

# Tobacco in Australia

## Facts & Issues

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### Relevant news and research

#### 4.3 Thirdhand smoke

*Last updated December 2024*

#### Research:

**Expression of Concern: Short-term early exposure to thirdhand cigarette smoke increases lung cancer incidence in mice. (2024).** *Clin Sci (Lond)*, 138(23), 1525. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/39589837>

Jiang, W, Liu, X, Lei, Q, Xiao, M, Li, M, Ma, Y et al. (2024). Long-term exposure to third-hand smoke could accelerate biological aging via mitochondrial dysfunction: Evidence from population and animal studies. *J Hazard Mater*, 480, 136061. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/39393317>

Jiang, C, Chen, L, Ye, C, Schick, SF, Jacob, P, 3rd, Zhuang, Y et al. (2024). Thirdhand smoke exposure promotes gastric tumor development in mouse and human. *Environ Int*, 191, 108986. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/39255676>

Ozcan, G, Kaygi Tartici, E, & Celik, B. (2024). Thirdhand Smoke Exposure Ignored by Pediatricians: A Cross-sectional Study. *Turk Arch Pediatr*, 59(3), 312-317. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/39140649>

Aras, A, & Bayraktar, M. (2024). Third-hand smoke perception and awareness among medical students: a survey study. *Sci Rep*, 14(1), 13355. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38858408>

Yildirim-Ozturk, EN, Uyar, M, & Ozturk, M. (2024). Determining the prevalence of people's knowledge that third-hand smoke is harmful to health: A meta-analysis study. *Public Health Nurs*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38591176>

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Qadri, S, Maia, ACG, Ali, HEA, Alarabi, AB, Alshbool, FZ, & Khasawneh, FT. (2024). Sex Dependent Occlusive Cardiovascular Disease Effects of Short-Term Thirdhand Smoke Exposure. *Nicotine Tob Res*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38520288>

Reis, R, Kolci, K, Yedikardes, EN, Coskun, GP, & Uzuner, Y. (2024). Dermal thirdhand smoke exposure induced epidermal alterations in human keratinocyte cells through oxidative damage and MMP-1 expression. *Exp Dermatol*, 33(2), e15020. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38414073>

Richardot, WH, Hamzai, L, Ghukasyan, T, Dodder, NG, Quintana, PJ, Matt, GE et al (2024). Novel chemical contaminants associated with thirdhand smoke in settled house dust. *Chemosphere*, 141138. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38104233>

Merianos, AL, Matt, GE, Stone, TM, Jandarov, RA, Hoh, E, Dodder, NG et al. (2023). Contamination of surfaces in children's homes with nicotine and the potent carcinogenic tobacco-specific nitrosamine NNK. *J Expo Sci Environ Epidemiol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/38104233>

Matt, GE, Merianos, AL, Stone, L, Wullenweber, C, Quintana, PJE, Hoh, E et al. (2023). Changes and stability of hand nicotine levels in children of smokers: Associations with urinary biomarkers, reported child tobacco smoke exposure, and home smoking bans. *Environ Int*, 181, 108239. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37852151>

Guan, Q, Mai, J, Teng, K, Liu, Z, Lin, L, Zhou, L et al (2023). Thirdhand smoke beliefs, exposure status and associated factors among young people in China: A cross-sectional study. *Tob Induc Dis*, 21, 132. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37842546>

Vanzi, V, Marti, F, & Cattaruzza, MS. (2023). Thirdhand Smoke Knowledge, Beliefs and Behaviors among Parents and Families: A Systematic Review. *Healthcare (Basel)*, 11(17). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37685437>

Editors, PO. (2023). Expression of Concern: A Health Threat to Bystanders Living in the Homes of Smokers: How Smoke Toxins Deposited on Surfaces Can Cause Insulin Resistance. *PLoS One*, 18(8), e0289810. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37535546>

Editors, PO. (2023). Expression of Concern: Cigarette Smoke Toxins Deposited on Surfaces: Implications for Human Health. *PLoS One*, 18(8), e0289796. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37535599>

Francis, DL, Reddy, SSP, Kaul, N, Jain, P, Krishnan, SA, & Chopra, SS. (2023). Inconspicuous risk factors for periodontitis: Third-hand smoking. *Oral Dis*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37593978>

Balhara, YPS, & Sarkar, S. (2022). Does ICD-11 exclude the harm caused due to second hand and third hand smoke? - A critique. *Lancet Reg Health Southeast Asia*, 6, 100075. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37383345>

