

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed on Form Page 2.
Photocopy this page or follow this format for each person.

NAME Robert H. Broyles	POSITION TITLE		
eRA COMMONS USER NAME Broylesr	Professor of Biochemistry & Molecular Biology		
EDUCATION/TRAINING (begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Wake Forest College, Winston-Salem, NC	B.Sc.	1965	Chemistry (Physics, Math)
Wake Forest University Medical Center, Winston-Salem, NC	Ph.D.	1970	Biochemistry (Developmental Biology), with C.F. Strittmatter
Florida State University, Tallahassee, FL	Post-Doc	1970-1972	Biochemistry (Metamorphosis, Iron Metabolism), with Earl Frieden

A. Positions and Honors. List in chronological order previous positions, concluding with you present position. List any honors. Include present membership on any Federal Government public advisory committee.

POSITIONS

1969(Summer) Embryology Course, Marine Biological Laboratory, Woods Hole, MA (with Dr. Malcom Steinberg)
 1970-1972 Research Associate, Depart. of Chemistry, Florida State University, Tallahassee, FA (w Dr. Earl Frieden)
 1973(Summer) NSF Workshop on Molecular Techniques for Developmental Biologists, UCSD, La Jolla, California
 1972-1977 Assist. Professor, Department of Zoology, University of Wisconsin, Milwaukee (**Tenure, 1977**)
 1975-1977 Member, Center for Great Lakes Studies, University of Wisconsin Milwaukee
 1975-1976 Chair, Joint Ph.D. Program Committee, UW-Milwaukee/Med. Coll. of Wisconsin
 1976-1977 Assoc. Director, Biological Sciences Ph.D. Program Steering Committee, UWM
 1977-1985 Associate Professor, Department of Biochemistry and Molecular Biology, University of Oklahoma Health Sciences Center (OUHSC), Oklahoma City, Oklahoma (**Tenure, 1979**)
 1977-present Associate Professor of Dental Biochemistry, College of Dentistry, OUHSC
 1983 Lecturer, Embryology Course, Marine Biological Laboratory, Woods Hole, Massachusetts
 1985-present Professor, Department of Biochemistry and Molecular Biology, OUHSC
 1988-present Adjunct Professor, Department of Pediatrics, College of Medicine, OUHSC
 1989-1991 Assistant Program Director/Senior Scientist, National Institutes of Health, NIDDK, Division of Kidney, Urologic and Hematologic Diseases, and Laboratory of Chemical Biology (LCB)
 1991-1997 Guest Scientist, LCB, NIDDK, NIH, Bethesda, Maryland
 1991-1999 Associate Director, MD/PhD Program, University of Oklahoma College of Medicine, OUHSC
 1993-1999 Director, **Advances in Human Molecular Genetics** Course/Distinguished Lecture Series, OUHSC
 1999-2000 Visiting Scientist, Oklahoma Medical Research Foundation (OMRF), Free Radical Biol.& Aging Res.Pgm.
 2001-2008 Research Member, OMRF, Free Radical Biology and Aging Research Program, Oklahoma City, OK
 2006-present President, **The Sickle Cell Cure Foundation, Inc. (SCCF)**, Oklahoma City, OK.

SOCIETY MEMBERSHIPS (*elected to membership): American Association for the Advancement of Science, American Association for Cancer Research*, American Chemical Society, American Society for Cell Biology, American Society of Biochemistry & Molecular Biology*, American Society for Gene Therapy* (founding member), American Society of Hematology*, American Society for Microbiology*, American Society of Zoologists, East Coast Iron Club, International Society for Differentiation, International Biolron Society, International Society for Stem Cell Research, New York Academy of Sciences, Society for Developmental Biology*, Society for Experimental Biology and Medicine, Society for Free Radical Biology and Medicine, Society of Sigma Xi*

SCHOLARSHIP AND HONORS: Honorary Scholarship, Wake Forest College, 1961-1963; Honorary Fraternities (Chem. & Math.), 1963-1965; NDEA Title IV Fellowship, 1965-1968; Wilder Fellowship, 1968-1970; NIH Fellow(NRSA, NHLBI), 1970-1972. Nominee, Aesculapian Award (for teaching), College of Medicine, Univ. of Oklahoma Health Sciences Center, 1979; Distinguished Service Award, Dept. of Bioc. & Mol. Biol., Univ. of Oklahoma Health Sciences Center, 1982; MASUA (Mid-America State Universities Association) Honor Lecturer, 1988-89; **Honorary Biographical Listings:** American Men & Women of Science, 19th Edition; Intrntl. Directory of Distinguished Leadership, 6th Ed.(nominated); Men of Achievement, 17th Edition (nominated); Who's Who in the South & Southwest, 24th Edition; Who's Who in American Education, 5th Edition; Who's Who in Science & Engineering, 2nd Edition; Who's Who in America, 64th Edition; Who's Who in the World, 13th Ed.

