



Large-scale association analysis identifies new lung cancer susceptibility loci and heterogeneity in genetic susceptibility across histological subtypes

Citation

McKay, James D, Rayjean J Hung, Younghun Han, Xuchen Zong, Robert Carreras-Torres, David C Christiani, Neil E Caporaso, et al. 2017. "Large-Scale Association Analysis Identifies New Lung Cancer Susceptibility Loci and Heterogeneity in Genetic Susceptibility Across Histological Subtypes." *Nature Genetics* 49 (7) (June 12): 1126–1132. doi:10.1038/ng.3892.

Published Version

doi:10.1038/ng.3892

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:33746109>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Title: Large scale genetic analysis identifies novel loci and histological variability in susceptibility to lung cancer.

James D. McKay*¹, Rayjean J. Hung*², Younghun Han³, Xuchen Zong², Robert Carreras-Torres¹, David C. Christiani⁴, Neil Caporaso⁵, Mattias Johansson¹, Xiangjun Xiao³, Yafang Li³, Jinyoung Byun³, Alison Dunning⁶, Karen Pooley⁶, David C. Qian³, Xuemei Ji³, Geoffrey Liu², Maria Timofeeva¹, Stig E. Bojesen⁷⁻⁹, Xifeng Wu¹⁰, Loic Le Marchand¹¹, Demetrios Albanes⁵, Heike Bickeböller¹², Melinda C. Aldrich¹³, William S. Bush¹⁴, Adonina Tardon¹⁵, Gad Rennert¹⁶, M. Dawn Teare¹⁷, John K. Field¹⁸, Lambertus A. Kiemeny¹⁹, Philip Lazarus²⁰, Aage Haugen²¹, Stephen Lam²², Matthew B. Schabath²³, Angeline S. Andrew²⁴, Hongbing Shen²⁵, Yun-Chul Hong²⁶, Jian-Min Yuan²⁷, Pier Alberto Bertazzi^{28,29}, Angela C. Pesator²⁹, Yuanqing Ye¹⁰, Nancy Diao⁴, Li Su⁴, Ruyang Zhang⁴, Yonathan Brhane², Natasha Leighl³⁰, Jakob S. Johansen³¹, Anders Møllegaard³¹, Dr. Walid Saliba¹⁶, Christopher Haiman³², Lynne Wilkens¹¹, Ana Fernandez-Somoano¹⁵, Guillermo Fernandez-Tardon¹⁵, Henricus F.M. van der Heijden¹⁹, Jin Hee Kim³³, Juncheng Dai²⁵, Zhibin Hu²⁵, Michael PA Davies¹⁸, Michael W. Marcus¹⁸, Hans Brunnström³⁴, Jonas Manjer³⁵, Olle Melander³⁵, David C. Muller³⁶, Kim Overvad³⁷, Antonia Trichopoulou³⁸, Rosario Tumino³⁹, Jennifer Doherty^{24,40}, Matt Barnett⁴⁰, Chu Chen⁴⁰, Gary Goodman⁴¹, Angela Cox⁴², Fiona Taylor⁴², Penella Woll⁴², Irene Brüske⁴³, H.-Erich Wichmann⁴³, Judith Manz⁴³, Thomas Muley^{44,45}, Angela Risch⁴⁵⁻⁴⁷, Albert Rosenberger¹², Kjell Grankvist⁴⁸, Mikael Johansson⁴⁹, Frances A. Shepherd⁵⁰, Ming-Sound Tsao⁵⁰, Susanne M. Arnold⁵¹, Eric B. Haura⁵², Ciprian Bolca⁵³, Ivana Holcatova⁵⁴, Vladimir Janout⁵⁴, Milica Kontic⁵⁵, Jolanta Lissowska⁵⁶, Anush Mukeria⁵⁷, Simona Ognjanovic⁵⁸, Tadeusz M. Orłowski⁵⁹, Ghislaine Scelo¹, Beata Swiatkowska⁶⁰, David Zaridze⁵⁷, Per Bakke⁶¹, Vidar Skaug²¹, Shanbeh Zienolddiny²¹, Eric J. Duell⁶², Lesley M. Butler²⁷, Woon-Puay Koh⁶³, Yu-Tang Gao⁶⁴, Richard Houlston⁶⁵, John McLaughlin⁶⁶, Victoria Stevens⁶⁷, Philippe Joubert⁶⁸, Maxime Lamontagne⁶⁸, David C. Nickle⁶⁹, Ma'en Obeidat⁷⁰, Wim Timens⁷¹, Bin Zhu⁵, Lei Song⁵, Linda Kachuri², María Soler Artigas^{72,73}, Martin D. Tobin^{72,73}, Louise V. Wain^{72,73}, SpiroMeta Consortium⁷⁴, Thorunn Rafnar⁷⁵, Thorgeir E. Thorgeirsson⁷⁵, Gunnar W. Reginsson⁷⁵, Kari Stefansson⁷⁵, Dana B. Hancock⁷⁶, Laura J. Bierut⁷⁷, Margaret R. Spitz⁷⁸, Nathan C Gaddis⁷⁹, Sharon M. Lutz⁸⁰, Fangyi Gu⁵, Eric O. Johnson⁸¹, Ahsan Kamal³, Claudio Pikielny³, Dakai Zhu³, Sara Lindström⁸², Xia Jiang⁴, Rachel F. Tyndale^{83,84}, Georgia Chenevix-Trench⁸⁵, Jonathan Beesley⁸⁵, Yohan Bossé^{68,86}, Stephen Chanock⁵, Paul Brennan¹, Maria Teresa Landi⁵, Christopher I. Amos³

