BEYOND PLASTIC MED

Business Club

ConsultantSeas

Plastic(s) & Health

Some concepts and feedback

BeMed Business Club
Fact sheet
January 2025

PRINCE ALBERT II OF MONACO FOUNDATION · Fondation tara océan explore and share · SURFRIDER FOUNDATION · IUCN · MAVA FONDATION POUR LA NATURE

This fact sheet is not intended to provide an exhaustive list of the impacts of plastics and their components on human health, but rather to provide key elements for economic stakeholders seeking to reduce the plastic footprint of their companies.
It is based on presentations made in 2024 by Dr. Hervé Raps (Centre Scientifique de Monaco), Mathieu Ben Braham (Générations Futures), Patrick Navard (Mines Paris/CNRS), Valérie Guillard (Université de Montpellier), Henri Bourgeois-Costa (Fondation Tara Océan), Ismahane Remonnay (Veolia) and Valérie Ingrand (Veolia).

Summary

Introduction - What is a health impact?

Since the 1960s, plastic consumption has grown exponentially. While plastic is at the heart of our economic activities, its impact on ecosystems is undeniable. However, its effects on health are still largely unknown, both to the general public and to certain economic stakeholders, although the effects are well documented in the scientific literature..

A. Debates around the notion of toxicity

The notion of 'toxicity' is essential when addressing health issues. However, its definition is subject to debate. The CNRS defines it as 'the property of a substance capable of poisoning a living organism.' In regulations, its definition is based on **the concept of a 'toxicity threshold'** implying that below a certain dose, there are no effects.

However, not all pollutants have a linear effect on health. **Toxicity depends not only on the product itself, but also on other factors such as** :

- Individual vulnerability: gender, age, sensitivity, etc.
- Exposure, which varies according to duration and other factors,
- Antagonistic or synergistic effects,
- Cocktail effects[1] - for example, with plastics or other toxic products.

There are also toxic compounds with no threshold effect, such as endocrine disruptors.

It should be emphasized that the regulatory approach is the result of the state of knowledge at a given time, of the legislator's appropriation of this knowledge, of that which is consensually established and that which is the subject of "legitimate precaution", but that it is also a societal compromise. This is based on a balance between the economic and political stakes involved in withdrawing a substance from the market. For example, complaints about the harmful effects of PFAS (per- and polyfluoroalkylated) on health are nothing new, yet it took until 2024 for regulations to be put in place[2].

B. Global health: a concept to overcome the limits of defining toxicity

Toxicity is a complex subject to tackle. It can have direct consequences that vary from one species or ecosystem to another, or indirect consequences through interactions within the ecosystem. This is why researchers and specialist associations are promoting **the concept of "global health"**, based on the fact that health inextricably links the environment, non-human species and humans, given their close interactions and interdependencies[3].

This holistic approach makes the link between human health and the degradation of ecosystems, biotopes and climate. It therefore integrates the direct and indirect causes and consequences of pollution, such as plastic pollution, on human health.

Although there is a considerable gap between the regulatory definition and the holistic vision of global health espoused by the World Health Organization (WHO), it is now accepted that the prosperity of humanity is inseparable from the health of all living beings (human and non-human). This is the essence of the resolutions adopted in 2020 by the WHO, and in 2022 by the United Nations General Assembly and the United Nations Human Rights Council, declaring that access to a "clean, healthy and sustainable environment" is a human right.

[1] *"Des substances sans danger pour l'Homme individuellement, peuvent devenir nocives lorsqu'elles sont mélangées : on parle d'effet cocktail" - Inserm "Unhappy hour - C'est quoi l'effet cocktail" (link)*

[2] *Commission Européenne - France représentation, "La Commission restreint l'utilisation d'un sous-groupe de produits chimiques PFAS pour protéger la santé humaine et l'environnement" (link)*

[3] *National Institute of Environmental Health Science, "Global Environmental Health" (link)*

I - What do we know about the impact of plastics on human health?