Grant Support: NIH R01-grants, contracts, fellowships, 1970-72, 1976-1989; 1989-1990; 2001-2008; U.S. Sea Grant Program/NOA, 1975-76, 1976-77, Research Corporation, 1973-1975; American Heart Association, 2001-2003; Presbyterian Health Foundation, 1986-88, 1988-89, 1991-92; 1997-99.

Study Section Service/Grant Reviews: AHA/OK Affiliate, Scientific Merit Rev. Comm., 1979-84; Chair, '83-84; **NIH, NCI/NIEHS**, RFA (Use of Fish/Shellfish as Sentinels for Environ.Carcin.), 1986; **NIH, NIDDK**, SBIR Grants Panel, 1989-91; NIH, DRG, Hematology Study Sections, Program Representative, 1989-91; NIDDK, National Advisory Council, Program Representative, 1989-91. **NIH, NHLBI**, Comprehensive Sickle Cell Centers (3 Site Visit Panels), 1992; Main Review Panel, 1997; Res. Training Grant Review Committee (Ad hoc), 1993, 1994; RFA/Gene Therapy for Sickle Cell Disease 1994, 1995; RFA/New Sickle Cell Treatments, 1996. National (NIH-type) Reviews: Canada, Israel, Netherlands, 1998-2001; INBRE Program/NSF Review Panel, 2007.

PATENTS:

U. S. Patent No. 7,517,669 B2: "Gene Regulation Therapy Involving Ferritin"

Filed: 1 Nov 2001. Approved: 8 Dec 2009. Issued: 14 April 2009

Canadian Patent Pending: "Gene Regulation Therapy Involving Ferritin"

Filed 1 Nov 2001.

Australian Patent No. 2002217964: Gene regulation therapy involving ferritin

Filed: 1 Nov 2001. Issued: 20 February 2006

European Patent No. 1354032: Gene regulation therapy involving ferritin

Filed 1 Nov 2001. Issued for 10 contracting countries: 09 August 2006

UK	Germany	Italy	Portugal	Turkey
France	Greece	Luxembourg	Spain	Albania

U.S. Patent Pending: "Abscisic Acid and Derivatives Thereof for the Treatment of Diseases"

Filed: 4 March 2006

PUBLICATIONS (peer-reviewed only):

Broyles RH, Strittmatter CF. Hexose monophosphate shunt dehydrogenases during sea urchin development. *Expt. Cell Res.* **67**, 471-474 (1971).

Broyles RH, Strittmatter CF. Hexose monophosphate shunt dehydrogenases in the developing frog. *Compar. Bioc. Physiol.* **44B**, 667-676 (1973).

Broyles RH, Frieden E. Sites of haemoglobin synthesis in amphibian tadpoles. *Nature* **241**:207-209 (1973).

Broyles RH, Deutsch MJ. Differentiation of red blood cells in vitro. *Science* **190**:471-473 (1975).

Deutsch MJ, Broyles RH. Effect of phenylhydrazine on the multiple hemoglobins of *Rana catesbeiana* tadpoles. *Devel Biol* **46**:277-231 (1975).

Broyles RH, Strittmatter CF. Hexose monophosphate shunt dehydrogenases in the sea urchin and the frog: Comparison of some functional properties of the enzymes *in vitro*. *Compar. Bioc. Physiol.* **57B**, 249-255 (1977).

Broyles RH, Noveck MI. Uptake and distribution of, 4,5,2',4',5'-hexachlorobiphenyl in fry of lake trout and Chinook salmon and its effects on viability. *Toxicol Appl Pharmacol* **50**:299-308 (1979).

Broyles RH, Noveck MI. Uptake and distribution of 2,5,2',5'-tetrachlorobiphenyl in developing lake trout. *Toxicol Appl Pharmacol* **50**:291-298 (1979).

Broyles RH Pack BM, Berger S, Dorn AR. Quantification of small amounts of hemoglobin in polyacrylamide gels with benzidine. *Anal Biochem* **94**:21-219 (1979).

Parkinson AM, Dorn AR, Maples PB, Broyles RH. Improved polyacrylamide gel electrophoresis with different amino acids as the trailing constituent. *Anal Biochem* **117**:6-11 (1981).

Broyles RH, Johnson GM, Maples PB, Kindell GR. Two erythropoietic microenvironments and two larval red cell lines in bullfrog tadpoles. *Devel Biol* **81**:299-314 (1981).

Dorn AR, Broyles RH. Erythrocyte differentiation during the metamorphic hemoglobin switch of *Rana catesbeiana*. *Proc Natl Acad Sci USA* **79**:5592-5596 (1982).

