Abstract

On December 13, 2023, Australia became the first country to ban engineered stone. This material contains more than 80 percent crystalline silica, agglomerated with resins, metal oxides and other (potentially toxic) substances. Engineered stone has become a mass-market product since the late 1990s and has contributed to a worldwide resurgence of accelerated forms of silicosis and a notable incidence of systemic diseases. Such a ban is a very rare event in a world where the regulatory framework governing the use of toxic substances in the workplace is generally limited to setting exposure limits. The Australian decision is exemplary in many respects: it is based on public consultation with all stakeholders, it contributes to updating biomedical knowledge that industries seek to conceal or undermine, and it is based on a realistic vision of real working conditions. In the absence of any evidence that lowering the silica content of this material would reduce occupational hazards related to toxic cocktail effects, this ban implements an evidence-based and precautionary public health policy.

References

1. Commonwealth, State and Territory Workplace Relations and Work Health and Safety (WHS) Ministers. *Communique - Meeting of Workplace relations and work health and safety ministers*. *December* 2023. https://www.dewr.gov.au/work-health-and-safety-and-workplace-relations-ministers-meeting-13-december-2023-online-version. Accessed December 22, 2023.

Google Scholar

2. León-Jiménez A, Mánuel JM, García-Rojo M, et al. Compositional and structural analysis of engineered stones and inorganic particles in silicotic nodules of exposed workers. *Part Fibre Toxicol*. 2021;18(1):1-16. https://doi.org/10.1186/s12989-021-00434-x

PubMed | Web of Science | Google Scholar

3. Kuroda E, Ishii KJ, Uematsu S, et al. Silica crystals and aluminum salts regulate the production of prostaglandin in macrophages via NALP3 inflammasome-independent mechanisms. *Immunity*. 2011;34(4):514-526. https://doi.org/10.1016/j.immuni.2011.03.019

PubMed | Web of Science | Google Scholar

4. Ramkissoon C, Gaskin S, Hall T, Pisaniello D, Zosky G. Engineered stone fabrication work releases volatile organic compounds classified as lung irritants. *Ann Work Expo Health*. 2023;67(2):288-293. https://doi.org/10.1093/annweh/wxac068

PubMed | Web of Science | Google Scholar

5. Safe Work Australia. *Decision Regulation Impact Statement: Prohibition on the Use of Engineered Stone*. Safe Work Australia; 2023. https://www.safeworkaustralia.gov.au/doc/decision-regulation-impact-statement-prohibition-use-engineered-stone. Accessed November 2, 2023.

Google Scholar

6. Akgün M, Araz O, Akkurt I, et al. An epidemic of silicosis among former denim sandblasters. *Eur Respir J*. 2008;32(5):1295-1303. https://doi.org/10.1183/09031936.00093507

PubMed | Web of Science | Google Scholar

7. Quail T. Overview of silica-related clusters in the United States: Will fracking operations become the next cluster? *J Environ Health*. 2017;79(6):20-27.

PubMed | Web of Science | Google Scholar

8. Hoy RF, Jeebhay MF, Cavalin C, et al. Current global perspectives on silicosis-convergence of old and newly emergent hazards. *Respirology*. 2022;27(6):387-398. https://doi.org/10.1111/resp.14242

PubMed | Web of Science | Google Scholar

9. Rosental PA, Rosner D, Blanc PD, eds. Special issue: From silicosis to silica hazards: An experiment in medicine, history and the social sciences. *Am J Ind Med*. 2015;58(S1):1-71.

Crossref | PubMed | Web of Science | Google Scholar

10. Cavalin C, Lescoat A, Ballerie A, et al. Beyond silicosis, is the world failing on silica hazards? *Lancet Respir Med*. 2019;7(8):649-650. https://doi.org/10.1016/S2213-2600(19)30174-2

PubMed | Web of Science | Google Scholar

11. León-Jiménez A, Hidalgo-Molina A, Conde-Sánchez MÁ, et al. Artificial stone silicosis: Rapid progression following exposure cessation. *Chest*. 2020;158(3):1060-1068. https://doi.org/10.1016/j.chest.2020.03.026

PubMed | Web of Science | Google Scholar

12. Cavalin C, Lescoat A, Sigaux J, et al. Crystalline silica exposure in patients with rheumatoid arthritis and systemic sclerosis: A nationwide cross-sectional survey. *Rheumatology (Oxford)*. 2023;62(8):2707-2715. https://doi.org/10.1093/rheumatology/keac675

PubMed | Web of Science | Google Scholar

13. Miller F, Alfredsson L, Costenbader K, et al. Epidemiology of environmental exposures and human autoimmune diseases: Findings from a national institute of environmental health sciences expert panel workshop. *J Autoimmun*. 2012;39(4):259-271. https://doi.org/10.1016/j.jaut.2012.05.002

