# CURRICULUM VITAE

## Alan Richard Brash

Date of Birth: November 9, 1948

Place of Birth: Glasgow, Scotland

Nationality: U.S.A.

Home address: 1105 Holly Tree Farms Rd.
Brentwood, Tennessee 37027
U.S.A.

Education:

1962 - 1967 Strathallan School, Forgandenny, Perthshire, Scotland

1967 - 1970 Downing College, Cambridge University B.A. (Honors) in Medical Sciences Part IA lst:, Part IB 2.1:, and Part II (Pharmacology) 1st.

1970 - 1973 Department of Pharmacology, University of Edinburgh, Ph.D.: Studies on the analysis of prostaglandins and their metabolites (submitted in 1976)

Employment:

Nov. 1973 - Aug. 1977
M.R.C. Research Fellow in the Department of Pharmacology, Royal Postgraduate Medical School

Aug. 1977 - Dec. 1978
Research Associate, Vanderbilt University, Department of Pharmacology, Nashville, Tennessee

Jan. 1979 - Oct 1979
Instructor, Vanderbilt University, Department of Pharmacology, Nashville, Tennessee

Nov. 1979 - June 1984
Assistant Professor, Vanderbilt University, Department of Pharmacology, Nashville, Tennessee

July 1984 - July 1988
Associate Professor, Vanderbilt University, Department of Pharmacology, Nashville, Tennessee

July 1988 – Present

Professor, Vanderbilt University, Department of Pharmacology, Nashville, Tennessee

Scholarships and Distinctions: (**Awards and Recognitions**)

1968-69 and
1969-70: Exhibition scholarship awarded by Downing College, Cambridge University

1970-71: Postgraduate scholarship awarded by Downing College, Cambridge University

1987 American Oil Chemists' Society: Outstanding Paper Presentation
New Orleans, LA, May 1987.

1990: International Symposium on Oxygenases, Kyoto, Japan, December 1990. Invited speaker.

2000: International Symposium on Oxygenases, Kyoto, Japan, November 2000. Invited speaker.

2006: International Symposium on Oxygenases, Kyoto, Japan, April 2006. Invited speaker.

2006: 20th IUBMB International Congress of Biochemistry and Molecular Biology and the 11th FAOBMB Congress, Kyoto, Japan, June 2006. Session commemorating the 50th Anniversary of the Discovery of Oxygenases. Invited as one of the four speakers.

2015: Delivered the 11th Lands Lecture (named for W. E. M. Lands), University of Michigan, Dept. of Biological Chemistry. “The Critical Role of Linoleic Acid in the Epidermal Permeability Barrier”. October 2015.

Invited Lectures:

"Metabolite measurement as an index of prostaglandin synthesis in vivo." 1979 Workshop Symposium on Prostaglandins, Prostacyclins and Thromboxanes Measurement, Nivelles, Belgium, November 1979.

"Endogenous prostacyclin production in human pregnancy." Symposium on Prostacyclin in Pregnancy, Royal Postgraduate Medical School, London, April, 1982.

"Cell specific metabolism of arachidonic acid." Pfizer Conference, Clinical Research Institute of Montreal, October 1982.

"Mechanisms of oxygenation in the biosynthesis of HETEs and leukotrienes." Twenty-fourth Annual Medicinal Chemistry Symposium, SUNY at Buffalo,

Lipoxygenases and Leukotrienes, May 1983.

"Oxygenation of arachidonic acid platelets and leukocytes." Conference on Regulation of Cellular Activities by Leukotrienes and other Lipoxygenase Products of Arachidonic Acid, the Kroc Foundation, Santa Inez, California, November 1983.

"Lipoxygenase products of arachidonic acid and platelet vascular interactions." Symposium on Platelet Inhibition and Vascular Occlusion in Man, London, August 1984.

"The 5- and 15-Lipoxygenases of Neutrophils and Eosinophils". A.N. Richards Symposium on Leukotrienes in Cardiovascular and Pulmonary Function, Philadelphia, May 1985.