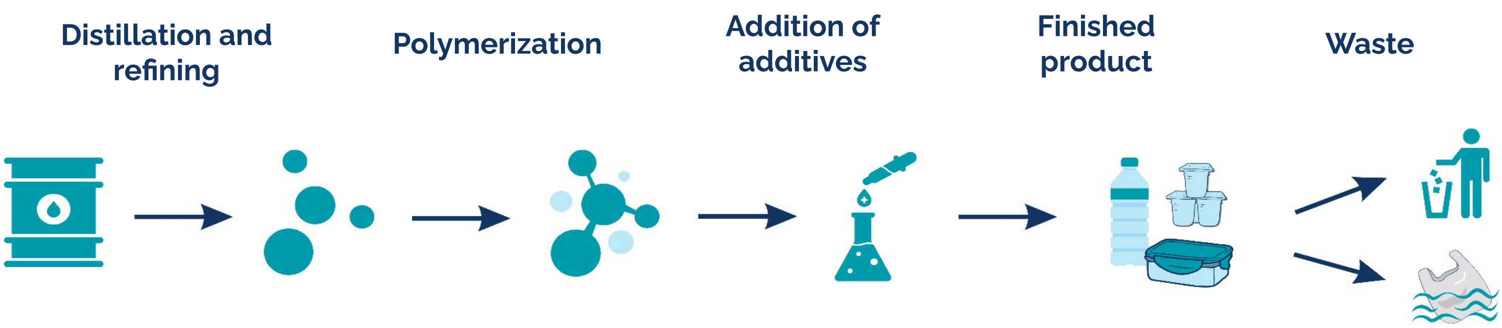
Throughout its life cycle, plastic has an impact on human health. However, it is difficult to precisely quantify the health effects of plastics given the current state of knowledge.

Plastic is a complex material, and our relationship with living things is even more so. Health impacts are not immediately perceptible, the effects can be very long-term, and populations are unevenly impacted.

A. Health issues related to plastic composition

The lack of transparency regarding the composition of plastic and the limits of our ability to measure its impact explain why the health risks of plastic have long been ignored. The same questions can be asked of alternative solutions proposed by manufacturers.

1. The inherently toxic nature of plastic



Naphtha is the basic ingredient in plastics. This oil-refining liquid undergoes a cracking operation (heated to high temperature, then brutally cooled), which breaks down the hydrocarbon molecules into monomers.

Plastics are **made up of monomers** that are assembled by **polymerization** to form different materials. As polymerization is rarely complete, polymers can contain free monomers, some of which are toxic. This is the case, for example, with styrene, from which ABS and polystyrenes are produced, bisphenols, which are used to manufacture polycarbonates, and certain polymeric PFAS, etc.

Added to these polymers are **additives and adjuvants**, which enable the plastic to achieve the technical characteristics desired by manufacturers (e.g. flame retardants, colorants, etc.), as well as unintentionally added substances (NIAS), resulting from the degradation of plastics or environmental contamination. The latter result from impurities in raw materials, material degradation, the polymerization process and plastic processing, among other things[4].

[4] *Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)*

Yet most of the chemicals present in plastics have never been tested for toxicity before being put on the market. Their potential direct or indirect harmful effets on human health are unknown. At present, of the 16,000 chemical molecules associated with plastic identified, only 5,000 have been studied, of which 4,000 have been defined as problematic because toxic[4] .

Throughout the "life" of plastic, additives, NIAS or monomers can migrate into the environment (air, water, earth), into food or living beings. The latter case is all the more important when the material is subsequently reused in food contact.

The case of food contact materials

The additives used must be declared and come from a positive list of authorized additives[5]. The regulation also specifies the specific migration limits applicable to the substance. These limits are derived from acceptable daily intakes.

The case of microplastics

Every time a plastic object of any kind is placed on the market, particulate plastic (micro and nanoplastics) is produced, both in the short and very long term. Microplastics are released at every stage in the plastic's life cycle, posing a risk right from the production phase, during use and post-use. This source of exposure is less regulated than additives, and therefore less controlled, and should not be underestimated since the health effects of these microplastics have now been proven.

Any plastic that is not molecularly destroyed will, after use, accumulate on earth and contribute to the production of microplastics for centuries or even millennia (as in the case of plastic immobilized in buildings, roads, controlled landfill sites, etc.). This deleterious effect, which sometimes only arrives with a considerable delay, is never taken into account when we talk about the toxicity of particulate plastic, despite the fact that it is the most important source of microparticles (in terms of quantity).

