Curriculum Vitae

Renu Virmani, M.D.

Education

1958-1961: Delhi Public School, New Delhi, India

July, 1961-June, 1962: Hindu College, Delhi University, New Delhi, India

July, 1962-1967: M.B.B.S. Maulana Azad Medical College, Delhi University, New Delhi, India

September, 1971-1973: M.D.; Lady Hardinge Medical College, Delhi University, New Delhi, India.
Research Thesis for M.D.: Cell Mediated Immunity in Breast Neoplasms

Medical Licensure

July, 1974: Educational Foundation for Foreign Medical Graduates (ECFMG)

July, 1975: Federal Licensure Examination (FLEX)

Licensed to Practice Medicine in:

1975	West Virginia
1976	Maryland (current)
1977	District of Columbia
1981	Tennessee (current)

Board Certification:

1978	American Board of Anatomic Pathology

Society Memberships

1986	Fellow, American College of Cardiology
1986	Member, American Heart Association
1978	Member, US and Canadian Academy of Pathology

Military Service

July, 1979-August, 1981: MAJ, MC, US Army
September, 1984-December 1986: MAJ, MC, US Army
January, 1987-September 1989: LTC, MC, US Army

Professional Background

July, 1967-December, 1968: Resident, Departments of Gynecology-Obstetrics and Internal Medicine, Maulana Azad Medical College and affiliated hospitals, New Delhi, India

February, 1969-July, 1971: Resident, Department of Pathology, Lala Lajpat Rai Memorial College and Hospitals, Meerut, India

October, 1971-June, 1974: Instructor, Department of Pathology, Lady Hardinge Medical College and Hospital, New Delhi, India

October, 1974-June, 1975: Visiting Scientist, Pathology Branch, National Heart, Lung and Blood Institute, National Institutes of Health, Bethesda, Maryland

July, 1975-June, 1977: Resident, Department of Pathology (clinical and anatomic), George Washington University Medical Center, Washington, D.C.

July, 1977-June, 1979: Staff Fellow, Pathology Branch, National Heart, Lung and Blood Institute, National Institutes of Health, Bethesda, Maryland

July, 1979-August, 1981: Staff Pathologist, Chief, Division of Cardiovascular Research, Department of Cardiovascular Pathology, Armed Forces Institute of Pathology, Washington, D.C.

August, 1981-September, 1984: Associate Professor, Director, Autopsy Service, Department of Pathology, Vanderbilt University Medical Center, Nashville, Tennessee

August, 1981-September, 1984: Staff Pathologist and Director, Autopsy Services, Veterans Administration Medical Center, Nashville, Tennessee

September, 1984-May, 1990: Associate Professor, Department of Pathology, Vanderbilt University, Nashville, Tennessee

Current Professional Activities

January 2005 – Present, Medical Director CVPath, A Reserch service of The International Registry of Pathology, Inc. Gaithersburg, MD 20878.

September, 1984- December 2004: Chairperson, Department of Cardiovascular Pathology, Armed Forces Institute of Pathology, Washington, DC.

July, 1985-Present: Clinical Professor, Department of Pathology, Georgetown University, Washington, DC.

October, 1985-Present: Clinical Professor, Department of Pathology, University of Maryland-Baltimore, Baltimore, Maryland.

July, 1985-Present: Clinical Professor, Department of Pathology, Uniform University of Health Sciences, Bethesda, Maryland.

July, 1985-Present: Clinical Professor, Department of Pathology, George Washington University, Washington, DC.

June, 1990-Present: Clinical Research Professor, Department of Pathology, Vanderbilt University, Nashville, TN.

Honors and Awards

Joint Service Commendation Medal for Outstanding Meritorious Service as Chief, Division of Cardiovascular Research, Armed Forces Institute of Pathology, Washington, D.C. for period of 5 July 1979 through 4 August 1981

Gold Medal for Best Scientific Exhibit at the American Society of Clinical Pathologists, Las Vegas, Nevada, October, 1981

Silver Medal for Second Best Scientific Exhibit at the American Society of Clinical Pathologists, Las Vegas, Nevada, October, 1985

Edward Rhodes Stitt Lecture Award, Association of Military Surgeons of the United States, San Antonio, Texas, November, 1988

Member Cardiology Advisory Committee, National Heart, Lung, and Blood Institute, National Institute of Health, Bethesda, Maryland, October 1988 to March 1992

Special Review Committee, National Institute of Drug Abuse, October 1989 to present.

Member AIDS Advisory Committee, National Heart, Lung, and Blood Institute, National Institutes of Health, October 1989 to Sept 1993.