Tang, X, Gambier, C, Lopez-Galvez, N, Padilla, S, Rapp, VH, Russell, ML et al. (2023). Remediation of Thirdhand Tobacco Smoke with Ozone: Probing Deep Reservoirs in Carpets. *Environ Sci Technol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/37268133>

- Cosgun, IG, Cilekar, S, Balci, A, Koymen, BN, Moral, S, Nur, B, & Yetim, B. (2023). The beliefs of medical faculty students about thirdhand smoke. *Tob Induc Dis*, 21, 17. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36762261>
- Peng, J, Shuopeng, J, Wang, H, Wang, X, & Wang, L. (2023). Thirdhand Smoke May Promote Lung Adenocarcinoma Development through HN1. *Comput Math Methods Med*, 2023, 3407313. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36756386>
- Merianos, AL, Mahabee-Gittens, EM, Stone, TM, Jandarov, RA, Wang, L, Bhandari, D et al. (2023). Distinguishing Exposure to Secondhand and Thirdhand Tobacco Smoke among U.S. Children Using Machine Learning: NHANES 2013-2016. *Environ Sci Technol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36705578>
- Pratt, K, Hilty, A, Jacob, P, & Schick, SF. (2023). Respiratory Exposure to Thirdhand Cigarette Smoke Increases Concentrations of Urinary Metabolites of Nicotine. *Nicotine Tob Res*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36617255>
- Lovelina Francis, D, & Sampooram Pape Reddy, S. (2022). The silent assassin: Third hand smoking. *J Glob Health*, 12, 03079. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36462200>
- Hinoue, M, Hara, K, Jiang, Y, & Yamato, H. (2022). Capability of Relative Odor Level Monitors to Measure the Odor of Thirdhand Smoke. *J UOEH*, 44(3), 269-275. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36089345>
- Sakamaki-Ching, S, Schick, S, Grigorean, G, Li, J, & Talbot, P. (2022). Dermal thirdhand smoke exposure induces oxidative damage, initiates skin inflammatory markers, and adversely alters the human plasma proteome. *EBioMedicine*, 84, 104256. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/36137411>
- Mahabee-Gittens, EM, Merianos, AL, Stone, L, Wullenweber, CA, Quintana, PJE, Hoh, E et al. (2022). Hand nicotine as an independent marker of thirdhand smoke pollution in children's environments. *Sci Total Environ*, 849, 157914. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35952873>
- Tang, X, Benowitz, N, Gundel, L, Hang, B, Havel, CM, Hoh, E et al. (2022). Thirdhand Exposures to Tobacco-Specific Nitrosamines through Inhalation, Dust Ingestion, Dermal Uptake, and Epidermal Chemistry. *Environ Sci Technol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35900278>
- Wu, J X, Lau, ATY, & Xu, YM. (2022). Indoor Secondary Pollutants Cannot Be Ignored: Third-Hand Smoke. *Toxics*, 10(7). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35878269>
- Xie, R, Xu, Y, Chen, G, & Zhang, S. (2022). Experimental study on the effect of the split-type air-conditioner on the transmission of smoking pollutants in a room. *J Air Waste Manag Assoc*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35862623>
- Zhong, Q, Li, Y, Mei, X, Li, J, & Huang, Y. (2022). Assessment of passive human exposure to tobacco smoke by environmental and biological monitoring in different public places in Wuhan, central China. *Int J Hyg Environ Health*, 244, 114008. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35870316>

Borujeni, ET, Yaghmaian, K, Naddafi, K, Hassanvand, MS, & Naderi, M. (2022). Identification and determination of the volatile organics of third-hand smoke from different cigarettes and clothing fabrics. *J Environ Health Sci Eng*, 20(1), 53-63. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35669833>

Park, MB, & Sim, B. (2022). Evaluation of Thirdhand Smoke Exposure after Short Visits to Public Facilities (Noraebang and Internet Cafes): A Prospective Cohort Study. *Toxics*, 10(6). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35736915>

Ramirez Gonzalez, N. (2021). Thirdhand Smoke: A Ubiquitous Hidden Threat in Pandemic Times. *Arch Bronconeumol*, 57(9), 569-570. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35698932>

Aquilina, NJ, Havel, CM, Benowitz, NL, & Jacob, P, 3rd. (2022). Tobacco-specific and combustion pollutants in settled house dust in Malta. *J Environ Expo Assess*, 1. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35497707>