Particulate plastic **has an intrinsic toxicity due to its shape and specific surface area**, but also **due to interactions with environmental constituents** (chemical and biological contaminants, viruses, bacteria).

Several adverse health effects have been attributed to plastic components :

- reduced fertility,
- premature births,
- increased obesity rates,
- disorders of the male reproductive system,
- cancer, kidney disease,
- cardiovascular disease,
- and neurodevelopmental disorders[6].

[4] *Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)*

[5] *Règlement (UE) No 10/2011 de la commission du 14 janvier 2011*

[6] *Landrigan PJ, et al, The Minderoo-Monaco Commission on Plastics and Human Health. Annals of Global Health. 2023; 89(1): 23, 1–215. (link)*

A few examples:

Phthalates

These additives are frequently used in food packaging, cosmetics and medical equipment[7]. Exposure to this additive has been recognized **as one of the main factors in neurodevelopmental disorders** in children in the United States, alongside bisphenol.

In children exposed in utero, there is evidence of lower IQ, learning disabilities, autism spectrum disorders and other dysfunctions[6].

Bisphenol A (BPA)

This plasticizer has been used in large quantities since 1960. It has a chemical structure virtually identical to distilbene, a substance whose **transgenerational disruptive effects** were first highlighted in the 1950s. Bisphenol A is therefore an endocrine disruptor, and has been used in food packaging, plastic bottles, etc.[8]. Bisphenol A can also be found in alternative packaging.

As early as 2011, the French Agency for Food, Environmental and Occupational Health Safety (Anses) published reports attesting to the harmful effects of bisphenol A on health[9]. It wasn't until 2015 that the substance was banned in packaging in direct contact with food in France, and then 2024 for the ban to be extended to the European level[10].

Zoom on PFAS

Poly and perfluoroalkyl substances (PFAS), form a family of molecules with unique properties: high resistance (thermal, chemical, biological, physical), hydrophobic, oleophobic and enfin which possesses surfactant properties[11] (thanks to the carboxylic acid terminal function). There is no universal definition of PFAS. In 2021, the OECD listed 4,700 substances belonging to this family, including some in the form of artificial polymers (plastics), or additives to plastics.

The omnipresence of PFAS

Due to their high resistance, PFAS have become virtually indispensable in modern society. PFAS are omnipresent, both in everyday products and in high-performance applications. Their use is highly diversified and complex to identify, since they can be found in cosmetics, fast-food packaging, kitchen utensils, waterproof clothing, furniture, pesticides and more.

[6] *Landrigan PJ, et al, The Minderoo-Monaco Commission on Plastics and Human Health. Annals of Global Health. 2023; 89(1): 23, 1–215. (link)*

[7] *Observatoire de la prévention, "Les phtalates : une composante de certains plastiques et produits cosmétiques nuisible à la santé humaine" (link)*

[8] *Ministère de la santé et de l'accès aux soins, "Bisphénols" (link)*

[9] *Ministère Territoires, écologie, logement" Bisphénol A" (link)*

[10] *Commission Européenne - France représentation, "Bisphénol A : les États membres de l'UE approuvent l'interdiction dans les matériaux en contact avec les aliments" (link)*

[11] *"A chemical compound which, when introduced into a liquid, lowers its surface tension, thereby enhancing its wetting properties. They enable the formation of emulsions and foams, as well as the transport of hydrophobic molecules in water. The molecules are composed of hydrophobic but lipophilic or oleophilic elements, and hydrophilic elements." - Actu-environnement "Dictionnaire de l'environnement - Tensio-actif" (link)*

[Continued] Zoom on PFAS

Health impacts

They are said to be "persistent" because they do not degrade, or degrade very slowly on the human timescale, and any emission into the environment is definitive. They are then found in all environments - air, water and soil - and can accumulate in living organisms.
The health impacts of PFAS are increasingly analyzed, particularly those of PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonate). The latter can lead to increased cholesterol levels, reduced response to vaccines, kidney and testicular cancers, abnormalities in pregnancy or fetal development, cardiovascular disease, diabetes, etc.

Despite the potential risks, **it is difficult for the end user to obtain information on the presence of PFAS in a product, their quantity, etc**.