"Lipoxygenase Metabolism of Endogenous and Exogenous Arachidonate in Leukocytes: GC-MS Analyses of Incubations in $H_2{}^{18}O$ Buffers". Symposium on Lipoxygenase Products and Polyunsaturated Fatty Acids:, Limoges, France, October, 1985.

“GC-MS analysis of urinary metabolites from prostanoids and leukotriene B4” Advanced research Workshop on Biology of Eicosanoids in Blood and Vascular Cells” Lyon, France, September 1986.

"Stereoselective Lipoxygenase Reactions Initiated at Carbon 10 of Arachidonic Acid." American Oil Chemists' Society Annual Meeting, New Orleans, May, 1987. Award for Outstanding Paper Presentation.

"Epoxide Intermediates in the Lipoxygenase Metabolism of Polyunsaturated Fatty Acids" 4th Biennial Meeting, International Society for Free Radical Research, Kyoto, April 1988.

"12- and 15-Lipoxygenase Products at Platelet/Vascular Interface" Symposium on Platelets and Vascular Occlusion, Rome, June 1988.

"Biosynthesis of Allene Oxides and their Transformation to Ketols and Cyclopentenones" 2nd International Conference on Leukotrienes and Prostanoids in Health and Disease, Jerusalem, October 1988.

"Lipoxygenase Catalyzed Oxygenations" Gordon Research Conference, Oxygen Radicals in Biology. Ventura, CA, February 1989.

"Physiological Role of Lipoxygenases" DeChatelet Conference, Bowman Gray School of Medicine, Winston-Salem, North Carolina, November 1989.

"Non-cyclooxygenase Prostaglandin Biosynthesis. Formation of $PGA_3$ Analogues via and Allene Oxide" Symposium on Biological Oxidation Systems, Bangalore, October 1989.

"Role of an 8R-Lipoxygenase in Maturation of the Starfish Oocyte" Joint Meeting of the American Society for Biochemistry and Molecular Biology/American Association of Immunologists, New Orleans, June 1990.

"Catalytic Properties and Function of Lipoxygenases of Marine Origin" Yamada Conference XXVII. International Symposium on Oxygenases and Oxygen Activation. Kyoto, Japan, Dec 1990.

"Purification of the Flaxseed Allene Oxide Synthase" XIth Washington Spring Symposium on Prostaglandins, Leukotrienes, Lipoxins and PAF. Washington, DC, May 1991.

"Role of an 8R-lipoxygenase in the maturation of starfish oocytes"
3rd International Conference on Eicosanoids and Cancer, Washington DC, 1993.

Columbia University, Dept of Pharmacology, 1993, “Allene Oxides and Prostaglandin Synthesis in Corals”

Molecular Biology of the Arachidonic Acid Cascade, Kyoto, December 1993, Japan: "Structure-function aspects of flaxseed allene oxide synthase"

Washington State University, Pullman, WA, October 1994 “Allene Oxide Synthase: A Novel Type of Cytochrome P450”

University of Kentucky, Lexington, May 1995, “Allene Oxide Biosynthesis”

10th International Conference on Cytochrome P450, Zurich, July 1995, “Mechanistic aspects of allene oxide synthesis”

10th International Conference on Prostaglandins and Related Compounds, Vienna, Austria, Sept 1996. "Structural features of R- and S-lipoxygenases revealed by enzyme purification and molecular cloning".

Humboldt University, Berlin, Germany, Dec 1996: "Discovery of novel lipoxygenases"

Fourth International Congress on Eicosanoids and Essential Fatty Acids, Edinburgh, July 1997. "Allene oxide synthesis in coral by a natural fusion protein with lipoxygenase and catalase-related domains".

International conference on Lipoxygenases and Their Products: Biological functions, Malta, May 1997, "Molecular cloning of a second human 15s-lipoxygenase and its murine homologue, an 8S-lipoxygenase: their relationship to other mammalian lipoxygenases"

5th International Conference on Eicosanoids in Cancer, San Diego, CA, Sept 1997. "Investigation of a Second 15S-Lipoxygenase in Humans and its Inducibility in Epithelial Tissues "

Keystone symposium on Molecular Mechanisms of Gastrointestinal Cancer/Lipid Mediators: April 1999, “Lipoxygenase expression in colon and prostate cancers”.