PubMed | Web of Science | Google Scholar

14. Turner MT, Samuel SR, Silverstone EJ, Yates DH. Silica exposure and connective tissue disease: An under-recognised association in three Australian artificial stone workers. *Am J Respir Crit Care Med*. 2020;201(3):378-380. https://doi.org/10.1164/rccm.201905-1057LE

PubMed | Web of Science | Google Scholar

15. Tomic D, Hoy RF, Sin J, et al. Autoimmune diseases, autoantibody status and silicosis in a cohort of 1238 workers from the artificial stone benchtop industry. *Occup Environ Med*. 2024;81(8):388-394. https://doi.org/10.1136/oemed-2024-109526

PubMed | Web of Science | Google Scholar

16. Patel S, Morrisroe K, Proudman S, et al. Occupational silica exposure in an Australian systemic sclerosis cohort. *Rheumatology (Oxford)*. 2020;59(12). https://doi.org/10.1093/rheumatology/keaa446

Web of Science | Google Scholar

17. Hoy RF, Dimitriadis C, Abramson M, et al. Prevalence and risk factors for silicosis among a large cohort of stone benchtop industry workers. *Occup Environ Med*. 2023;80(8):439-446. https://doi.org/10.1136/oemed-2023-108892

PubMed | Web of Science | Google Scholar

18. Hoy RF, Jones C, Newbigin K, et al. Chest x-ray has low sensitivity to detect silicosis in artificial stone benchtop industry workers. *Respirology*. 2024;29(9):785-794. https://doi.org/10.1111/resp.14755

PubMed | Web of Science | Google Scholar

19. Hoy RF, Baird T, Hammerschlag G, et al. Artificial stone-associated silicosis: A rapidly emerging occupational lung disease. *Occup Environ Med*. 2018;75(1):3-5. https://doi.org/10.1136/oemed-2017-104428

PubMed | Web of Science | Google Scholar

20. National Dust Disease Taskforce. *Final Report to Minister for Health and Aged Care*. Australian Government, Department of Health; 2021. https://www.health.gov.au/resources/publications/national-dust-disease-taskforce-final-report?language=en. Accessed January 12, 2023.

Google Scholar

21. National Dust Disease Taskforce. *Interim Advice to Minister for Health*. Australian Government Department of Health; 2019. https://www.health.gov.au/sites/default/files/documents/2022/07/national-dust-disease-taskforce-interim-advice-to-minister-for-health.pdf. Accessed December 6, 2020.

Google Scholar

22. Safe Work Australia. *Decision Regulation Impact Statement: Managing the Risks of Respirable Crystalline Silica at Work*. Safe Work Australia; 2023. https://www.safeworkaustralia.gov.au/doc/decision-regulation-impact-statement-managing-risks-respirable-crystalline-silica-work. Accessed November 1, 2023.

Google Scholar

23. Safe Work Australia. *Managing the Risks of Respirable Crystalline Silica from Engineered Stone in the Workplace. Code of Practice*. Safe Work Australia; 2023. https://www.safeworkaustralia.gov.au/sites/default/files/2023-11/safe_work_australia-model_code_of_practice_-_respirable_crystalline_silica_from_engineered_stone_in_the_workplace-_november_2023.pdf Accessed January 21, 2024.

Google Scholar

24. Proctor RN, Schiebinger LL, eds. *The Making and Unmaking of Ignorance*. Stanford University Press; 2008.

Google Scholar

25. Polland M. Safety in numbers? Firm size and injury risk. Presented at the: New Zealand Association of Economists Conference; July 2017; Victoria Universty Wellington. https://www.nzae.org.nz/wp-content/uploads/2017/07/Michelle-Poland.pdf.

Google Scholar

26. Amossé T, Célérier S. Pratiques d'entreprises en santé et sécurité - un panorama de la situation française depuis une double perspective, quantitative et qualitative. *Pistes Perspectives interdisciplinaires sur le travail et la santé*. 2013;15(3):1-30. https://journals.openedition.org/pistes/3601

Google Scholar

27. Dodier N. La fugacité des chantiers : Inspection du travail et prévention des risques professionnels dans le secteur du bâtiment et des travaux publics. *Sociologie et sociétés*. 1986;18(2):61-72. https://www.erudit.org/fr/revues/socsoc/1986-v18-n2-socsoc100/001187ar/

Crossref | Google Scholar

28. Requena-Mullor M, Alarcón-Rodríguez R, Parrón-Carreño T, Martínez-López JJ, Lozano-Paniagua D, Hernández AF. Association between crystalline silica dust exposure and silicosis development in artificial stone workers. *Int J Environ Res Public Health*. 2021;18(11):5625. https://doi.org/10.3390/ijerph18115625

