MERCOLA
Take Control of Your Health

# Study Reveals Bile as Reservoir for Microplastics in Humans

Analysis by Dr. Joseph Mercola | May 21, 2026

## STORY AT-A-GLANCE

- Microplastics have been found in every human bile sample tested, showing that your body is likely actively storing them in a key digestive fluid
- Higher levels of microplastics are linked to gallstones, meaning everyday plastic exposure connects directly to a condition that causes pain, inflammation, and digestive disruption
- These particles are large enough to interact with your cells, where they interfere with energy production and slow down your body's ability to repair and function
- Repeated exposure drives your cells into premature aging, creating a cycle of inflammation and tissue damage that builds over time without obvious early symptoms
- Simple daily changes like avoiding plastic food contact, filtering your water, and improving indoor air quality reduce how much plastic enters your body and lowers what accumulates in your bile

**Microplastics are no longer just polluting oceans and rivers; they're accumulating inside your body. A 2026 study published in Environmental Science and Ecotechnology found plastic particles inside human bile, revealing that your body's own waste-processing fluid is acting as a collection site for these contaminants.[1] What researchers uncovered goes beyond simple exposure.**

The evidence points to cellular damage, including energy failure at the mitochondrial level and premature aging of tissue that lines your bile ducts. This is not a problem to ignore and hope resolves on its own. Once plastics settle into bile, your body has limited ability to flush them without targeted support. That reality is exactly why I wrote "**Microplastics Cure: Total Body Cleanse**," which comes out soon.

The book goes deeper into how this invisible exposure affects your long-term health, why your body struggles to clear plastics once they accumulate, and what you can do to lower your burden and strengthen your natural defenses. Understanding how microplastics reach your bile, and what they do once trapped there, starts with a closer look at how researchers uncovered this hidden reservoir inside the human body.

## Plastic Is Accumulating Where Your Body Processes Waste

For the Environmental Science and Ecotechnology study, researchers investigated whether **microplastics** collect inside human bile, a fluid your liver produces to break down fats and carry waste out of your body. Bile is a key pathway your body uses to process and eliminate toxins. Scientists analyzed bile samples using advanced detection methods that identify both the type and amount of plastic present.

- **Every participant carried measurable plastic inside their bile —** The study examined bile from 14 adults undergoing gallbladder surgery and found microplastics in every single sample tested. Six different plastic types showed up, with polyethylene terephthalate (PET) making up 68.05% and polyethylene (PE) accounting for 27.11% of the total. These are the same plastics used in water bottles, food packaging, and containers you encounter daily.

- **People with gallstones had more plastic buildup —** Participants with **gallstones** showed significantly higher concentrations of microplastics in their bile compared to those without. Gallstones form when substances like cholesterol harden inside the gallbladder, leading to pain, nausea, and digestive issues. The fact that higher plastic levels appear in this group signals a direct connection between environmental exposure and a physical condition you can feel and experience.

- **The particles are large enough to interfere with your cells —** Most of the detected microplastics ranged from 20 to 50 micrometers in size, large enough for these particles to interact directly with cells rather than pass through unnoticed. This size range increases the likelihood that plastics become embedded in tissues or disrupt normal cellular processes instead of being easily flushed out.

- **Your daily habits influence how much plastic builds up —** The study tracked lifestyle factors such as bottled water use and takeout consumption among participants. A noticeable portion reported frequent plastic bottle use and regular exposure to packaged food. While the sample size is small, it reflects a pattern you can recognize in your own life — repeated, low-level exposure that adds up over time rather than a single large event.

## How Plastics Disrupt Bile and Damage Your Cells

The researchers explained that bile is part of your body's waste removal system.[2] Its unique composition, rich in fats and bile salts, attracts and binds to plastic particles. This means once microplastics enter your system, bile becomes a place where they collect instead of being quickly eliminated.

- **Plastic buildup disrupts normal bile function —** When microplastics accumulate, they interfere with how bile flows and how its components stay balanced. Bile needs the right mix of cholesterol, acids, and pigments to function properly. Disruption leads to crystallization, which is the first step in gallstone formation. In simple terms, plastic interferes with your body's ability to keep this fluid stable.

