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The Importance of Detoxification

Our bodies constantly encounter toxins – far more than ever before in human history.[1] While your body has built-in detoxification systems that process and eliminate toxins, excess exposure can overwhelm these systems and contribute to chronic health issues. This guide explains how detoxification works and outlines simple ways to support it each day so you can help your body manage toxin exposures.

Toxins, Toxicants, and Detoxification

A "toxin" is a substance produced naturally, often by living organisms.[2] A "toxicant" is a toxic substance produced by humans or introduced into the environment by human activities.[3] Since the term "toxin" is used more often in daily life, we will use it to describe both types of exposures. Detoxification or "detox" is the body's process of breaking down and eliminating toxins and other substances, like hormones.

What is the Toxic Body Burden?

The term "toxic body burden" refers to the total quantity of toxins found in the body at a given time and reflects both past exposures and ongoing toxin accumulation.

A high toxic body burden can tax your body's detox systems[4-6] and is associated with chronic health issues.[7] Your toxic body burden may include a range of toxins commonly found in our environment today, such as pesticides, flame retardants, and other persistent organic pollutants (POPs).[8,9]

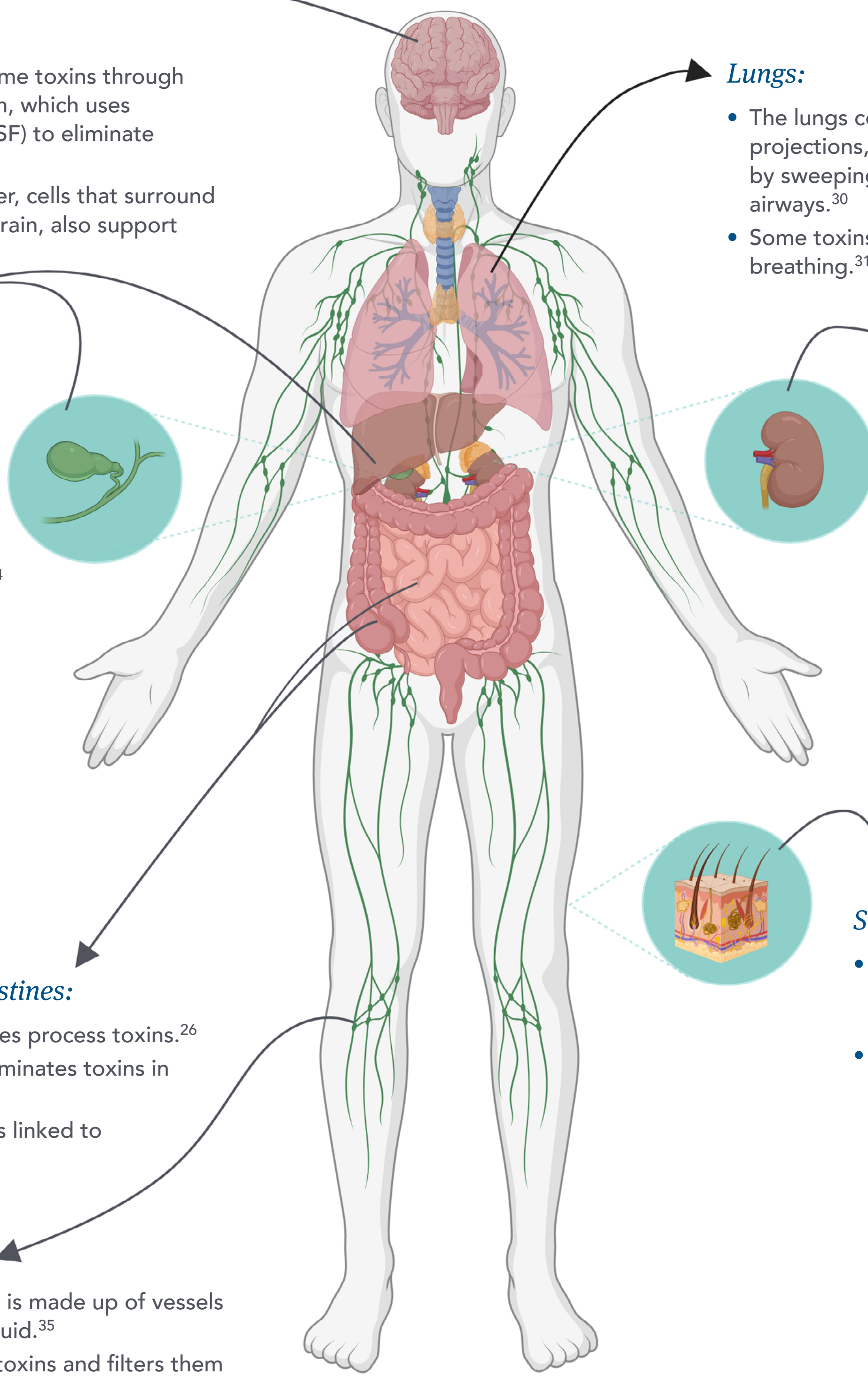
Your toxic body burden is linked to:

- The **amount of toxins** that enter your body from internal and external sources, like food,[10-12] drinking water,[13] personal care products,[14,15] workplace exposures.[16-18]
- Your **genetics**, including variants in genes that affect detoxification.[19]
- The amount of **detox-supporting nutrients** in your diet. Specific foods and nutrients support the processes that convert toxins into less harmful forms and assist in their elimination.[20,21]

Symptoms of toxin buildup may occur when you reach your personal limit of accumulated toxins and are unable to eliminate them quickly or efficiently.

How Your Body Detoxifies

Every day, your brain, lungs, liver, small intestine, large intestine, kidneys, lymphatic system, and skin work together to help you detoxify.



Brain:

- The brain removes some toxins through the glymphatic system, which uses cerebrospinal fluid (CSF) to eliminate toxins.[22]
- The blood-brain barrier, cells that surround blood vessels in the brain, also support detox.[23]

Liver and Gallbladder:

- The liver processes toxins through Phases I and II of detoxification.[24]
- Phase I converts fat-soluble toxins into water-soluble forms.[24]
- Phase II further processes toxins and releases them in bile, a fluid made by the liver and stored in the gallbladder, and urine.[24]
- The gallbladder drains bile-bound toxins into the small intestine.[25]

Small and Large Intestines:

- Small intestine enzymes process toxins.[26]
- The large intestine eliminates toxins in stool.[27,28]
- The gut microbiome is linked to detoxification.[29]

Lymphatic System:

- The lymphatic system is made up of vessels that circulate lymph fluid.[35]
- Lymph fluid picks up toxins and filters them through lymph nodes.[35]

Lungs:

- The lungs contain cilia, tiny hair-like projections, that eliminate toxins by sweeping them out of the airways.[30]
- Some toxins are eliminated by breathing.[31]

Kidneys:

- The kidneys filter toxins from blood, eliminating them in the urine.[32]
- The kidneys remove heavy metals, broken-down hormones, and byproducts of normal bodily proesses, including ammonia from protein digestion.[33]

Skin:

- The skin contains detoxification enzymes.[34]
- The skin releases toxins such as heavy metals and immune molecules through sweat.[34]

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Simple Ways to Support Detoxification:

- Brain: **Physical activity** and **quality sleep** are associated with brain detoxification via the glymphatic system.[60-65]
- Lungs: **Use your kitchen vent fan** while cooking to reduce airborne toxins at home.[66,67]
- Liver and gallbladder: Eating **cruciferous vegetables** like broccoli sprouts is associated with healthy liver function.[68,69]
- Small and large intestines: Irregular bowel movements are linked to impaired detoxification.[70,71] **Dietary fiber** supports regular bowel movements and is associated with reduced toxin levels.[72-75]
- Kidneys: **Proper hydration** is linked to healthy kidney function.[76,77]
- Skin: **Sweating** eliminates some toxins, such as the heavy metals, through the skin.[78,79]
- Lymphatic system: **Physical activity** is linked to lymphatic system function.[80,81]

Health Conditions Related to Toxin Buildup

A heavy toxic burden is associated with a variety of health conditions, including:

- Behavioral disorders, such as attention-deficit/hyperactivity disorder (ADHD)[36] and autism spectrum disorder (ASD)[37,38]
- Blood sugar imbalances[39]
- Chemical sensitivities[40]
- Fatigue[41,42]
- Hormone imbalances[43-45]
- Impaired fertility[46-49]
- Mood disorders, such as depression and anxiety[50-52]
- Muscle aches and weakness[53]
- Neurological conditions such as tremors,[54] headaches,[55] and cognitive decline[56]
- Weight gain and obesity[57,58]

The Bottom Line on Detoxification

While your body has built-in detox systems, supporting your detoxification capacity through nutrition and lifestyle practices such as eating a fiber-rich diet, hydration, sleep, and physical activity may help your body better manage its toxin load.[59] Talk with your functional healthcare provider to determine if you could benefit from additional detoxification support.

