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CURRICULUM VITAE

Richard Warren Gross, M.D., Ph.D.

Birthplace/date: New York, New York, December 6, 1950

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Bioorganic Chemistry and Molecular Pharmacology
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Present Position: Division Chief, Bioorganic Chemistry and
Molecular Pharmacology
Washington University School of Medicine
St. Louis, Missouri

Education: Columbia College, New York, New York,
A.B., 1972

New York University Medical School,
New York, New York, M.D., 1976

Washington University, St. Louis,
Missouri, Ph.D., 1982 (Chemistry)

Residency: Internal Medicine, Barnes Hospital,
St. Louis, Missouri, 1976-78

Fellowship: Cardiology, Barnes Hospital, St. Louis,
Missouri, 1978-81

Academic Positions: Assistant Professor of Medicine, Department of Internal
Medicine; Washington University, St. Louis, Missouri,
1982-86

Assistant Professor of Chemistry,
Chemistry Department, Washington
University, St. Louis, Missouri, 1984-86

Associate Professor Medicine, Department
of Internal Medicine, Washington
University, St. Louis, Missouri, 1987-91

Associate Professor of Chemistry,
Chemistry Department, Washington
University, St. Louis, Missouri, 1987-91

Richard W. Gross

Academic
Positions (cont.):

Associate Professor of Pharmacology,
Department of Molecular Biology and
Pharmacology, Washington University,
St. Louis, Missouri, 1987-91

Director, Section of Molecular and
Cellular Cardiovascular Biochemistry,
Washington University, St. Louis,
Missouri, 1987-91

Professor of Medicine, Department of Internal Medicine,
Washington University,
St. Louis, Missouri, 1991-present

Professor of Chemistry, Chemistry
Department, Washington University,
St. Louis, Missouri 1991-present

Professor of Molecular Biology and
Pharmacology, Washington University,
St. Louis, Missouri, 1991-present

Division Chief, Bioorganic Chemistry and
Molecular Pharmacology, Washington
University, St. Louis, Missouri,
1992-present

Hospital
Appointments:

Attending Physician, Medical Service
Barnes Hospital, St. Louis, MO
1982-Present

Medical Licensure/
Certification:

National Board of Medical Examiners,
1977
American Board of Internal Medicine,
1979
Missouri Medical License R8298, Jan. 1978

Honors, Awards:

Phi Lambda Upsilon, Columbia College, 1972
Solomon Shapiro Scholarship Award,
New York University, 1976
Buder-Peters Scholarship Award, St. Louis
Heart Association 1978-81
Searle Scholar 1983-86
Established Investigator of the American
Heart Association, 1986-91

Appointments and
Committees Service:

Permanent Member of the Biophysics and Biochemistry of
Membranes Study Section, National Institutes of Health
(2008-Current)
NIH Cardiovascular Study Section (Ad Hoc Reviewer)
Biological Chemistry Program Planning Committee (1992-
1995)
Thesis Committees

Richard W. Gross
External Advisory Board
University of Alabama SCOR in Ischemic Heart Disease
Scientific Board of Directors, Sphinx Pharmaceuticals Co.

Editorial
Service:

Advisory Board, University of Alabama
SCOR in Ischemic Heart Disease 1988-present
Editorial Board, Journal of Molecular and Cellular
Cardiology, 1987-1992
Editorial Board, Journal of Biological Chemistry 1993-1998
NIH Medicinal Biochemistry Study Section (Ad Hoc
Reviewer)
Ad Hoc Reviewer (Biochemistry; Journal of Clinical
Investigation; Circulation Research; Circulation; American
Journal of Physiology; Biochem. Biophys. Acta.; Archives of
Biochemistry; Lipids; Chemistry and Physics of Lipids;
Journal of Lipid Research)

Professional
Societies:

American Society of Biologic Chemistry
American Society for Clinical Investigation
American Chemical Society
American Federation of Clinical Research
American Heart Association
Basic Science Council of the American Heart Association
New York Academy of Sciences

Past Research Awards:

Buder-Peters Scholarship Award
St. Louis Heart Association (1978-81) Searle Scholar (1983-
86)
Established Investigator of the American Heart Association
(1986-91)

Research Support:

1) Program Director, NIH (National Heart, Lung, and Blood
Institute) Program Project Grant: Membrane-Mediated
Alterations in Diabetes, 2008-2013 (\$1,500,113 annual direct
costs).
2) Principal Investigator, NIH (National Heart, Lung, and
Blood Institute), RO1: Lipid Mediators of Signal
Transduction in Smooth Muscle, 2007-2012 (\$250,000
annual direct costs).