The case of food packaging

The number of additives that can be used in food-certified packaging is limited to a "positive" list of 885 additives[5]. For a package to be food-certified, the supplier must demonstrate its safety to the European Food Safety Authority (EFSA), by showing that exposure to the additives it contains does not exceed threshold doses (specific migration limit = SML).

The SML is calculated on the basis of a toxicity threshold (e.g. Acceptable Daily Intake[12] = ADI). If the additive does not have a SML in Annex 1 of the European Regulation[5], this does not mean that the substance has not been evaluated. It means that there is no defined toxicity threshold, and therefore no SML.

However, these checks have a number of limitations:

The ADI used to establish the SML is only well established for an adult population, which is not necessarily representative for infants and young children. Furthermore, neo-formed[13] chemical compounds are not taken into account, despite the health risks they represent[14].

Finally, **despite issuing a certificate of suitability, material suppliers do not systematically provide a list of additives and chemical substances used in packaging**[15] . Normally, this can be requested when issuing the certificate of suitability, which must only include data on substances that belong to the positive list, and must demonstrate that they do not exceed the authorized limit. All other information is not mandatory and is kept confidential.

5 Règlement (UE) No 10/2011 de la commission du 14 janvier 2011

12 Clarification provided by Valérie Guillard: ADIs take into account a person's overall daily consumption, taking all exposures into account. There is an ADI for each category (infant, child, adult, etc.). Food-contact plastics regulations give only one SML, which refers to a single toxicity threshold (e.g., ADI). However, they are calculated for a 60kg adult.

13 "[...] during the process of technological transformation and/or industrial or domestic culinary preparations of foodstuffs, chemical reactions can occur and cause the formation of compounds, some of which may be undesirable.", Agence Nationale de Sécurité sanitaire alimentation, environnement, travail (ANSES), "Dangers chimiques liés à la présence de substances néoformées dans les aliments au cours des procédés de fabrication, de transformation et de préparation des aliments" (link)

14 Techniques de l'ingénieur, "Les substances préoccupantes provenant des matériaux au contact des aliments" (link)

15 Intervention by Valérie Guillard (University of Montpellier), workshop February 2024

The case of synthetic textiles

Among the sectors where plastic consumption is increasing every year is the textile industry. In 2022, 65% of total production was made from synthetic textile fibers, of which 54% was polyester[16]. The global market for synthetic fibers is expected to grow at an annual rate of 6.6% between 2021 and 2028[16]. The abundance of these synthetic materials in clothing is leading to increased leakage of microfibers into the environment.

The direct and prolonged contact of these synthetic fibers with the skin prompted scientists to study the diffusion coefficient of plastic additives to the body through the skin barrier. The study involved leaving a plastic disc containing 6 of the most common additives on the skin for 24 hours. **The results showed that 4 of the 6 additives tested diffused through the skin.**

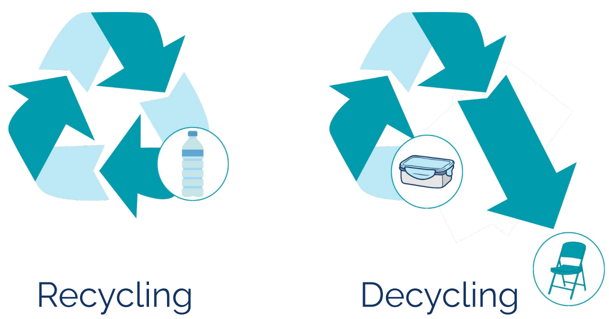
In addition, microplastics from textiles, such as nylon and polyester, have been associated with impaired lung tissue repair, worsening of covid-19-induced lung damage and chronic inflammation[17].

Today, there are no regulations governing the additives permitted in clothing design.

2. The case of recycled material

Two types of recycling are possible :

- The **"closed-loop" recycling** process, in which recycled plastics are returned to their original use[4]. At present, on the packaging market, only clear PET bottles belong to this circuit..
- The **"open-loop" recycling** process (decycling), in which recycled plastic materials are used for applications that are less demanding in terms of raw material quality[4]. This second option favors mixing, which makes it difficult to monitor the quality of these materials.



