SAMMY RAY SHAVER
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SUMMARY

Organized and highly motivated professional with a solid background in Medicinal, Synthetic, Computational, and Analytical Chemistry. Experience with *in silico* lead identification and development, med-chem product development, process and method transfer, process scale-up and validations. Leader of multiple cross-functional project teams, experience in directing and leading research projects, proven record of versatile skill set. Author or co-author of 31 scientific publications, presented 6 invited lectures, and co-inventor on 38 patents.

AREAS OF STRENGTH

Synthetic and Medicinal Chemistry
Compound synthesis and purification particularly in the area of nucleosides and nucleotides, analysis of structure/activity trends, optimization of synthetic procedures and process scale-up, structure determination and elucidation.

Information Technology
Molecular modeling of iron- and zinc-based enzymes (MOE/Chemical Computing Group, AutoDock) for hit-to-lead development, *in silico* evaluation of focused and diverse compound libraries to enhance lead identification and optimization. Administration, creation, and maintenance of Oracle and non-Oracle based scientific databases and electronic notebooks.

Intellectual Property
Preparation of biological/chemical/process applications, preparation of Office Action rebuttals.

Process, Product and Assay Development
Formulation, process and product development, analytical methods development, technology transfer and methods validations.

Analytical Techniques
Applied spectroscopy: NMR, UV-VIS, IR, fluorescence. Chromatography methods: HPLC, UPLC, LC-MS. Other analytical assays: solubility determinations, Karl Fisher determinations, optical rotation.

WORK EXPERIENCE

SR Consulting March 2019-present
Restarted an independent Chemistry and Informatics consulting business to provide biopharmaceutical and biotech companies with expertise in molecular modeling and informatics, databases, intellectual property, process/development chemistry, and drug development.

Selenity Therapeutics July 2018-February 2019
Responsible for bio-informatics and molecular modeling for multiple enzyme-based discovery programs focusing on zinc-based targets in the areas of oncology, neuropathies, and CNS disease.

Viamet Pharmaceuticals April 2015-July 2018
Responsible for bio-informatics and molecular modeling for multiple successful metalloenzyme discovery programs, primarily Cytochrome P450 iron-based enzymes as antifungals and cardiovascular therapies as well as several zinc-based targets.

SR Consulting March 2009-April 2015

Founded independent Chemistry and Informatics consulting business to provide local biopharmaceutical and biotech companies with expertise in databases, intellectual property, process/development chemistry, and drug development. Have collaborated with companies on both coasts, ranging from a pre-funding startup to a 100+ employee mature biotech, in each of the above areas of expertise. The challenges range from directing a medicinal chemistry optimization program, to setting up chemistry and biology databases and modeling programs which assist drug development programs, to overseeing a GMP process campaign, and to preparing applications for intellectual property coverage.

Inspire Pharmaceuticals Inc. Durham, NC 1995-2009

Held multiple positions of increasing responsibility within the Discovery organization, notably Director of Chemistry, Principal Investigator in the Screening Technologies group, and lastly as Principal Investigator in Pharmaceutical Sciences. Duties in this role included successfully developing a validatable UPLC method for the small molecule glaucoma lead and transferring the method to a CRO for qualification. Served as the analytical contact and reviewer for preclinical and non-clinical contract labs in collaboration with the Toxicology group and was a member of the Chemical Manufacturing and Controls team for denufosol and two glaucoma projects. Administered and maintained all the scientific databases (ActivityBase, Synthematix/Symyx, CisPro).

Burroughs Wellcome Co. Research Triangle Park, NC 1981-1995

Held multiple positions of increasing responsibility in the Chemistry Department, working primarily within the antiviral program; specifically, nucleoside analogs as antiretroviral agents.

University of North Carolina, Chapel Hill Chapel Hill, NC 1977-1981

EDUCATION

University of North Carolina, Chapel Hill, N.C. — Bachelor of Science in Chemistry, 1977

AWARDS

Technical Achievement in Organic Chemistry Award: American Chemical Society, Division of Organic Chemistry August 2010.

Wellcome Synthetic Organic Chemistry Achievement Prize: *For your effort in achieving a viable synthesis of 524W91* March 1995.