Member judging panel for the 1996 Young Investigators Awards Competition in the Physiology, Pharmacology & Pathology Category. 45th Annual Scientific Session of the College of Cardiology, Orlando, Florida.

Editorial Review Board Member

Circulation
Journal of the American College of Cardiology
Human Pathology
Modern Pathology
Cardiovascular Pathology
Pathology Case Review
Cardiovascular Radiation Medicine
American Journal of Cardiology
Journal of Invasive Cardiology
Atherosclerosis, Arteriosclerosis, Thrombosis and Vascular biology
Catheterization and Cardiovascular Interventions

Manuscripts Reviewed For:

American Heart Journal
Journal of Molecular and Cellular Cardiology
Chest
Atherosclerosis
Journal of the American College of Cardiology
American Journal of Clinical Pathology
Laboratory Investigation
Human Pathology
Modern Pathology
Circulation
Cardiovascular Pathology
Pathology Case Review

Cardiovascular Radiation Medicine
Archives of Pathology and Laboratory Medicine
Mayo Clinic Proceedings
American Journal of Pathology
Cardiovascular and Interventional Radiology
American Journal of Cardiology
Journal of Respiratory Distress
New England Journal of Medicine
Lancet
Atherosclerosis, Arteriosclerosis, Thrombosis, and Vascular Biology
Journal of Invasive Cardiology
Catheterization and Cardiovascular Interventions

Selected Publications, peer reviewed

Atherosclerosis

1. Farb A, Tang AL, Burke AP, Sessums L, Liang Y, Virmani R. Sudden coronary death. Frequency of active coronary lesions, inactive coronary lesions, and myocardial infarction. Circulation 1995; 92:1701-9.

2. Farb A, Burke AP, Tang AL, Liang TY, Mannan P, Smialek J, Virmani R. Coronary plaque erosion without rupture into a lipid core. A frequent cause of coronary thrombosis in sudden coronary death. Circulation 1996; 93:1354-63.

3. Kolodgie FD, Katocs AS, Jr., Largis EE, Wrenn SM, Cornhill JF, Herderick EE, Lee SJ, Virmani R. Hypercholesterolemia in the rabbit induced by feeding graded amounts of low-level cholesterol. Methodological considerations regarding individual variability in response to dietary cholesterol and development of lesion type. Arterioscler Thromb Vasc Biol 1996; 16:1454-64.

4. Burke AP, Farb A, Liang YH, Smialek J, Virmani R. Effect of hypertension and cardiac hypertrophy on coronary artery morphology in sudden cardiac death. Circulation 1996; 94:3138-45.
5. Carr S, Farb A, Pearce WH, Virmani R, Yao JS. Atherosclerotic plaque rupture in symptomatic carotid artery stenosis. J Vasc Surg 1996; 23:755-65; discussion 765-6.

6. Burke AP, Farb A, Malcom GT, Liang YH, Smialek J, Virmani R. Coronary risk factors and plaque morphology in men with coronary disease who died suddenly. N Engl J Med 1997; 336:1276-82.

7. Burke AP, Farb A, Malcom GT, Liang Y, Smialek J, Virmani R. Effect of risk factors on the mechanism of acute thrombosis and sudden coronary death in women. Circulation 1998; 97:2110-6.

8. Carr SC, Farb A, Pearce WH, Virmani R, Yao JS. Activated inflammatory cells are associated with plaque rupture in carotid artery stenosis. Surgery 1997; 122:757-63; discussion 763-4.

9. Virmani R, Burke A, Farb A. Coronary risk factors and plaque morphology in men with coronary disease who died suddenly. Eur Heart J 1998; 19:678-80.

10. Burke AP, Farb A, Malcom GT, Liang Y, Smialek JE, Virmani R. Plaque rupture and sudden death related to exertion in men with coronary artery disease. JAMA 1999; 281:921-6.

11. Taylor AT, Burke AP, O'Malley PG, Farb A, Malcom GT, Smialek J, Virmani R. A comparison of the Framingham Risk Index, coronary artery calcification, and culprit plaque morphology in Sudden Cardiac Death. Circulation. 101:1243-1248. 2000

12. Burke AP, Taylor A, Farb A, Malcolm GT, Virmani R. Coronary calcification: insights from sudden coronary death victims. Zeitschrift Kardiologie., Vol 89: Suppl 2, II/49-II/53.2000.

13. Virmani R, Kolodgie F, Burke A, Farb A, Schwartz S. Lessons from sudden coronary death. A comprehensive morphological classification scheme for atherosclerotic lesions. Arterioscler Thromb Vasc Biol 2000;20:1262-1275.