Clinical, Teaching
Responsibilities:

1) Attending Physician, Barnes Hospital Internal Medicine
2) The Chemistry of Biological Membranes (Chem 476)
3) Lipid Mediators of Signal Transduction Pharmacology
Special Topics

Peer-reviewed articles:

1. Gross, R.W. and Sobel, B.E.: Augmentation of cardiac phospholipase activity induced with negative liposomes. *Trans. Assoc. Am. Physicians* 1979, 92:136-147. PMID:549249.
2. Lee, F.C., Ahumada, G.G., Gross R.W., and Sobel, B.E.: Hydrolysis of phosphatidyl-ethanolamine induced by nominally synthetic lysophosphoglycerides: Methodological implications. *Biochemistry* 1980, 19:1934-1937. PMID:7378384.
3. Gross, R.W. and Sobel, B.E.: Isocratic high-performance liquid chromatography separation of phosphoglycerides and lysophosphoglycerides, *J. Chromatogr.* 1980, 197:79-85. PMID:7430309.
4. Corr, P.B., Snyder, D.W., Cain, M.E., Crafford, W.A., Jr., Gross, R.W. and Sobel, B.E.: Electrophysiological effects of amphiphiles on canine Purkinje fibers: Implications for dysrhythmia secondary to ischemia. *Circ. Res.* 1981, 49:354-363. PMID:7249272.
5. Saffitz, J.E., Gross, R.W., Williamson, J.R. and Sobel, B.E.: Autoradiography of phosphatidylcholine. *J. Histochem. Cytochem.* 1981, 29:371-378. PMID:7240719.
6. Gross, R.W. and Sobel, B.E.: Inhibition of myocardial lysophosphatidylcholine transacylase by palmitoylcarnitine: Implications for arrhythmogenesis. *Trans. Assoc. Physicians* 1982, 94:115-125. PMID:7344217.
7. Corr, P.B., Snyder, D.W., Lee, B.I., Gross, R.W., Keim, C.R., and Sobel, B.E.: Pathophysiological concentrations of lysophosphatides and the slow response. *Am. J. Physiol.:Heart Circ. Physiol.* 1982, 12:H187-H195. PMID:7114230.
8. Gross, R.W., Corr, P.B., Lee, B.I., Saffitz, J.E., Crafford, W.A., Jr., and Sobel, B.E.: Incorporation of radiolabeled lysophosphatidylcholine into canine Purkinje fibers and ventricular muscle: Electrophysiological, biochemical and autoradiographic correlations. *Circ. Res.* 1982, 51:27-36. PMID:7083488.
9. Gross, R.W. and Sobel, B.E.: Lysophosphatidylcholine metabolism in the rabbit heart. Characterization of metabolic pathways and partial purification of myocardial lysophospholipase-transacylase. *J. Biol. Chem.* 1982, 257:6702-6708. PMID:7085596.
10. Levine, R.P., Finn, R. and Gross, R.W.: Interactions between C_{3b} and cell-surface macromolecules. *Ann. N.Y. Acad. Sci.* 1983, 421:235-245.
11. Gross, R.W. and Sobel, B.E.: Rabbit myocardial cytosolic lysophospholipase: Purification, characterization, and competitive inhibition by L-palmitoylcarnitine. *J. Biol. Chem.* 1983, 258:5221-5226. PMID:6833297.
12. Gross, R.W.: Purification of rabbit myocardial cytosolic acyl CoA hydrolase, identity with lysophospholipase, and modulation of enzymic activity by endogenous cardiac amphiphiles. *Biochemistry* 1983, 22:5641-5646. PMID:6140028.
13. Gross, R.W., Drisdell, R.C. and Sobel, B.E.: Rabbit myocardial lysophospholipase-transacylase: Purification, characterization, and inhibition by endogenous cardiac amphiphiles. *J. Biol. Chem.* 1983, 258:15165-15172. PMID:6654912.
14. Gross, R.W., Ahumada, G.G. and Sobel, B.E.: Cytosolic lysophospholipase in cardiac myocytes and its inhibition by L-palmitoylcarnitine. *Am. J. Physiol.* 1984, 246 (Cell Physiol. 15): C266-C270. PMID:6703040.