PUBLICATIONS AND PRESENTATIONS

Shaver SR, Garvey EP, Schotzinger RJ, Yates CM, Hoekstra WJ Scaffold Modifications of Fungal CYP51 Inhibitors Podium presentation at the North American UGM & Conference 2018 Montreal, QC Canada June 28, 2018

Yates CM, Garvey EP, Shaver SR, Schotzinger RJ, Hoekstra WJ Design and optimization of highly-selective, broad spectrum fungal CYP51 inhibitors. *Bioorganic and Medicinal Chemistry Letters*, 27, 3243 (2017)

Shaver SR Modification of the nucleotide sugar: manipulation of GPCR activity TAOC Symposium 240th National ACS meeting Boston, MA August 25, 2010

Douglass JG, Patel RI, Yerxa BR, Shaver SR, Watson PS, Bednarski K, Plourde R, Redick CC, Brubaker K, Jones AC, Boyer JL. Lipophilic modifications to dinucleoside polyphosphates and nucleotides that confer antagonist properties at the platelet P2Y12 receptor. *J Med Chem*.51(4),1007-1025 (2008).

Shaver SR The Politics of Publishing: A Small Company Perspective Podium presentation at the Council of Science Editors Atlanta , GA May 22, 2005

Shaver SR, Rideout JL, Pendergast W, Douglass JG, Brown EG, Boyer JL, Patel RI,. Redick CC, Jones AC, Picher M, Yerxa BR Structure-Activity Relationships of Dinucleotides: Potent and Selective Agonists of P2Y Receptors *Purinergic Signalling*, **1**(2), 183 (2005)

Shaver SR Chemistry in Small Pharma: Be All You Can Be by Using All of What You've Learned Inspire Pharmaceuticals Lecture in Organic Chemistry at the University of North Carolina-Chapel Hill May 16, 2003

Min K, Munarriz R, Yerxa BR, Goldstein I, Shaver SR, Cowlen MS, and M. Traish AM Selective P2Y2 Receptor Agonists Stimulate Vaginal Moisture in Ovariectomized Rabbits *Fertility and Sterility*, **79** (2), 393 (2003)

Shaver SR Assessing Alternative Options for Financing Your Drug Discovery Research & Development Program Podium Presentation at Discovery Tech 2001 Palm Beach, FL November 26, 2001

Shaver SR P2Y Receptors: Biological Advances and Therapeutic Opportunities *Current Opinion in Drug Discovery & Development*, **4**, 665 (2001).

Pendergast W, Yerxa BR, Douglass III JG, Shaver SR, Dougherty RW,. Redick CC,. Sims IF and Rideout JL Synthesis and P2Y Receptor Activity of a Series of Uridine Dinucleoside 5'-Polyphosphates *Bioorganic and Medicinal Chemistry Letters*, **11**, 157 (2001)

Shaver, SR Synthesis and SAR of P2Y2 Receptor Agonists Podium presentation at the 220th ACS National Meeting, Washington D.C. August 20-24, 2000

Shaver, SR, Pendergast, W, Siddiqi, SM, Yerxa, BR, Croom, DK, Dougherty, RW, James, MK, Jones, AN, and Rideout, JL 4-Substituted Uridine 5'-Triphosphates as Agonists of the P2Y2 Purinergic Receptor *Nucleosides and Nucleotides*, **16**, 1099 (1997)

Freeman, GA, Shaver, SR, Rideout, JL, and Short, SA 2-Amino-9-(3-Azido-2,3-Dideoxy-β-D-*erythro*-Pentofuranosyl)-6-Substituted-9H-Purines: Synthesis and Anti-HIV Activity, *Bioorg. Med. Chem.*, **3**, 447 (1995)

Krenitsky, TA, Freeman, GA, Shaver, SR, Beacham III, LM, Hurlbert, S, Cohn, NK, Elwell, LP, and Selway, JWT 3'Amino-2',3'-dideoxyribonucleosides of Some Pyrimidines: Synthesis and Biological Activities. *J. Med. Chem.*, **26**, 891 (1983).

Dubovi, EJ, Geratz, JD, Shaver, SR, and Tidwell, RR Inhibition of Respiratory Syncytial Virus-Host Cell Interactions by Mono- and Diamidines. *Antimicrobial Agents and Chemotherapy,* **19**, 649 (1981).