6th International Conference on Eicosanoids in Cancer, Boston, MA, Sept 1999. "15-Lipoxygenase-2 in human epithelial cells and its reduced expression in cancer"

Winter Prostaglandin Conference, Baltimore, March 2000. “Two novel epidermal lipoxygenases”

International Oxygenase Symposium, Kyoto, Japan, Nov 2000. “Lipoxygenases with R- or S-Stereospecificity”

International Symposium on Non-mammalian Eicosanoids, Berlin, Germany, May 2000. “Allene Oxide Synthase in Coral: a catalase-related protein with P450-like activity”

American Oil Chemists Society, Minneapolis, May 2001. “Biogenesis of volatile aldehydes from fatty acid hydroperoxides: Molecular cloning of hydroperoxide lyases”

German Biochemical Society, Bochum, Germany, Sept 2001. “Jasmonates, octadecanoids, and prostaglandins – analogous signalling molecules in plants and animals”

Center in Molecular Toxicology, Vanderbilt University, 35th Anniversary. Oxidative Damage Symposium, May 9-10, 2002: “Mechanisms of 4-hydroxynonenal formation”

International Symposium: “Recent BioMedical Advances in Eicosanoid Research: New Therapeutic Opportunities & The Unmet Challenges 2002”, Berlin, Germany, August 2002: Insights into cyclooxygenase structure-function from novel enzymes in coral”.

Keystone Conference on Eicosanoids, Tahoe, April 2003, “Epithelial Lipoxygenases and Their Functioning”.

International Conference in Plant Lipids, Goettingen, Germany, June 2003, “Lipoxygenases from Marine Invertebrates”.

7th International Conference on Eicosanoids in Cancer, Chicago, IL, Sept 2003, “Catalytic Activities and Functions of the Epithelial Lipoxygenases,15-LOX-2, 12*R*-LOX, eLOX3”.

AOCS Annual meeting, Cincinnati OH, May 2004. “Chiral HPLC Resolution of Eicosanoids and other Oxylipins”.

Meharry Medical College, Nashville TN, October 2004, “Control of Hydroxyl Stereochemistry by Prostaglandin Synthase (Cyclooxygenase): Why Cyclooxygenase inhibition by Aspirin is Conserved Throughout Evolution”.

Winter Eicosanoid Conference, Baltimore, March 2005. Session organizer and speaker: "Lipoxygenases and the Barrier Function in Skin: Sequential Actions of 12R-LOX and eLOX3".

University of North Dakota, Dept of Pharmacology, Physiology & Therapeutics, March 2005: "Prostaglandins in Coral: A spur to Biochemical Discovery"

2006: International Symposium on Oxygenases, Kyoto, Japan, April 2006. Invited speaker.

2006: 20th IUBMB International Congress of Biochemistry and Molecular Biology and the 11th FAOBMB Congress, Kyoto, Japan, June 2006. Session commemorating the 50th Anniversary of the Discovery of Oxygenases. Invited as one of the four speakers

Winter Eicosanoid Conference, Baltimore, March 2006. Organizer and Co-Chair on "Emerging Roles of Lipoxygenases"

International Conference on Non-mammalian Eicosanoids and Oxylipins, Berlin, Germany, May 2006 Co-organizer, co-chair, speaker: "Allene oxide synthase and other mini-catalases".

7th International Conference on Eicosanoids and other Bioactive Lipids, Montreal, Canada, September 2007. Invited speaker: "Lipoxygenases in the Epidermis".

Japanese Conference on the Biochemistry of Lipids, Tokushima, May 2008. Plenary Speaker: "Lipoxygenases and Epidermal Barrier Function".

Kyoto University, Japan, Department of Pharmacology, May 2008: "Role of Epithelial Lipoxygenases".

Shimane University, Department of Life Sciences, Matsue, Japan, May 2008, : "Role of Epithelial Lipoxygenases".