PubMed | Web of Science | Google Scholar

29. Menéndez-Navarro A, Cavalin C, García-Gómez M, Gherasim A. La remergencia de la silicosis como enfermedad profesional en España, 1990-2019. *Rev Esp Salud Publica*. 2021;95:1-26. https://ojs.sanidad.gob.es/index.php/resp/article/view/543

Web of Science | Google Scholar

30. Juzgado penal n°2 de Vigo. Sentencia 35/2023 de 30 de enero. 2023.

Google Scholar

31. Tribunal Superior de Justicia de Andalucía, Granada (Sala de lo Contencioso-Administrativo, Sección 2a). Sentencia 534/2007 de 29 de Octubre; 2007.

Google Scholar

32. Programa Integral de Silicosis de Andalucía en el manipulado de aglomerados de cuarzo. *Informe Seguimiento y Evaluación del PISA (Período 01/05/2017 a 31/11/2021)*. Consejería de Salud, Consejería de Empleo, Empresa y Comercio; 2022.

Google Scholar

33. Boudia S, Jas N. *Gouverner Un Monde Toxique*. Quae; 2019.

Google Scholar

34. Nixon R. *Slow Violence and the Environmentalism of the Poor*. Harvard University Press; 2011.

Crossref | Google Scholar

35. European Parliament, Council of the European Union. *Directive (EU) 2022/431 of the European Parliament and of the Council of 9 March 2022 Amending Directive 2004/37/EC on the Protection of Workers from the Risks Related to Exposure to Carcinogens or Mutagens at Work*; 2022:L88/1-L88/14.

Google Scholar

36. IARC. *Silica Dust, Crystalline, in the Form of Quartz or Cristobalite*. WHO; 2012. https://monographs.iarc.fr/ENG/Monographs/vol100C/mono100C-14.pdf. Accessed August 13, 2016.

Google Scholar

37. Rainhorn J. *Blanc de plomb. Histoire d'un poison légal*. Presses de Sciences Po; 2019.

Crossref | Google Scholar

38. Boullier H. *Toxiques Légaux. Comment Les Firmes Chimiques Ont Mis La Main Sur Le Contrôle de Leurs Produits*. La Découverte; 2019.

Crossref | Google Scholar

39. Markowitz G, Rosner D. The limits of thresholds: Silica and the politics of science, 1935 to 1990. *Am J Public Health*. 1995;85(2):253-262. https://doi.org/10.2105/ajph.85.2.253

PubMed | Web of Science | Google Scholar

40. Ziem GE, Castleman BI. Threshold limit values: Historical perspectives and current practice. *J Occup Med*. 1989;31(11):910-918. https://doi.org/10.1097/00043764-198911000-00014

PubMed | Web of Science | Google Scholar

41. Counil É, Henry E. When scientific knowledge and ignorance make it difficult to improve occupational health: A French and European perspective. *New Solut*. 2021;31(2):141-151. https://doi.org/10.1177/10482911211019135

PubMed | Web of Science | Google Scholar

42. European Union. *Directive (EU) 2017/2398 of the European Parliament and of the Council of 12 December 2017 Amending Directive 2004/37/EC on the Protection of Workers from the Risks Related to Exposure to Carcinogens or Mutagens at Work*; 2017. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017L2398&from=FR. Accessed April 25, 2019.

Google Scholar

43. ACGIH. *Product: Silica, Crystalline: Alpha-Quartz and Cristobalite: TLV(R) Chemical Substances 7th Edition Documentation: ACGIH*. ACGIH; 2010. https://www.acgih.org/forms/store/ProductFormPublic/silica-crystalline-alpha-quartz-and-cristobalite-tlv-r-chemical-substances-7th-edition-documentation. Accessed October 26, 2019.

Google Scholar

44. Expertise collective ANSES. *Dangers, Expositions et Risques Relatifs à La Silice Cristalline*. ANSES; 2019. https://www.anses.fr/fr/system/files/AIR2015SA0236Ra.pdf. Accessed June 2, 2019.

Google Scholar

45. ANSES. *ANSES Opinion on "Updating knowledge on the hazards, exposures and risks associated with crystalline silica."* 2019. https://www.anses.fr/en/content/anses-opinion-updating-knowledge-hazards-exposures-and-risks-associated-crystalline-silica. Accessed October 26, 2019.

Google Scholar

46. The Office of Impact Analysis. *Value of Statistical Life*. Australian Government Department of the Prime Minister and Cabinet; 2023. https://oia.pmc.gov.au/sites/default/files/2023-10/value-of-statistical-life.pdf.

