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Director, School of Molecular and Cellular Biology
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EDUCATION:

B.S. Drexel University, Philadelphia, Pennsylvania, June 1970

M.S. University of Illinois, Urbana, Illinois, August 1971

Ph.D. University of Illinois, Urbana, Illinois, June 1975

ACADEMIC APPOINTMENTS:

2007-Present Director, School of Molecular and Cellular Biology, University of Illinois, Urbana, IL

2006 Founder, NanoBioCon, LLC, Urbana, IL

2003 Founder, Nanodisc, Inc., Urbana, IL

1997-1999 Scientific Board, Frontier Research Program, RIKEN, Wako, Saitama, Japan

1995-Present Professor, College of Medicine, University of Illinois, Urbana, IL

1994-1997 Director, School of Chemical Sciences, University of Illinois, Urbana, IL

1986-Present Professor, Departments of Biochemistry, Chemistry, Center for Biophysics and Computational Biology, and the Beckman Institute, University of Illinois, Urbana, IL

1982-1986 Associate Professor, Department of Biochemistry, University of Illinois, Urbana, IL

1977-1982 Assistant Professor, Department of Molecular Biophysics and Biochemistry, Yale University, New Haven, CT

1975-1977 Research Associate, Department of Biochemistry, University of Illinois, Urbana, IL

1971-1975 Research Assistant, Departments of Biochemistry and Physics, University of Illinois, Urbana, IL

1971-1973 Guest Associate, Division of Biological and Medical Research, Argonne National Laboratory

1970-1971 Instructor, Department of Physics, University of Illinois, Urbana, IL

1965-1970 Physicist, Naval Air Propulsion Test Center, Philadelphia, PA

AWARDS AND HONORS:

Fellow, Academic Leadership, Committee on Institutional Cooperation, 2008-2009

Fellow, The Biophysical Society, 2007 -

I. C. Gunsalus Endowed Professorship, 2005 -

University Scholar, University of Illinois 1995-

Protein Society Annual Eli Lilly Award, 2003

Pell Lecturer, Rockefeller University, 2002

Fellow, Jerome Karle Nobel Laureate World Innovation Foundation, 2002

NIH Merit Award, 1999-2009

Outstanding Ph.D.-M.D. Mentor Award, Medical Scholars Program, University of Illinois, 2000

Japan Society for the Promotion of Science Senior Fellowship, 1999

Bert L. and N. Kuggie Vallee Visiting Professor, Harvard Medical School, 1999

Bert L. and N. Kuggie Vallee Visiting Professor, Oxford University, 1998-99

Janet and William Lycan Endowed Professorship, 1994-2005

Fellow, American Association for the Advancement of Science, 1993

Fulbright Research Scholar, Institute de Biologie Physico-Chimique, Paris,
and Yale University, New Haven, 1989-1990

