

Advertisement



We know you're busy, so we'll make it quick:
Try NEJM Online for 21 days... absolutely FREE!
 Start your free trial now! ▶



The NEW ENGLAND JOURNAL of MEDICINE

FREE NEJM E-TOC

HOME

SUBSCRIBE

CURRENT ISSUE

PAST ISSUES

COLLECTIONS

Keyword, citation, or author

SEARCH

Advanced Search

Sign in | Get NEJM's E-Mail Table of Contents — Free | Subscribe

ORIGINAL ARTICLE

◀ Previous

Volume 359:2195-2207

November 20, 2008

Number 21

Next ▶

Rosuvastatin to Prevent Vascular Events in Men and Women with Elevated C-Reactive Protein

Paul M Ridker, M.D., Eleanor Danielson, M.I.A., Francisco A.H. Fonseca, M.D., Jacques Genest, M.D., Antonio M. Gotto, Jr., M.D., John J.P. Kastelein, M.D., Wolfgang Koenig, M.D., Peter Libby, M.D., Alberto J. Lorenzatti, M.D., Jean G. MacFadyen, B.A., Børge G. Nordestgaard, M.D., James Shepherd, M.D., James T. Willerson, M.D., Robert J. Glynn, Sc.D., for the JUPITER Study Group

Editor's note: We invite readers to submit comments on the JUPITER trial in a new interactive feature, Clinical Directions – [The JUPITER Trial: Will You Change Your Practice?](#) Commenting closes November 26, 2008.

NEJM's E-Mail
Table of Contents

SIGN UP NOW FREE

THIS ARTICLE

- ▶ Full Text
- ▶ PDF
- ▶ PDA Full Text
- ▶ PowerPoint Slide Set
- ▶ Supplementary Material

COMMENTARY

- ▶ Editorial
by Hlatky, M. A.
- ▶ Editorial
by Kritek, P.
- ▶ Letters

TOOLS & SERVICES

- ▶ Add to Personal Archive
- ▶ Add to Citation Manager
- ▶ Notify a Friend
- ▶ E-mail When Cited
- ▶ E-mail When Letters Appear

MORE INFORMATION

- ▶ PubMed Citation

ABSTRACT

Background Increased levels of the inflammatory biomarker high-sensitivity C-reactive protein predict cardiovascular events. Since statins lower levels of high-sensitivity C-reactive protein as well as cholesterol, we hypothesized that people with elevated high-sensitivity C-reactive protein levels but without hyperlipidemia might benefit from statin treatment.

Methods We randomly assigned 17,802 apparently healthy men and women with low-density lipoprotein (LDL) cholesterol levels of less than 130 mg per deciliter (3.4 mmol per liter) and high-sensitivity C-reactive protein levels of 2.0 mg per liter or higher to rosuvastatin, 20 mg daily, or placebo and followed them for the occurrence of the combined primary end point of myocardial infarction, stroke, arterial revascularization, hospitalization for unstable angina, or death from cardiovascular causes.

Results The trial was stopped after a median follow-up of 1.9 years (maximum, 5.0). Rosuvastatin reduced LDL cholesterol levels by 50% and high-sensitivity C-reactive protein levels by 37%. The rates of the primary end point were 0.77 and 1.36 per 100 person-years of follow-up in the rosuvastatin and placebo groups, respectively (hazard ratio for rosuvastatin, 0.56; 95% confidence interval [CI], 0.46 to 0.69; $P < 0.00001$), with corresponding rates of 0.17 and 0.37 for myocardial infarction (hazard ratio, 0.46; 95% CI, 0.30 to 0.70; $P = 0.0002$), 0.18 and 0.34 for stroke (hazard ratio, 0.52; 95% CI, 0.34 to 0.79; $P = 0.002$), 0.41 and 0.77 for revascularization or unstable angina (hazard ratio, 0.53; 95% CI, 0.40 to 0.70; $P < 0.00001$), 0.45 and 0.85 for the combined end point of myocardial infarction, stroke, or death from cardiovascular causes (hazard ratio, 0.53; 95% CI, 0.40 to 0.69; $P < 0.00001$), and 1.00 and 1.25 for death from any cause (hazard ratio, 0.80; 95% CI, 0.67 to 0.97; $P = 0.02$). Consistent effects were observed in all subgroups evaluated. The rosuvastatin group did not have a significant increase in myopathy or cancer but did have a higher incidence of physician-reported diabetes.