On the other hand, the properties of recycled plastic diminish with each recycling cycle[4]. This is why the addition of virgin plastic is still necessary to guarantee the desired performance.

[16] *Gliaudelyte et al., "Impact of textile composition, structure, and treatment on microplastic release during washing: a review", 2024 (link)*
[17] Changing Markets Foundation, "Fashion's Plastic Paralysis - How brands resist change and fuel microplastic pollution" (*link*)
[4] *Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)*

Recycled raw materials present toxicity risks linked to various aspects of recycling:

- Additives present in the plastic waste may find their way into the recycled material if there is no decontamination step[15].
- Chemical contamination can occur during waste processing.
- Toxic elements can accumulate as a result of chemical degradation of the recycled material or contact with external pollutants[4]. It is therefore possible to find traces of additives banned several years ago in some recycled plastics.

It is difficult to identify and know the origin of these toxic compounds: do they come from the initial resin or from the recycling process? Do concentrations increase with each recycling cycle, or are they the result of contamination during use, collection and sorting, or insufficient decontamination?

If the potential toxicity of recycled materials is an obstacle to their use, there are few studies to answer these questions. This may be due to the lack of available methods, but also to the financial cost of systematic controls. Nevertheless, a study carried out in 2023 revealed that recycled plastics can contain a wide range of chemical compounds, some of them potentially hazardous[18]. Out of 28 samples of recycled HDPE from several countries (Serbia, Argentina, India, Cameroon, etc.) 491 organic compounds belonging to different categories were identified (pesticides, pharmaceuticals, plastic additives)[18].

3. Healthier alternatives to plastic?

Faced with regulations banning plastics, particularly single-use plastics, many governments and manufacturers are turning to biosourced, biodegradable or paper/cardboard solutions. However, these alternatives can also present health risks.

As with petrosourced plastics, it is necessary to add chemical substances to these alternatives in order to obtain similar properties[19] .

This is the case, for example, with **plasticized cardboard**, widely used in the fast-food sector. Indeed, the Générations Futures report[20] shows the presence of **PFAS in these products**. These PFAS are contained in the plastic film added to the cardboard. Even if the concentrations found are low, the risks of leakage into the environment are high, notably into the water during the recycling process (pulper) or at the wastewater treatment plant (the sludge is then spread on fields).

Biosourced and biodegradable plastics do not eliminate the use of chemical substances similar to those used in conventional plastics[19].

[15] Intervention by Valérie Guillard (University of Montpellier), workshop February 2024
[4] Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)
18 Carmona E., et al., "A dataset of organic pollutants identified and quantified in recycled polyethylene pellets", Data in Brief, 2023 (link)
[19] Scientists Coalition for an Effective Plastic Treaty, "Policy Brief: Plastic Chemicals" (link)
[20] Générations Futures, "Des perfluorés dans des contenants et emballages alimentaires" (link)

B. Vectors of contamination

The negative impacts of plastics on health are complex to identify, because they come on top of other disease risk factors (tobacco, sedentary lifestyle, diet, other pollutants, etc.), but also because there are major differences in sensitivity between populations of individuals.

This is the case, for example, with fetuses in the uterus or children at birth and puberty, who are physiologically more vulnerable to chemical substances[6]. The toxicity threshold of plastics is lower for infants and children than for adults. Gender differences can also be observed.

1. During plastic production and waste management

The health impacts of plastics begin with their production and continue through to their end-of-life processing. As plastics are of petro-sourced origin, some of their impact is felt by employees in extraction plants, refineries, polymer production and manufacturing plants (e.g. textiles), but also by employees in waste treatment plants. They are particularly exposed to chemical substances, endocrine disruptors, etc.

Thanks to occupational medicine, regular monitoring can highlight any pathologies developed by employees over time.

- For employees working in polymerization plants, there are risks of brain cancer, breast cancer, lung cancer, leukemia, etc[6].
- For employees working in waste treatment plants, there are risks of heavy metal poisoning, cardiovascular disease, cancer, etc[6].