National Institutes of Health Research Career Development Award, 1980-1985

PUBLICATIONS**I. REVIEWED PAPERS**

- 294 Shih, A.Y. Sligar, S. G., and Schulten, K. (2009) "Maturation of High-Density Lipoproteins." *J. Royal Society Interface*, in press.
- 293 Fruh, V., Grinkova, Y., Sligar, S. G., and Siegal, G. (2009) "Self Assembly of Protein - Nanodisc Complexes: A Solubilization Strategy Which Enables Fragment Based Drug Discover of Membrane Proteins in Aqueous Buffers." *JACS*
- 292 Das, A., Zhao, J., Schatz, G. C., Sligar, S. G., and Van Duyne, R. P. (2009) "Screening of Type I and II Drug Binding to Human Cytochrome P450-3A4 in Nanodiscs by Localized Surface Plasmon Resonance Spectroscopy." *Anal. Chem.* 81, 3754-3759. PMID: 19364136
- 291 McLean, M. A., Rajfur, S., Chen, Z., Humphrey, D., Yang, B., Sligar, S.G., and Jacobson, K. (2009) "Mechanism of Chromophore Assisted Laser Inactivation Employing Fluorescent Proteins." *Anal. Chem.* 81, 1755-1761. PMID: 19199572
- 290 Li, H., Das, A., Sibhatu, H., Jamal, J., Sligar, S.G., and Poulos, T.L. (2008) "Exploring the Electron Transfer Properties of Neuronal Nitric Oxide Synthase by Reversal of the FMN Redox Potential." *J. Biol. Chem.* 283, 34762-34772. PMID: 18852262
- 289 Shih, A.Y., Freddolino, P.L., Arkhipov, A., Sligar, S.G., and Schulten, K. (2008) "Molecular Modeling of the Structural Properties and Formation of High-Density Lipoprotein Particles." *Current Topics in Membranes* 60, 313-342.
- 288 Goluch, E.D., Shaw, A. W., Sligar, S.G., and Liu, C. (2008) "Microfluidic Patterning of Nanodisc Lipid Bilayers and Multiplexed Analysis of Protein Interaction." *Lab Chip* 8, 1723-1728. PMID: 18813396
- 287 Zhao, J., Das, A., Schatz, G.C., Sligar, S.G., and VanDuyne, R. P. (2008) "Resonance Localized Surface Plasmon Spectroscopy: Sensing Substrate and Inhibitor Binding to Cytochrome P450." *J. Phys. Chem.* 112, 13084-13088. PMID: 16925400
- 286 Borch, J., Torta, F., Sligar, S. G., and Roepstorff, P. (2008) "Nanodiscs for Immobilization of Lipid Bilayers and Membrane Receptors: Kinetic Analysis of Cholera Toxin Binding to a Glycolipid Receptor." *Analytical Chemistry*, 80, 6245-6252. PMID: 18616345
- 285 Denisov, I. G., Mak, P. J., Makris, T. M., Sligar, S. G., and Kincaid, J. R. (2008) "Resonance Raman Characterization of the Peroxo and Hydroperoxo Intermediates in Cytochrome P450." *Journal of Physical Chemistry A*, 112, 13172-13179. PMID: 18630867
- 284 Kuhnel, K., Ke, N., Cryle, M. J., Sligar, S. G., Schuler, M. A., and Schlichting, I (2008) "Crystal Structures of Substrate-Free and Retinoic Acid-Bound Cyanobacterial Cytochrome P450 CYP120A1." *Biochemistry*, 47 6552-6559. PMID: 18512957
- 283 Grinkova, Y.V., Denisov, I. G., Waterman, M. R., Arase, M., Kagawa, N., and Sligar, S. G. (2008) "The Ferrous-Oxy Complex of Human Aromatase." *Biochem Biophys Res Comm*, 372, 379-382. PMID: 18482580
- 282 Morrissey, J. H., Pureza, V., Davis-Harrison, R. L., Sligar, S. G., Ohkubo, Y. Z. and Tajkhorshid, E. (2008) "Blood Clotting Reactions on Nanoscale Phospholipid Bilayers" *Thrombosis Research*, 122 (Supplement 1), S23-S26.
- 281 Gruia, F., Ionascu, D., Kubo, M., Ye, X., Dawson, J., Osborne, R.L., Sligar, S.G., Denisov, I., Das, A., Poulos, T.L., Ternier, J., and Champion, P.M. (2008) "Low Frequency Dynamics of *Caldariomyces Fumago* Chloroperoxidase Probed by Femtosecond Coherence Spectroscopy." *Biochemistry* 47, 5156-5167. PMID: 18407660
- 280 Shih, A.Y., Sligar, S.G., and Schulten, K. (2008) "Molecular Models Need to be Tested: The Case of the Solar Flares Discoidal HDL Model." *Biophysical Journal*, 94, L87-L89. PMID: 18375520