14. Arbustini E, Dal Bello B, Morbini P, Burke AP, Specchia G, Virmani R. Plaque erosion is a major substrate for coronary thrombosis in acute myocardial infarction. Heart. 1999 Sep;82 (3) :269-72.

15. Kolodgie FD, Narula J, Burke AP, Haider N, Farb A, Hui-Liang Y, Smialek J, Virmani R. Localization of apoptotic macrophages at the site of plaque rupture in sudden coronary death. Am J Pathol. 2000 Oct;157(4):1259-68.

16. Burke AP, Kolodgie FD, Farb A, Weber DK, Malcom GT, Smialek J, Virmani R. Healed plaque ruptures and sudden coronary death: evidence that subclinical rupture has a role in plaque progression. Circulation. 2001 Feb 20;103(7):934-40.

17. Huang H, Virmani R, Younis H, Burke AP, Kamm RD, Lee RT. The impact of calcification on the biomechanical stability of athe-rosclerotic plaques. Circulation. 2001 Feb 27;103(8):1051-6.

18. Sugiyama S, Okada Y, Sukhova GK, Virmani R, Heinecke JW, Libby P. Macrophage myeloperoxidase regulation by granulocyte machrophage colony-stimulating factor in human atherosclerosis and implications in acute coronary syndromes. Am J Pathol. 2001 Mar;158(3):879-91.

19. Kolodgie FD, Burke AP, Farb A, Gold HK, Yuan J, NarulaJ, Finn AV, Virmani R. The thin-cap fibroatheroma: a type of vulnerable plaque: the major precusolesion to acute coronary syndromes. Curr Opin Cardiol. 2001 Sep;16(5):285-92.

20. Burke AP, Kolodgie FD, Farb A, Weber D, Virmani R. Morphological predictors of arterial remodeling in coronary atherosclerosis. *Circ*. 2002; 105(3):297-303.

21. Burke AP, Farb A, Pestaner J, Malcom GT, Zieske A, Kutys R, Smialek J, Virmani R. Traditional risk factors and the incidence of sudden coronary death with and without coronary thrombosis in blacks. *Circ*. 2002; 105:419-424.

22. Kolodgie FD, Narula J, Haider N, Virmani R. Apoptosis in atherosclerosis. Does it Contribute to Plaque Instability? *Cardiol Clinics*. 2001; 19:127-39.

23. Burke AP, Tracy RP, Kolodgie F, Malcom GT, Zieske A, Kutys R, Pestaner J, Smialek J, Virmani R. Elevated C-Reactive protein values and atherosclerosis in sudden coronary death. Association with different pathologies. *Circ*. 2002; 105:2019-2023.

24. Virmani R, Burke AP, Farb A, Kolodgie FD. Vulnerable Plaque: The Pathology of Unstable Coronary Lesions. *J Interven Cardiol* 2002; 15(6): 439-446.

25. Kolodgie FD, Burke AP, Farb A, Weber DK, Kutys R, Wight TN, Virmani R. Differential accumulation of proteoglycans and hyaluronan in culprit lesions. Insights into plaque erosion. *Arterioscler Thromb Vasc Biol.* 2002; 22:1642-1648.

26. Burke AP, Fonseca V, Kolodgie F, Zieske A, Fink L, Virmani R. Increased serum homocysteine and sudden death resulting from coronary atherosclerosis with fibrous plaques. *Arterioscler Thromb Vasc Biol.* 2002; 22:1936-1941.

27. Burke AP, Tracy RP, Kolodgie F, Malcom GT, Zieske A, Kutys R, Pestaner J, Smialek J, Virmani R. Elevated C-reactive protein values and atherosclerosis in sudden coronary death: association with different pathologies. *Circ.* 2002; 105 (17):2019-23.

28. Virmani R, Burke AP, Kolodgie, Farb A. Pathology of the thin-cap fibroatheroma: A type of vulnerable plaque. *J Interv Cardiol.* 2003; 16(3):267-72. Review.

29. Burke AP, Virmani R, Galis G, Haudenschild CC, Muller JE. 34th Bethesda Conference: Task force #2—What is the pathologic basis for new atherosclerosis imaging techniques? *JACC.* 2003; 41(11):1874-86.

30. Kolodgie FD, Petrov A, Virmani R, Narula N, Verjans JW, Weber DK, Hartung D, Steinmetz N, Vanderheyden JL, Vannan MA, Gold HK, Reutelingsperger CP, Hofstra L, Narula J. Targeting of apoptotic macrophages and experimental atheroma with radiolabeled annexin V: a technique with potential for noninvasive imaging of vulnerable plaque. *Circulation.* 2003; 108(25):3134-9.