15. Gross, R.W.: High plasmalogen and arachidonic acid content of canine myocardial sarcolemma: A fast atom bombardment mass spectroscopic and gas chromatography-mass spectroscopic characterization. *Biochemistry* 1984, 23:158-165. PMID:6419772.
16. Hashimoto, H., Grace, A.M., Billadello, J.J., Gross, R.W., Strauss, A.W. and Sobel, B.E.: Non-denaturing quantification of subforms of canine MM creatine kinase isoenzymes (isoforms) and their interconversion. *J. Lab. Clin. Med.* 1984, 103:470-484. PMID:6699467.
17. Saffitz, J.E., Corr, P.B., Lee, B.I., Gross, R.W., Williamson E.K. and Sobel, B.E.: Pathophysiological concentrations of lysophosphoglycerides quantified by electron microscopic autoradiography. *Lab. Invest.* 1984, 50:278-286. PMID:6700193.
18. Sobel, B.E., Gross, R.W. and Robison, A.K.: Thrombolysis, clot selectivity, and kinetics. *Circulation* 1984, 70:160-164. PMID:6539658.
19. Fink, K.L. and Gross, R.W.: Modulation of canine myocardial sarcolemmal membrane fluidity by amphiphilic compounds. *Circ. Res.* 1984, 55:585-594. PMID:6091941.
20. Gross, R.W.: Purification and characterization of mitochondrial thioesterase from rabbit myocardium and its inhibition by palmitoylcarnitine. *Biochem. Biophys. Acta.* 1984, 802:197-202. PMID:6498215.
21. Creer, M.H., Pastor, C., Corr, P.B., Gross, R.W. and Sobel, B.E.: Quantification of choline and ethanolamine phospholipids in rabbit myocardium. *Anal. Biochem.* 1985, 144:65-74. PMID:3985327.
22. Billadello, J.J., Gard, J.K., Ackerman, J.J.H. and Gross, R.W.: Determination of intact tissue glycerophosphorylcholine levels by quantitative ³¹P-nuclear magnetic resonance spectroscopy and correlation with spectrophotometric quantification. *Anal. Biochem.* 1985, 144:269-274. PMID:3985321.
23. Creer, M.R. and Gross, R.W.: Reverse-phase high-performance liquid chromatographic separation of molecular species of alkyl ether, vinyl ether, and monoacyl lysophospholipids. *J. Chromatogr.* 1985, 338:61-69.
24. Gross, R.W.: Identification of plasmalogen as the major phospholipid constituent of cardiac sarcoplasmic reticulum. *Biochemistry* 1985, 24:1662-1668.
25. Wolf, R.A. and Gross, R.W.: Semi-synthetic approach for the preparation of homogeneous plasmenylethanolamine utilizing phospholipase D from *Streptomyces Chromofuscus*. *J. Lipid Res.* 1985, 26:629-633.
26. Wolf, R.A. and Gross, R.W.: Identification of neutral active phospholipase C which hydrolyzes choline glycerophospholipids and plasmalogen selective phospholipase A₂ in canine myocardium. *J. Biol. Chem.* 1985, 260:7295-7303.
27. Gard, J.K., Kichura, G.M., Ackerman, J.J.H., Eisenberg, J.D., Billadello, J.J., Sobel, B.E. and Gross, R.W.: Quantitative ³¹P NMR analysis of metabolite concentrations in Langendorff-perfused rabbit hearts. *Biophys. J.* 1985, 48:803-813.
28. Creer, M.H. and Gross, R.W.: Separation of isomeric lysophospholipids by reverse phase HPLC. *Lipids* 1985, 20:922-928.