Google Scholar

47. Cavalin C. La valeur d'une vie statistique. Histoire américaine, histoire de la pensée économique. Introduction à the life you save may be your own. *Incidence*. 2016(12):65-82.

Google Scholar

48. Burki T. Silicosis and the countertop industry. *T Lancet Respir Med*. 2021;9(11). https://doi.org/10.1016/S2213-2600(21)00452-5

Google Scholar

49. Blanc PD, Annesi-Maesano I, Balmes JR, et al. The occupational burden of nonmalignant respiratory diseases. An official American Thoracic Society and European Respiratory Society statement. *Am J Respir Crit Care Med*. 2019;199(11):1312–1334. https://doi.org/10.1164/rccm.201904-0717ST

PubMed | Web of Science | Google Scholar

50. Murgia N, Akgun A, Blanc P, et al. Issue 3-the occupational burden of respiratory diseases, an update. *Pulmonology*. 2024 May 3;S2531-0437(24):00045-X. https://doi.org/10.1016/j.pulmoe.2024.03.004

Google Scholar

51. Cavalin C, Henry E, Jouzel JN, Pélisse J, dir. *Cent Ans de Sous-Reconnaissance Des Maladies Professionnelles*. Presses des Mines; 2021.

Google Scholar

52. Lescoat A, Cavalin C, Ehrlich R, et al. The nosology of systemic sclerosis: How lessons from the past offer new challenges in reframing an idiopathic rheumatological disorder. *Lancet Rheumatol*. 2019;1(4):e257-e264. https://doi.org/10.1016/S2665-9913(19)30038-4

PubMed | Web of Science | Google Scholar

53. Lescoat A, Ballerie A, Lecureur V, et al. The neglected association of crystalline silica exposure and systemic sclerosis. *Rheumatology (Oxford)*. 2020;59(12):3587-3588. https://doi.org/10.1093/rheumatology/keaa638

PubMed | Web of Science | Google Scholar

54. Lescoat A, Cavalin C, Lecureur V, Jégo P. Vers une meilleure compréhension de l'étiologie des maladies auto-immunes systémiques : Une maladie systémique doit-elle toujours être définie comme une « maladie inflammatoire diffuse d'origine inconnue » en 2021 ? exemple de l'exposition à la silice cristalline. *Rev Med Interne*. 2021;42(4):233-236. doi.org/10.1016/j.revmed.2021.03.005

Crossref | PubMed | Web of Science | Google Scholar

Biographies

Catherine Cavalin is research fellow in sociology for CERMES3 (the Centre for research in medicine, science, health, mental health, and society at the French National Centre for Scientific Research [CNRS]). She works on the diversity of health status and social inequalities in health, including gender, work and exposure to occupational toxicants, and interpersonal violence. She is particularly interested in the categories on which statistics are based, the nosological categories that frame medical knowledge, the boundaries between occupational and environmental health, and related public health policies. Cavalin was one of the contributors of the report on silica hazards published by the French health agency (ANSES) in 2019. She is the project leader of two international projects on the reemergence of silicosis in Spain, funded by the French Foundation for Medical Research (FRM) and the CNRS Institute of the Humanities and Social Sciences (CNRS SHS).

Alfredo Menéndez-Navarro is a professor of the history of science at the University of Granada, Spain. His main research field is the history of occupational health and particularly focuses on the medical and social framing of occupational diseases in contemporary Spain. He investigates the emergence of medical and social concerns on asbestos-related diseases and silica hazards, as well as the processes of the under-recognition of these risks. Since 2019, his research has focused on the study of the actual reemergence of silicosis in Spain, linked to the introduction of so-called engineered stone. This project is carried out in collaboration with scientists in the human and social sciences and the medical teams treating patients, and also with social actors (affected workers, trade unions, lawyers, employers, etc.). He is a member of and has served as secretary of the International Commission on Occupational Health (ICOH) Scientific Committee on the History of Prevention of Occupational and Environmental Diseases.

Alain Lescoat, MD, PhD, is an associate professor of internal medicine and clinical immunology and the principal investigator of the scleroderma (i.e., systemic sclerosis [SSc]) cohort of Rennes University Hospital (Brittany, France). He is also a researcher in the Rennes Research Institute for Environmental and Occupational Health (IRSET), a unit within the French National Institute of Health and Medical research (Inserm). This unit explores the links between environmental exposures such as crystalline silica exposures and the onset of SSc with a specific focus on the role of macrophages in the pathogenesis of this systemic disorder. Lescoat has especially developed this field of study during his PhD as MD at Inserm, under the direction of Valérie Lecureur. He has also taken part in the SILICOSIS project, with Paul-André Rosental and Catherine Cavalin, exploring the prevalence of silica exposure in SSc patients.

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