Kazan, Russia, International Symposium on Plant Lipids and Oxylipins, September 2008. Plenary Speaker: "Novel Oxylipin Synthesis via Lipoxygenase and Hemoprotein Enzymes".

University of Pennsylvannia, Institute for Environmental Medicine, May 2009: "Routes to 4-Hydroxy-nonenal (HNE): Fundamental Issues in the Mechanisms of Lipid Peroxidation"

Lausanne, Switzerland, International Conference, Regulatory Oxylipins, June 2009, Co-organizer/Invited speaker: "Unstable Fatty Acid Epoxides from CYP74 and Catalase-related Hemoproteins"

Vienna, Austria, FEBS workshop on Microbial Lipids, May 2010: from Genomics to Lipidomics, invited speaker, "Biosynthesis and Transformation of Fatty Acid

Hydroperoxides"

International Keystone Conference on Bioactive Lipids, Kyoto, Japan. June 2010, Invited talk, "Lipoxygenases, Essential Fatty acids, and the Epidermis".

Washington State University, Pullman, WA, Institute for Biological Chemistry, November 2011, seminar "Biosynthesis and Metabolism of Fatty Acid Hydroperoxides".

Lipid Maps Conference, La Jolla, CA, May 2011, Selected short talk: "Specifically oxidized ceramide esters: required intermediates in formation of the skin permeability barrier".

Scripps Institute of Oceanography, La Jolla, CA, May 2011: "Biosynthesis of Prostaglandins in Coral: Developments from the 1960's to 2011".

1st International Conference on Lipid Mediators, Fukuoka, Japan, June 2012: "Lipoxygenases and Epidermal Barrier Function".

Cayman Fall Lipid Mediators Symposium, Ann Arbor, MI, October 2013: Invited speaker (of three): "Mechanistic studies on the biosynthesis of exceptionally unstable fatty acid epoxides"

Tallinn Technical University, Tallinn, Estonia, October 2013: Invited talk ""Biosynthesis of unstable fatty acid epoxides in lipoxygenase pathways from plants to corals to humans "

Bioactive Lipids Conference, San Juan, PR, November 2-7 2013: Invited talk: Characterization of an Annotated "COX-2" gene from *Nostoc punctiforme* PCC 73102: An Ancestral Heme Dioxygenase-Peroxidase"

Invited speaker at the 6th International Conference on Phospholipase $A_2$ and Lipid Mediators (PLM2015), Tokyo, Japan, February 2015:
The Importance of Lipoxygenases in Formation of the Epidermal Water Barrier

Invited speaker at the satellite symposium (Igakuken symposium), Tokyo, Japan, February 2015, "Mechanistic Studies on the Biosynthesis of Exceptionally Unstable Fatty Acid Epoxides".

Current Teaching at Vanderbilt:

Pharmacology 501 (Pharmacology for Medical Students): "Antihistamines"

Pharmacology for Graduate Students, Pharmacology 321: Section Coordinator on GI drugs, antiinflammatory agents, asthma, diabetes, steroids and endocrine drugs, and cancer chemotherapy.

Pharmacological Targets & Mechanisms, Pharmacology 324: Section Coordinator and lecturer (10 hours) "GI Drugs and Metabolism" Lecture topics: GI Physiology, Cytochrome P450s and Drug Metabolism

Graduate Student Journal Club: faculty overseer.

NIH Grant Support:

Previous grant support:-

RO1-AM28511, Alan R. Brash, Principal Investigator. Metabolism of Leukotriene $B_4$. Total Direct Costs Awarded (Dec. 1, 1984 - Nov. 30, 1987), $206,362.

RO1-AM35275, Alan R. Brash, Principal Investigator. Activation of Arachidonate Metabolism. Total Direct Costs Awarded (Apr. 1, 1985 - March 31, 1988), $224,101.

R01-DK35275, Alan R. Brash, Principal Investigator. Activation of Arachidonate Metabolism. Total Direct Costs Awarded (Apr. 1, 1985 - March 31, 1993), $103,352.