Quispe-Cristobal, B, Lidon-Moyano, C, Martin-Sanchez, JC, Perez-Martin, H, Cartanya-Hueso, A, Cabriada-Saez, I et al. (2022). Knowledge and Opinions of Healthcare Professionals about Thirdhand Smoke: A Multi-National, Cross-Sectional Study. *Healthcare (Basel)*, 10(5). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35628082>

Matt, GE, Merianos, AL, Quintana, PJE, Hoh, E, Dodder, NG, & Mahabee-Gittens, EM. (2022). Prevalence and Income-Related Disparities in Thirdhand Smoke Exposure to Children. *JAMA Netw Open*, 5(2), e2147184. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/35129597>

Mahabee-Gittens, EM, Quintana, PJE, Hoh, E, Merianos, AL, Stone, L, Lopez-Galvez, N, & Matt, GE. (2021). Collecting Hand Wipe Samples to Assess Thirdhand Smoke Exposure. *Front Public Health*, 9, 770505. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34988051>

Yeh, K, Li, L, Wania, F, & Abbatt, JPD. (2021). Thirdhand smoke from tobacco, e-cigarettes, cannabis, methamphetamine and cocaine: Partitioning, reactive fate, and human exposure in indoor environments. *Environ Int*, 160, 107063. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34954646>

Northrup, TF, Stotts, AL, Suchting, R, Khan, AM, Klawans, MR, Green, C et al. (2021). Handwashing Results in Incomplete Nicotine Removal from Fingers of Individuals who Smoke: A Randomized Controlled Experiment. *Am J Perinatol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34634832>

Ali, HA, Alarabi, AB, Karim, ZA, Rodriguez, V, Hernandez, KR, Lozano, PA et al. (2021). In utero thirdhand smoke exposure modulates platelet function in a sex-dependent manner. *Haematologica*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34525795>

Liu, H, & Chen, H. (2021). The effects of thirdhand smoke on reproductive health. *J Appl Toxicol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34462936>

Shehab, K., & Ziyab, A. H. (2021). Beliefs of parents in Kuwait about thirdhand smoke and its relation to home smoking rules: A cross-sectional study. *Tob Induc Dis*, 19, 66. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34531710>

Record, RA, Greiner, LH, Wipfli, H, Pugel, J, & Matt, GE. (2021). Thirdhand Smoke Knowledge, Attitudes, and Behavior: Development of Reliable and Valid Self-report Measures. *Nicotine Tob Res*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/34165559>

Northrup, TF, Stotts, AL, Suchting, R, Matt, GE, Quintana, PJE, Khan, AM et al. (2021). Thirdhand smoke associations with the gut microbiomes of infants admitted to a neonatal intensive care unit: An observational study. *Environmental Research*, 197, 111180. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33865820>

Pozuelos, GL, Jacob, P, 3rd, Schick, SF, Omaiye, EE, & Talbot, P. (2021). Adhesion and Removal of Thirdhand Smoke from Indoor Fabrics: A Method for Rapid Assessment and Identification of Chemical Repositories. *International Journal of Environmental Research and Public Health*, 18(7). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33808392>

Jiang, W, Wu, H, Yu, X, Wang, Y, Gu, W, Wei, W et al (2021). Third-hand smoke exposure is associated with abnormal serum melatonin level via hypomethylation of CYP1A2 promoter: Evidence from human and animal studies. *Environ Pollut*, 277, 116669. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33652180>

Kelley, ST, Liu, W, Quintana, PJE, Hoh, E, Dodder, NG, Mahabee-Gittens, EM et al (2021). Altered microbiomes in thirdhand smoke-exposed children and their home environments. *Pediatr Res*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33654287>

Ramirez Gonzalez, N. (2021). Thirdhand Smoke: A Ubiquitous Hidden Threat in Pandemic Times. *Arch Bronconeumol*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33736892>

Mahabee-Gittens, EM, Merianos, AL, & Matt, GE. (2021). Comment regarding categorization of Third-hand smoke exposure in "Third-hand Exposure at Homes: Assessment Using Salivary Cotinine". *Environ Res*, 195, 110595. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33556354>

Xie, Z, Chen, M, Fu, Z, He, Y, Tian, Y, Zhang, X, & Feng, N. (2021). Thirdhand smoke beliefs and behaviors among families of primary school children in Shanghai. *Tob Induc Dis*, 19, 10. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33584165>

Matt, GE, Quintana, PJE, Hoh, E, Dodder, NG, Mahabee-Gittens, EM, Padilla, S et al (2020). Tobacco smoke is a likely source of lead and cadmium in settled house dust. *J Trace Elem Med Biol*, 63, 126656. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/33022485>