Conclusions In this trial of apparently healthy persons without hyperlipidemia but with elevated high-sensitivity C-reactive protein levels, rosuvastatin significantly reduced the incidence of major cardiovascular events. (ClinicalTrials.gov number, NCT00239681 [[ClinicalTrials.gov](#)].)

Source Information

From the Center for Cardiovascular Disease Prevention (P.M.R., E.D., J.G.M., R.J.G.) and Division of Cardiovascular Medicine (P.M.R., P.L.), Brigham and Women's Hospital, Harvard Medical School, Boston; Universidade Federal de São Paulo, São Paulo (F.A.H.F.); McGill University Health Center, Montreal (J.G.); Weill Cornell Medical College of Cornell University, New York (A.M.G.); Department of Vascular Medicine, Academic Medical Center, University of Amsterdam, Amsterdam (J.J.P.K.); University of Ulm Medical Center, Ulm, Germany (W.K.); Hospital Cordoba, Cordoba, Argentina (A.J.L.); Herlev Hospital, Copenhagen University Hospital, Herlev, Denmark (B.G.N.); University of Glasgow, Glasgow, Scotland (J.S.); and St. Luke's Episcopal Hospital—Texas Heart Institute, Houston (J.T.W.).

This article (10.1056/NEJMoa0807646) was published at www.nejm.org on November 9, 2008.

Address reprint requests to Dr. Ridker at the Center for Cardiovascular Disease Prevention, Brigham and Women's Hospital, Boston, MA 02215, or at pridker@partners.org.

Full Text of this Article

Related Letters:

Rosuvastatin in Patients with Elevated C-Reactive Protein

Gibbons R. J., Fugh-Berman A., Chan P. S., Nallamothu B. K., Hayward R. A., Jenny-Avital E. R., Mak K.-H., Chan E. S.-Y., Pierard L. A., Davis C. E., Koller M. T., Bucher H. C., Steyerberg E. W., Ridker P. M., Glynn R. J.

[Extract](#) | [Full Text](#) | [PDF](#)

N Engl J Med 2009; 360:1038-1042, Mar 5, 2009. **Correspondence**

This article has been cited by other articles:

- Gellad, W. F., Detsky, A. S., Choudhry, N. K. (2009). Implications of recent clinical trials on pay-for-performance. *Am J Health Syst Pharm* 66: 864-867 [\[Full Text\]](#)
- Sosnovik, D. E. (2009). Will Molecular MR Imaging Play a Role in Identification and Treatment of Patients with Vulnerable Atherosclerotic Plaques?. *Radiology* 251: 309-310 [\[Full Text\]](#)
- Ashikaga, H., Marine, J. E (2009). Prevention of atrial fibrillation: another good reason to recommend statins to women?. *Heart* 95: 693-694 [\[Full Text\]](#)
- Lundberg, J. O. (2009). Cardiovascular prevention by dietary nitrate and nitrite. *Am. J. Physiol. Heart Circ. Physiol.* 296: H1221-H1223 [\[Full Text\]](#)
- Glynn, R. J., Danielson, E., Fonseca, F. A.H., Genest, J., Gotto, A. M. Jr., Kastelein, J. J.P., Koenig, W., Libby, P., Lorenzatti, A. J., MacFadyen, J. G., Nordestgaard, B. G., Shepherd, J., Willerson, J. T., Ridker, P. M (2009). A Randomized Trial of Rosuvastatin in the Prevention of Venous Thromboembolism. *NEJM* 360: 1851-1861 [\[Abstract\]](#) [\[Full Text\]](#)
- Farrelly, C. (2009). Towards a more inclusive vision of the medical sciences. *QJM* 0: hcp049v1-hcp049 [\[Abstract\]](#) [\[Full Text\]](#)
- Fayad, Z. A., Razzouk, L., Briley-Saebo, K. C., Mani, V. (2009). Iron Oxides Magnetic Resonance Imaging for Atherosclerosis Therapeutic Evaluation: Still "Rusty?". *J Am Coll Cardiol* 0: j.jacc.2009.03.021v1-14703 [\[Full Text\]](#)
- Sanz, J., Moreno, P. R., Fuster, V. (2009). The year in atherothrombosis.. *J Am Coll Cardiol* 53: 1326-1337 [\[Full Text\]](#)
- Fellstrom, B. C., Jardine, A. G., Schmieder, R. E., Holdaas, H., Bannister, K., Beutler, J., Chae, D.-W., Chevaile, A., Cobbe, S. M., Gronhagen-Riska, C., De Lima, J. J., Lins, R., Mayer, G., McMahon, A. W., Parving, H.-H., Remuzzi, G., Samuelsson, O., Sonkodi, S., Sci., D., Suleymanlar, G., Tsakiris, D., Tesar, V., Todorov, V., Wiecek, A., Wuthrich, R. P., Gottlow, M., Johnsson, E., Zannad, F., the AURORA Study Group. (2009). Rosuvastatin and Cardiovascular Events in Patients Undergoing Hemodialysis. *NEJM* 360: 1395-1407 [\[Abstract\]](#) [\[Full Text\]](#)
- Sattar, N., Hingorani, A. D. (2009). C-Reactive Protein and Prognosis in Diabetes: Getting to the Heart of the Matter. *Diabetes* 58: 798-799 [\[Full Text\]](#)
- BHATT, D. L., KOTTKE-MARCHANT, K., ALEXANDER, J. H., PEACOCK, W. F., SABATINE, M. S. (2009). Platelet response in practice: Applying new insights and tools for testing and treatment. *Cleveland Clinic Journal of Medicine* 76: S24-S32 [\[Full Text\]](#)
- Stein, E. A. (2009). Low-Density Lipoprotein Cholesterol Reduction and Prevention of Cardiovascular Disease. *Mayo Clin Proc.* 84: 307-309 [\[Full Text\]](#)
- Karalis, D. G. (2009). Intensive Lowering of Low-Density Lipoprotein Cholesterol Levels for Primary Prevention of Coronary Artery Disease. *Mayo Clin Proc.* 84: 345-352 [\[Abstract\]](#) [\[Full Text\]](#)
- Al Badarin, F. J., Kullo, I. J., Kopecky, S. L., Thomas, R. J. (2009). Impact of Ezetimibe on Atherosclerosis: Is the Jury Still Out?. *Mayo Clin Proc.* 84: 353-361 [\[Abstract\]](#) [\[Full Text\]](#)
- Libby, P. (2009). Molecular and cellular mechanisms of the thrombotic complications of atherosclerosis. *J. Lipid Res.* 50: S352-S357 [\[Abstract\]](#) [\[Full Text\]](#)
- Torrens, C., Kelsall, C. J., Hopkins, L. A., Anthony, F. W., Curzen, N. P., Hanson, M. A. (2009). Atorvastatin Restores Endothelial Function in Offspring of Protein-Restricted Rats in a Cholesterol-Independent Manner. *Hypertension* 53: 661-667 [\[Abstract\]](#) [\[Full Text\]](#)