GM-15431, Alan R. Brash, Principal Investigator on Project III. Novel Lipoxygenase Pathways and Mechanisms of Oxygenation of Arachidonic Acid. (In Research Center for Pharmacology and Drug Toxicology, John A. Oates, Principal Investigator). Total Direct Costs for Project III (Dec. 1, 1987-Nov. 30, 1992), $150,000.

HD05797, Alan R. Brash, Director of Prostaglandin Core Laboratory. (In Center for Reproductive Biology Research, M-C Orgebin-Crist, Principal Investigator). Total Direct Costs for PG Core Lab (May 1, 1987 - April 30, 1992), $110,000.

GM-49502, Alan R. Brash, Principal Investigator. "Biochemistry and Function of Allene Oxides". (Apr. 1, 1993 - March 31, 1998): Annual Direct Costs: $149,000

NIH/NCI, Vanderbilt Cancer Center, Pilot Project: "Evalauation of lipoxygenase activity in colon cancer". 5/1/98-4/30/99: Annual Direct Costs: $18,046

NIEHS/Center in Molecular Toxicology, Pilot Project: "A catalase-related protein with P450-like activity". 5/1/99-4/30/00: Annual Direct costs: $17,219.

Research contract: Firmenich Inc., Alan R. Brash, Principal Investigator. "Expression of hydroperoxide Lyase". (7/1/96-12/30/99) Annual Direct costs: $61,960

Fogarty International Research Collaboration Award (FIRCA), R03 TW00404-04 "Characterization of a novel prostaglandin synthase". Annual Direct costs (supplies exclusively for Estonia): $19,650

Mouse Models of Human Cancer Consortium: P.I., Robert J. Coffey, Jr. Eicosanoid metabolism/profiling Core, annual Direct costs requested: $103,014.

GM-53638, Supplement (to replace Fogarty grant) collaboration with Estonian group of Dr Nigulas Samel, Tallinn Technical University, Estonia. Requested $35,000

RO1-AR-45943, Alan R. Brash, Principal Investigator. “Pathophysiological Role of 12R-Lipoxygenase” (Oct1, 1999–Sept31, 2003) Annual Direct Costs: $172, 864.

Alcon Laboratories (P.I. Alan R. Brash) 15-Lipoxygenase activity in Conjunctiva. (02/21/00-2/28/05) Annual Direct Costs: $16,000

P30 ES000267 (P.I. F. Peter Guengerich). Pilot Pjoject P.I. Alan R. Brash. “A novel hemoprotein in microbial oxidative defense” (4/01/05-3/31/06). Annual direct costs $40,000.

RO1 AR-51968 Alan R. Brash, Principal Investigator. “A Lipoxygenase Pathway in Epithelial Differentiation” (7/01/05-6/30/10) Annual direct costs: $176,000.

Center Grant GM-15431 (P.I. Jason D. Morrow), Project Leader, Project 4 Alan R. Brash “Pathways to 4-hydroxynonenal: mechanisms, and biological consequences. (07/01/05-06/30/11). Annual Direct Costs: $156,000

**Current Grant support**

RO1 GM-74888, P.I., Alan R. Brash. ”Novel Catalase and Their Products”
4/01/10-3/30/14. Annual direct costs: $190,000

Center Grant GM-15431 (P.I. L. Jackson Roberts), Project Leader, Project 5 Alan R. Brash “Mechanisms of Leukotriene, Resolvin, and Protectin Biosynthesis. (07/01/11-06/30/15). Annual Direct Costs: $176,000

RO1 AR-5196806 Alan R. Brash, Principal Investigator. “Linking Lipoxygenases with Essential Fatty Acids and Epidermal Barrier Formation” (7/01/12-6/30/17) Annual direct costs: $225,000.

