# Indoor climbing shoes release toxic chemicals at levels akin to megacity pollution, study finds



Indoor rock climbers may be inhaling toxic chemicals released from the rubber soles of their climbing shoes, according to new research from Austrian scientists. A study conducted by researchers at the University of Vienna has found that the fumes emitted by climbing shoe soles contain harmful pollutants at levels comparable to some of the most polluted cities globally.

The scientists collected air samples from nine indoor climbing gyms across Europe, including five in Vienna and others located in France, Spain, and Switzerland. Using an impinger device—an instrument that simulates human lung exposure—they measured concentrations of toxic chemicals in the gym air. They discovered that the levels of these pollutants were similar to those found alongside busy multi-lane roads in large Chinese cities.

The chemical additives released are similar to those used in car tyres to enhance grip and durability. One such chemical identified is 6PPD-quinone, which has been linked to lung inflammation, scarring, and organ damage in animal studies. Research from China has suggested that high exposure to this substance could harm human airways, while children living in areas with elevated 6PPD-quinone levels were found to be more susceptible to respiratory infections like influenza. Another compound detected, benzothiazole, has associations with an increased risk of bladder cancer among factory workers.

Joint author of the study Anya Sherman, an environmental scientist, highlighted that climbers often encounter black residue on indoor holds produced by these shoe materials. She told the Daily Mail, “Climbers wipe it off to get a better grip, and it gets kicked up into the air.” Fellow researcher Professor Thilo Hofmann added, “The levels we measured are among the highest ever documented worldwide, comparable to multi-lane roads in mega-cities.”

The researchers are urging for improved ventilation systems in indoor climbing facilities to lower airborne pollutant concentrations. They also advocate for a redesign of climbing shoe materials to eliminate or reduce harmful chemicals. “These substances do not belong in the air we breathe,” Professor Hofmann said. He stressed that although the full health implications of long-term exposure remain uncertain, precautionary measures are necessary, especially for vulnerable groups such as children.

Indoor rock climbing, also known as bouldering when done without harnesses, has seen significant growth in popularity in recent years across the UK and internationally. A 2018 survey found that 1% of Britons and 5% of Americans frequented climbing gyms, with about 20% of those identifying as regular climbers attending multiple sessions each week. Public figures like actor Jason Momoa have also brought attention to the sport.

Meanwhile, Ms Sherman suggested climbers might reduce their exposure by visiting gyms during off-peak hours when pollutant levels tend to be lower. The study detailing these findings was published in the journal Environmental Science and Technology Air. The Daily Mail is reporting on these scientific developments which could have implications for health protocols in climbing gyms.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://gettotext.com/bouldering-toxic-chemicals-from-abrasion-of-climbing-shoes-kassensturz-espresso/> - This article discusses a study by the University of Vienna and ETH Lausanne, revealing that the air in climbing gyms is heavily polluted with chemicals from the abrasion of climbing shoe soles, similar to tire wear particles.
* <https://gizmodo.com/indoor-climbing-gyms-might-be-chock-full-of-toxic-rubber-additives-study-finds-1851454391> - This article reports on research indicating that indoor climbing gyms may have high levels of toxic rubber additives in the air and dust, likely originating from the soles of climbing shoes.
* <https://pubs.acs.org/doi/10.1021/acs.estlett.3c00521> - This review article examines the environmental occurrence and toxicity of 6PPD-quinone, a chemical compound found in tire rubber, highlighting its presence in various environmental media and its toxic effects on aquatic organisms.
* <https://www.usgs.gov/programs/environmental-health-program/science/6ppd-quinone/> - This page from the U.S. Geological Survey provides information on 6PPD-quinone, a chemical released from tires, detailing its environmental impact and toxicity to aquatic life.
* <https://pubmed.ncbi.nlm.nih.gov/36464050/> - This study investigates the long-term exposure to tire-derived 6-PPD quinone and its effects on intestinal toxicity in Caenorhabditis elegans, providing insights into the compound's impact on biological systems.
* <https://www.sciencedirect.com/science/article/pii/S0160412024002630> - This article discusses the environmental profiles, hazard identification, and toxicological effects of emerging tire rubber-related contaminants, including 6PPD and 6PPD-quinone, emphasizing their widespread presence and potential health risks.
* <https://www.dailymail.co.uk/health/article-14663241/Bouldering-rock-climbing-lung-damage-warn-pollution.html?ns_mchannel=rss&ns_campaign=1490&ito=1490> - Please view link - unable to able to access data