REFERENCES

1. Brander SM. Rethinking our chemical legacy and reclaiming our planet. *One Earth*. 2022;5(4):316-319. https://doi.org/10.1016/j.oneear.2022.03.020
2. Clark GC, Casewell NR, Elliott CT, et al. Friends or foes? emerging impacts of biological toxins. *Trends Biochem Sci*. 2019;44(4):365-379. doi:10.1016/j.tibs.2018.12.004
3. Sokan-Adeaga AA, Sokan-Adeaga MA, Sokan-Adeaga ED, et al. Environmental toxicants and health adversities: a review on interventions of phytochemicals. *J Public Health Res*. 2023;12(2):22799036231181226. doi:10.1177/22799036231181226
4. He X, Zhang S, Bai Q, et al. Air pollution exposure and prevalence of non-alcoholic fatty liver disease and related cirrhosis: a systematic review and meta-analysis. *Ecotoxicol Environ Saf*. 2025;289:117469. doi:10.1016/j.ecoenv.2024.117469
5. Jalili C, Kazemi M, Cheng H, et al. Associations between exposure to heavy metals and the risk of chronic kidney disease: a systematic review and meta-analysis. *Crit Rev Toxicol*. 2021;51(2):165-182. doi:10.1080/10408444.2021.1891196
6. [in vitro] Sun M, Zhang M, Di F, et al. Polystyrene nanoplastics induced learning and memory impairments in mice by damaging the glymphatic system. *Ecotoxicol Environ Saf*. 2024;284:116874. doi:10.1016/j.ecoenv.2024.116874
7. Rojas-Rueda D, Morales-Zamora E, Alsufyani WA, Herbst CH, AlBalawi SM, Alsukait R, Alomran M. Environmental risk factors and health: an umbrella review of meta-analyses. *Int J Environ Res Public Health*. 2021;18(2):704. https://doi.org/10.3390/ijerph18020704
8. Young AS, Herkert N, Stapleton HM, et al. Chemical contaminant exposures assessed using silicone wristbands among occupants in office buildings in the USA, UK, China, and India. *Environ Int*. 2021;156:106727. doi:10.1016/j.envint.2021.106727
9. Herkert NJ, Getzinger GJ, Hoffman K, et al. Wristband personal passive samplers and suspect screening methods highlight gender disparities in chemical exposures. *Environ Sci Technol*. 2024;58(35):15497-15510. doi:10.1021/acs.est.4c06008
10. Chen L, Qian Y, Wang X, et al. A nationwide characterization of organochlorine pesticides (OCPs) in livestock and poultry food products across China: Residual levels, origin and the associated health risks. *Chemosphere*. 2024;364:142999. doi:10.1016/j.chemosphere.2024.142999
11. Dokic M, Nekic T, Varenina I, et al. Pesticides and polychlorinated biphenyls in milk and dairy products in Croatia: a health risk assessment. *Foods*. 2024;13(8):1155. doi:10.3390/foods13081155
12. Stadion M, Blume K, Hackethal C, et al. Germany's first Total Diet Study - occurrence of non-dioxin-like polychlorinated biphenyls and polybrominated diphenyl ethers in foods. *Food Chem X*. 2024;22:101274. doi:10.1016/j.fochx.2024.101274
13. Smalling KL, Romanok KM, Bradley PM, et al. Per- and polyfluoroalkyl substances (PFAS) in United States tapwater: comparison of underserved private-well and public-supply exposures and associated health implications. *Environ Int*. 2023;178:108033. https://doi.org/10.1016/j.envint.2023.108033
14. Van der Schyff Suchankova L, Kademoglou K, Melymuk L, Klanova J. Parabens and antimicrobial compounds in conventional and "green" personal care products. *Chemosphere*. 2022;297:134019. https://doi.org/10.1016/j.chemosphere.2022.134019
15. Pagoni A, Arvaniti OS, Kalantzi OI. Exposure to phthalates from personal care products: urinary levels and predictors of exposure. *Environ Res*. 2022;212(Part A):113194. https://doi.org/10.1016/j.envres.2022.113194
16. Hyland C, Hernandez A, Gaudreau E, et al. Examination of urinary pesticide concentrations, protective behaviors, and risk perceptions among Latino and Latina farmworkers in Southwestern Idaho. *Int J Hyg Environ Health*. 2024; 255:114275. doi:10.1016/j.ijheh.2023.114275