- 279 Newcomb, M., Halgrimson, J.A., Horner, J.H., Wasinger, E.C., Chen, L.X., and Sligar, S.G. (2008) "X-Ray Absorption Spectroscopic Characterization of a Cytochrome P450 Compound II Derivative." *Proceedings of the National Academy of Sciences*, 24, 8179-8184. PMID: 18174331
- 278 Hall, B., McLean, M. A., Davis, K., Casanova, J. E., Sligar, S. G., and Schwartz, M. A. (2008) "A Fluorescence Resonance Energy Transfer Activation Sensor for Arf6." *Analytical Biochemistry*, 374, 243-249. PMID: 18162163
- 277 Makris, T.M., vonKoenig, J., Schlichting, I., Sligar, S.G. (2007) "Alteration of P450 Distal Pocket Solvent Leads to Impaired Proton Delivery and Changes in Heme Geometry." *Biochemistry*, 46, 14129-14140. PMID: 18001135
- 276 Davydov, D.R., Baas, B.J., Sligar, S.G., Hapler, J.R. (2007) "Allosteric Mechanisms in Cytochrome P450 3A4 Studied by High-Pressure Spectroscopy: Pivotal Role of Substrate-Induced Changes in the Accessibility and Degree of Hydration of the Heme Pocket." *Biochemistry*, 46, 7852-7864. PMID: 17555301
- 275 Marin, V. L., Bayburt, T. H., Sligar, S. G., and Mrksich, M. (2007) "Functional Assays of Membrane-Bound Proteins with SAMDI-TOF Mass Spectrometry." *Angew. Chem, Int. Ed* 46, 8796-8798. PMID: 17943935
- 274 Kijac, A.Z., Li, Y., Sligar, S.G., and Rienstra, C.M. (2007) "Magic-Angle Spinning Solid-State NMR Spectroscopy of Nanodisc-Embedded Human CYP3A4." *Biochemistry* 46, 13696-13703. PMID: 17985934
- 273 Das, A., Grinkova, Y.V., and Sligar, S.G. (2007) "Redox Potential Control by Drug Binding to Cytochrome P450 3A4." *J. American Chemical Society* 129, 13778-13779. PMID: 17948999
- 272 Denisov, I.G., Dawson, J.H., Hager, L.P., and Sligar, S.G. (2007) "The Ferric-Hydroperoxo Complex of Chloroperoxidase." *Archives Biochemistry and Biophysics* 363, 954-958. PMID: 17920039
- 271 Shih, A.Y., Arkhipov, A., Freddolino, P.L., Sligar, S.G. and Schulten, K. (2007) "Assembly of Lipids and Proteins into Lipoprotein Particles." *J Phys Chem B*, 111, 11095-11104. PMID: 17696388
- 270 Sligar, S. G., and Denisov. I. G. (2007) "Understanding Cooperativity in Human P450 Mediated Drug-Drug Interactions." *Drug Metabolism Reviews*, 39, 567-579. PMID: 17786639
- 269 Denisov, I.G., Grinkova, Y.V., McLean, M.A., and Sligar, S. G. (2007) "The One Electron Autoxidation of Human Cytochrome P4503A4." *J. Biological Chemistry*, 282, 26865-26873. PMID: 17650504
- 268 Kimmich, N., Das, A., Sevrioukova, I., Meharena, Y., Sligar, S. G., and Poulos, T. L. (2007) "Electron Transfer Between Cytochrome P450CIN and It's FMN-Containing Redox Partner, Cindoxin." *J. Biological Chemistry*, 282, 27006-27011. PMID 17606612
- 267 Nath, A., Grinkova, Y.V., Sligar, S. G., and Atkins, W. M. (2007) "Ligand Binding to Cytochrome P450 3A4 in Phospholipid Bilayer Nanodiscs: The Effect of Model Membranes." *J Biological Chemistry*, 282, 28309-28320. PMID: 17573349
- 266 Mak, P.J., Denisov, I.G., Victoria, D., Makris, T.M., Deng, T., Sligar, S.G., and Kincaid, J.R. (2007) "Resonance Raman Detection of the Hydroperoxo Intermediate in the Cytochrome P450 Enzymatic Cycle." *J. American Chemical Society* 129, 6382-6383. PMID: 17461587
- 265 Zhao, Q., Sigalov, G., Dimitrov, V., Dorvel, B., Mirsaidov, U., Sligar, S., Aksimentiev, A. and Timp, G. (2007) "Detecting SNPs Using a Synthetic Nanopore" *NanoLetters*, 7, 1680-1685. PMID: 17500578
- 264 Shih, A. Y., Freddolino, P. L., Sligar, S. G. and Schulten, K. (2007) "Disassembly of Nanodiscs with Chololate." *NanoLetters*, 7, 1692-1696. PMID: 17503871
- 263 Bayburt, T.H., Leitz, A.J., Xie, G., Oprian, D.D., and Sligar, S.G. (2007) "Transducin Activation by Nanoscale Lipid Bilayers Containing One and Two Rhodopsins." *J. Biol. Chem*, 282, 14875-14881. PMID: 17395586
- 262 Chougnet, A., Grinkova, Y., Ricard, D., Sligar, S., and Woggon, W-D (2007) "Fluorescent Probes for Raid Screening of Potential Drug-Drug Interactions at the CYP3A4 Level." *ChemMedChem*, 2, 717-724. PMID: 17357170