- **Chronic exposure damages the energy systems inside your cells —** The study exposed human bile duct cells to low doses of microplastics over several days to simulate real-world exposure. Researchers observed **mitochondrial dysfunction**, meaning the parts of your cells responsible for producing energy began to fail. When your cells lose energy efficiency, every process slows down — repair, detox, and communication all suffer.

- **Damaged cells enter a state of premature aging —** Scientists identified a process called **senescence** in the exposed cells, which means the cells stop working properly but don't die off. Instead, they release inflammatory signals that damage nearby healthy cells. This creates a ripple effect, where one damaged cell influences others, accelerating tissue decline over time.

- **Melatonin showed a measurable protective effect —** When researchers introduced **melatonin**, a compound your body produces naturally, they observed preserved mitochondrial function and reduced cellular damage. In plain terms, melatonin helped keep the cells' energy systems running and slowed the aging process triggered by plastic exposure. This finding highlights a clear mechanism — oxidative stress — as a key driver of the damage.

## Reduce Your Plastic Burden to Protect Your Bile

What this means in practical terms is that every day your bile sits loaded with plastic particles, the cells lining your bile ducts are aging faster than they should, and you won't feel it until the damage has accumulated. But the exposure pattern that drives this is largely within your control.

Microplastics build up because they enter your system daily and your bile traps them instead of clearing them efficiently. That gives you two clear targets: reduce what comes in and support how your body moves and eliminates those particles. When you focus on both, you shift the entire trajectory.

1. **Cut off the biggest source of exposure first — plastic food and drink contact —** If you drink from plastic bottles, store food in plastic containers, or heat food in plastic, that's a constant source of exposure. Research has found that a single liter of bottled water can contain thousands of microplastic particles, and heating plastic dramatically increases release.[3,4] Switch to glass or stainless steel for water and food storage.

Don't microwave in plastic, as even containers labeled "microwave safe" still release particles at elevated temperatures. Use glass or ceramic dishes instead. Replace plastic cutting boards with wood or bamboo alternatives, which don't shed synthetic fragments into your food. Every plastic contact point you remove means fewer particles circulating into your bile.

2. **Change how you handle takeout and packaged foods —** Takeout meals sit in plastic or foam containers, often while still hot, which accelerates leaching. Transfer hot food to glass or ceramic immediately upon arrival; don't eat directly from the container. Even better, cook most of your food at home to avoid takeout meals as much as possible.

   When buying groceries, choose unpackaged produce over pre-wrapped options. Avoid single-serve plastic-wrapped snacks when whole food alternatives are available.

   If you use tea bags, switch to loose-leaf tea, since many commercial tea bags are made with or sealed using plastic and release billions of micro- and nanoplastic particles when steeped in hot water. These are small, daily habits, but the cumulative reduction is significant when you consider how many meals per week involve plastic contact.

3. **Support bile flow so your body clears waste more efficiently —** Your bile is a transport system for waste. When it stagnates, buildup increases. You want steady bile movement. Eat bitter foods like arugula, dandelion greens, artichokes, and citrus. These stimulate bile flow by triggering cholecystokinin, a hormone that causes your gallbladder to contract and release bile.

   While increased bile flow hasn't been directly studied as a microplastic clearance strategy, the principle of keeping bile cycling rather than stagnant reduces the window for accumulation. Also include soluble fiber from foods like apples and root vegetables, which binds to bile acids in your gut and promotes their excretion rather than recirculation.

Stay well-hydrated with plenty of filtered water daily, since bile is mostly water and thickens when you're dehydrated. Include healthy fats from sources like grass fed butter, ghee, and tallow to trigger natural gallbladder contractions. **Choline-rich foods** such as pastured eggs and grass fed liver support your liver's ability to produce bile in the first place. The goal is to keep bile thin, flowing, and actively cycling waste out of your body instead of storing it.

4. **Filter your water and rethink your daily fluid sources —** If your main hydration comes from tap or bottled water, you're getting a steady stream of microplastics. Municipal treatment plants don't remove microplastics effectively. Look for a high-quality water filtration system specifically designed to target fine particulates, including microplastics at the submicron level.