Geratz, JD, Shaver, SR, and Tidwell, RR Inhibitory Effect of Amidino-Substituted Heterocyclic compounds on the Amidase Activity of Plasmin and of High and Low Molecular Weight Urokinase and on Urokinase - Induced Plasminogen Activation, *Thrombosis Research*, **24**, 73 (1981).

Tidwell, RR, Webster, WP, Shaver, SR, and Geratz, JD Strategies for Anticoagulation with Synthetic Protease Inhibitors. Xa Inhibitors Versus Thrombin Inhibitors. *Thrombosis Research*, **19**; 339 (1980).

POSTERS

Shaver SR, Yates CM, Garvey EP, Schotzinger RJ, Hoekstra WJ Creation and Utilization of Homology Models of *Aspergillus Fumigatus*-CYP51 in Drug Discovery. Poster presented at the North American UGM & Conference 2017 Montreal, QC Canada June 21, 2017

Hoekstra WJ, Garvey EP, Shaver SR, Schotzinger RJ, Sparks SM. Rational Design of the Potent and Selective Fungal CYP51 Inhibitor VT-1129. Poster presented at the *251st National ACS Meeting* San Diego, CA March 16, 2016

Boyer JL, Patel RI, Douglass JG, Cowlen M, Crean CS, Whitsell R, Peterson, W, Shaver SR, Watson PS, Krishnamoorthy R, Hechler B, Gachet C, Yerxa BR. Development of reversible P2Y12 receptor antagonists. Powerpoint presentation at the *3rd International Meeting, ADP 2004, P2 Receptors and Other, New Targets for Antithrombotic Drugs.* 2004 September 16-18; Lucca, Tuscany, Italy.

Douglass JG, Bednarski K, Crean CS, Shaver SR. Effects of ribose modified adenosine phosphates in models of acute and inflammatory pain. Poster presented at the *4th International Symposium of Nucleosides and Nucleotides Purines 2004 Meeting.* 2004 June 6-9; Chapel Hill, North Carolina, USA.

Douglass JG, Patel RI, Redick CC, Jones AC, Shaver SR, Boyer JL. Lipophilic adenine nucleotides as reversible inhibitors of P2Y12-mediated platelet aggregation. Poster presented at the *4th International Symposium of Nucleosides and Nucleotides Purines 2004 Meeting.* 2004 June 6-9; Chapel Hill, North Carolina, USA.

Patel RI, Douglass JG, Cowlen M, Crean CS, Whitsell R, Peterson W, Shaver SR, Watson PS, Krishnamoorthy R, Gachet C, Hechler B, Yerxa BR, Boyer JL. *In vivo* antiplatelet activity of a reversible P2Y12 receptor antagonist. Poster presented at the *4th International Symposium of Nucleosides and Nucleotides Purines 2004 Meeting.* 2004 June 6-9; Chapel Hill, North Carolina, USA.

Douglass JG, Patel RI, Redick C, Jones AC, Shaver SR, Boyer JL. Adenine mononucleotides modified with lipophilic acetal and urea moieties as reversible P2Y12 receptor antagonists. Poster presented at the *227th Annual American Chemical Society Meeting.* 2004 March 28-April 1; Anaheim, California, USA.

Jones AC, Patel RI, Douglass J, Redick C, Brubaker K, Shaver SR, Yerxa BR, Boyer JL. Adenosine 5' diphosphate analogues with ribose & base substitutions that confer P2Y12 antagonist properties. Poster presented at *Experimental Biology 2003.* 2003 April 11-15; San Diego, California, USA.

Douglass J, Patel RI, Redick C, Brubaker K, Jones AC, Shaver SR, Yerxa B, Baurand A, Gachet C, Boyer JL. Ribose and Nucleobase Modifications to Nucleotides That Confer Antagonist Properties Against the Platelet P2Y12 Receptor. *The Platelet ADP Receptors - Biochemistry, Physiology, Pharmacology, and Clinical Aspects.* 2002 October 3-5; Sardinia, Italy.

Brown EG, Boyer J, Shaver SR. Detection of INS316, INS365 and other nucleotides in plasma and fluids by LC/MS. *IUPHAR 2002 - XIVth World Congress of Pharmacology.* 2002 July 7-12; San Francisco, California, USA.