- 261 Alami, M., Dalal, K., Lelj-Garolla, B., Sligar, S. G., and Duong, F. (2007) "Nanodiscs Unravel the Interaction Between the SecYEG Channel and its Cytosolic Partner SecA." *The EMBO Journal*, 26, 1995-2004. PMID: 17396152
- 260 Nath, A., Atkins, W. M., and Sligar, S. G. (2007) "Applications of Phospholipid Bilayer Nanodiscs in the Study of Membranes and Membrane Proteins." *Biochemistry* 46, 2059-2069. PMID: 17263563
- 259 Denisov, I.G., Baas, B.J., Grinkova, Y.V., and Sligar, S. G. (2007) "Cooperativity in P450 CYP3A4: Linkages in Substrate Binding, Spin State, Uncoupling and Product Formation." *J. Biological Chemistry* 282, 7066-7076. PMID: 17213193
- 258 Denisov, I.G., Victoria, D.C., Sligar, S.G. (2007) "Cryoradiolytic Reduction of Heme Proteins: Maximizing Dose-Dependent Yield." *Radiation Physics and Chemistry* 76, 714-721. PMID: 18379640
- 257 Shaw, A.W., Pureza, V.S., Sligar, S.G., and Morrissey, J.H. (2007) "The Local Phospholipid Environment Modulates the Activation of Blood Clotting." *J. Biological Chemistry*, 282, 6556-6563. PMID: 17200119
- 256 Li, Y., Kijac, A. Z., Sligar, S. G., and Rienstra, C. M. (2006) "Structural Analysis of Nanoscale Self-Assembled Discoidal Lipid Bilayers by Solid-State NMR Spectroscopy." *Biophys. J.* 91, 3819-3828. PMID: 16905610
- 255 Zhao, J., Das, A., Zhang, X., Schatz, G. C., Sligar, S. G., and Van Duyne, R. P. (2006) "Resonance Surface Plasmon Spectroscopy: Low molecular Weight Substrate Binding to Cytochrome P450." *J. A. Chem. Soc.* 128, 11004-11005. PMID: 16925400
- 254 Boldog, T., Grimme, S., Li, M., Sligar, S. G., and Hazelbauer, G. L. (2006) "Nanodiscs Separate Chemoreceptor Oligomeric States and Reveal Their Signaling Properties." *Proceedings of the National Academy of Sciences* 103, 11509-11514. PMID: 16864771
- 253 Newcomb, M., Zhang, R., Chandrasena, R.E.P., Halgrimson, J. A., Horner, J. H., Makris, T. M., and Sligar, S. G. (2006) "Cytochrome P450 Compound I." *J. American Chemical Society* 128, 4580-4581. PMID: 16594688
- 252 Bayburt, T. H., Grinkova, Y. V., and Sligar, S. G., (2006) "Assembly of Single Bacteriorhodopsin Trimers in Bilayer Nanodiscs." *Archives Biochemistry and Biophysics* 450, 215-222. PMID: 16620766
- 251 Denisov, I. G., Grinkova, Y.V., Baas, B.J., and Sligar, S.G. (2006) "The Ferrous-Dioxygen Intermediate in Human Cytochrome P450 3A4: Substrate Dependence of Formation and Decay Kinetics." *J. Biol. Chem*, 281, 23313-23318. PMID: 16762915
- 250 Leitz, A. J., Bayburt, T. H., Barnakov, A. N., Springer, B. A., and Sligar, S. G. (2006) "Functional Reconstitution of β 2-Adrenergic Receptors Utilizing Self-Assembling Nanodisc Technology." *BioTechniques* 40, 601-610. PMID: 16708760
- 249 Makris, T. M., von Koenig, K., Schlichting, I. and Sligar, S. G. (2006) "The Status of High-Valent Metal Oxo Complexes in the P450 Cytochromes." *J. Inorganic Biochemistry*, 100, 507-518. PMID: 16510191
- 248 Heng, J. B., Aksimentiev, A., Ho, C., Grinkova, Y. V., Sligar, S. G., Schulten, K., and Timp, G. (2006) "The Electromechanics of DNA in a Synthetic Nanopore." *Bipophysical Journal*, 90, 1098-1106. PMID: 16284270
- 247 Heng, J. B., Aksimentiev, A., Ho, C., Marks, P., Grinkova, Y. V., Sligar, S. G. and Schulten, K. (2005) "Stretching DNA Using the Electric Field in a Synthetic Nanopore." *NanoLetters*, 5, 1883-1888. PMID: 16218703
- 246 Davydov, Dmitri, Fernando, Harshica, Baas, Bradley J., Sligar, Stephen G., and Halpert, James R. (2005) "Kinetics of Dithionite-Dependent Reduction of Cytochrome P450 3A4: Heterogeneity of the Enzyme Caused by its Oligomerization." *Biochemistry*, 44, 13902-13913. PMID: 16229479
- 245 Sligar, Stephen G., Makris, Thomas M., and Denisov, Ilia G. (2005) "Thirty Years of Microbial P450 Monooxygenase Research: Peroxo-Heme Intermediates--The Central Bus Station in Heme Oxygenase Catalysis." *Biochem. Biophys. Res. Comm.* 338, 346-354. PMID: 16139790
- 244 Denisov, I. G., Makris, Thomas M., Sligar, Stephen G., and Schlichting, Ilme (2005) "Structure and Chemistry of Cytochrome P450." *Chem. Rev.* 105, 2253-2277. PMID: 15941214

