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Researchers Surprised by the Level of Toxicity Found in Rubber Gloves

Analysis by Dr. Joseph Mercola | January 31, 2024

STORY AT-A-GLANCE

- In a study of 50 common consumer products, those made of rubber turned out to be most toxic
- The scientists were studying how chemicals that leach from plastic products affect marine organisms, long before the plastics ever break down into microplastic particles
- Only 26% of the chemical features could be identified out of all the products tested, highlighting how little is known about the toxicity of everyday products
- Out of all the chemicals detected, those added to natural rubber and used in dishwashing gloves were the worst
- Household products contain a striking number of plastics chemicals; one rubber car tire contained 2,456 chemical features, and there was a median of 386 across all the products tested

Plastics in the environment break down into microplastics consumed by marine animals worldwide. But the chemicals leached from plastic products may represent an even bigger issue, one that starts the moment they enter the water.[1] Further, in a study of 50 common consumer products, those made of rubber turned out to be most toxic,[2] surprising the researchers since untreated rubber is considered natural.

The number of chemical compounds in plastic goods added another shock. One rubber car tire contained 2,456 chemical features, with a median of 386 across all the objects

tested. Both chemical complexity and abundance were associated with toxicity in the environment, but the chemicals from rubber products, known as elastomers, were particularly toxic.[3]

Most Plastic Chemicals Could Not Be Identified

Researchers with SINTEF Ocean conducted the study as part of project MicroLEACH, which stands for Microplastics — Long-term Effects of plastics and Additive CHemicals on marine organisms. Research scientist Lisbet Sørensen explained:[4]

> *"In this project, we've been focusing on the impacts on marine organisms of chemical additives in plastics. To do this, we've been studying a variety of marine species. During the first screening exercise, we examined two groups of microorganisms — bacteria and microalgae, also known as phytoplankton.*
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> *These species are easy to work with and provide us with quick answers that we can use to help us map out the future direction of our research.*
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> *Later, we worked with the eggs and larvae of cod, which is one of our most important natural resources. We're well aware that fish, just like humans, are more vulnerable to the health effects of pollution when they're immature."*

The team selected 50 products to test, including plastic bags, rubber gloves, car tire granules, children's toys and balloons. They were interested in finding out how the chemicals that leach from these products affect marine organisms, long before the plastics ever break down into microplastic particles.

Chemicals are added to plastics to influence their performance and properties. The most commonly used chemical additives include:[5]

Plasticizers	Flame retardants
Antioxidants	Antiaging chemicals

Colorants	Lubricants
Thermal stabilizers	

Other additives include slip agents, antistatics, antiblocking agents and other compounds used to improve the plastics' performance, along with impurities. All of these are able to leach into the environment. The team wrote in the Journal of Hazardous Materials:[6]

> *"Besides the intentional chemical additives, residual monomers and oligomers, solvents and other polymerization and production impurities are usually also present in plastic and rubber products. None of these 'associated chemicals' are chemically bound to the polymer, typically being dispersed in the porous polymer structure.*
>
> *This means they may leach to the surrounding environment depending on the physicochemical properties of both the polymer and the compound."*

Further, there were so many different chemicals detected that only a small percentage showed up in multiple products — and the vast majority couldn't be identified at all. In fact, only 26% of the chemical features could be identified out of all the products tested.[7] Sørensen said:[8]

> *"We were very surprised at the number of different chemicals we identified in these products. Only 30 percent of the chemical compounds identified were found in two or more products. There were also a large number of chemicals that we couldn't identify with certainty because they were not listed in established substance indexes.*
>
> *This told us how little we know about the composition of many of the everyday products that we have around us all the time."*

Chemicals From Rubber Dishwashing Gloves Were Most Toxic

Upon testing, the study found that 86% to 93% of the rubber extracts were more toxic than the median, compared to only 33% to 36% of the polymer extracts. Thermoplastics are polymers such as polycarbonate, polyethylene and polypropylene.

"Importantly, the study clearly highlighted that extracts from elastomer-based consumer products (both natural and synthetic rubbers) were, in most cases, more toxic than thermoplastic extracts," the researchers wrote. "While the current focus on plastic chemicals is towards thermoplastics, we show that elastomers may be of more concern from an environmental and human health perspective."[9]

Andy Booth, chief research scientist at SINTEF, explained that products made mostly of rubber "had the worst impact on the microorganisms that we investigated in our experiment." He described it as surprising "not least because untreated rubber is seen as a 'natural' product. We found, however, that it was among the substances that was most toxic to the microorganisms we were studying."[10]

Out of all the chemicals detected, those added to natural rubber and used in dishwashing gloves were the worst. "These are substances that we found in four of the fifty products that we tested — dishwashing gloves, car tires, rubber balloons and disposable gloves," Booth said.[11]

Further experiments by the team involved exposing cod embryos and larvae to microplastic particles and related chemicals. They used both compounds since marine animals are exposed to both in the environment. In some cases, the exposures prevented eggs from hatching, while larvae developed vertebral deformities similar to scoliosis.[12]

The team also developed a way to "clean" microplastics of chemicals, then exposed eggs and larvae to chemicals and the "scrubbed" microplastics separately. Interestingly, no toxic effects occurred from exposure to the chemical-free particles.