If plastics industry workers are more exposed than other segments of the population, so too are communities living close to production and waste management plants, known as **"Fencelines communities".** Studies indicate increased risks of leukemia, lymphoma, asthma, cardiovascular disease, etc[6]. Yet these populations are often the most socially vulnerable. Depending on the country, they do not have access to the same preventive measures against the risks caused by pollution. These inequalities in exposure highlight the importance of including environmental justice issues in the fight against plastic pollution.

2. During use

The health impacts associated with plastic use are more difficult to quantify, **as exposure doses are low and spread over long periods, from a lifetime to several generations**. While exposure to additives and monomers is regulated in the case of food contact, this is not the case when it comes to microplastics produced during product use.

In order to observe the effects of plastic use on health, cohorts of patients would need to be monitored for fifteen years or more. It should be noted that in utero exposure can also have lifelong impacts.

[6] *Landrigan PJ, et al, The Minderoo-Monaco Commission on Plastics and Human Health. Annals of Global Health. 2023; 89(1): 23, 1–215. (link)*

3. Le cas du post-usage et du long terme

Once used, plastics continue to have an impact on health, particularly in the form of micro- and nanoplastics.

In its micro form, plastics can be ingested by living organisms. They accumulate in the tissues of individuals, triggering inflammatory phenomena and oxidative stress. What's more, during their degradation into microplastics, the particles become porous and can aggregate heavy metals, pathogenic bacteria and other pollutants on their surfaces, adding to the chemical substances already contained in the plastic.

Early studies reported the presence of microplastics in certain body compartments (placenta, lungs, etc.)[21]. The extent of their effects on health and the level of exposure of populations are still largely unknown, though certain and alarming.

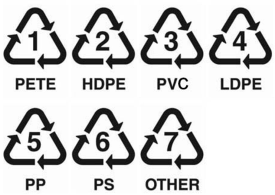
II - Why is our knowledge so limited?

Among the reasons why plastic is so ubiquitous in our society are its versatility and resistance. Thanks to plastic, many sectors derive significant benefits in terms of use and living comfort.

However, behind this versatility lies an opaque composition, sometimes difficult to master. Faced with this opacity, our ability to identify the composition of plastic materials, to predict their fragmentation kinetics into microparticles over the medium and especially the long term, and the interactions of these microparticles with possible contaminants makes it difficult to assess their impact on human and environmental health.

A. Transparency and control over the composition of plastics

One of the roles of packaging is to enable consumers to know the composition of the product they are buying, whether it's food or cosmetics, for example. In the case of the composition of the packaging itself, the Moebius triangle identifies the type of plastic (PET, HDPE, PVC, PP, etc.).



[22]

However, they give no indication of the additives or other chemical substances added.

Indeed, when a manufacturer wishes to produce a plastic object, he is primarily looking for certain properties (hydrophobic, oleophobic, etc.). They express their requirements to a supplier, who may call on the services of a formulator, who in turn may contact a polymer supplier.

The multiplication of intermediaries and the secrecy of manufacturing explain why the exact composition of a plastic is difficult to know.

[21] *Radio-Canada, "Microplastiques : la traque des effets sur la santé s'intensifie" (link)*
[22] *Greenr, "Déchets recyclables : Les symboles du recyclage" (link)*

B. The limits of our measurement capabilities

To obtain a reliable measurement of the composition of a plastic, it is necessary to go through various stages, from sampling to interpretation of the results. It is also essential, when making a measurement, to take into account the regulatory context in which the plastic sample being analyzed falls.

Step 1 - Sampling

At this stage, it is essential to ensure that the sample is representative, stable and non-evolving. Different methods are used, depending on the sample matrix.

The subject of plastics involves working at the particle scale (including the micro and nanoparticle levels) and taking an interest in the environmental conditions with which plastic materials are confronted. The sampling stage is therefore a challenge, since the sample size has to be reduced, while guaranteeing representative and uniform results.

Step 2 - Characterizing the sample

This stage involves identifying and analyzing the physical, chemical or structural properties of a sample. There are several methods available:

- **Targeted methods**, which involve searching only for a positive list of previously identified molecules. This historical approach is imposed by regulations. However, it can only deal with a hundred or so molecules at a time.
- **Non-targeted methods** can search for hundreds or even thousands of molecules. This approach allows us to go beyond the positive list of molecules, and thus to identify NIAS and anticipate regulations.