29. Loeb, L.A. and Gross, R.W.: Identification and purification of sheep platelet phospholipase A₂ isoforms: Activation by physiologic concentrations of calcium ion. *J. Biol. Chem.* 1986, 261:10467-10470.
30. Pak, J.H., Bork, V.P., Norberg, R.E., Creer, M.H., Wolf, R.A. and Gross, R.W.: Disparate molecular dynamics of plasmenyl-choline and phosphatidylcholine bilayers. *Biochemistry* 1987, 26:4824-4830.
31. Miyazaki, Y., Gross, R.W. and Saffitz, J.E.: Biochemical and subcellular distribution of arachidonic acid in rat myocardium. *Am. J. Physiol.* 1987, 253(Cell Physiol. 22):C846-853.
32. Ford, D.A. and Gross, R.W.: Identification of endogenous 1-*O*-alk-1'-enyl-2-acyl-*sn*-glycerol in myocardium and its effective utilization by choline phosphotransferase. *J. Biol. Chem.* 1988, 263:2644-2650.
33. Ford, D.A. and Gross, R.W.: Differential accumulation of diacyl and plasmalogenic diglycerides during myocardial ischemia. *Circ. Res.* 1989, 64:173-177.
34. Ford, D.A. and Gross, R.W.: Plasmenylethanolamine is the major storage depot for arachidonic acid in rabbit vascular smooth muscle cells and is rapidly hydrolyzed after angiotensin II stimulation. *Proc. Natl. Aca. Sci.* 1989, 86:3479-3483.
35. Scherrer, L.A. and Gross, R.W.: Subcellular distribution, molecular dynamics and catabolism of plasmalogens in myocardium. *Mol. and Cell. Biochem.* 1989, 88:97-105.
36. Ford, D.A., Miyake, R., Glaser, P.E. and Gross, R.W.: Activation of protein kinase C by naturally occurring ether-linked diglycerides. *J. Biol. Chem.* 1989, 264:13818-13824. PMID:2760045.
37. Steffens, D.L. and Gross, R.W.: Sequencing of cloned DNA using bacteriophage λ gt11 templates. *BioTechniques* 1989, 7:674-677. PMID:2534351.
38. Issacson, Y., Sherbourne, C., Gross, R.W., and Stenson, W.F.: The synthesis and molecular dynamics of phospholipids having hydroxylated fatty acids at the *sn*-2 position. *Chem. Phys. Lipids.* 1990, 52:217-226. PMID:2160333.
39. Ford, D.A. and Gross, R.W.: Activation of myocardial protein kinase C by plasmalogenic diglycerides. *Am. J. Physiol.* 1990, 258:(Cell Physiol. 27):C30-C36. PMID: 2154113.
40. Han, X. and Gross, R.W.: Plasmenylcholine and phosphatidylcholine membrane bilayers possess distinct conformational motifs. *Biochemistry* 1990, 29:4992-4996. PMID:2364071.
41. Hazen, S.L., Stuppy, R.J. and Gross, R.W.: Purification and characterization of canine myocardial cytosolic phospholipase A₂: A calcium independent phospholipase with absolute *sn*-2 regio specificity for diradyl glycerophospholipids. *J. Biol. Chem.* 1990, 265:10622-10630. PMID:2355013.
42. Ford, D.A. and Gross, R.W.: Differential metabolism of diradyl glycerol molecular subclasses and molecular species by rabbit brain diglyceride kinase. *J. Biol. Chem.* 1990, 265:12280-12286. PMID:2165056.
43. Miyazaki, Y., Gross, R.W., Sobel, B.E. and Saffitz, E.: Selective turnover of sarcolemmal phospholipids during lethal cardiac myocyte injury. *Am. J. Physiol.* 1990, 259:(Cell Physiol. 28):C325-C331.