17. Yang X, Yu Q, Zhang Y, Ma W. Occupational health risk assessment of construction workers caused by particulate matter exposure on construction sites. *Heliyon*. 2023;9(10):e20433. https://doi.org/10.1016/j.heliyon.2023.e20433
18. Ki N, Shin S, Choi J, Shim S, Byeon S. Chemical substance exposure of some cleaning workers in Korea: focusing on inhalation exposure. *Appl Sci*. 2024;14(17), 7533. https://doi.org/10.3390/app14177533
19. Aronica L, Ordovas JM, Volkov A, et al. Genetic biomarkers of metabolic detoxification for personalized lifestyle medicine. *Nutrients*. 2022;14(4):768. doi:10.3390/nu14040768
20. Hodges RE, Minich DM. Modulation of metabolic detoxification pathways using foods and food-derived components: a scientific review with clinical application. *J Nutr Metab*. 2015;2015:760689. doi:10.1155/2015/760689
21. Hennig B, Petriello MC, Gamble MV, et al. The role of nutrition in influencing mechanisms involved in environmentally mediated diseases. *Rev Environ Health*. 2018;33(1):87-97. doi:10.1515/reveh-2017-0038
22. Chen S, Wang H, Zhang L, et al. Glymphatic system: a self-purification circulation in brain. *Front Cell Neurosci*. 2025;19:1528995. doi:10.3389/fncel.2025.1528995
23. Agúndez JA, Jiménez-Jiménez FJ, Alonso-Navarro H, García-Martín E. Drug and xenobiotic biotransformation in the blood-brain barrier: a neglected issue. *Front Cell Neurosci*. 2014;8:335. doi:10.3389/fncel.2014.00335
24. Kalra A, Yetiskul E, Wehrle CJ, et al. Physiology, liver. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Updated May 1, 2023. Accessed November 18, 2025. https://www.ncbi.nlm.nih.gov/books/NBK535438/
25. Ahmed M. Functional, diagnostic and therapeutic aspects of bile. *Clin Exp Gastroenterol*. 2022;15:105-120. doi:10.2147/CEG.S360563
26. Iacopetta D, Ceramella J, Catalano A, Scali E, Scumaci D, Pellegrino M, Aquaro S, Saturnino C, Sinicropi MS. Impact of cytochrome P450 enzymes on the phase I metabolism of drugs. *Appl Sci*. 2023;13(10):6045. https://doi.org/10.3390/app13106045
27. Zhu L, Wu Z, Dong J, et al. Unveiling small-sized plastic particles hidden behind large-sized ones in human excretion and their potential sources. *Environ Sci Technol*. 2024;58(27):11901-11911. doi:10.1021/acs.est.3c11054
28. Hartmann C, Lomako I, Schachner C, et al. Assessment of microplastics in human stool: a pilot study investigating the potential impact of diet-associated scenarios on oral microplastics exposure. *Sci Total Environ*. 2024;951:175825. doi:10.1016/j.scitotenv.2024.175825
29. Collins SL, Patterson AD. The gut microbiome: an orchestrator of xenobiotic metabolism. *Acta Pharm Sin* B. 2020;10(1):19-32. doi:10.1016/j.apsb.2019.12.001
30. Sher AC, Stacy MR, Reynolds SD, Chiang T. In vivo detection of pulmonary mucociliary clearance: present challenges and future directions. *Eur Respir Rev*. 2024;33(173):240073. doi:10.1183/16000617.0073-2024
31. Takano APC, Closs JGV, Fajersztajn L, Veras MM. Challenges in studying the toxicity of particulate air pollution on the respiratory system. *Front Environ Eng*. 2025;4. https://doi.org/10.3389/fenve.2025.1611782
32. Ogobuiro I, Tuma F. Physiology, renal. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Updated July 24, 2023. Accessed November 21, 2025. https://www.ncbi.nlm.nih.gov/books/NBK538339/
33. Pizzorno J. The kidney dysfunction epidemic, part 1: causes. *Integr Med (Encinitas)*. 2015;14(6):8-13.
34. Zhou SS, Li D, Zhou YM, Cao JM. The skin function: a factor of anti-metabolic syndrome. *Diabetol Metab Syndr*. 2012;4(1):15. doi:10.1186/1758-5996-4-15