- Mathieu, P., Poirier, P., Pibarot, P., Lemieux, I., Despres, J.-P. (2009). Visceral Obesity: The Link Among Inflammation, Hypertension, and Cardiovascular Disease. *Hypertension* 53: 577-584 [\[Full Text\]](#)
- Lauer, M. S. (2009). Discarding Logic: 2008 Ancel Keys Memorial Lecture. *Circulation* 119: 1533-1537 [\[Full Text\]](#)
- Michos, E. D., Blumenthal, R. S. (2009). Prevalence of low low-density lipoprotein cholesterol with elevated high sensitivity C-reactive protein in the U.S.: implications of the JUPITER (Justification for the Use of Statins in Primary Prevention: An Intervention Trial Evaluating Rosuvastatin) study.. *J Am Coll Cardiol* 53: 931-935 [\[Abstract\]](#) [\[Full Text\]](#)
- Kritek, P., Campion, E. W. (2009). JUPITER Clinical Directions -- Polling Results. *NEJM* 360: e14-e14 [\[Full Text\]](#)
- Gibbons, R. J., Fugh-Berman, A., Chan, P. S., Nallamothu, B. K., Hayward, R. A., Jenny-Avital, E. R., Mak, K.-H., Chan, E. S.-Y., Pierard, L. A., Davis, C. E., Koller, M. T., Bucher, H. C., Steyerberg, E. W., Ridker, P. M., Glynn, R. J. (2009). Rosuvastatin in Patients with Elevated C-Reactive Protein. *NEJM* 360: 1038-1042 [\[Full Text\]](#)
- Song, S. H., Gray, T. A (2009). Management of type 2 diabetes and lipids: a critique of the NICE guidelines 2008. *British Journal of Diabetes & Vascular Disease* 9: 69-74 [\[Abstract\]](#)
- Kang, P. M., Ruel, M., Sellke, F. W. (2009). Highlights from the 2008 American Heart Association scientific session.. *J. Thorac. Cardiovasc. Surg.* 137: 791-794 [\[Full Text\]](#)
- Dobkin, B. H. (2009). Progressive Staging of Pilot Studies to Improve Phase III Trials for Motor Interventions. *Neurorehabil Neural Repair* 23: 197-206 [\[Abstract\]](#)
- Kaul, P., Douglas, P. S. (2009). Atherosclerosis Imaging: Prognostically Useful or Merely More of What We Know?. *Circ Cardiovasc Imaging* 2: 150-160 [\[Full Text\]](#)
- MacDonald, M. L.E., van Eck, M., Hildebrand, R. B., Wong, B. W.C., Bissada, N., Ruddle, P., Kontush, A., Hussein, H., Pouladi, M. A., Chapman, M. J., Fievet, C., van Berkel, T. J.C., Staels, B., McManus, B. M., Hayden, M. R. (2009). Despite Antiatherogenic Metabolic Characteristics, SCD1-Deficient Mice Have Increased Inflammation and Atherosclerosis. *Arterioscler. Thromb. Vasc. Bio.* 29: 341-347 [\[Abstract\]](#) [\[Full Text\]](#)
- Coull, B. M., Johnston, S. C. (2009). Statins: Not just for the young or the faint of heart. *Neurology* 72: 684-685 [\[Full Text\]](#)
- Rana, J. S., Arsenaault, B. J., Despres, J.-P., Cote, M., Talmud, P. J., Ninio, E., Jukema, J. W., Wareham, N. J., Kastelein, J. J.P., Khaw, K.-T., Boekholdt, S. M. (2009). Inflammatory biomarkers, physical activity, waist circumference, and risk of future coronary heart disease in healthy men and women. *Eur Heart J* 0: ehp010v1-9 [\[Abstract\]](#) [\[Full Text\]](#)
- Paraskevas, K. I., Bessias, N., Papas, T. T., Andrikopoulos, V., Mikhailidis, D. P. (2009). Is High-sensitivity C-reactive Protein Associated With Subclinical Peripheral Atherosclerosis?. *ANGIOLOGY* 60: 8-11
- Ridker, P. M (2009). Myocardial Infarction in a 72-Year-Old Woman with Low LDL-C and Increased hsCRP: Implications for Statin Therapy. *Clin. Chem.* 55: 369-374 [\[Full Text\]](#)
- Koenig, W. (2009). Is hsCRP Back on Board? Implications from the JUPITER Trial. *Clin. Chem.* 55: 216-218 [\[Full Text\]](#)
- Fujita, Y., Kakino, A., Nishimichi, N., Yamaguchi, S., Sato, Y., Machida, S., Cominacini, L., Delneste, Y., Matsuda, H., Sawamura, T. (2009). Oxidized LDL Receptor LOX-1 Binds to C-Reactive Protein and Mediates Its Vascular Effects. *Clin. Chem.* 55: 285-294 [\[Abstract\]](#) [\[Full Text\]](#)