## Study Section Service

### Special Study Section

Site Visit: Univ of Wisconsin, Madison, 1980.
Special Study Section: Chicago, April 1983.
Special Study Section: Endocrinology Study Section. May 1985.
Site Visit, Univ Colorado: Biomed. Engin. & Technology-2, Denver, July 1984.
Special Study Section: Univ Colorado, Denver, July 1984.
Special Study Section: Medicinal Chemistry (AHR-M1) Study Section, April 1988.
Biochemistry Study Section (Subcommittee 2), NIH, February 1989.
Special Study Section: Medicinal Chemistry Study Section (AHR-M2), April 1989.
External Reviewer: Allergy & Immunology Study Section, Jan 1991.
External Reviewer: NSF (Biochemistry section)
External Reviewer: NSF, 1993, 1995
Site Visit: Michigan State Univ, Ann Arbor, December 1997.
External Reviewer: NIH, 1995, 1998
Special Emphasis Panel, Study Section, NIH, Aug 2000
Special Study Section, NIH, Dec 2001
Site Visit, Wake Forest University Medical Center, NCI, September 2002
Special Study Section, NIH, November 2004
Special Study Section, SBIR reviews, NIH, April 2012
External reviewer: NIH, MCH Study Section, October 2013
Special Study Section, SBIR reviews, NIH, December 2013

### Ad hoc member on Study Section

Medical Biochemistry 2, June 1985.
Medical Biochemistry 2, February 1989.

### Other grant reviews for:

NSF, USDA, Canadian MRC (Site Visit), Canadian Arthritis Foundation, Austrian Science fund, California Sea Grant Program, Netherlands Organisation for Scientific Research (NWO).

### Society Memberships

1985 - present American Society for Experimental Therapeutics
1991 - present American Society for Biochemistry and Molecular Biology

### Journal Editorial Boards

1989-1993 The Journal of Biological Chemistry, Editorial Board member
2006-2011 The Journal of Biological Chemistry, Editorial Board member

1997 – present Lipids, Associate Editor

## PUBLICATIONS


1. Brash, A.R. and Jones, R.L.: Straight-phase separation of prostaglandin methyl esters on lipophilic gels. Prostaglandins 5, 441, 1974.

2. Brash, A.R. and Jones, R.L.: Applications of liquid gel partition chromatography in the prostaglandin field. Brit. J. Pharmacol. 52:145, 1974.

3. Brash, A.R., Baillie, T.A., Clare, R.A. and Draffan, G.H.: Quantitative determination of the major metabolite of prostaglandin $F_{1\alpha}$ and $F_{2\alpha}$ in human urine by stable isotope dilution and combined gas chromatography-mass spectrometry. Biochem. Soc. Trans. 4:706, 1976.

3a Brash, A.R., Baillie, T.A., Clare, R.A. and Draffan, G.H.: Quantitative determination of the major metabolite of prostaglandin $F_{1\alpha}$ and $F_{2\alpha}$ in human urine by stable isotope dilution and combined gas chromatography-mass spectrometry. Biochem. Med. 16:77, 1976.

4. Brash, A.R. and Baillie, T.A.: A comparison of t-butyldimethylsilyl and trimethylsilyl ether derivatives for the characterization of urinary metabolites of prostaglandin $F_{2\alpha}$ by gas chromatography-mass spectrometry. Biomed. Mass Spectrometry 5:346, 1978.

5. Brash, A.R., Conolly, M.E., Draffan, G.H., Tippett, P. and Baillie, T.A.: Application of deuterium labelling in studies of the biosynthesis and metabolism of prostaglandin $F_{2\alpha}$ in man. Stable Isotopes (T.A. Baillie, Ed.), The MacMillan Press, 289, 1978.

6. Brash, A.R. and Conolly, M.E.: The effect of indomethacin on the biosynthesis and metabolism of prostaglandin $F_{2\alpha}$ in man. Prostaglandins 15(6):983-991, 1978.

7. Brash, A.R. and Baillie, T.A.: Identification of 5b,7a-dihydroxy-11-oxotetranor-prostane-1,16-dioic acid as a urinary metabolite of prostaglandin $F_{2\alpha}$ in the rat. Biochem. Biophys. Acta 572:371, 1979.

8. Gould, S.R., Brash, A.R., Conolly, M.E. and Lennard-Jones, J.E.: Studies of prostaglandins and sulphasalazine in ulcerative colitis, Prostagland. Med. 6:165, 1981.

