

Toxic substances are flooding our environment



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"We live in a fluorinated society," says Arkenbout. He is deeply concerned about poly- and perfluoroalkyl substances (PFAS) "flooding us like a tsunami". Arkenbout, who is active across Europe with its Toxicowatch agency, has been raising alarm for years about the rapid spread of so-called Substances of Very High Concern (SVHC) such as dioxins and PFAS. He is not the only one. Just recently, 116 scientists called on the WHO to tighten guidelines on PFAS exposure drastically. The Dutch government is also concerned: it is working on "a European pathway to limit the use and production of PFAS".

Arkenbout says things are moving far too slowly. "If just one compound is banned, the industry already has a series of new variants in place. There should be a total ban as soon as possible." PFAS are called forever chemicals because they hardly biodegrade, Arkenbout explains. "You remember DDTs and PCBs, the chlorinated compounds. Those were banned in the 1980s but are still found, even in breast milk. The PFAS, which are fluorine compounds, are even worse because of their persistent toxicity. They accumulate in our bodies and in the environment." PFAS are used in countless everyday products such as clothes, make-up, electronics, baking paper, dental floss, solar panels, windmills, fire extinguishing foam, and so on. "They cause all kinds of diseases, related to a weakened immune system. PFAS are an accelerator for cancers, fertility disorders, neurodegenerative diseases and thyroid problems, among others."

PFAS have even been found to be in face masks, in "shocking quantities", says Arkenbout. On his own initiative, he investigated the composition of the most common types of face masks. This presented a shocking result. The face masks are full of PFAS, as well as other toxic substances such as bisphenols, phthalates, graphene, brominated compounds and microplastics. How much of these substances are absorbed into the body is unknown, says Arkenbout. "It has not been researched sufficiently, which is serious in itself, given the health risks."

"We are living in a fluorinated world."

Toxicologist Abel Arkenbout and his partner Kirsten Bouman have been campaigning for years against the spreading of toxic substances in the environment, especially dioxins, and the even more harmful PFAS compounds that are incorporated in many products - even in face masks, from where they can enter the body in a direct way. "This is a tremendous hazard for the population."

Abel Arkenbout acquired nationwide attention in 2014 when a documentary was broadcasted of a new waste incinerator in the Netherlands. He conducted research commissioned by residents who were concerned about the toxic emissions. He brought to attention that European legislation only required the waste incinerator to measure dioxin emissions twice a year for six to eight hours. "Which is only 0.1 per cent of annual emissions. We did continuous measurements, then you get a very different picture," says Arkenbout. "What they say comes out in a year, we sometimes saw in a few hours."

Back then, the main issue was dioxins, including PCBs. These are now overshadowed by a new, even more, worrying threat: poly- and perfluoroalkyl substances (PFAS). "PFAS have been known since the 1940s but are used in more and more products. There are probably more than 10,000 PFAS compounds. They are called forever chemicals because they are hardly biodegradable. Toxicowatch analysed PFAS in the stack of a waste incinerator in 2017. These findings were published in a scientific context. That had never happened before. That astonished us immensely."

Toxicowatch has since been called in by citizens' groups in several European cities, including Paris and Madrid, and has also been granted commissions from EU funds. According to Arkenbout, the spread of PFAS "poses a huge danger to the population. It causes all kinds of diseases, related to a weakened immune system. PFAS are an accelerator for cancers, fertility disorders, neurodegenerative diseases, and thyroid problems. They also are spoiling the environment. Our soil, our water. It's happening very fast."

Arkenbout and Bouman are by far not the only ones worried. A sizeable international movement of scientists and policymakers is now trying to contain the PFAS 'tsunami'. The RIVM even announced on 19 July 2021 the "official launch" for a "European PFAS ban". The Netherlands, Germany, Denmark, Norway, and Sweden are working together in this initiative "to ban all harmful PFAS substances, some 6 000 in total, at once". The RIVM acknowledges that the PFAS "are much more harmful than was thought".

While Arkenbout welcomes this initiative, he is not convinced that it will be successful. According to him, to start with, there is a lot of uncertainty about how many and which compounds have been brought to market by industry. The RIVM reports that officially 4 700 PFAS now exist but acknowledges that there are "possibly" more. According to Arkenbout, there are now more than 10,000.

Moreover, it is exceptionally challenging to analyse them. Arkenbout: "With chemical analysis, you can only detect a few PFAS compounds. Only four are now regulated within the EU. Every time a PFAS compound is banned, such as PFOA or PFOS, the industry develops variants that are not covered by the ban, such as Gen-X. In turn, each company has its own processes and

PFAS compounds, which are then patented. People have no idea what they are being exposed to. We have become a fluorinated society."

Regulation is failing on many levels, according to Arkenbout. The EU has set maximum limits for PFAS in textiles, signed by the textile industry, "but who checks this?" he asks. "The industry itself does not provide information on the PFAS present in the products." Medical devices, including face masks, are also subject to various exemptions. "Hospitals and dental practices are full of PFAS-containing products," he says.

To analyse the presence of PFAS, Toxicowatch uses an analytical method called 'bioassay'. "With a chemical analysis, you look for a specific substance. With a bioassay, you look at the total toxic effect. The values you measure with a bioassay are related to the suppressive effects on thyroid hormones. In particular, the PFAS compounds act on the functioning of the thyroid gland, which subsequently interacts with other organs."

Toxicowatch is now involved in seven countries' biomonitoring projects concerning dioxin emissions from waste incinerators. "We have never been so busy," he says. When Arkenbout and Bouman encountered more and more face masks in waste due to the face mask obligations, they decided to investigate the harmful compounds it contained. "We didn't find that out easily right away. We observed substances being used to make them waterproof. That's what PFAS are typically used for." They bought some samples of three types of mouth caps, cut them into pieces and ran their analysis method on them. The results were alarming. The PFAS content (more precisely, PFOA equivalents) was between 331-1424 µg PFOA eq./m². The EU limit for textiles, says Arkenbout, is 1 µg PFOA/m².

Exactly how much someone ends up absorbing PFAS - and other harmful substances - by wearing a face mask is unclear, Arkenbout says. "We did an extensive literature search and found out that there are many other toxic substances in these things besides PFAS, including bisphenols, phthalates and nanoparticles, including graphene oxide. Some 483,888 plastic particles can be released from one new disposable mask. A used mask involves more than 1.5 million particles. And such a mask is meant for single use. The dust fibres disintegrate easily. But only 10 per cent of people actually use it once."

The substances can leak from the masks in many ways, Arkenbout says - and be absorbed into the body in many ways: through the skin, through the mouth - to the lungs and gastrointestinal tract, and perhaps most dangerously: through the nose. "The most worrying thing is nasal uptake," says Arkenbout. "Behind the nasal cavity is an essential membrane that keeps toxic substances from entering the brain. This is called the blood-brain barrier. However, some PFAS pass through this easily. PFAS have been found in all parts of the brain, the literature shows." Arkenbout and Bouman call it "very worrying" that these substances are in face masks - and that people can be required to be wearing these devices. "You really shouldn't want this."