Min, K, Guo, P, Chen, D, Huang, S, Luo, W, Ma, M et al. (2020). Direct and quantitative in-situ analysis of third-hand smoke in and on various matrices by ambient desorption corona beam ionization mass spectrometry. *Talanta*, 219, 121330. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/32887064>

Northrup, TF, Stotts, AL, Suchting, R, Khan, AM, Green, C, Klawans, MR et al. (2020). Thirdhand smoke contamination and infant nicotine exposure in a neonatal intensive care unit: An observational study. *Nicotine Tob Res*. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/32866238>

Matt, GE, Quintana, PJE, Hoh, E, Zakarian, JM, Dodder, NG, Record, RA et al. (2020). Remediating Thirdhand Smoke Pollution in Multiunit Housing: Temporary Reductions and the Challenges of

Persistent Reservoirs. *Nicotine Tob Res*. Retrieved from

<https://www.ncbi.nlm.nih.gov/pubmed/32803265>

Lidon-Moyano, C, Diez-Izquierdo, A, & Martinez-Sanchez, JM. (2020). [Thirdhand smoke and other challenges of tobacco control in the pediatric population]. *An Pediatr (Barc)*. Retrieved from

<https://www.ncbi.nlm.nih.gov/pubmed/32682725>

Hang, B, Wang, P, Zhao, Y, Chang, H, Mao, JH, & Snijders, A. (2020). Thirdhand smoke: Genotoxicity and carcinogenic potential. *Chronic Dis Transl Med*, 6(1), 27-34. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/32226932>

Sarker, AH, Trego, KS, Zhang, W, Jacob, P 3rd, Snijders, A.M, Mao, JH et al (2020). Thirdhand smoke exposure causes replication stress and impaired transcription in human lung cells. *Environ Mol Mutagen*. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/32267018>

Kastury, F, Ritch, S, Rasmussen, PE, & Juhasz, AL. (2020). Influence of household smoking habits on inhalation bioaccessibility of trace elements and light rare earth elements in Canadian house dust. *Environ Pollut*, 262, 114132. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/32179218>

Sheu, R, Stonner, C, Ditto, JC, Klupfel, T, Williams, J, & Gentner, DR. (2020). Human transport of thirdhand tobacco smoke: A prominent source of hazardous air pollutants into indoor nonsmoking environments. *Sci Adv*, 6(10), eaay4109. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/32181345>

Stapleton, EM, Manges, R, Parker, G, Stone, EA, Peters, TM, Blount, RJ et al. (2019). Indoor Particulate Matter From Smoker Homes Induces Bacterial Growth, Biofilm Formation, and Impairs Airway Antimicrobial Activity. A Pilot Study. *Front Public Health*, 7, 418. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/32039129>

Kuo, HW, & Rees, VW. (2019). Third-hand smoke (THS): What is it and what should we do about it? *J Formos Med Assoc*. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/31500939>

Northrup, TF, Stotts, AL, Suchting, R, Khan, AM, Green, C, Quintana, PJE et al. (2019). Medical staff contributions to thirdhand smoke contamination in a neonatal intensive care unit. *Tob Induc Dis*, 17, 37. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/31516480>

Matt, GE, Mahabee-Gittens, EM, Zakarian, JM, Quintana, PJE, Hoh, E, & Myers, M. (2019). Nicotine in thirdhand smoke residue predicts relapse from smoking cessation: A pilot study. *Addict Behav*, 98, 106041. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/31330468>

Pozuelos, GL, Kagda, MS, Schick, S, Girke, T, Volz, DC, & Talbot, P. (2019). Experimental Acute Exposure to Thirdhand Smoke and Changes in the Human Nasal Epithelial Transcriptome: A Randomized Clinical Trial. *JAMA Netw Open*, 2(6), e196362. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/31251375>

Mahabee-Gittens, EM, Matt, GE, Hoh, E, Quintana, PJE, Stone, L, Geraci, MA et al. (2019). Contribution of thirdhand smoke to overall tobacco smoke exposure in pediatric patients: study protocol. *BMC Public Health*, 19(1), 491. Available from:

<https://www.ncbi.nlm.nih.gov/pubmed/31046729>

Mahabee-Gittens, EM, Merianos, AL, Hoh, E, Quintana, PJ, & Matt, GE. Nicotine on Children's Hands: Limited Protection of Smoking Bans and Initial Clinical Findings. *Tob Use Insights*, 2019. 12, 1179173X18823493. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30728727>