Maples PB, Dorn AR, Broyles RH. Embryonic and larval hemoglobins during the early development of the bullfrog *Rana catesbeiana*. *Devel Biol* **96**:515-519 (1983).

Maples PB, Palmer JC, Broyles RH. In vivo regulation of hemoglobin phenotypes of developing *Rana catesbeiana*. *Devel Biol* **117**:337-341 (1986).

Broyles R, Palmer J, Ramseyer L, Smith D, Jarman R, Do T, McBride K. Hemoglobin switching across vertebrate classes: Exchange of developmental signals by cell fusion. *Prog Clin Biol Res* **251**:285-294 (1987).

Maples PB, Palmer JC, Broyles RH. Determination of hemoglobin expression patterns in erythrocytes of *Rana catesbeiana* tadpoles. *Compar Biochem Physiol* **91B**:755-762 (1988).

Barker-Harrel J, McBride KA, Broyles RH. Formation of transient polykaryons by fusion of erythrocytes of different developmental programs. *Exptl Cell Res* **178**:435-448 (1988).

Palakodety R, Griffin MJ, **Broyles RH**. Circulating epoxide hydrolase immunodeterminants in rats bearing hyperplastic nodules induced by 2-acetylaminofluorene. **Cancer Letters** 38:347-358 (1988).

Broyles RH, Barker-Harrel J, Ramseyer LTH, McBride KA, Sexton DL. Erythroid heterokaryons: a system for investigating the functional role of trans-acting factors in developmental hemoglobin switching. **Prog. Clin. Biol. Res.** 316B, 83-96 (1989).

Ramseyer LTH, Barker-Harrel J, Smith DJ, McBride KA, Jarman RN, **Broyles RH**. Intracellular signals for developmental hemoglobin switching. **Devel Biol** 133:262-271 (1989).

Smith DJ, Zhu H, Kolatkar PR, Tam L-T, Baldwin TO, Riggs A, Roe BA, **Broyles RH**. The hemoglobins of the bullfrog, *Rana catesbeiana*. The cDNA-derived amino acid sequences of the alpha chain of adult hemoglobins B and C. Their roles in deoxygenation-induced aggregations. **J Biol Chem** 68:26961-26971 (1993).

Kurien BT, **Broyles RH**. Plasmid DNA preparation by heat treatment of E.coli lysates. **Anal Biochem** 213:174-176 (1993).

Broyles RH, Ramseyer LTH, Do TH, McBride KA, Barker JC. Hemoglobin switching in *Rana/Xenopus* erythroid heterokaryons. Factors mediating the metamorphic hemoglobin switch are conserved. **Devel Genetics** 15:347-355(1994).

Broyles RH, Blair FC, Kyker KD, Kurien BT, Stewart DR, Hala'sz H, Berg PE, Schechter A. A ferritin-like protein binds to a highly conserved CAGTGC sequence in the beta-globin promoter. **Colloque INSERM** 234:43-51 (1995).

Kurien BT, Scofield RH, **Broyles RH**. Efficient 5' end labeling of dephosphorylated DNA. **Anal Biochem** 245:123-126 (1997).

Broyles RH. Use of Somatic Cell Fusion to Reprogram Globin Genes. **Sem Cell Devel Biol** 10:259-265(1999).

Broyles RH, Belegu V, DeWitt CR, Shah SN, Stewart CA, Pye QN, Floyd RA. Specific repression of the human β -globin promoter by nuclear ferritin. **Proc Natl Acad Sci USA** 98:9145-9150 (31 July 2001).

Guo W-X, Pye QN, Williamson KS, Stewart CA, Hensley KL, Kotake Y, Floyd RA, **Broyles RH**. Reactive oxygen species in choline deficiency-induced apoptosis in rat hepatocytes. **Free Radic Biol Med** 37:1081-1089 (2004).

Scofield RH, Kurien BT, Ganick S, McClain MT, Pye Q, James JA, Schneider RI, **Broyles RH**, Bachmann M, Hensley K. Modification of lupus-associated 60-kDa Ro protein with the lipid oxidation product 4-hydroxy-2-nonenal increases antigenicity and facilitates epitope spreading. **Free Radic Biol Med** 38:719-728 (2005).

Guo W-X, Pye QN, Williamson KS, Stewart CA, Hensley KL, Kotake Y, Floyd RA, **Broyles RH**. Mitochondrial dysfunction in choline deficiency-induced apoptosis in cultured rat hepatocytes. **Free Rad Biol Med** 39:641-650 (2005).