- 243 Denisov, I. G., McLean, M. A., Shaw, A. W., Grinkova, Y. V., and Sligar, S. G. (2005) "Thermotropic Phase Transition in Soluble Nanoscale Lipid Bilayers." *J. Phys. Chem*, 109, 15580-15588. PMID: 16852976
- 242 Ke, N., Baudry, J., Makris, T. M., Schuler, M. A., and Sligar, S. G. (2005) "A Retinoic Acid Binding Cytochrome P450: CYP120A1 from *Synechocystis* sp PCC 6803." *Archives Biochemistry and Biophysics*, 436, 110-120. PMID: 15752715
- 241 Sono, M., Perera, R., Jin, S., Makris, T. M., Sligar, S. G., Bryson, T. A., and Dawson, J. H. (2005) "The Influence of Substrate on the Spectral Properties of Oxyferrous Wild-Type and T252A Cytochrome P450-CAM." *Archives Biochemistry and Biophysics*, 436, 40-49. PMID: 15752707
- 240 Shih, A. Y., Denisov, I. G., Phillips, J. C., Sligar, S. G., Schulten, K. (2005) "Molecular Dynamics Simulations of Discoidal Bilayers Assembled from Truncated Human Lipoproteins." *Biophysical Journal*, 88, 548-556. PMID: 15533924
- 239 Schunemann, V., Lenzian, F., Jung, C., Contzen, J., Barra, A. L., Sligar, S. G., Trautwein, A. X. (2004) "Tyrosine Radical Formation in the Reaction of Wild Type and Mutant Cytochrome 450cam with Peroxy Acids: A Multifrequency EPR Study of Intermediates on the Millisecond Time Scale." *J. Biol. Chem*, 279, 10919-10930. PMID: 14688245
- 238 Heng, J.B., Ho, C., Kim, T., Timp, R., Aksimentiev, A., Grinkova, Y.V., Sligar, S.G., Schulten, K., and Timp, G. (2004) "Sizing DNA Using a Nanometer-Diameter Pore." *Biophysical Journal*, 87, 2905-2911.
- 237 Baas, B. J., Denisov, I. G., and Sligar, S. G. (2004) "Homotropic Cooperativity of Monomeric Cytochrome P450 3A4 in a Nanoscale Native Bilayer Environment." *Archives Biochemistry and Biophysics*, 430, 218-228. PMID: 15369821
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- 235 Denisov, I.G., Grinkova, Y.V., Lazarides, A.A., and Sligar, S.G. (2004) "Directed Self-Assembly of Monodisperse Phospholipid Bilayer Nanodiscs With Controlled Size." *J. American Chemical Society* 126, 3477-3487. PMID: 15025475
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- 232 Ibrahim, M., Denisov, I. G., Makris, T. M., Kincaid, J. R., and Sligar, S. G. (2003) "Resonance Raman Spectroscopic Studies of Hydroperoxo-Myoglobin at Cryogenic Temperatures." *J. Am. Chem. Soc.* 125, 13714-13718. PMID: 14599210
- 231 Bayburt, T. H., and Sligar, S. G. (2003) "Self- Assembly of Single Integral Membrane Proteins into Soluble Nanoscale Phospholipid Bilayers." *Protein Science* 12, 2476-2481. PMID: 14573860
- 230 Huisman, G., and Sligar, S. G. (2003) "Evolution of Protein Technologies from Voodoo to Science," Editorial Overview, *Current Opinion in Biotechnology*, 14, 357-359. PMID: 12943842
- 229 Civjan, N. R., Bayburt, T. H., Schuler, M. A., and Sligar, S. G. (2003) "Direct Solubilization of Heterologously Expressed Membrane Proteins by Incorporation into Nanoscale Lipid Bilayers." *BioTechniques*, 35, 556-563. PMID: 14513561
- 228 Makris, T. M., Denisov, I. G., and Sligar, S. G. (2003) "Haem-Oxygen Reactive Intermediates: Catalysis by the Two-Step." *Biochemical Society Transactions*, 31, 516-519. PMID: 12773147
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- 226 Dmochowski, I. J., Dunn, A. R., Wilker, J. J., Crane, B. R., Green, M. T., Dawson, J. H., Sligar, S. G., Winkler, J. R., and Gray, H. B. (2002) "Sensitizer-Linked Substrates and Ligands: Ruthenium Probes of Cytochrome P450 Structure and Mechanism, " *Methods in Enzymology*, 120-133. PMID: 12424904

