

Microplastics Found to Trigger Cancer-Linked Changes in Lung Cells

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STORY AT-A-GLANCE

- › Microplastics were found to trigger cancer-like changes in healthy lung cells, including increased mobility, DNA damage, and activated survival pathways
- › Inhaled particles bypass your body's defenses and embed deep in your lungs, where they silently disrupt cellular function without causing obvious inflammation
- › A review of 31 studies confirmed that microplastics harm your lungs, gut, and reproductive organs even at exposure levels that mimic everyday life
- › Smaller nanoplastics are especially dangerous because they cross into your bloodstream, reaching your liver, brain, and other organs where they cause long-term damage
- › Natural strategies like psyllium, chitosan, probiotics, and autophagy-enhancing nutrients help trap and remove plastic particles before they're absorbed

Microplastics are no longer just a problem in the ocean — they're showing up deep in your lungs, changing how your cells function, and raising red flags about cancer risk.

A study published in the Journal of Hazardous Materials revealed that when healthy lung cells absorb polystyrene micro- and nanoplastics — the same kind found in food containers and packaging — they adapt in dangerous ways.¹

Instead of dying off, these cells become more mobile and activate pro-survival signals linked to tumor formation. In other words, plastic doesn't kill your lung cells; it rewires them to behave more like cancer. You inhale thousands of these particles every day from indoor dust, car tires, synthetic fabrics, and degraded packaging.

They're small enough to bypass your airways' built-in defenses and embed themselves in the tissue, right where gas exchange happens. Once there, they generate oxidative stress — an internal firestorm of reactive molecules that attack your DNA, disrupt repair systems, and throw off normal cell function. The transformation into a more aggressive, unstable state starts earlier than anyone thought — not in tumors, but in the tissues you rely on to breathe.

These changes don't cause symptoms right away. But left unchecked, they lay the groundwork for chronic inflammation, lung disease, or cancer later in life. The evidence is clear: plastic is interfering with the core biology of your lungs. Now let's look at how these findings came to light — and what exactly plastic does once it enters your body.

Healthy Lung Cells Absorb More Plastic Than Cancer Cells — and Change in Dangerous Ways

For the Journal of Hazardous Materials study, researchers examined the effects of microplastics and nanoplastics on both healthy lung cells and three types of lung cancer cells.² They wanted to see if these **plastic particles** — widely found in food packaging, household dust, and industrial waste — interfere with normal cell function or trigger biological changes tied to disease.

- **Healthy cells were more affected than cancerous ones** — The researchers exposed the cells to various sizes of microplastics and nanoplastics at low doses meant to reflect real-world conditions. Surprisingly, it was the healthy lung epithelial cells that absorbed more plastic than the cancer cell lines. These normal cells also showed a greater shift in behavior, including changes in shape, structure, and migration — all red flags for malignant transformation.

- **Plastic exposure didn't kill cells — it pushed them into survival mode —** Unlike many toxins that kill off cells through apoptosis, or programmed cell death, **microplastics** didn't trigger widespread cell death. Instead, they activated internal damage response systems, including DNA repair signals and antioxidant defense. This is concerning because it means the cells adapted to survive in a toxic environment — the first step in the chain reaction that leads to cancer.
- **DNA damage and oxidative stress were key findings —** The lung cells showed elevated markers of oxidative stress and significant DNA strand breaks after exposure to microplastics and nanoplastics. This kind of internal damage, if not properly repaired, leads to genetic instability — a known precursor to cancer development. The study also confirmed that oxidative stress was size-dependent, with smaller nanoparticles causing more harm than larger ones.