Wu, CC, Wang, WJ, Bao, LJ, Shi, L, Tao, S, & Zeng, EY. Impacts of texture properties and airborne particles on accumulation of tobacco-derived chemicals in fabrics. *J Hazard Mater*, 2019. 369, 108-115. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30776593>

Liu, Q, Chen, Q, Shen, J, Wu, H, Sun, Y, & Ming, WK. Data Analysis and Visualization of Newspaper Articles on Thirdhand Smoke: A Topic Modeling Approach. *JMIR Med Inform*, 2019. 7(1), e12414. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30694199>

Adhami, N, Starck, SR, Flores, C, & Martins Green, M. (2018). Correction: A Health Threat to Bystanders Living in the Homes of Smokers: How Smoke Toxins Deposited on Surfaces Can Cause Insulin Resistance. *PLoS One*, 2018. 13(11), e0208056. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30458047>

Collins, DB, Wang, C, & Abbatt, JPD. Selective Uptake of Third-Hand Tobacco Smoke Components to Inorganic and Organic Aerosol Particles. *Environ Sci Technol*, 2018. Available from: <https://pubs.acs.org/doi/10.1021/acs.est.8b03880>

Matt, GE, Hoh, E, Quintana, PJE, Zakarian, JM, & Arceo, J. Cotton pillows: A novel field method for assessment of thirdhand smoke pollution. *Environ Res*, 2018. 168, 206-210. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30317105>

Lai, FY, Lympousi, K, Been, F, Benaglia, L, Udrișard, R, Delemont, O, Esseiva, P, Thomaidis, NS, Covaci, A, van Nuijs, ALN. Levels of 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) in raw wastewater as an innovative perspective for investigating population-wide exposure to third-hand smoke. *Sci Rep*. 2018 Sep 5;8(1):13254. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30185880>

Diez-Izquierdo, A, Cassanello-Penarroya, P, Lidon-Moyano, C, Matilla-Santander, N, Balaguer, A, Martinez-Sanchez, JM. Update on thirdhand smoke: A comprehensive systematic review. *Environ Res*. 2018 Jul 11;167:341-371. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/30096604>

Adhami, N, Chen, Y, Martins-Green, M. Correction: Biomarkers of disease can be detected in mice as early as 4 weeks after initiation of exposure to third-hand smoke levels equivalent to those found in homes of smokers. *Clin Sci (Lond)*. 2018 Jun 28;132(12):1365-1366. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29954953>

Hang, B, Mao, JH, Snijders, AM. Genetic Susceptibility to Thirdhand Smoke induced Lung Cancer Development. *Nicotine Tob Res*, 2018. June 16, 2018. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29917126>

DeCarlo, PF, Avery, AM, Waring, MS. Thirdhand smoke uptake to aerosol particles in the indoor environment. *Sci Adv*. 2018 May 9;4(5):eaap8368. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29750194>

Drehmer, JE, Walters, BH, Nabi-Burza, E, Winickoff, JP. Guidance for the Clinical Management of Thirdhand Smoke Exposure in the Child Health Care Setting. *J Clin Outcomes Manag.* 2017 Dec;24(12):551-559. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29217965>

Figueiro, LR, Linden, R, Ziulkoski, AL, Dantas, DCM. Cellular effects of thirdhand tobacco smoke from smokers' homes. *Toxicol Mech Methods*, 2017. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/29185369>

Adhami, N, Chen, Y and Martins-Green, M. Biomarkers of disease can be detected in mice as early as 4 weeks after initiation of exposure to third-hand smoke levels equivalent to those found in homes of smokers. *Clin Sci (Lond)*. 2017 Sep 14;131(19):2409-2426. Available from: <http://www.clinsci.org/content/131/19/2409>

Hang, B, Wang, P, Zhao, Y, Sarker, A, Chenna, A, Xia, Y, Snijders, AM, Mao, JH. Adverse Health Effects of Thirdhand Smoke: From Cell to Animal Models. *Int J Mol Sci.* 2017 Apr 28;18(5). Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28452951>

Lee, W, Lee, S, Roh, J, Won, JU, Yoon, JH. The Association between Involuntary Smoking Exposure with Urine Cotinine Level and Blood Cadmium Level in General Non-Smoking Populations. *J Korean Med Sci.* 2017 Apr;32(4):568-575. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28244280>

Mahabee-Gittens, EM, Merianos, AL, Matt, GE. Preliminary evidence that high levels of nicotine on children's hands may contribute to overall tobacco smoke exposure. *Tob Control*, 2017. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28360145>