31. Kolodgie FD, Gold HK, Burke AP, Fowler DR, Kruth HS, Weber DK, Farb A, Guerrero LJ, Hayase M, Kutys R, Narula J, Finn AV, Virmani R. Intraplaque hemorrhage and progression of coronary atheroma. *E Engl J Med.* 2003; 349(24):2316-25.

Stents and Stent Grafts

32. Barth KH, Virmani R, Froehlich J, Takeda T, Lossef SV, Newsome J, Jones R, Lindisch D. Paired comparison of vascular wall reactions to Palmaz stents, Strecker tantalum stents, and Wallstents in canine iliac and femoral arteries. Circulation 1996; 93:2161-9.

33. Carter AJ, Laird JR, Kufs WM, Bailey L, Hoopes TG, Reeves T, Farb A, Virmani R. Coronary stenting with a novel stainless steel balloon-expandable stent: determinants of neointimal formation and changes in arterial geometry after placement in an atherosclerotic model. J Am Coll Cardiol 1996; 27:1270-7.

34. Farb A, Lee SJ, Min DH, Parandoosh Z, Cook J, McDonald J, Pierce GF, Virmani R. Vascular smooth muscle cell cytotoxicity and sustained inhibition of neointimal formation by fibroblast growth factor 2-saporin fusion protein. Circ Res 1997; 80:542-50.

35. Carter AJ, Laird JR, Bailey LR, Hoopes TG, Farb A, Fischell DR, Fischell RE, Fischell TA, Virmani R. Effects of endovascular radiation from a beta-particle-emitting stent in a porcine coronary restenosis model. A dose-response study. Circulation 1996; 94:2364-8.

36. Carter AJ, Scott D, Laird JR, Bailey L, Kovach JA, Hoopes TG, Pierce K, Heath K, Hess K, Farb A, Virmani R. Progressive vascular remodeling and reduced neointimal formation after placement of a thermoelastic self-expanding nitinol stent in an experimental model. Cathet Cardiovasc Diagn 1998; 44:193-201.

37. Farb A, Sangiorgi G, Carter AJ, Walley VM, Edwards WD, Schwartz RS, Virmani R. Pathology of acute and chronic coronary stenting in humans. Circulation 1999; 99:44-52.

38. Farb A, Lindsay J, Jr., Virmani R. Pathology of bailout coronary stenting in human beings. Am Heart J 1999; 137:621-31.

39. Virmani R, Kolodgie FD, Dake MD, Silver JH, Jones RM, Jenkins M, Gillespie DL. Histopathologic evaluation of an expanded polytetrafluoroethylene-nitinol stent endoprosthesis in canine iliofemoral arteries. J Vasc Interv Radiol 1999; 10:445-56.

40. Sangiorgi G, Farb A, Carter AJ, Edwards WD, Holmes DR, Virmani R, Schwartz RS. Histopathology of Post-PTCA Remodeling in Human Coronary Arteries. Am Heart J 1999;138:681-7.

41. Farb A, Virmani R. Arterial restenosis: Focus on inflammatory cell infiltration and adhesion molecules. *Current Opinion in Anti-Inflammatory & Immunomodulatory Investigational Drugs.* 2000; 2(3):206-218.

42. Cejna M, Virmani R, Jones R, Bergmeister H, Losert U, Xu Z, Yang P, Schoder M, Lamme. Biocompatibility and performance of the wallstent and several covered stents in a sheep iliac artery model. J Vasc Interv Radiol. 2001 Mar;12(3):351-8.

43. Farb A, Shroff S, John M, Sweet W, Virmani R. Late arterial responses (6 and 12 months) after (32)P beta-emitting stent placement sustained intimal supression with incomplete healing. Circulation. 2001 Apr 10;103(14):1912-9.

44. Taylor AJ, Gorman PD, Kenwood B, Hudak C, Tashko G, Virmani R. A comparison of four stent designs on arterial injury, cellular proliferation, formation, and arterial dimensions in an experimental porcine model. Catheter Cardiovasc Interv. 2001 Jul;53(3):420-5.

45. Farb A, Heller PF, Shroff S, Cheng L, Kolodgie FD, Carter AJ, Scott DS, Froehlich J, Virmani R. Pathological analysis of local delivery of paclitaxel via a polymer-coated stent. Circ. 2001 Jul 24;104(4):473-9.