Asada K, Kotake Y, Asada R, Saunders D, **Broyles RH**, Towner RA, Fukui H, Floyd RA. LINE-1 hypomethylation in a choline-deficiency-induced liver cancer in rats: Dependence on feeding period. **J Biomed Biotechnol** 2006/ID 17142:1-6 (2006).

Broyles RH, Roth AC, Todd M, Belegu V. Nuclear reprogramming by cell fusion. **Meth Molec Biol** 325: 47-57 (2006).

GRANT SUPPORT

(1) Current Active Support

SCCF (The Sickle Cell Cure Foundation, Inc.)

Title: "Gene Regulation Therapy for Sickle Cell Disease"

Status: Funded Period: 06/01/07 – present

Role: Principal Investigator

(2) Previous/Completed Support

NIH, NCI

Title: "Free Radicals and Choline-Deficient Liver Carcinogenesis"

Grant #: 5 R01 CA082506; 5 R01 CA082506S1; 5 R01 CA082506S2

Status: Funded Period: 02/01/2001 - 01/31/2008

Role: Co-Investigator

NIH, NCI

Title: "Organotypic Liver Cultures and Hepatocarcinogenesis"

Grant #: 3 R01 CA082506-02S

Status: Funded Period: 02/01/02-01/31/2005

Role: Co-Principal Investigator

American Heart Association

Title: "Elucidation of the Function and Regulation of Ferritin in Atherosclerotic Lesions"

Grant #: AHA 0110280Z (Fellowship for Visar Belegu)

Status: Funded Period: 07/01/01 - 6/30/03

Role: Principal Investigator

OCAST (Okla. Ctr. Advancement Sci. Tech) & Presbyterian Health Foundation

Title: "Advanced Topics in Human Molecular Genetics"

Grant type: Education Grant

Funds; \$25,000/yr to bring top scientists to meet with grad students in a special course.

(100 speakers, incl. 12 Nobel Laureates, 35 NAS members, 14 HHMI Investigators)

Period: 09/01/1993-08/31/2000 (7 years) Role: Director (PI)

Presbyterian Health Foundation

Title: "Silencing Sickle Cell: A Repressor of the Human Beta Globin Gene"

Grant type: Seed Grant

Status: Funded

Period: 07/01/91 – 10/30/92

Role: Principal Investigator

NIH, NIDDK

Title: "Gene Regulation and Cellular Signaling in the Kidneys and Urothelium"

Grant type: IPA Contract

Status: Funded

Period: 01/01/89 – 12/31/90

Role: Co-PI (with John R. Sokatch, Dept. Chair)

NIH, NIDDK

Title: "Regulation of Hemoglobin Switching *In vivo* and *In vitro*"

Grant #s: 5R01AM021764-05, -06, -07, -08A1, -09A1

Status: Funded

Period: 1986-1989

Role: Principal Investigator

Presbyterian Health Foundation

Title: "Regulation of hemoglobin Switching *In vivo* and *In vitro*"

Grant type: Approved-but-not-funded

Status: Funded

Period: 07/01/88 – 06/30/89

Role: Principal Investigator

Presbyterian Health Foundation

Title: "Regulation of hemoglobin Switching *In vivo* and *In vitro*"

Grant type: Seed Grant

Status: Funded

Period: 07/01/86 – 6/30/88

Role: Principal Investigator

NIH, NIAM/NIAMD

Title: "Regulation of Hemoglobin Switching *In vivo* and *In vitro*"

Grant #s: 1R01AM021764-01, 5R01AM0121764-02, 3R01AM021764-02S1, 5R01AM021764-03, 2R01AM021764-04A1

Status: Funded

Period: 1981-1985

Role: Principal Investigator

NIH, NIAM

Title: "Differentiation of Red Blood Cells *In vitro*"

Grant #s: 7R01AM021386-01, 5R01AM021386-02, -03, 3R01AM021386-03S1

Status: Funded

Period: 1977-1980

Role: Principal Investigator

NIH, NIAM

Title: "Differentiation of Red Blood Cells *In vitro*"

Grant #: 1R01AM019232-01

Status: Funded

Period: 1976-1977

Role: Principal Investigator

NOA, Sea Grant Program

Title: "Effects of Polychlorinated Biphenyls on the Early Development of Lake Trout and Other Great Lakes Fishes"

Grant type: Project Grant

Status: Funded

Period: 7/01/75 – 6/31/77

Role: PI/Project Director

Research Corporation

Title: "Effect of Thyroid Hormones on the Metamorphic Hemoglobin Transition"

Grant type: Cottrell Grant

Status: Funded

Period: 10/01/73 – 9/30/75

Role: Principal Investigator

NIH, NHLBI (NHLI)

Fellowship: Individual NRSA (National Research Service Award)

Role: Applicant/named recipient Mentor/PI: Earl Frieden