Step 3 - Interpreting the results

For interpretation to be robust, it is essential to ensure the reliability and traceability of the information, as well as the performance of the laboratory. To be usable, data must be accompanied by a quantification of uncertainties.

Our knowledge of the impact of plastics on health is limited by our measurement capabilities. This is why one of the current challenges is to increase the number of molecules that can be targeted by studies, and to improve detection limits. Emphasis must also be placed on raising stakeholder awareness of the risks and biases associated with uncertainties in the interpretation of results.

III - What can be done to limit the risks?

In view of the health risks posed by plastics, it is possible to take action to reduce them at several levels: at government level, at company level, at the level of the scientific community and at the individual level.

A. At the legislator's level

Here are the measures that can be taken by public authorities to protect people from the health impacts of plastic. For example:

- Have a clear roadmap, with quantified targets for reducing the volumes of "non-essential" plastics on the market,
- Limit the number of resins used and eliminate the most dangerous (e.g. styrenics),
- Set up a public system of pre-registration of substances associated with plastic production before they are placed on the market (taking into account molecules, volume, uses and end-of-life),
- Impose simplification of formulations,
- Support academic research to ensure its independence,
- Increase the cost of plastic, to reduce its economic attractiveness,
- Promote the deployment of alternatives to plastic,
- Push for the adoption of an ambitious international treaty to combat plastic pollution, and for the adoption of a global framework convention on chemicals.

Zoom on the issues surrounding a "white or black list" of additives

To date, 16,000 chemical molecules associated with plastic production have been identified, but only 5,000 have been studied and 4,000 have been defined as problematic because they are toxic[4].

It is difficult to define the toxicity of each of the 16,000 substances currently associated with plastic production. Indeed, to demonstrate that a substance is not dangerous to health or the environment, it is necessary to be able to demonstrate its safety on several species from different groups representative of the diversity of living organisms.
In addition, we need to take into account the combinations of molecules that can lead to chemical cocktails. So, even if a substance is authorized, it could be toxic in certain cases.

Drawing up a "white" list of chemical substances classified as non-hazardous to health, or a "black" list of substances classified as hazardous to health, is an approach that cannot cope with the number of molecules to be assessed individually. Such a list could not be kept up to date with the latest scientific discoveries.

[4] *Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)*

[Continued] Zoom on the issues surrounding a "white or black list" of additives

At present, it is possible to rely on the "SIN List", which lists hazardous chemicals that may be used in products[23]. This can be used as a basis for regulation and industry.

However, it is preferable to opt for an approach with several lists: a red list, an orange list and a yellow list, regularly revised[4].

- A red list covering the "worst" polymers and additives whose toxicity has already been proven.
- An orange list for those not yet sufficiently studied.
- A yellow list for those that have been studied and whose health risks appear to be limited.

This approach could be complemented by the identification of priority chemical families. For this, a number of criteria can be used to classify them: persistence, bioaccumulation, toxicity, use in large quantities, highly dispersed, etc[4]. If a substance meets one or more of these criteria, the family can be classified as a priority.

The same rules can also be applied to polymers, to which the following criteria can be added: degradability and presence of free monomers or oligomers[4].

B. At the company level

At company level, it is also possible to implement several actions to protect people from the health impacts of plastic. For example:

- Have a strategy that respects the 3R hierarchy: Reduce, Reuse, Recycle,
- Define for each type of product, a roadmap to reduce the environmental and health impacts of products, taking into account their uses to provide a satisfactory solution,
- Take an approach by Consumer Sales Unit containing plastic, and not just by tonnage,
- Demand greater transparency from suppliers on product composition,
- Precisely definish product uses to explore possible alternatives with suppliers and find the "right" plastic with the minimum additives adapted to their needs,
- Use food contact-certified plastic for all types of plastic use.
- Avoid multi-material or recycled/non-recycled multi-layers involving plastics unsuitable for food contact.

C. At the scientific community level

At the level of the scientific community, there are still many challenges to be met and many actions that can be implemented. For example:

- Establish more international research consortia bringing together universities, research institutes and private companies.