9. Goetzl, E.J., Brash, A.R., Tauber, A.I., Oates, J.A. and Hubbard, W.C.: Modulation of human neutrophil function by mono-hydroxy-eicosatetraenoic acids. Immunology, 39:491, 1980.

10. Boeynaems, J.M., Brash, A.R., Oates, J.A. and Hubbard, W.C.: Preparation and assay of monohydroxy-eicosatetraenoic acids. Anal. Biochem. 104:259, 1980.

11. Hubbard, W.C., Hough, A.J., Brash, A.R., Johnson, R.M. and Oates, J.A.: The $VX_2$ carcinoma: Humoral effects and arachidonic acid metabolism. Advances in Prostaglandin and Thromboxane Research, 6:525, 1980.

12. Brash, A.R.: Metabolite measurement as an index of prostaglandin biosynthesis in vivo. In: Prostaglandins, prostacyclin and thromboxane measurement: methodological problems and clinical prospects (Eds., A. Herman and J.M. Boeynaems) Martin Nijhoff, The Hague, 1980.

13. Hubbard, W.C., Hough, A.J., Brash, A.R., Watson, J.T. and Oates, J.A.: Metabolism of linoleic

and arachidonic acids in $VX_2$ carcinoma tissue: Identification of Monohydroxy Octadecadienoic acids and monohydroxy Eicosatetraenoic acids. Prostaglandins 20:431, 1980.

14. FitzGerald, G.A., Brash, A.R., Falardeau, P. and Oates, J.A.: Estimated rate of prostacyclin secretion into the secretion of man. J. Clin. Invest. 68:1272, 1981.

15. Brash, A.R., Hickey, D.E., Graham, T.P., Stahlman, M.T., Oates, J.A. and Cotton, R.B.: Pharmacokinetics of indomethacin in the neonate: The relationship of indomethacin plasma levels to response of the ductus anteriosus. N. Engl. J. Med. 305:67, 1981.

16. Goodman, R.P. and Brash, A.R.: Measurement of 5,8,11,14-eicosatetraynoic acid by gas-liquid chromatography. J. Lipid Res. 22:541, 1981.

17. Maas, R.L., Brash, A.R. and Oates, J.A.: A second pathway of leukotriene production in porcine leukocytes. Proc. Natl. Acad. Sci. 78:5523, 1981.

18. Falardeau, P., Oates, J.A. and Brash, A.R.: Quantitative analysis of two dinor urinary metabolites of Prostacyclin $I_2$. Anal. Biochem. 115:359, 1981.

19. Maas, R.L., Brash, A.R. and Oates, J.A.: Novel leukotrienes and lipoxygenase product from rat mononuclear cells. In: SRS-A and leukotrienes (Editor: P.J. Piper) John Wiley, London, p. 151, 1981.

20. Oliw, E., Lawson, J.A., Brash, A.R. and Oates, J.A.: Arachidonic acid metabolism in rabbit renal cortex. Formation of two novel dihydroxyeicosatrienoic acids. J. Biol. Chem. 256:9924, 1981.

21. Oates, J.A., Falardeau, P., FitzGerald, G.A., Branch, R.A. and Brash, A.R.: Quantitation of Urinary Prostacyclin Metabolites in Man: Estimates of the rate of Secretion of Prostacyclin into the general circulation. In: Clinical Pharmacology of Prostacyclin (eds. Lewis and O'Grady) Raven Press, New
York, p. 21, 1981.

22. FitzGerald, G.A., Roberts, L.J., Maas, R.L., Brash, A.R. and Oates, J.A.: Intravenous prostacyclin in thrombotic thrombocytopenia Purpura. In: Clin. Pharm. of Prostacyclin. (eds. Lewis and O'Grady) Raven Press, New York, p. 81, 1981.

23. Cotton, R.B., Hickey, D., and Brash, A.R.: Pharmacokinetics of indomethacin in premature infants with symptomatic patient ductus arteriosus. In Intensive Care in the Newborn, II (eds. Stern, L., Salle, B., and Sriis-Hansen, B.) Masson Publishing Company, New York, pp. 351-354, 1981.