35. Null M, Arbor TC, Agarwal M. Anatomy, lymphatic system. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Updated March 6, 2023. Accessed November 19, 2025. https://www.ncbi.nlm.nih.gov/books/NBK513247/
36. Gu Q, Liu J, Zhang X, et al. Association between heavy metals exposure and risk of attention deficit hyperactivity disorder (ADHD) in children: a systematic review and meta-analysis. *Eur Child Adolesc Psychiatry*. 2025;34(3):921-941. doi:10.1007/s00787-024-02546-z
37. Ding M, Shi S, Qie S, Li J, Xi X. Association between heavy metals exposure (cadmium, lead, arsenic, mercury) and child autistic disorder: a systematic review and meta-analysis. *Front Pediatr*. 2023;11:1169733. doi:10.3389/fped.2023.1169733
38. Duque-Cartagena T, Dalla MDB, Mundstock E, et al. Environmental pollutants as risk factors for autism spectrum disorders: a systematic review and meta-analysis of cohort studies. *BMC Public Health*. 2024;24(1):2388. doi:10.1186/s12889-024-19742-w
39. Bennett KA, Sutherland C, Savage AL. A systematic review of evidence that environmental contaminant exposure impedes weight loss and glycemic control during calorie-restricted diets in humans. *Obes Rev*. 2025;26(5):e13886. doi:10.1111/obr.13886
40. Molot J, Sears M, Anisman H. Multiple chemical sensitivity: It's time to catch up to the science. *Neurosci Biobehav Rev*. 2023;151:105227. doi:10.1016/j.neubiorev.2023.105227
41. Wu TY, Khorramshahi T, Taylor LA, Bansal NS, Rodriguez B, Rey IR. Prevalence of aspergillus-derived mycotoxins (ochratoxin, aflatoxin, and gliotoxin) and their distribution in the urinalysis of ME/CFS patients. *Int J Environ Res Public Health*. 2022;19(4):2052. doi:10.3390/ijerph19042052
42. Morris G, Berk M, Walder K, Maes M. The putative role of viruses, bacteria, and chronic fungal biotoxin exposure in the genesis of intractable fatigue accompanied by cognitive and physical disability. *Mol Neurobiol*. 2016;53(4):2550-2571. doi:10.1007/s12035-015-9262-7
43. Zhao S, Dong J, Luo Z. The associations between exposure to mixed environmental endocrine disruptors and sex steroid hormones in men: a comparison of different statistical models. *Sci Rep*. 2024;14(1):26375. doi:10.1038/s41598-024-76972-z
44. Li X, Chen M, Zheng Q, Wang Z, Lin D, Peng M. The association between brominated flame retardants and serum testosterone levels in American adult men: NHANES 2013-2016. *Front Public Health*. 2025;13:1589047. doi:10.3389/fpubh.2025.1589047
45. Hassan S, Thacharodi A, Priya A, et al. Endocrine disruptors: unravelling the link between chemical exposure and women's reproductive health. *Environ Res*. 2024;241:117385. doi:10.1016/j.envres.2023.117385
46. Wang W, Hong X, Zhao F, Wu J, Wang B. The effects of perfluoroalkyl and polyfluoroalkyl substances on female fertility: a systematic review and meta-analysis. *Environ Res*. 2023;216(Pt 3):114718. doi:10.1016/j.envres.2022.114718
47. Xie G, Zhou Y, Zheng Q, et al. Association between phthalate exposure and reproductive health in patients undergoing assisted reproductive treatment: a systematic review and meta-analysis. *Reprod Toxicol*. 2025;136:108948. doi:10.1016/j.reprotox.2025.108948
48. Zhang C, Zhang G, Sun K, et al. Association of mixed exposure to microplastics with sperm dysfunction: a multi-site study in China. *EBioMedicine*. 2024;108:105369. doi:10.1016/j.ebiom.2024.105369
49. Hamed MA, Akhigbe TM, Adeogun AE, Adesoye OB, Akhigbe RE. Impact of organophosphate pesticides exposure on human semen parameters and testosterone: a systematic review and meta-analysis. *Front Endocrinol (Lausanne)*. 2023; 14:1227836. doi:10.3389/fendo.2023.1227836
50. Guo J, Garshick E, Si F, et al. Environmental toxicant exposure and depressive symptoms. *JAMA Netw Open*. 2024;7(7):e2420259. doi:10.1001/jamanetworkopen.2024.20259