Plastic Exposure Made Healthy Cells More Mobile — a Cancer-Like Behavior

One of the most troubling findings was that lung cells increased their rate of migration after plastic exposure. In cancer biology, increased mobility is a marker for aggressive tumor cells, which invade surrounding tissues and spread throughout the body. The fact that noncancerous cells began behaving this way highlights the hidden risk of daily microplastic exposure.³

- **Plastic particles disrupted the cell membrane and cytoskeleton —** Researchers used imaging tools to show that both nano- and microplastics entered the cells and altered the internal structure. The actin cytoskeleton — a network that helps cells maintain their shape and movement — was significantly reorganized in exposed cells. This internal restructuring made the cells more fragile and unstable.
- **Several survival pathways were activated in the lung cells —** Exposure to microplastics and nanoplastics triggered signaling pathways that promote cell survival and resistance to stress. These same pathways are commonly overactive in

tumor cells, and their activation in healthy lung cells suggests that plastic is not just a passive contaminant but an active disruptor of cell biology.

- **Plastic-induced changes occurred without visible inflammation** — One of the more insidious findings was that all of these harmful changes occurred without classic signs of inflammation or immune response. That means you wouldn't feel anything or see any symptoms — but the long-term cellular effects could be serious. This stealth effect underscores why [daily exposure to microplastics](#) should not be dismissed.
- **Cells exposed to plastic lost their ability to function normally** — Overall, the study showed that plastic particles interfere with nearly every aspect of healthy lung cell behavior: from DNA integrity to cell shape, mobility, and stress response. While the research didn't follow these changes to full tumor formation, the authors emphasized that these are precisely the kinds of shifts that lead to long-term disease.

Microplastics Damage Your Lungs, Gut, and Reproductive System — Even at Everyday Exposure Levels

A 2024 review in Environmental Science & Technology looked at 28 animal studies and three human studies to understand what happens when microplastics get inside you — whether you [breathe them in](#) or swallow them.⁴ The damage wasn't limited to one area. It showed up in the lungs, digestive tract, and even [reproductive organs](#).

- **Plastic triggered inflammation, DNA damage, and hormonal disruption** — Inhaling plastic particles caused inflammation in the lungs, scarring of airways, and changes in how immune cells responded.

Ingested plastics damaged the gut lining, disrupted the gut microbiome, and kicked off chronic inflammation. Some studies showed sperm damage, lower testosterone, changes in ovary structure, and reduced fertility in animals. These effects weren't limited to high doses — they happened at levels that mimic everyday life.

- **Oxidative stress was the main mechanism behind the harm** — The common thread was oxidative stress — a kind of internal “rusting” process where your body struggles to keep up with damaging free radicals. That stress interferes with DNA repair, weakens cell membranes, and confuses your immune system. Once it starts, it becomes harder for your body to recover from the damage.
- **Smaller particles go deeper — and stay longer** — Nanoplastics, the tiniest particles, were the most dangerous. They could pass through the lungs or gut lining, enter the bloodstream, and end up in places like your liver, kidneys, or even [your brain](#). These particles didn’t just pass through — they stuck around and changed how those organs functioned.
- **Plastic isn’t just an environmental problem — it’s a full-body health threat** — What you breathe, eat, and drink every day could be slowly reshaping your internal biology. Even though more human studies are needed, the fact that dozens of animal studies found damage across key organ systems — at realistic exposure levels — makes one thing clear: your daily contact with microplastics isn’t harmless.

Natural Strategies to Eliminate Microplastics Are Being Explored

Studies are now looking at strategies to help the human body filter, trap, and eliminate microplastics before they can spread throughout your other systems. These methods offer a multi-angle approach to help reduce your internal plastic load and support overall health. I’ve written a paper discussing these methods in detail, and while it is still under peer-review, I’ve provided the key findings below.

- **Cross-linked psyllium could help eliminate microplastics** — One key system that plays a role in removing microplastics from your body is your gut. A 2024 study showed that acrylamide cross-linked psyllium (PLP-AM) removed over 92% of common plastic types like polystyrene, polyvinyl chloride (PVC), and polyethylene terephthalate (PET) from water.

Because of its high swelling ability and sticky, gel-like texture, cross-linked psyllium could be adapted to work inside the gut, where it may trap plastic particles before they're absorbed into the body. While the study was conducted in a water treatment setting, the results are also promising for human health.⁵

- **Chitosan, a natural fiber derived from shellfish, also shows promise for clearing microplastics from your body** — An animal study published in Scientific Reports found that rats given a chitosan-enriched diet were able to eliminate about 115% of the polyethylene microplastics they were fed, compared to just 84% in the control group.