44. Hazen, S.L., Ford, D.A. and Gross, R.W.: Activation of a membrane-associated phospholipase A₂ during rabbit myocardial ischemia which is highly selective for plasmalogen substrate. *J. Biol. Chem.* 1991, 266:5629-5633.
45. Hazen, S.L., Zupan, L.A., Weiss, R.H., Getman, D.P. and Gross, R.W.: Suicide inhibition of canine myocardial cytosolic calcium-independent phospholipase A₂. *J. Biol. Chem.* 1991, 266:7227-7232.
46. Ford, D.A., Hazen, S.L., Saffitz, J.E. and Gross, R.W.: The rapid and reversible activation of a calcium-independent plasmalogen-selective phospholipase A₂ during myocardial ischemia. *J. Clin. Inv.* 1991, 88:331-335.
47. Zupan, L.A., Kruszka, K.K. and Gross, R.W.: Calcium is sufficient but not necessary for activation of sheep platelet cytosolic phospholipase A₂. *FEBS Letters* 1991, 284:27-30. PMID:2060623.
48. Hazen, S.L. and Gross, R.W.: ATP-dependent regulation of rabbit myocardial cytosolic calcium-independent phospholipase A₂. *J. Biol. Chem.* 1991, 266:14526-14534. PMID:1860859.
49. Han, X., Chen, X. and Gross, R.W.: Chemical and magnetic inequivalence of glycerol protons in individual subclasses of choline glycerophospholipids: Implications for subclass-specific changes in membrane conformational states. *J. Amer. Chem. Soc.* 1991, 113:7104-7109.
50. Han, X. and Gross, R.W.: Alterations in membrane dynamics elicited by amphiphilic compounds are augmented in plasmemylcholine bilayers. *Biochem. Biophys. Acta.* 1991, 1069:37-45. PMID:1932047.
51. Hazen, S.L. and Gross, R.W.: Human myocardial cytosolic calcium-independent phospholipase A₂ is modulated by ATP: Concordant ATP-induced alterations in enzyme kinetics and mechanism-based inhibition. *Biochem. J.* 1991, 280:581-587. PMID:1764021.
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53. Han, X., Zupan, L.A., Hazen, S.L. and Gross, R.W.: Semisynthesis and purification of homogeneous plasmemylcholine molecular species. *Analytical Biochemistry* 1992, 200:119-124. PMID:1317681.
54. Hazen, S.L. and Gross, R.W.: Identification and Characterization of human myocardial phospholipase A₂ from transplant recipients suffering from end stage ischemic heart disease. *Circulation Research.* 1992, 70:486-495. PMID:1537086.
55. Ramanadham, S., Gross, R.W. and Turk, J.: Arachidonic acid induces an increase in the cytosolic calcium concentration in single pancreatic islet beta cells. *Biochem. Biophys. Res. Comm.* 1992, V184:647-653.
56. Pak, J.H., Han, X. and Gross, R.W.: Differential molecular dynamics and transmembrane fluidity gradients in canine myocardial sarcolemmal and sarcoplasmic reticulum. *Chemistry and Physics of Lipids* 1992, 61:111-119. PMID:1324803.
57. Zupan, L.A., Steffens, D.L., Berry C.A., Landt, M.A. and Gross, R.W.: Cloning and Expression of a human 14-3-3 protein mediating phospholipolysis: Identification of an arachidonoyl-enzyme intermediate during catalysis. *J. Biol. Chem.* 1992, 267:8707-8710. PMID:1577711.