Bednarski K, Douglass JG, Redick CC, Jones AC, Patel RI, Shaver SR. Modified nucleoside polyphosphates as platelet aggregation. *IUPHAR 2002 - XIVth World Congress of Pharmacology.* 2002 July 7-12; San Francisco, California, USA.

Boyer JL, Patel RI, Redick C, Brubaker K, Douglass J, Shaver S, Baurand A, Gachet C, Yerxa B. Inhibition of platelet aggregation by novel selective P2Y12 receptor antagonists. *IUPHAR 2002 - XIVth World Congress of Pharmacology.* 2002 July 7-12; San Francisco, California, USA.

Baurand A, Patel RI, Redick K, Douglass J, Shaver S, Yerxa B, Boyer JL, Cazenave JP, Gachet C. Reduced thromboembolism in mice treated with a novel class of P2Y12 receptor antagonists. *IUPHAR 2002 - XIVth World Congress of Pharmacology.* 2002 July 7-12; San Francisco, California, USA.

Patel RI, Douglass J, Redick C, Brubaker K, Jones AC, Shaver SR, Yerxa B, Boyer JL. Identification of a ribose substitution that confers antagonist properties to ADP against the platelet P2Y12 receptor. *IUPHAR 2002 - XIVth World Congress of Pharmacology.* 2002 July 7-12; San Francisco, California, USA.

Matthew S. Cowlen, Carolyn F. Moyer, Lisa Sheridan, Sammy R. Shaver, and Benjamin R. Yerxa Cellular Localization of P2Y2 Receptor Gene Expression in Monkey Vaginal and Cervical Tissue Sections by Non-radioisotopic In Situ Hybridization Presented at New Perspectives in the Management of Female Sexual Dysfunction Boston MA October 26-29, 2000

Siddiqi SM, Shaver SR, Pendergast W, Yerxa BR, Croom DK, Dougherty RW, James MK, Jones AC, and Rideout JL. Molecular modeling of the P2Y2 purinoceptor and synthesis of selected ligands. 6th International Symposium on Adenosine and Adenine Nucleotides. 1998 May 19-24; Ferrara, Italy.

Shaver, SR, Pendergast, W, Siddiqi, SM, Yerxa, BR, Croom, DK, Dougherty, RW, James, MK, Jones, AN, and Rideout, JL 4-Substituted Uridine 5'-Triphosphates as Agonists of the P2Y2 Purinergic Receptor Presented at Twelfth International Roundtable of Nucleosides, Nucleotides, and Their Biological Applications La Jolla, California September 15-19, 1996

Shaver, SR, St. Clair, MH, and Rideout, JL Synthesis of Several 6-Substituted 3'-Azido-2',3'-Dideoxy Purine Nucleosides Presented at Gordon Conference: Purines, Pyrimidines, and Related Compounds Newport, R. I. July 4-9, 1993

Shaver, SR, St. Clair, MH, and Rideout, JL Synthesis of Several 6-Substituted 3'-Azido-2',3'-Dideoxy Purine Nucleosides Presented at Tenth International Roundtable Nucleosides, Nucleotides, and Their Biological Applications Park City, Utah September 16-20, 1992.

PATENTS

Metalloenzyme Inhibitor Compounds
Sparks, Steven; Yates, Christopher M; Shaver, Sammy R.
United States Patent Number 10538511

Metalloenzyme Inhibitor Compounds
Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
United States Patent Number 10464922

Metalloenzyme Inhibitor Compounds
Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
WO 2019016700

Metalloenzyme Inhibitor Compounds
Sparks, Steven; Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
WO 2019008861

Metalloenzyme Inhibitor Compounds
Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
United States Patent Number 10085984

Metalloenzyme Inhibitor Compounds
Sparks, Steven; Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
WO 2018125800

Metalloenzyme Inhibitor Compounds
Sparks, Steven; Yates, Christopher M; Shaver, Sammy R.
WO 2018125799

Metalloenzyme Inhibitor Compounds
Yates, Christopher M; Shaver, Sammy R.; Hoekstra, William J.
WO 2017117393

