How does plastic pollution affect health? | Explained

Why have negotiators in Geneva rejected a draft treaty? What is the threat from lab-made polymers? What are the chemicals potentially used or present in plastic materials and products? Does exposure to these chemicals have an adverse impact on health?

Published - August 17, 2025 02:49 am IST

JACOB KOSHY

Plastic items are displayed at an artwork by Canadian artist and activist Benjamin Von Wong, titled "The Thinker's Burden", during the fifth session of the Intergovernmental Negotiating Committee on Plastic Pollution, at the European headquarters of the United Nations in Geneva, Switzerland, Friday, Aug. 15, 2025. | Photo Credit: AP

The story so far: Around 180 countries have failed to find consensus on an internationally binding legal agreement that sought to restrict plastic pollution. Talks in Geneva remained deadlocked on the issue late this week. While there is already a

United Nations Environment Programme (UNEP)-backed resolution on the need for such a move, only a binding agreement will actually force countries to take concrete action. However, countries are divided on several questions: should they address plastic waste alone or include plastic production?; should developing countries be funded by developed countries for the purpose? The key point of contention is the role of plastics in health.

What are the challenges from plastic?

No material symbolises the global, industrialised, consumption-based economy like plastic. The chemical constituents of plastics are polymers, and they can be natural — like cellulose, lignin, and are the basis of nearly everything in nature — or made in labs. Polymers derived from fossil fuel and then shaped into objects are in general called 'plastic.' As a derivative of crude oil, it has the ability to be moulded into a nearly infinite variety of objects, from critical things, including aircraft and medical equipment, to cosmetic items such as tinsel, baubles and packaging. Add to that its low cost of production relative to materials such as glass and aluminium. The ubiquity of plastics and the fact that it is cheap has led to it being the prime source of litter and a symbol of the collapse of waste management systems.

However, plastic's flexibility also implies its persistence. Plastics are mixtures of various types that include monomers, polymers, and chemical additives. There are more than 16,000 chemicals potentially used or present in plastic materials and products. There is little or no information about the potential impact on human health or the environment by over 10,000 of these chemicals. A report last year in the journal Nature concluded that more than 4,000 chemicals of concern can be present in each major plastic type, such as PVC, polyurethanes, PET, polyethylene and others. Given that most of these are synthetic and non-biodegradable, public opinion has generally focussed on recycling or waste management. Over the years, however, there has been a body of scientific investigation into how these chemicals — that are indestructible — may make their way into living organisms in rivers, oceans, land and ultimately inside people.

What is evidence that plastic harms health?

Ethylene, propylene, styrene and their derivatives are commonly used to make plastic. Ethylene derivatives such as polypropene (PP), low-density polyethylene (LDPE), linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE) and polyethylene terephthalate (PET) comprise the largest portion of downstream petrochemicals used to

make plastic packaging. However, manufacturing them requires a range of other chemicals, several of which are monomers (the building blocks of polymers). These include bisphenols, phthalates, polychlorinated-biphenyls (PCB), polybrominated diphenyl ethers (PBDEs), and per- and poly-fluoroalkyl substances (PFAS). They are used to produce food containers, drink bottles, teething toys, polyester, intravenous bags, cosmetics, paints, electronic components, adhesives and sealants.

For years, there have been a bulk of studies where medical researchers have investigated if exposure to these chemicals, via the products used, is having a discernible impact on health. Earlier this month, Boston College in the U.S. and Australia's Minderoo Foundation launched a dashboard that compiled such evidence. There are around 1,100 primary studies involving about 1.1 million individuals that have linked changes in thyroid function, hypertension, kidney and testicular cancer, and gestational diabetes to exposure to these chemicals. The vast proportion of these individuals studied are in the developed world. Nearly, all of these studies are "associative", in the sense that the measured disease outcome could be a result of exposure to the chemicals as well as a range of other factors, and it is not always possible to tease apart individual effects.

The true "gold standard" of exposure is a "longitudinal study", where a fixed group of people are tracked over a long time to discern the effects of chemical exposure, but this is time consuming. There are studies underway, said Dr. Sarah Paul, neuroscientist and head of Plastics and Human Health, Minderoo, to evaluate if a group of people who were consciously less exposed to certain plastics would have improved health outcomes.

What about microplastics?

Microplastics are plastics smaller than five millimetres and can refer to the constituent elements of a variety of additives or plastic products. Given that technology available to detect them is relatively recent, they have over the years been found in blood, breast milk, placenta and bone marrow. While their exact impact on human health is unclear, they too are implicated in a wide range of disorders.

What is India doing about plastic?

There is a ban on the production and use of single-use plastics in nearly 20 States. These are the category of plastic goods that are the least re-usable and difficult to recycle. Given that they constitute a waste management problem, India has a range of administrative process meant to push companies towards ensuring that a proportion of

plastic that is used are collected back. However, this has had limited effect. India doesn't yet recognise the impact of plastics and chemicals on health.

In international negotiations on the global plastics treaty, India and other countries have expressed reservations on including discussions on health in the plastic treaty and said that these are matters to be taken up at the World Health Organization. Thus, plastics is primarily a waste management problem, as far as India is concerned.

Published – August 17, 2025 02:49 am IST