58. Ford, D.A., Rosenbloom, K.B. and Gross, R.W.: The primary determinant of rabbit myocardial ethanolamine phosphotransferase substrate selectivity is the covalent nature of the *sn*-1 aliphatic group of diradyl glycerol acceptors. *J. Biol. Chem.* 1992, 267:11222-11228. PMID:1597457.
59. Miyake, R. and Gross, R.W.: Multiple phospholipase A₂ activities in canine vascular smooth muscle. *Biochem. Biophys. Acta.* 1992, 1165:167-176. PMID:1450211.
60. Han, X. and Gross, R.W.: Nonmonotonic alterations in the fluorescence anisotropy of polar head group labeled fluorophores during the lamellar to hexagonal phase transition of phospholipids. *Biophys. J.* 1992, 63:309-316. PMID:1420879.
61. Gross, R.W.: Myocardial phospholipase A₂ and their membrane substrates. *Trends Cardiovasc. Med.* 1992, 2:115-121.
62. Zupan, L.A., Weiss, R.H., Hazen, S.L., Parnas, B.L., Aston, K.W., Lennon, R.J., Getman, D.P. and Gross, R.W.: Structural determinants of haloenol lactone-mediated suicide inhibition of canine myocardial calcium-independent phospholipase A₂. *Journal Medicinal Chemistry* 1993, 36:95-100. PMID:8421294.
63. Gross, R.W., Ramanadham, S., Kruszka, K.K., Han, X. and Turk, J.: Rat and human pancreatic islet cells contain a Ca²⁺-independent phospholipase A₂ activity selective for hydrolysis of arachidonate which is stimulated by ATP and is specifically localized to islet β-cells. *Biochemistry* 1993, 32:327-336. PMID:8418853.
64. Ramanadham, S., Gross, R.W., Han, X. and Turk, J.: Inhibition of arachidonate release by secretagogue-stimulated pancreatic islets suppresses both insulin secretion and the rise in β-cell cytosolic Ca²⁺ concentration. *Biochemistry* 1993, 32:337-346. PMID:8418854.
65. Goligorsky, M.S., Morgan, M.A., Lyubsky, S., Gross, R.W., Adams, D.T. and Spitz, D.R.: Establishment of a hydrogen peroxide resistant variant of renal tubular epithelial cells. Role of calcium-independent phospholipase A₂ in cell damage. *Arch. Biochem. Biophys.* 1993, 301:119-128. PMID:8442655.
66. Hazen, S.L., Hall, C.R., Ford, D.A. and Gross, R.W.: Isolation of a human myocardial cytosolic phospholipase A₂ isoform: Fast atom bombardment mass spectroscopic and reverse phase HPLC identification of choline and ethanolamine glycerophospholipid substrates. *J. Clin. Invest.* 1993, 91:2513-2522. PMID:8514863.
67. Hazen, S.L. and Gross, R.W.: The specific association of a phosphofructokinase isoform with myocardial calcium-independent phospholipase A₂: Implications for the coordinated regulation of phospholipolysis and glycolysis. *J. Biol. Chem.* 1993, 268:9892-9900. PMID:8486669.
68. Ramanadham, S., Bohrer, A., Mueller, M., Jett, P., Gross, R.W., and Turk, J.: Mass spectrometric identification and quantitation of arachidonate-containing phospholipids in pancreatic islets: Prominence of plasmenylethanolamine molecular species. *Biochemistry* 1993, 32:5339-5351. PMID:8499439.
69. Chen, X., Han, X. and Gross, R.W.: Dynamics of binary mixtures of plasmenylcholine/arachidonic acid and phosphatidylcholine/arachidonic acid - a study using fluorescence and NMR spectroscopy. *Biochem. Biophys. Acta.* 1993, 1149:241-248. PMID:8323943.

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72. Hazen, S.L., Wolf, M.J., Ford, D.A. and Gross, R.W.: The rapid and reversible association of phosphofructokinase with myocardial membranes. *FEBS Letters* 1994, 339:213-216.
73. Kruszka, K.K. and Gross, R.W.: The ATP- and CoA-independent synthesis of arachidonylethanolamide: A novel mechanism underlying the synthesis of the endogenous ligand of the cannabinoid receptor. *J. Biol. Chem.* 1994, 269:14345-14348. PMID:8182035.
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- 264.7) that is largely mediated by calcium-independent phospholipase A₂. *J. Biol. Chem.* 1995, 270:14855-14858. PMID:7797462.
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 85. Glaser, P.E. and Gross, R.W. Rapid plasmenylethanolamine-selective fusion of membrane bilayers catalyzed by an isoform of glyceraldehyde-3-phosphate dehydrogenase: Discrimination between glycolytic and fusogenic roles of individual isoforms. *Biochemistry* 1995, 34:12193-12203. PMID:7547960.
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 91. Han, X., Gubitosi-Klug, R.A., Collins, B.J., and Gross, R.W. Alterations in individual molecular species of human platelet phospholipids during thrombin stimulation: Electrospray ionization mass spectrometry-facilitated identification of the boundary conditions for the magnitude and selectivity of thrombin-induced platelet phospholipid hydrolysis. *Biochemistry* 1996, 35:5822-5832. PMID:8639543.
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