*these authors have equal contributions

1. International Agency for Research on Cancer, World Health Organization,, Lyon, France.
2. Lunenfeld-Tanenbaum Research Institute of Mount Sinai Hospital, University of Toronto, Toronto, Canada.
3. Biomedical Data Science, Geisel School of Medicine at Dartmouth, Hanover NH.
4. Department of Environmental Health, Harvard TH Chan School of Public Health, and Massachusetts General Hospital/ Harvard Medical School, Boston, MA. 02115.
5. Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Bethesda, MD.
6. Centre for Cancer Genetic Epidemiology, University of Cambridge, Cambridge, United Kingdom.

7. Department of Clinical Biochemistry, Herlev and Gentofte Hospital, Copenhagen University Hospital, Denmark.
8. Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark.
9. Copenhagen General Population Study, Herlev and Gentofte Hospital, Copenhagen, Denmark.
10. Department of Epidemiology, The University of Texas MD Anderson Cancer Center, Houston, TX USA.
11. Epidemiology Program, University of Hawaii Cancer Center, Honolulu, HI, USA.
12. Department of Genetic Epidemiology, University Medical Center, Georg-August-University Göttingen, Germany.
13. Department of Thoracic Surgery, Division of Epidemiology, Vanderbilt University Medical Center.
14. Department of Epidemiology and Biostatistics, School of Medicine, Case Western Reserve University, Cleveland, OH.
15. University of Oviedo and CIBERESP, Faculty of Medicine, Campus del Cristo s/n, 33006 Oviedo, Spain.
16. Clalit National Cancer Control Center at Carmel Medical Center and Technion Faculty of Medicine, Haifa, Israel.
17. School of Health and Related Research, University Of Sheffield, England, UK.
18. Institute of Translational Medicine, University of Liverpool, Liverpool, United Kingdom
19. Radboud University Medical Center, Nijmegen, The Netherlands.
20. Department of Pharmaceutical Sciences, College of Pharmacy, Washington State University, Spokane, Washington, USA.
21. National Institute of Occupational Health, Oslo, Norway.
22. British Columbia Cancer Agency, Vancouver, Canada.
23. Department of Cancer Epidemiology, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL.
24. Department of Epidemiology, Geisel School of Medicine, Hanover, NH.
25. Department of Epidemiology and Biostatistics, Jiangsu Key Lab of Cancer Biomarkers, Prevention and Treatment, Collaborative Innovation Center for Cancer Personalized Medicine, School of Public Health, Nanjing Medical University, Nanjing, P.R. China.
26. Department of Preventive Medicine, Seoul National University College of Medicine, Seoul, Republic of Korea.
27. University of Pittsburgh Cancer Institute, Pittsburgh, USA.
28. Department of Preventive Medicine, IRCCS Foundation Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy.
29. Department of Clinical Sciences and Community Health - DISCCO, University of Milan, Milan, Italy.
30. University Health Network- The Princess Margaret Cancer Centre, Toronto, CA.
31. Department of Oncology, Herlev and Gentofte Hospital, Copenhagen University Hospital, Denmark.
32. Department of Preventive Medicine, Keck School of Medicine, University of Southern California Norris Comprehensive Cancer Center, Los Angeles, CA.
33. Department of Integrative Bioscience & Biotechnology, Sejong University, Gwangjin-gu, Seoul, Republic of Korea.
34. Dept. of Pathology, Lund University, Lund, Sweden.
35. Faculty of Medicine, Lund University, Lund, Sweden.
36. School of Public Health, St Mary's Campus, Imperial College London, UK.
37. Section for Epidemiology, Department of Public Health, Aarhus University, Denmark.
38. Hellenic Health Foundation, Athens, GR