   Not all filters are equal; standard pitcher filters and refrigerator filters have pore sizes thousands of times too large to catch the smallest particles.

   When evaluating systems, check whether they're tested and certified for microplastic removal, and prioritize units with the finest filtration capability your budget allows. Store all filtered water in glass, and don't refill plastic bottles, which continue to leach. This single change eliminates thousands of plastic particles from what you consume every day.

5. **Reduce airborne plastic exposure inside your home —** Microplastics are in the **air you breathe**. Indoor air often contains higher concentrations of airborne microplastics than outdoor air because synthetic carpets, polyester clothing and bedding, vinyl flooring, and household dust continuously shed tiny fibers. You inhale and swallow these throughout the day.

   Use an air purifier with HEPA filtration, which captures 99.97% of particles down to 0.3 microns, well within the range of most airborne microplastic fibers and fragments. Place it in rooms where you spend the most time, particularly your

bedroom. Vacuum regularly with a HEPA-filtered vacuum so settled fibers don't become airborne again. Replace synthetic carpeting with hardwood, tile, or natural fiber rugs when possible.

Choose clothing and bedding made from natural fabrics like cotton, linen, or wool over polyester and nylon. Even your home furnishings matter; synthetic upholstery and curtains shed fibers constantly. Reducing your airborne load directly reduces what accumulates in your lungs, your gut, and ultimately your bile.

6. **Support your body's defenses against microplastic-driven oxidative damage —** Even after reducing exposure, some microplastics will still reach your system. The study found that melatonin preserved mitochondrial function and reduced cellular damage caused by microplastic exposure.

   Your mitochondria actually produce 95% of your body's melatonin. This process depends on your exposure to natural sunlight.[5] Near-infrared light penetrates deep into your skin and switches on an enzyme inside your mitochondria that drives mitochondrial melatonin production, also known as subcellular melatonin. Melatonin acts as a potent antioxidant that neutralizes reactive oxygen species, the primary mechanism through which microplastics damage cells.

   Support your body's own melatonin production by maintaining a consistent sleep schedule, sleeping in total darkness, and getting morning sunlight exposure. Beyond melatonin, other antioxidant-rich foods like berries, green tea, and cruciferous vegetables provide additional protection against the oxidative stress that microplastics generate. The goal is to build internal resilience so the particles that do get through cause less damage.

## FAQs About Microplastics in Bile

### Q: What are microplastics and how do they end up in bile?

**A:** Microplastics are tiny plastic particles from packaging, bottled water, and synthetic materials that enter your body through food, water, and air. The research shows your bile, a fluid that helps digest fats and remove waste, attracts and collects these particles instead of clearing them efficiently.

**Q: Why does it matter that microplastics build up in bile?**

**A:** Bile plays a key role in digestion and waste removal. When plastics accumulate, they disrupt its balance and flow. This interference contributes to gallstone formation, which is linked to symptoms like abdominal pain, nausea, and digestive problems. Over time, this disruption places ongoing stress on your liver and gallbladder.

**Q: How do microplastics damage my cells?**

**A:** The study showed that even low, repeated exposure damages mitochondria, the parts of your cells that produce energy. When these structures fail, your cells lose efficiency and shift into a state called senescence, where they stop functioning properly and release inflammatory signals that harm nearby tissue.

**Q: Are some people at higher risk for microplastic buildup?**

**A:** Individuals with gallstones had higher levels of microplastics in their bile compared to those without. Daily habits also play a major role. Frequent use of plastic bottles, packaged foods, and takeout increases your exposure, which raises the amount that accumulates in your body over time.

**Q: What can I do to reduce my exposure and protect my body?**

**A:** You can lower your burden by removing everyday sources of plastic contact, such as bottled water, plastic food storage, and packaged meals. Filtering your water, improving indoor air quality, and supporting bile flow through diet all help reduce how much plastic enters and stays in your system. These steps directly reduce what builds up in your bile and limit the damage to your cells.

## Sources and References


- [1, 2] Environmental Science and Ecotechnology May 2026, Volume 31, 100686
- [3] National Institutes of Health January 23, 2024
- [4] Toxics. 2026 Jan 20;14(1):94
- [5] Int J Mol Sci. 2021 Nov 19;22(22):12494