel Viral and Non-Viral Gene Delivery Systems