51. Borroni E, Pesatori AC, Bollati V, Buoli M, Carugno M. Air pollution exposure and depression: a comprehensive updated systematic review and meta-analysis. *Environ Pollut*. 2022 ;292(Part A):118245. https://doi.org/10.1016/j.envpol.2021.118245
52. Bai L, Wen Z, Zhu Y, Jama HA, Sawmadal JD, Chen J. Association of blood cadmium, lead, and mercury with anxiety: a cross-sectional study from NHANES 2007-2012. *Front Public Health*. 2024;12:1402715. doi:10.3389/fpubh.2024.1402715
53. Sangwijit C, Ong-Artborirak P, Naksen W, Kallawicha K, Siewchaisakul P. Health Effects of heavy metal exposure among E-waste workers and community-dwelling adults in Thailand: a cross-sectional study. *J Prev Med Public Health*. 2025;58(2):156-166. doi:10.3961/jpmph.24.415
54. Lucchini RG, Hashim D. Tremor secondary to neurotoxic exposure: mercury, lead, solvents, pesticides. *Handb Clin Neurol*. 2015;131:241-249. doi:10.1016/B978-0-444-62627-1.00014-7
55. Garg D, Mehndiratta MM, Wasay M, Aggarwal V. Air pollution and headache disorders. *Ann Indian Acad Neurol*. 2022;25(Suppl 1):S35-S40. doi:10.4103/aian.aian_1138_21
56. Ge R, Wang Y, Zhang Z, Sun H, Chang J. Association of long-term exposure to various ambient air pollutants, lifestyle, and genetic predisposition with incident cognitive impairment and dementia. BMC Public Health. 2024;24(1):179. Published 2024 Jan 15. doi:10.1186/s12889-024-17702-y
57. Ribeiro CM, Beserra BTS, Silva NG, et al. Exposure to endocrine-disrupting chemicals and anthropometric measures of obesity: a systematic review and meta-analysis. *BMJ Open*. 2020;10(6):e033509. doi:10.1136/bmjopen-2019-033509
58. Wu Q, Li G, Zhao CY, et al. Association between phthalate exposure and obesity risk: a meta-analysis of observational studies. *Environ Toxicol Pharmacol*. 2023 ; 102:104240. doi:10.1016/j.etap.2023.104240
59. Panda C, Komarnytsky S, Fleming MN, et al. Guided metabolic detoxification program supports phase II detoxification enzymes and antioxidant balance in healthy participants. *Nutrients*. 2023;15(9):2209. doi:10.3390/nu15092209
60. Jessen NA, Munk AS, Lundgaard I, Nedergaard M. The glymphatic system: a beginner's guide. *Neurochem Res*. 2015;40(12):2583-2599. doi:10.1007/s11064-015-1581-6
61. Yoo RE, Kim JH, Moon HY, et al. Long-term physical exercise facilitates putative glymphatic and meningeal lymphatic vessel flow in humans. *Nat Commun*. 2025;16(1):3360. doi:10.1038/s41467-025-58726-1
62. [in vitro] von Holstein-Rathlou S, Petersen NC, Nedergaard M. Voluntary running enhances glymphatic influx in awake behaving, young mice. *Neurosci Lett*. 2018;662:253-258. doi:10.1016/j.neulet.2017.10.035
63. Ma J, Chen M, Liu GH, et al. Effects of sleep on the glymphatic functioning and multimodal human brain network affecting memory in older adults. *Mol Psychiatry*. 2025;30(5):1717-1729. doi:10.1038/s41380-024-02778-0
64. Xiong Z, Bai M, Wang Z, et al. Resting-state fMRI network efficiency as a mediator in the relationship between the glymphatic system and cognitive function in obstructive sleep apnea hypopnea syndrome: insights from a DTI-ALPS investigation. *Sleep Med*. 2024;119:250-257. doi:10.1016/j.sleep.2024.05.009
65. Chong PLH, Garic D, Shen MD, Lundgaard I, Schwichtenberg AJ. Sleep, cerebrospinal fluid, and the glymphatic system: a systematic review. *Sleep Med Rev*. 2022;61:101572. https://doi.org/10.1016/j.smrv.2021.101572
66. Lee WR, Dangal P, Langan G, et al. Associations between household characteristics and environmentally persistent free radicals in house dust from two Australian locations. *Front Public Health*. 2025;13:1603114. doi:10.3389/fpubh.2025.1603114
67. Sun, L., & Wallace, L. A. Residential cooking and use of kitchen ventilation: the impact on exposure. *J Air Waste Manag Assoc*. 2021;71(7), 830–843. https://doi.org/10.1080/10962247.2020.1823525