Hang, B, Snijders, AM, Huang, Y, Schick, SF, Wang, P, Xia, Y, Havel, C, Jacob, P, 3rd, Benowitz, N, Destailats, H, Gundel, LA, Mao, JH. Early exposure to thirdhand cigarette smoke affects body mass and the development of immunity in mice. *Sci Rep.* 2017 Feb 3;7:41915. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28157226>

Matt, GE, Quintana, PJ, Zakarian, JM, Hoh, E, Hovell, MF, Mahabee-Gittens, M, Watanabe, K, Datuin, K, Vue, C, Chatfield, DA. When smokers quit: exposure to nicotine and carcinogens persists from thirdhand smoke pollution. *Tob Control*, 2016. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27655249>

Bahl, V, Johnson, K, Phandthong, R, Zahedi, A, Schick, SF, Talbot, P. Thirdhand cigarette smoke causes stress-induced mitochondrial hyperfusion and alters the transcriptional profile of stem cells. *Toxicol Sci*, 2016. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27255386>

Figueiro, LR, Dantas, DC, Linden, R, Ziulkoski, AL. Thirdhand tobacco smoke: procedures to evaluate cytotoxicity in cell cultures. *Toxicol Mech Methods*, 2016. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27268319>

Darlow, SD, Heckman, CJ, Munshi, T, Collins, BN. Thirdhand smoke beliefs and behaviors among healthcare professionals. *Psychol Health Med.* 2016 May 26:1-10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27231157>



Adhami, N, Starck, SR, Flores, C, Martins Green, M. Correction: A health threat to bystanders living in the homes of smokers: How smoke toxins deposited on surfaces can cause insulin resistance. PLoS One. 2016 Apr 6;11(4):e0153382. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27050097>

Xu, B, Chen, M, Yao, M, Ji, X, Mao, Z, Tang, W, Qiao, S, Schick, SF, Mao, JH, Hang, B, Xia, Y. Corrigendum: Metabolomics reveals metabolic changes in male reproductive cells exposed to thirdhand smoke. Sci Rep. 2016 Apr 13;6:23849. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27072199>

Adhami, N, Starck, SR, Flores, C, Martins Green, M. A health threat to bystanders living in the homes of smokers: How smoke toxins deposited on surfaces can cause insulin resistance. PLoS One. 2016 Mar 2;11(3):e0149510. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26934053>

No authors listed. Nicotine still found on newborn babies' cots in 'smoke-free' hospitals. Nurs Stand. 2016 Jan 6;30(19):14. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26938389>

Northrup, TF, Jacob, P, 3rd, Benowitz, NL, Hoh, E, Quintana, PJ, Hovell, MF, Matt, GE, Stotts, AL. Thirdhand smoke: state of the science and a call for policy expansion. Public Health Rep. 2016 Mar-Apr;131(2):233-8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26957657>

Cheng, CY et al. Detection of third-hand smoke on clothing fibers with a surface acoustic wave gas sensor. Biomicrofluidics, 2016. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26909119>

Ganjre, AP, Sarode, GS. Third hand smoke - A hidden demon. Oral Oncol, March 2016. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26826754>

Northrup, TF et al. Thirdhand smoke contamination in hospital settings: assessing exposure risk for vulnerable paediatric patients. Tob Control, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26635031>

Ramirez, N et al. Comparative study of comprehensive gas chromatography-nitrogen chemiluminescence detection and gas chromatography-ion trap-tandem mass spectrometry for determining nicotine and carcinogen organic nitrogen compounds in thirdhand tobacco smoke. J Chromatogr A, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26684592>

Acuff, L et al. Third-hand smoke: old smoke, new concerns. J Community Health, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26512014>

Santos, E et al. A simple and rapid method for the determination of nicotine in third-hand smoke by liquid chromatography and its application for the assessment of contaminated outdoor communal areas. Drug Testing and Analysis, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26059092>

Chen, YT et al. Effects of a parent-child interactive program for families on reducing the exposure of school-aged children to household smoking. Nicotine & Tobacco Research, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25987674>

Wagener, TL et al. Caregivers' interest in using smokeless tobacco products: Novel methods that may reduce children's exposure to secondhand smoke. Journal of Health Psychology, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25845835>

Brown, N et al. Interventions to reduce harm from smoking with families in infancy and early childhood: a systematic review. *International Journal of Environmental Research and Public Health*, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25785496>

Rowa-Dewar, N et al. Protecting children from smoke exposure in disadvantaged homes. *Nicotine & Tobacco Research*, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25762761>

Peck, KR et al. Reduction of secondhand smoke exposure in the cars of children with cancer. *Journal of Pediatric Oncology Nursing*, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25650378>