P2Y6 Receptor Agonists for Treating Lung Diseases
Boyer, Jose L.; Shaver, Sammy R.; Douglass III, James G.; Redick, Catherine C.
United States Patent Number 8158776

Method for Treating Ophthalmic Diseases Using Kinase Inhibitor Compounds in ProDrug Forms
Lampe, John W.; Shaver, Sammy R.; Watson, Paul S.
WO2012015760

Methods for Treating Inflammatory Conditions
Douglass III, James G.; Shaver, Sammy R; Navratil, Tomas; Boyer, Jose L.; Samuelson, Carl A.; deCamp, Jonathan B.
WO2010/080540

Non-Nucleotide Composition and Method for Inhibiting Platelet Aggregation
Plourde, Jr., Robert; Shaver, Sammy R.; Douglass, III, James G.; Watson, Paul S.; Boyer, José L.; Tu, Chi; Abreo, Melwyn A.; Alfaro-Lopez, Lorenzo J.; Feng, Yangbo; Harvey, Daniel F.; Khasonova, Tatyana V.
United States Patent Number 7943760

Pyrimidine-Based Non-Nucleotide Composition and Method for Inhibiting Platelet Aggregation
Douglass III, James G.; Watson, Paul S.; Shaver, Sammy R.; Bednarski, Krzysztof
United States Patent Number 7932376

P2Y6 Receptor Agonists for Treating Lung Diseases
Boyer, Jose L.; Shaver, Sammy R.; Douglass III, James G.; Redick, Catherine C.
United States Patent Number 7851456

Drug-Eluting Stents Coated with Non-Nucleotide P2Y12 Receptor Antagonist Compound
Boyer, Jose L.; Douglass III, James G.; Shaver, Sammy R.
United States Patent Number 7749981

Non-Nucleotide Compositions and Method for Treating Pain
Plourde JR., Robert; Shaver, Sammy R.; Abreo, Melwyn Anthony; Alfaro-Lopez, Lorenzo Josue; Feng, Yangho; Khasanova, Tatyana V.; Holladay, Mark W.; Crean, Christopher S.
United States Patent Number 7749980

Methods for Treating Inflammatory Conditions
Douglass III, James G.; Shaver, Sammy R; Navratil, Tomas; Boyer, Jose L.; Samuelson, Carl A.; deCamp, Jonathan B.
Pub. No. US2010/0160250-A1

Drug-Eluting Stents Coated with P2Y12 Receptor Antagonist Compound
Boyer, Jose L.; Douglass III, James G.; Shaver, Sammy R.
United States Patent Number 7618949

Degradation-Resistant Mononucleoside Phosphate Compounds
Douglass, III, James G.; Yerxa, Benjamin R.; Shaver, Sammy Ray; Peterson, Ward M.; Brown, Edward G.; Crean, Christopher S.; Boyer, Jose L.
United States Patent Number 7612047

Non-Nucleotide Composition and Method for Inhibiting Platelet Aggregation
Plourde, Jr., Robert; Shaver, Sammy R.; Douglass, III, James G.; Watson, Paul S.; Boyer, José L.; Tu, Chi; Abreo, Melwyn A.; Alfaro-Lopez, Lorenzo J.; Feng, Yangbo; Harvey, Daniel F.; Khasonova, Tatyana V.
United States Patent Number 7592445

Drug-Eluting Stents Coated with P2Y12 Receptor Antagonist Compound
Boyer, José L.; Douglass, III, James G.; Shaver, Sammy R.
United States Patent Number 7452870

Degradation-Resistant Mononucleoside Phosphate Compounds
Douglass, III, James G.; Yerxa, Benjamin R.; Shaver, Sammy Ray; Peterson, Ward M.; Brown, Edward G.; Crean, Christopher S.; Boyer, Jose L.