24. Turk, J., Maas, R.L., Brash, A.R., Roberts, L.J. and Oates, J.A.: Arachidonic acid 15-lipoxygenase products from human eosinophils. J. Biol. Chem. 257:7068, 1982.

25. Maas, R.L., Turk, J., Oates, J.A. and Brash, A.R.: Formation of a novel dihydroxy acid from arachidonic acid by lipoxygenase catalyzed double oxygenation in rat mononuclear cells and human leukocytes. J. Biol. Chem. 257:7056, 1982.

26. Brash, A.R.: Arachidonic Metabolites: Prostaglandins, Prostacyclin, Thromboxane and Leukotrienes. In: Drugs and Anesthesia: Pharmacology for Anesthesiologists. Wood, M. and

Wood, A.J.J., Williams and Wilkins, N.Y., 1982.
Brash, A.R. (1990) Arachidonate Metabolites. Prostaglandins, Prostacyclin, Thromboxane and Leukotrienes. In: Drugs and Anesthesia: Pharmacology for Anesthesiologists. 2nd edition, pp 631-644. Wood, M. and Wood, A.J.J., Williams and Wilkins, Baltimore, Maryland.

27. Goodman, R.P., Branch, R.A. and Brash, A.R.: Prostacyclin production during pregnancy: Comparison of production during normal pregnancy and pregnancy complicated by hypertension. Amer. J. Ob. Syn. 142:817, 1982.

28. Maas, R.L., Brash, A.R. and Oates, J.A.: Novel leukotrienes and lipoxygenase products from arachidonic acid. In: Leukotrienes and Other Lipoxygenase Products, Advances in Prostaglandin, Thromboxane and Leukotriene Research 9:29, 1982.

29. Brash, A.R.: Quantitation of the major urinary metabolite of $PGF_{2\alpha}$ by GC-MS. Methods Enzymol., 86:579, 1982.

30. FitzGerald, G.A. and Brash, A.R.: Endogenous prostacyclin and Thromboxane biosynthesis during chronic Vitamin E therapy in man. Ann. N.Y. Acad. Sci. 393:209, 1982.

31. Brash, A.R., Goodman, R.P. and FitzGerald, G.A.: Endogenous prostacyclin production in human pregnancy. In: Prostacyclin in Pregnancy, (P.J. Lewis, S. Moncada and J. O'Grady eds). Raven Press, New York, p. 71, 1983.

32. Brash, A.R., Jackson, E.K., Lawson, J.A., Branch, R.A., Oates, J.A. and FitzGerald, G.A.: Quantitative aspects of prostacyclin metabolism in man. In: Advances in Prostaglandin, Thromboxane and Leukotriene Research 12:119, 1983.

33. FitzGerald, G.A., Maas, R.L., Lawson, J.A., Oates, J.A., Roberts, L.J. and Brash, A.R.: Aspirin inhibits endogenous prostacyclin and thromboxane synthesis in man. In: Advances in Prostaglandin, Thromboxane and Leukotriene Research, 12:265, 1983.

34. Maas, R.L., Lawson, J.A., Brash, A.R. and Oates, J.A.: Derivatization and analysis of leukotrienes by desorption-chemical ionization mass spectrometry at the subnanomole level. In: Advances in Prostaglandin, Thromboxane and Leukotriene Research 12:229, 1983.

35. Turk, J., Maas, R.L., Roberts, L.J., Brash, A.R. and Oates, J.A.: Conjugated triene metabolites of arachidonic acid derived from the dioxygenation at carbon-15: Origin from the eosinophil and mechanisms of biosynthesis. In: Advances in Prostaglandin, Thromboxane and Leukotriene Research 12:123, 1983.

36. Jackson, E.K., Gerkens, J.F., Brash, A.R. and Branch, R.A.: Acute renal artery constriction increases renal $PGI_2$ synthesis and renin release in the conscious dog. J. Pharmacol. Exp. Ther. 222:410, 1982.

37. Falardeau, P. and Brash, A.R.: Quantitation of two dinor metabolites of prostacyclin by GC-MS. Methods Enzymol. 86:585-592, 1982.

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