39. Molecular and Nutritional Epidemiology Unit CSPO (Cancer Research and Prevention Centre), Scientific Institute of Tuscany, Florence, Italy.
40. Fred Hutchinson Cancer Research Center, Seattle, Washington, USA.
41. Swedish Medical Group, Seattle, WA, USA
42. Department of Oncology, University of Sheffield, Sheffield, UK.
43. Research Unit of Molecular Epidemiology, Institute of Epidemiology II, Helmholtz Zentrum München, German Research Center for Environmental Health, Neuherberg, Germany.
44. Thoraxklinik at University Hospital Heidelberg
45. Translational Lung Research Center Heidelberg (TLRC-H), Heidelberg, Germany.
46. German Center for Lung Research (DZL), Heidelberg, Germany.
47. University of Salzburg and Cancer Cluster Salzburg, Austria
48. Department of Medical Biosciences, Umeå University, Umeå, Sweden
49. Department of Radiation Sciences, Umeå University, Umeå, Sweden
50. Princess Margaret Cancer Centre, Toronto, Canada.
51. University of Kentucky, Markey Cancer Center, Lexington, Kentucky, USA.
52. Department of Thoracic Oncology, H. Lee Moffitt Cancer Center and Research Institute, Tampa, Florida, USA.
53. Institute of Pneumology “Marius Nasta”, Bucharest, Romania.
54. Faculty of Medicine, University of Ostrava, Czech Republic.
55. Clinical Center of Serbia, Belgrade. School of Medicine, University of Belgrade.
56. M. Sklodowska-Curie Cancer Center, Institute of Oncology, Warsaw, Poland.
57. Department of Epidemiology and Prevention, Russian N.N.Blokhin Cancer Research Centre, Moscow, Russian Federation.
58. International Organization for Cancer Prevention and Research, Belgrade, Serbia.
59. Department of Surgery, National Tuberculosis and Lung Diseases Research Institute, Warsaw, Poland.
60. Nofer Institute of Occupational Medicine, Department of Environmental Epidemiology, Lodz, Poland.
61. Department of Clinical Science, University of Bergen, Bergen, Norway.
62. Unit of Nutrition and Cancer, Catalan Institute of Oncology (ICO-IDIBELL), Barcelona, Spain.
63. Duke-National University of Singapore Medical School, Singapore, Singapore.
64. Department of Epidemiology, Shanghai Cancer Institute, China.
65. The Institute of Cancer Research, London, England.
66. Public Health Ontario, Canada.
67. American Cancer Society, Inc., Atlanta, Georgia, USA.
68. Institut universitaire de cardiologie et de pneumologie de Québec, Québec, Canada.
69. Merck Research Laboratories, Genetics and Pharmacogenomics, Boston, MA, USA.
70. The University of British Columbia Centre for Heart Lung Innovation, St Paul’s Hospital, Vancouver, BC, Canada.
71. University of Groningen, Groningen, University Medical Center Groningen, Department of Pathology and Medical Biology, GRIAC Research Institute, The Netherlands.
72. Genetic Epidemiology Group, Department of Health Sciences, University of Leicester, Leicester LE1 7RH, UK
73. National Institute for Health Research (NIHR) Leicester Respiratory Biomedical Research Unit, Glenfield Hospital, Leicester, UK.
74. SpiroMeta Consortium see Supplemental Materials for full list of participating members.
75. deCODE Genetics, Amgen Inc., Reykjavik, Iceland.

76. Behavioral and Urban Health Program, Behavioral Health and Criminal Justice Division, RTI International, Research Triangle Park, North Carolina, USA.
77. Department of Psychiatry, Washington University School of Medicine, St. Louis, Missouri, USA.
78. Duncan Cancer Center, Baylor College of Medicine, Houston, TX 77030.
79. Research Computing Division, RTI International, Research Triangle Park, North Carolina, USA.
80. Department of Biostatistics and Informatics, University of Colorado Anschutz Medical Campus, Aurora, Colorado, USA.
81. *Program and Behavioral Health and Criminal Justice Division, RTI International, Research Triangle Park, North Carolina, USA.*
82. Department of Epidemiology, University of Washington, 1959 NE Pacific Street, Health Sciences Bldg, F-247B, Box 357236, Seattle, WA 98195.
83. Departments of Pharmacology and Toxicology & Psychiatry, Toronto, Ontario, Canada.
84. Campbell Family Mental Health Research Institute, Centre for Addiction and Mental Health, Toronto, Ontario, Canada.
85. Cancer Division, QIMR Berghofer Medical Research Institute, Brisbane, Queensland, Australia.
86. Department of Molecular Medicine, Laval University, Québec, Canada.