Are People Consuming Plastic?

While the featured study focused on environmental effects of microplastics and their chemical additives, tiny bits of plastic are virtually everywhere — and they're finding their way into humans as well.

"Both humans and other animals are continuously being exposed to both macro- and microplastics and the chemical additives they contain," Stefania Piarulli, with the MicroLEACH project, notes. "It is thus natural to assume that we are also exposed to plastic-related chemical additives via the food we eat."[13]

A University of Newcastle study analyzed the "existing but limited" literature available on the average amount of plastic ingested by humans. Their calculations were based on 33 studies on the consumption of plastic via foods and beverages, such as drinking water, beer, shellfish and salt.[14] Per week, the researchers estimated that the average person consumes:[15]

- 1,769 plastic particles from drinking water
- 182 plastic particles from shellfish
- 10 plastic particles from beer
- 11 plastic particles from salt

As the data show, drinking water is the greatest contributor to plastic ingestion for humans, and plastic particles were found in groundwater, surface water, tap water and bottled water throughout the world. In the U.S., 94.4% of tap water samples contained plastic fibers, as did 82.4% of tap water samples from India and 72.2% of those from Europe.[16]

Food Manufacturing Is a Major Part of the Problem

The food you eat — from canned salmon to boxed cereal — is also likely contaminated with plastic. Consumer Reports tested 85 foods and found plasticizer chemicals known as phthalates in all but one.[17] Even chewing gum is essentially plastic. The list of

ingredients the U.S. Food and Drug Administration allows in gum base includes the following, which are plastics, rubbers and waxes:[18]

- Butadiene-styrene rubber
- Isobutylene-isoprene copolymer (butyl rubber)
- Petroleum wax, Petroleum wax synthetic
- Polyethylene, one of the most widely used plastics, included in plastic wrap, grocery bags, drainage pipes and bulletproof vests
- Polyvinyl acetate, one of the ingredients found in PVA glue, which you may know as school glue and wood glue[19]

It's also common in household goods. The SINTEF Ocean researchers detected dibutyl phthalate, which is known to cause immunotoxicity in zebrafish and cell damage in algae, in six products — vinyl flooring, flame retardant workwear, an antislip mat, a refuse bag, a phone case and a garden hose.[20]

Meanwhile, while food packaging has received considerable attention for its role in contaminating the food supply, it's only one part of the problem. The manufacturing process itself, which is dependent on plastics, is another.

"My view is that we are exposed to far more chemicals in connection with food processing and cooking than the plastic packaging. We are also exposed to plastic-related chemical additives in many other ways," Piarulli says.[21] As noted by Consumer Reports, during processing foods are exposed to plastics via:[22]

- Pasteurization, during which high temperatures may speed up leaching
- Vinyl gloves, which may contain more than one-third plasticizers
- Plastic tubing, used for milk and oils
- Conveyor belts, which are often plasticized

Phthalates are often hidden in foods like milk, too, due to the milking machines used by conventional dairies, which use extensive plastic tubing. A 2013 study published in

Environment International found that milk was contaminated with phthalates at "several stages in the milk chain."[23]

In addition to the mechanical milking process, the milk may be contaminated due to phthalate-containing feed consumed by the cattle as well as packaging material.

Beyond milk, items such as vinyl rain coats, boots and shower curtains are high in phthalates, Shanna Swan, Ph.D., a reproductive epidemiologist and professor of environmental medicine and public health at the Icahn School of Medicine at Mount Sinai in New York City, says, and they're also found in cosmetics, personal care and household products such as lipstick, nail polish, perfume, scented laundry soap and air fresheners because they help them retain scent and color.[24]

They also enhance absorption, which is why they're often added to lotions as well as to pesticides — to help them get absorbed into plants. "It's hard to find things that don't have these chemicals in them," Swan said.[25]

Avoid Plastic as Much as Possible

Avoiding plastic products as much as possible is key to reducing your exposure and helping to reduce environmental pollution. This includes everything from the items you use around your home to choosing food packaged in glass. As Piarulli puts it:[26]

> *"Never in history have we been exposed to more pollution than we are today. This is why we should always be aiming to reduce our use of plastics. We know that plastics have adverse effects, and we also know that there are most probably effects that we have yet to find out about, including direct impacts on terrestrial, fresh- and seawater environments.*
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> *… plastics are … used in many settings where they are entirely unnecessary, such as in the textile sector and in situations of product overpackaging. Perhaps the most important thing to remember is to avoid the use of plastics where possible, and to exert our influence as consumers when we buy new products."*

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