- Mora, S., Musunuru, K., Blumenthal, R. S. (2009). The Clinical Utility of High-Sensitivity C-Reactive Protein in Cardiovascular Disease and the Potential Implication of JUPITER on Current Practice Guidelines. *Clin. Chem.* 55: 219-228 [[Abstract](#)] [[Full Text](#)]
- Collinson, P. O. (2009). Concentrations of C-Reactive Protein and B-Type Natriuretic Peptide 30 Days after Acute Coronary Syndromes Independently Predict Hospitalization for Heart Failure and Cardiovascular Death: Just Another Brick in the Wall?. *Clin. Chem.* 55: 203-205 [[Full Text](#)]
- Glynn, R. J., MacFadyen, J. G., Ridker, P. M. (2009). Tracking of High-Sensitivity C-Reactive Protein after an Initially Elevated Concentration: The JUPITER Study. *Clin. Chem.* 55: 305-312 [[Abstract](#)] [[Full Text](#)]
- Jialal, I., Verma, S., Devaraj, S. (2009). Inhibition of Endothelial Nitric Oxide Synthase by C-Reactive Protein: Clinical Relevance. *Clin. Chem.* 55: 206-208 [[Full Text](#)]
- Ridker, P. M. (2009). C-Reactive Protein: Eighty Years from Discovery to Emergence as a Major Risk Marker for Cardiovascular Disease. *Clin. Chem.* 55: 209-215 [[Full Text](#)]
- Vasan, R. S. (2009). Commentary: C-reactive protein and risk prediction--moving beyond associations to assessing predictive utility and clinical usefulness. *Int J Epidemiol* 38: 231-234 [[Full Text](#)]
- Miner, M. M. (2009). Erectile Dysfunction and the "Window of Curability": A Harbinger of Cardiovascular Events. *Mayo Clin Proc.* 84: 102-104 [[Full Text](#)]
- Newman, D. H., Steinberg, D. (2009). The Statins in Preventive Cardiology. *NEJM* 360: 541-542 [[Full Text](#)]
- Nambi, V., Ballantyne, C. M. (2009). "Risky Business": Ten Years Is Not a Lifetime. *Circulation* 119: 362-364 [[Full Text](#)]
- SHISHEHBOR, M. H., HAZEN, S. L. (2009). JUPITER to Earth: A statin helps people with normal LDL-C and high hs-CRP, but what does it mean?. *Cleveland Clinic Journal of Medicine* 76: 37-44 [[Abstract](#)] [[Full Text](#)]
- Spatz, E. S., Canavan, M. E., Desai, M. M. (2009). From Here to JUPITER: Identifying New Patients for Statin Therapy Using Data From the 1999-2004 National Health and Nutrition Examination Survey. *Circ Cardiovasc Qual Outcomes* 2: 41-48 [[Abstract](#)] [[Full Text](#)]
- Krasuski, R. A. (2008). Primary Prevention and Statins: Is It Just About Going to Class?. *Mayo Clin Proc.* 83: 1313-1315 [[Full Text](#)]
- Hlatky, M. A. (2008). Expanding the Orbit of Primary Prevention -- Moving beyond JUPITER. *NEJM* 359: 2280-2282 [[Full Text](#)]
- (2008). More Data on Statins in Primary Prevention -- The JUPITER Study. *JWatch General* 2008: 1-1 [[Full Text](#)]
- Donner-Banzhoff, N., Sonnichsen, A. (2008). Statins and primary prevention of cardiovascular events. *BMJ* 337: a2576-a2576 [[Full Text](#)]

HOME | SUBSCRIBE | SEARCH | CURRENT ISSUE | PAST ISSUES | COLLECTIONS | PRIVACY | TERMS OF USE | HELP | beta.nejm.org

Comments and questions? Please [contact us](#).

The New England Journal of Medicine is owned, published, and [copyrighted](#) © 2009 [Massachusetts Medical Society](#). All rights reserved.