46. Farb A, Weber DK, Kolodgie FD, Burke AP, Virmani R. Morphological predictors of restenosis after coronary stenting in humans. *Circ.* 2002; 105:2974-2980.

47. Farb A, John M, Acampado E, Kolodgie FD, Prescott MF, Virmani R. Oral everolimus inhibits in-stent neointimal growth. *Circ*. 2002; 106:2379-2384.

48. Kolodgie FD, John M, Khurana C, Farb A, Wilson PS, Acampado E, Desai N, Soon-Shiong P, Virmani R. Sustained reduction of in-stent neointimal growth with the use of a novel systemic nanoparticle paclitaxel. *Circ*. 2002; 106:1195-1198.

49. Finn AV, Gold HK, Tang A, Weber DK, Wight TN, Clermont A, Virmani R, Kolodgie FD. A novel rat model of carotid artery stenting for the understanding of restenosis in metabolic diseases. *J Vasc Res*. 2002; 39:414-425.

50. Virmani R, Liistro F, Stankovic G, Di Mario C, Montorfano M, Farb A, Kolodgie FD, Colombo A. Mechanism of late in-stent restenosis after implantation of a Paclitaxel derivate-eluting polymer stent system in humans. *Circ*. 2002; 106:2649-51.

51. Nakai T, Lesh MD, Gerstenfeld EP, Virmani R, Jones R, Lee RJ. Percutaneous left atrial appendage occlusion (PLAATO) for preventing cardioembolism: first experience in canine model. *Circ*. 2002; 105 (18):2217-2222.

52. Schwartz RS, Edelman ER, Carter A, Chronos N, Rogers C, Robinson KA, Waksman R, Weinberger J, Wilensky RL, Jensen DN, Zuckerman BD, Virmani R; Consensus Committee. Drug-eluting stents in preclinical studies: recommended evaluation from a consensus group. *Circ.* 2002; 106(14):1867-73.

53. Virmani R, Farb A, Kolodgie FD, Lafont A. Drug eluting stents: are clinical and animal studies comparable. *Heart*. 2003;89:133-138.

54. Guagliumi G, Farb A, Musumeci G, Valsecchi O, Tespili M, Motta T, Virmani R. Images in cardiovascular medicine. Sirolimus-eluting stent implanted in human coronary artery for 16 months. Pathological findings. *Circ.* 2003;107:1340-1341.

55. Cheneau E, John MC, Fournadjiev J, Chan RC, Kim HS, Leborgne L, Pakala R, Yazdi H, Ajani AE, Virmani R, Waksman R. Time course of stent endothelialization after intravascular radiation therapy in rabbit iliac arteries. *Circ*. 2003; 107(16):2153-8.

56. Guagliumi G, Virmani R, Musumeci G, Motta T, Valsecchi O, Bonaldi G, Saino A, Tespili M, Greco N, Farb A. Drug-eluting versus bare metal stents: long-term human pathology. Findings from different coronary arteries in the same patient. *Ital Heart J*. 2003; 4(10):713020.

57. Farb A, Burke AP, Kolodgie FD, Virmani R. Pathological mechanisms of fatal late coronary stent thrombosis in humans. *Circulation*. 108(14):1701-6.

58. Strauss BH, Goldman L, Qiang B, Nili N, Segev A, Butany J, Sparkes JD, Jackson ZS, Eskandarian MR, Virmani R. Collagenase plaque digestion for facilitating guide wire crossing in chronic total occlusions. *Circulation*. 2003; 108(10)1259-62.

Books Edited

1. Virmani R, Forman MB. Non-atherosclerotic Ischemic Heart Disease. Raven Press, New York, NY. 1989

2. Virmani R, Atkinson JB, Fenoglio JJ. Cardiovascular Pathology. W.B. Saunders, Philadelphia, PA. 1991

3. Virmani R, Burke A. Atlas of Tumor Pathology: Tumors of the Heart and Great Vessel. Armed Forces Instititue of Patholgy, Washington,DC. 1996

4. Virmani R, Burke A, Farb A. Atlas of Cardiovascular Pathology. W.B. Saunders, Philadelphia, PA. 1996

5. Renu Virmani. Guest Editor, Pathology Case Reviews November/December 2001, Volume 6, Number 6

6. Virmani R, Burke A, Farb A, Atkinson JB. *Cardiovascular Pathology,* Second Edition. Philadelphia, PA: W.B. Saunders Company; 2001.

7. Narula J, Virmani R, Ballester M, Carrio I, Westaby S, Frazier O, Willerson JT. *Heart Failure Pathogenesis and Treatment*. London, England: Martin Dunitz Ltd; 2002:69-103.