United States Patent Number 7435724

Method of Promoting Cervical and Vaginal Secretions
Pendergast, William; Shaver, Sammy Ray; Drutz, David J.; Rideout, Janet L.; Yerxa, Benjamin R.
United States Patent Number 7432252

Non-Nucleotide Composition and Method for Inhibiting Platelet Aggregation
Plourde, Jr., Robert; Shaver, Sammy R.; Boyer, José L.; Abreo, Melwyn A.; Alfaro-Lopez, Lorenzo J.; Feng, Yangbo; Harvey, Daniel F.; Khasonova, Tatyana V.; Tu, Chi
United States Patent Number 7368438

Non-Nucleotide Composition and Method for Inhibiting Platelet Aggregation
Plourde, Jr., Robert; Shaver, Sammy R.; Douglass, III, James G.; Watson, Paul S.; Boyer, José L.; Tu, Chi; Abreo, Melwyn A.; Alfaro-Lopez, Lorenzo J.; Feng, Yangbo; Harvey, Daniel F.; Khasonova, Tatyana V.
United States Patent Number 7335648

Composition and Method for Inhibiting Platelet Aggregation
Boyer, José L.; Douglass, III, James G.; Shaver, Sammy R.; Bednarski, Krzysztof; Yerxa, Benjamin R.; Olins, Gillian M.;
United States Patent Number 7132408

Compositions For Treating Epithelial And Retinal Tissue Diseases
Yerxa, Benjamin R.; Douglass, III, James G.;Shaver, Sammy Ray; Peterson, Ward M.; Brown, Edward G.; Crean, Christopher S.
United States Patent Number 7115585

Dinucleoside Polyphosphate Compositions and Their Therapeutic Uses
Rideout, Janet; Yerxa, Benjamin R.; Shaver, Sammy Ray; Douglass III, James G.
United States Patent Number 6867199

Method of Treating Gastrointestinal Tract Disease with Purinergic Receptor Agonists
Yerxa, Benjamin R; Rideout, Janet L; Pendergst, William; Shaver, Sammy Ray; Zhang, Zhen; Peterson, Ward M; Cowlen, Matthew
United States Patent Number 6624150

Dinucleoside Polyphosphate Compositions and Their Therapeutic Use As Purinergic Receptor Agonists
Rideout, Janet; Yerxa, Benjamin R.; Shaver, Sammy Ray; Douglass III, James G.
United States Patent Number 6555675

Method of Promoting Cervical and Vaginal Secretions
Pendergast, William; Shaver, Sammy R.; Drutz, David J.; Rideout, Janet L.; Yerxa, Benjamin R.
United States Patent Number 6462028

Method of treating lung diseases with uridine 5'-diphosphate and analogs thereof
Boucher, Jr., Richard C. ; Shaver, Sammy Ray; Pendergast, William; Yerxa, Benjamin; Rideout, Janet L.; Dougherty, Robert ; Croom, Dallas
United States Patent Number 6451288

Uridine 5'-diphosphate and analogs useful for treating lung diseases
Boucher, Jr., Richard C.; Shaver, Sammy Ray; Pendergast, William; Yerxa, Benjamin; Rideout, Janet L.; Dougherty, Robert ; Croom, Dallas
United States Patent Number 6143279

Method of treating lung diseases with uridine 5'-diphosphate and analogs thereof
Boucher, Jr., Richard C. ; Shaver, Sammy Ray; Pendergast, William; Yerxa, Benjamin; Rideout, Janet L.; Dougherty, Robert ; Croom, Dallas
United States Patent Number 6022527

Use of Uridine 5'-Diphosphate and Analogs Thereof for the Treatment of Lung Diseases
Boucher, Jr., Richard, C. ; Shaver, Sammy, Ray , Pendergast, William, Yerxa, Benjamin, Rideout, Janet, L., Dougherty, Robert , Croom, Dallas
WO9909998A1

Therapeutic Nucleosides: Anti-HIV Pyrimidine Nucleosides.
Shaver, S.R., Freeman, G.A., Rideout, J.L.
United States Patent Number 5064946.

Nucleosides and Use Thereof: Deoxy AZT and Esters.
Shaver, S.R., Freeman, G.A., Rideout, J.L.
United States Patent Number 5041543.

Therapeutic Nucleosides: Antiviral/Antibacterial 3'-Azido Purine/Pyrimidine Nucleosides.
Rideout, J.L., Furman, P.A., DeMiranda, P.M.S., Clemons, R.H., Barry, D.W., Freeman, G.A., Shaver, S.R., Lehrman, S.N., Zimmerman, T.P., Kirk III, L.E., St. Clair, M.H., Wolberg, G., King, D.H.
European Patent EP-217580.