This suggests that chitosan not only helps bind and eliminate new plastic particles but might even help pull out some that were already absorbed. However, while it's generally considered safe and already used in supplements, people with shellfish allergies are advised to steer clear of it.⁶

Psyllium and chitosan work through physical adsorption, where hydrophobic (water-repelling) and electrostatic forces stick microplastic particles to the fiber, keeping them from being absorbed. However, one drawback with these binders is that they can also soak up nutrients if not timed carefully. Hence, they need to be used strategically to provide the most benefit, such as ingesting them with processed or packaged foods, which are more likely to contain plastics.

- **Certain beneficial bacteria strains can help clear microplastics from the gut** — A 2025 animal study found that two specific strains, *Lactocaseibacillus paracasei* DT66 and *Lactiplantibacillus plantarum* DT88, were able to bind to and eliminate tiny polystyrene particles in lab tests.

These probiotics work by forming protective biofilms that trap plastic particles, making them easier to flush out.⁷ When combined with dietary fibers like psyllium and chitosan, the result could be a more effective and natural way to sweep microplastics out of the gut before they're absorbed.

- **The liver also plays an essential role in clearing microplastics from the bloodstream** — Specialized immune cells in the liver, known as Kupffer cells, help trap these foreign particles and route them into bile for elimination via the intestines. However, while this method may work on smaller plastics, larger ones can linger and build up, especially if your liver function is compromised.

To support this natural detox pathway, researchers are studying the use of compounds like ursodeoxycholic acid (UDCA) and its variant tauroursodeoxycholic acid (TUDCA), which stimulate bile production and improve particle flow out of the liver.

- **Researchers are also looking at strategies to enhance autophagy to eliminate microplastics** — Autophagy is your body's natural cellular recycling system. Researchers are looking at compounds that can help promote this system, mainly rapamycin and spermidine.

Rapamycin works by inhibiting the mTOR pathway, a nutrient-sensing mechanism that normally suppresses autophagy. When mTOR is turned off, cells ramp up their cleanup efforts, forming membranes that can collect and isolate plastic particles for breakdown or removal. Meanwhile, spermidine is a naturally occurring polyamine found in foods that enhances cellular resilience and supports the clearance of toxic substances.

In lab and animal studies, the combination of spermidine and rapamycin helped reverse mitochondrial dysfunction and reduce oxidative stress caused by microplastics.

The table below summarizes these novel strategies to eliminate microplastics, including their mechanisms of action, how much testing has been done, and important safety considerations. It shows that although several different approaches may be needed, clearing plastics from your body naturally is possible. Of course, reducing your exposure is still the ideal preliminary course of action.

Approach	Mechanism	Pre-clinical evidence	Human evidence	Major safety notes
Cross-linked psyllium fiber	Adsorption & fecal excretion	92% MP removal in vitro (PLP AM 2024)	None	Monitor malabsorption
Probiotic strains DT66/DT88	Biofilm aggregation & excretion	30% ↑ fecal MP in mice (2025 Front Microbiol)	None	GRAS, but strain-specific
UDCA bile acid therapy	↑ Hepatobiliary efflux	Mitigates liver injury, ↑ transporter expression (2024 Sci Rep)	UDCA approved for PBC	GI upset at >15mg kg ⁻¹ d ⁻¹
Rapamycin (autophagy enhancer)	Restores autophagosome-lysosome fusion	Reverses NP-induced pyroptosis in vitro (2025 J Transl Med)	Phase II trials for other uses	Immunosuppression risk
Kupffer-targeted nanoliposome "vacuum"	Phagocytic sequestration & bile export	80% capture of 100-300 nm MPs in ex vivo liver perfusion (2025)	None	First-in-animal planned

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How to Reduce Your Exposure to Lung-Damaging Microplastics

If you're breathing, you're exposed. Microplastics are in the air around you – from synthetic carpets and clothing to packaging dust and car exhaust. You don't need to panic, but you do need to act. These particles aren't just passing through your lungs.