Bahl V, Jacob P, 3rd, Havel C, Schick SF, and Talbot P. Thirdhand cigarette smoke: factors affecting exposure and remediation. *PLoS One*, 2014; 9(10):e108258. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25286392>

Semple S, Apsley A, Azmina Ibrahim T, Turner SW, and Cherrie JW. Fine particulate matter concentrations in smoking households: just how much secondhand smoke do you breathe in if you live with a smoker who smokes indoors? *Tob Control*, 2014. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25331379>

Sleiman M, Logue JM, Luo W, Pankow JF, Gundel LA, et al. Inhalable Constituents of Thirdhand Tobacco Smoke: Chemical Characterization and Health Impact Considerations. *Environ Sci Technol*, 2014. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25317906>

Abdullah, AS et al. Secondhand smoke exposure reduction intervention in Chinese households of young children: a randomized controlled trial. *Acad Pediatr*, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26300367>

Blaakman, SW et al. Secondhand smoke exposure reduction after NICU discharge: results of a randomized trial. *Academic Paediatrics*, 2015. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26210908b>

Wang Y, Huang Z, Yang M, Wang F, and Xiao S. Reducing environmental tobacco smoke exposure of preschool children: a randomized controlled trial of class-based health education and smoking cessation counseling for caregivers. *Int J Environ Res Public Health*, 2015; 12(1):692-709. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25590146>

Ulbricht S, Gross S, Meyer C, Hannover W, Nauck M, et al. Reducing tobacco smoke exposure in children aged below 4 years - a randomized controlled trial. *Prev Med*, 2014; 69C:208-213. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25456808>

Schuck K, Otten R, Kleinjan M, Bricker JB, and Engels RC. Promoting smoking cessation among parents: Effects on smoking-related cognitions and smoking initiation in children. *Addict Behav*, 2014; 40C:66-72. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25222850>

Ortega Cuelva G, Cabezas Pena C, Almeda Ortega J, Saez Zafra M, Ballve Moreno JL, et al. Effectiveness of a brief primary care intervention to reduce passive smoking in babies: a cluster

randomised clinical trial. J Epidemiol Community Health, 2014. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/25389300>

## News reports:

**Caruana, D. Study Looks Into the Cleaning of Thirdhand Smoke Pollutants in Smokers' Homes. *Vaping Post*, 2020. Nov 23, 2020. Retrieved from**  
<https://www.vapingpost.com/2020/11/23/study-looks-into-the-cleaning-of-thirdhand-smoke-pollutants-in-smokers-homes/>

Renner, B. Toxic Thirdhand Smoke Still Lingers In A Casino Months After Ban. Study Finds, 2018. Sept 22, 2018. Available from <https://www.studyfinds.org/thirdhand-smoke-lingers-casino-after-ban/>

Reinberg, Steven. Third-hand smoke may be lurking in nonsmoking areas, study finds. CBS News, 2018. May 14, 2018. Available from: <https://www.cbsnews.com/news/third-hand-smoke-lingers-in-nonsmoking-areas-study-finds/>

No authors listed. Thirdhand smoke found to increase lung cancer risk in mice. EurekAlert!, 2018. Mar 13, 2018. Available from: [https://www.eurekalert.org/pub\\_releases/2018-03/dbnl-tsf030818.php](https://www.eurekalert.org/pub_releases/2018-03/dbnl-tsf030818.php)

No authors listed. Third hand cigarette smoke not cause for panic. Medical Xpress, 2018. Feb 19, 2018. Available from: <https://medicalxpress.com/news/2018-02-cigarette-panic.html>

Rahhal, Natalie. Third-hand smoke may linger forever: Study shows casinos are still toxic to customers after cigarette ban - and replacing material could be the only solution. Daily Mail, 2018. Feb 13, 2018. Available from: <http://www.dailymail.co.uk/health/article-5368729/Thirdhand-smoke-lingers-long-cigarettes-banned.html>

Borrelli, Lizette. Smoking Cigarettes: Smell in Clothes and Furniture Can Damage Brain, Liver. Newsweek, 2017. Sept 19, 2017. Available from: <http://www.newsweek.com/smoking-cigarettes-smell-clothes-furniture-can-damage-brain-liver-667183>

No authors listed. 8 ways to remove smoke smells from your home. British Telecom, 2017. Nov 28, 2017. Available from: <http://home.bt.com/lifestyle/house-home/cleaning/8-ways-to-remove-smoke-smells-from-your-home-11364032089438>