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- 224 Denisov, I. G., Makris, T. M., and Sligar, S. G. (2002) "Formation and Decay of Hydroperoxo-Ferric Heme Complex in Horseradish Peroxidase Studied by Cryoradiolysis." *J. Biol. Chem.* 277, 42706-42710. PMID: 12215454
- 223 Makris, T. M., Davydov, R., Denisov, I. G., Hoffman, B. M., and Sligar, S. G. (2002) "Mechanistic Enzymology of Oxygen Activation by the Cytochromes P450." *Drug Metabolism Reviews*, 34, 691-708. PMID: 12487147
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- 220 Bayburt, T. H., Grinkova, Y. V., and Sligar, S. G. (2002) "Self-Assembly of Discoidal Phospholipid Bilayer Nanoparticles with Membrane Scaffold Proteins." *NanoLetters* 2, 853-856.
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- 215 Unno, M., Christian, J. F., Sjodin, T., Benson, D. E., Macdonald, I. D. G., Sligar, S. G., and Champion, P. M. (2002) "Complex Formation of Cytochrome P450cam with Putidaredoxin, Evidence for Protein-Specific Interactions Involving the Proximal Thiolate Ligand." *J. Biol. Chem.*, 277, 2547-2553. PMID: 11706033
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- 213 Rosca, F., Kuman, A.T.N., Ionascu, D., Ye, X., Demidov, A. A., Sjodin, T., Wharton, D., Barrick, D., Sligar, S. G., Yonetani, T., and Champion, P. M. (2002) "Investigations of Anharmonic Low Frequency Oscillations in Heme Proteins." *J. Phys. Chem.* 106, 3540-3552.
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- 211 Ivanov, Y. D., Kanaeva, I. P., Karuzina, I. I., Usanov, S. A., Hui Bon Hoa, G., Sligar, S. G., and Archakov. A. I., (2001) "Revelation of Ternary Complexes between Redox Partners in Cytochrome P450-Containing Monooxygenase Systems by the Optical Biosensor Method." *J. Inorganic Biochemistry*, 87, 175-184.
- 210 Sjodin, T., Christian, J. F., Davydov, R., Unno, M., Macdonald, I.D.G., Sligar, S. G., Hoffman, B. M., and Champion, P. M. (2001) "Resonance Raman and EPR Investigations of D251N Oxycytochrome P450cam/Putidaredoxin Complex." *Biochemistry*, 40, 6852-6859. PMID: 11389599

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