68. Satomi S, Takahashi S, Yoshida K, et al. Effects of broccoli sprout supplements enriched in glucoraphanin on liver functions in healthy middle-aged adults with high-normal serum hepatic biomarkers: a randomized controlled trial. *Front Nutr*. 2022;9:1077271. doi:10.3389/fnut.2022.1077271
69. Kikuchi M, Ushida Y, Shiozawa H, et al. Sulforaphane-rich broccoli sprout extract improves hepatic abnormalities in male subjects. *World J Gastroenterol*. 2015;21(43):12457-12467. doi:10.3748/wjg.v21.i43.12457
70. Johnson-Martínez JP, Diener C, Levine AE, et al. Aberrant bowel movement frequencies coincide with increased microbe-derived blood metabolites associated with reduced organ function. *Cell Rep Med*. 2024;5(7):101646. doi:10.1016/j.xcrm.2024.101646
71. Ramos CI, Armani RG, Canziani ME, et al. Bowel habits and the association with uremic toxins in non-dialysis-dependent chronic kidney disease patients. *J Ren Nutr*. 2020;30(1):31-35. doi:10.1053/j.jrn.2019.02.004
72. Vanegas SM, Meydani M, Barnett JB, et al. Substituting whole grains for refined grains in a 6-wk randomized trial has a modest effect on gut microbiota and immune and inflammatory markers of healthy adults. *Am J Clin Nutr*. 2017;105(3):635-650. doi:10.3945/ajcn.116.146928
73. Suenghataiphorn T, Danpanichkul P, Kulthamrongsri N, et al. Larger fruit consumption helps constipation patients: socioeconomic analysis from 2005 - 2010 NHANES matched cohorts. *Gastroenterol Hepatol Bed Bench*. 2025;18(1):70-81. doi:10.22037/ghfbb.v18i1.2997
74. Guo J, Knol LL, Yang X, Kong L. Dietary fiber intake is inversely related to serum heavy metal concentrations among US adults consuming recommended amounts of seafood: NHANES 2013–2014. *Food Front*. 2021;3(1):142-149. https://doi.org/ 10.1002/fft2.114
75. Sultan H, Buckley JP, Kalwarf H, et al. Dietary per- and polyfluoroalkyl substance (PFAS) exposure in adolescents: the HOME study. *Environ Res*. 2023;231(Pt 1):115953. doi:10.1016/j.envres.2023.115953
76. Lo JA, Kim JS, Jo MJ, et al. Impact of water consumption on renal function in the general population: a cross-sectional analysis of KNHANES data (2008-2017). *Clin Exp Nephrol*. 2021;25(4):376-384. doi:10.1007/s10157-020-01997-3
77. Wang HW, Jiang MY. Higher volume of water intake is associated with lower risk of albuminuria and chronic kidney disease. *Medicine (Baltimore)*. 2021;100(20):e26009. doi:10.1097/MD.0000000000026009
78. Kuan WH, Chen YL, Liu CL. Excretion of Ni, Pb, Cu, As, and Hg in sweat under two sweating conditions. *Int J Environ Res Public Health*. 2022;19(7):4323. doi:10.3390/ijerph19074323
79. Siquier-Coll J, Bartolome I, Perez-Quintero M, Munoz D, Robles MC, Maynar-Marino M. Effect of exposure to high temperatures in the excretion of cadmium and lead. *J Therm Bio*l. 2020;89:102545. https://doi.org/10.1016/j.jtherbio.2020.102545
80. Fu MR, McTernan ML, Qiu JM, et al. The effects of kinect-enhanced lymphatic exercise intervention on lymphatic pain, swelling, and lymph fluid level. *Integr Cancer Ther*. 2021;20:15347354211026757. doi:10.1177/15347354211026757
81. Fu MR, Li Y, Conway C, Masone A, Fang J, Lee C. The effects of exercise-based interventions on fluid overload symptoms in patients with heart failure: a systematic review and meta-analysis. *Biomedicines*. 2022;10(5):1111. doi:10.3390/biomedicines10051111