They're embedding, altering how your cells behave, and triggering damage at a cellular level. That means you need to treat this like any other environmental toxin: identify the source and cut it off. Here's how I recommend you take control of your environment and protect your lungs:

- 1. Ditch synthetic textiles and go natural wherever possible** — If you're wearing polyester or drying synthetic fabrics indoors, you're likely inhaling fibers you can't see. Switch to natural clothing like cotton, wool, linen, or hemp. Use a vented dryer and keep your laundry space well-ventilated to reduce airborne fibers.

If you're a parent, prioritize organic natural fibers for children — they're more vulnerable to inhalation damage. For the synthetic pieces you already own, wash them less frequently, line dry when possible, and use a microfiber-catching laundry bag to trap loose fibers.

- 2. Upgrade your indoor air filtration and filter your water** — Your lungs are working overtime in enclosed spaces. Use a high-efficiency particulate air (HEPA) filter in the rooms where you spend the most time — especially bedrooms and workspaces. If you live in an apartment or near a busy road, a good air purifier is nonnegotiable.

Make sure it's rated for micro-sized particles (PM2.5 or smaller) to catch airborne plastic dust. In addition, use a high-quality water filtration system that removes particles down to the micron level.

- 3. Avoid heating plastic containers or food packaging** — Microwaving plastic, drinking hot liquids from plastic-lined cups, or using plastic containers for leftovers can release polystyrene particles and nanoplastics. Store food in glass or stainless steel instead. If you're reheating, make it a habit to transfer your food out of plastic first — this one small change significantly lowers your microplastic load.

- 4. Vacuum with a sealed system and damp dust frequently** — Dust is one of the biggest sources of indoor microplastics — and your vacuum matters. Use a sealed vacuum with a HEPA filter, and clean floors regularly, especially if you have carpets or pets. Dry dusting just pushes particles into the air, so use a damp cloth to trap and remove dust instead.

- 5. Avoid personal care products that contain microbeads or plastic thickeners** — If you're using exfoliating scrubs, toothpaste, or face washes that list polyethylene or polypropylene on the label, you're applying plastic directly to your skin and possibly

rinsing it into the air. Choose clean, microplastic-free products.

You won't just help your body — you'll help reduce contamination in the environment, too. Small actions, when done consistently, have a compounding effect. The less plastic you breathe in, the lower your risk of cellular stress, immune dysfunction, and long-term lung damage.

FAQs About Microplastics

Q: How do microplastics affect my lungs?

A: Microplastics don't just sit in your airways — they get absorbed into lung cells and trigger changes linked to cancer. They cause oxidative stress, DNA damage, and make healthy cells behave more like tumor cells by activating survival pathways and increasing mobility, even without obvious inflammation.

Q: Where do microplastics come from, and how do I inhale them?

A: You breathe them in from indoor dust, synthetic clothing, carpets, car tires, and even packaging materials. These particles are tiny enough to bypass your lungs' natural defenses and embed in your tissue — right where gas exchange happens.

Q: What other parts of my body do microplastics harm?

A: Beyond your lungs, microplastics damage your digestive system and reproductive organs. Studies show they disrupt your gut lining, alter your microbiome, and interfere with hormones, fertility, and immune signaling. Smaller nanoplastics even reach your brain and liver through your bloodstream.

Q: Can I remove microplastics from my body naturally?

A: Emerging research suggests that natural binders like cross-linked psyllium, chitosan, and specific probiotics help trap and eliminate microplastics in your gut. Other strategies like supporting liver detox and boosting autophagy with compounds like spermidine and rapamycin are also being studied.

Q: What are the best ways to reduce my exposure to microplastics?

A: Switch to natural fabrics, use HEPA air filters, avoid heating food in plastic, vacuum with sealed systems, and choose clean personal care products without microbeads. Small daily changes significantly lower your plastic exposure and protect your long-term health.

Sources and References

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