Adhami, N, Chen, Y and Martins-Green, M. Biomarkers of disease can be detected in mice as early as 4 weeks after initiation of exposure to third-hand smoke levels equivalent to those found in homes of smokers. Clin Sci (Lond). 2017 Sep 14;131(19):2409-2426. Available from:  
<http://www.clinsci.org/content/131/19/2409>

Faust, Vince. Even thirdhand smoke poses health risks. The Philadelphia Tribune, 2017. Oct 11, 2017. Available from: [http://www.phillytrib.com/lifestyle/health/even-third-hand-smoke-poses-health-risks/article\\_147c90be-6ab4-5982-8a25-13b2f49bd936.html](http://www.phillytrib.com/lifestyle/health/even-third-hand-smoke-poses-health-risks/article_147c90be-6ab4-5982-8a25-13b2f49bd936.html)

No authors listed. Thirdhand Smoke Is Real—Here’s How It Can Damage Your Brain and Liver. Press From, 2017. Oct 9, 2017. Available from: <http://uk.pressfrom.com/lifestyle/health/-214333-thirdhand-smoke-is-real-here-s-how-it-can-damage-your-brain-and-liver/>

Hamilton, Jacqueline. Tobacco-smoke residue that lingers in furniture, curtains and house dust can still be harmful. The Conversation, 2017. Sept 18, 2017. Available from: <https://theconversation.com/tobacco-smoke-residue-that-lingers-in-furniture-curains-and-house-dust-can-still-be-harmful-84145>

No authors listed. Mice exposed to third-hand smoke developed brain and liver damage. National Health Service (NHS), 2017. Sept 15, 2017. Available from: <https://www.nhs.uk/news/lifestyle-and-exercise/mice-exposed-third-hand-smoke-developed-brain-and-liver-damage/>

Adhami, N, Chen, Y and Martins-Green, M. Biomarkers of disease can be detected in mice as early as 4 weeks after initiation of exposure to third-hand smoke levels equivalent to those found in homes of smokers. Clin Sci (Lond). 2017 Sep 14;131(19):2409-2426. Available from: <http://www.clinsci.org/content/131/19/2409>

Woodward, Aylin. Third-hand smoke in furniture and clothes damages mouse organs. New Scientist, 2017. Sept 15, 2017. Available from: <https://www.newscientist.com/article/2147549-third-hand-smoke-in-furniture-and-clothes-damages-mouse-organs/>

No authors listed. Secondhand (and third-hand) smoke may be making your pet sick. U.S. Food and Drug Administration, Dec 2016. Available from: <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm530220.htm>

No authors listed. FDA warns of secondhand and ‘thirdhand’ smoke dangers to pets. International Animal Health Journal, 2016. Sept 27, 2016. Available from: <http://animalhealthmedia.com/fda-warns-secondhand-thirdhand-smoke-dangers-pets/>

Price, Michael. Thirdhand smoke lingers in the home long after smokers have quit. Medical Xpress, 2016. Sept 22, 2016. Available from: <http://medicalxpress.com/news/2016-09-thirdhand-lingers-home-smokers.html>

No authors listed. Thirdhand smoke linked to type 2 diabetes. Medical News Today, 2016. Mar 3, 2016. Available from: <http://www.medicalnewstoday.com/releases/307356.php>

Ward, Victoria. Buying a house from a smoker could prove dangerous for your health, study finds. The Telegraph, 2016. Jan 1, 2016. Available from: <http://www.telegraph.co.uk/news/health/12077562/Buying-a-house-from-a-smoker-could-prove-dangerous-for-your-health-study-finds.html>

No authors listed. Newborns in intensive care exposed to thirdhand smoke residue. Medical News Today, 2015. Dec 4, 2015. Available from: <http://www.medicalnewstoday.com/releases/303565.php?tw>

No authors listed. Take 7 Steps Out’ to protect children from secondhand smoke. Morley Observer & Advertiser, 2015. Apr 18, 2015. Available from: <http://www.morleyobserver.co.uk/news/local/take-7-steps-out-to-protect-children-from-secondhand-smoke-1-7215846>

DOE/Lawrence Berkeley National Laboratory. Thirdhand smoke: Toxic airborne pollutants linger long after smoke clears. Science Daily, 2014. Available from:  
<http://www.sciencedaily.com/releases/2014/11/141103142316.htm>

Jacob, P, Benowitz, NL, Destailats, H, Gundel, L, Hang, B et al. Thirdhand smoke: new evidence, challenges, and future directions. Chem Res Toxicol, 2017 Jan 17;30(1):270-294. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/28001376>