23 ChemSec, "What is the SIN List ?" (link)
4 Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)

- Develop platforms for sharing data and research results between public and private stakeholders in the field,
- Develop standardized methodologies for assessing the impact of plastics on human and environmental health,
- Establish partnerships with public health organizations to conduct long-term epidemiological studies,
- Develop modeling and simulation tools to predict the behavior of plastics and cocktail effects in the environment, and their impact on health,
- Launch a study on the training of scientists to accelerate the integration of these issues into their curricula,
- Inform and develop exposure prevention, particularly for at-risk groups (pregnant women, children, teenagers).

D. At individual level

Although plastic is everywhere, in the air and in the water. It is possible, on an individual scale, to take a few precautions to reduce our exposure to plastic, and therefore to its impact on our health. For example:

- Favoring more neutral materials in our everyday products and objects (e.g., glass, ceramics),
- Avoid reheating food in plastic,
- Opt for clothing made from natural fibers,
- Avoid drinking from single-use containers,
- Voting for public policies that promote reduction at source.

IV - For further information

Sources and resources

1. Inserm "Unhappy hour - C'est quoi l'effet cocktail" (link)
2. Commission Européenne - France représentation, "La Commission restreint l'utilisation d'un sous-groupe de produits chimiques PFAS pour protéger la santé humaine et l'environnement" (link)
3. National Institute of Environmental Health Science, "Global Environmental Health", (link)
4. Fondation Tara Océan, "Policy brief - Traité international sur la pollution plastique", 2024 (link)
5. Règlement (UE) No 10/2011 de la commission du 14 janvier 2011 (link)
6. Landrigan PJ, et al, The Minderoo-Monaco Commission on Plastics and Human Health. Annals of Global Health. 2023; 89(1): 23, 1–215. (link)
7. Observatoire de la prévention, "Les phtalates : une composante de certains plastiques et produits cosmétiques nuisible à la santé humaine", (link)
8. Ministère de la santé et de l'accès aux soins, "Bisphénols", (link)
9. Ministère Territoires, écologie, logement" Bisphénol A" (link)
10. Commission Européenne - France représentation, "Bisphénol A : les États membres de l'UE approuvent l'interdiction dans les matériaux en contact avec les aliments", (link)
11. Actu-environnement "Dictionnaire de l'environnement - Tensio-actif" (link)
12. Autorité Européenne de sécurité alimentaire (EFSA), "DJA" (link)
13. Agence Nationale de Sécurité sanitaire alimentation, environnement, travail (ANSES), "Dangers chimiques liés à la présence de substances néoformées dans les aliments au cours des procédés de fabrication, de transformation et de préparation des aliments" (link)
14. Techniques de l'ingénieur, "Les substances préoccupantes provenant des matériaux au contact des aliments" (link)
15. Intervention by Valérie Guillard (University of Montpellier), workshop February 2024
16. Gliaudelyte et al., "Impact of textile composition, structure, and treatment on microplastic release during washing: a review", 2024 (link)
17. Changing Markets Foundation, "Fashion's Plastic Paralysis - How brands resist change and fuel microplastic pollution" (link)
18. Carmona E., et al., "A dataset of organic pollutants identified and quantified in recycled polyethylene pellets", Data in Brief, 2023 (link)
19. Scientists Coalition for an Effective Plastic Treaty, "Policy Brief: Plastic Chemicals" (link)
20. Générations Futures, "Des perfluorés dans des contenants et emballages alimentaires" (link)
21. Radio-Canada, "Microplastiques : la traque des effets sur la santé s'intensifie" (link)
22. Greenr, "Déchets recyclables : Les symboles du recyclage" (link)
23. ChemSec, "What is the SIN List ?" (link)

Plastic(s) & Health

BeMed Business Club fact sheet - January 2025

Here are a few resources to help you explore this subject further.

Reports

- Scientists Coalition for an Effective Plastic Treaty, "Policy brief : Human Health in the Global Plastic Treaty" (link)
- Les rapports de l'OPECST, "Les impacts des plastiques sur la santé humaine" (link)

Videos & Podcasts

- Plastic Soup Foundation, "Scientists Speak Out #1: Plastic & Cancer" (link)
- Plastic Soup Foundation, "Scientists Speak Out #2 - Plastic & Brains" (link)
- Avant l'Orage, "PFAS : comment les industriels nous empoisonnent" (link)
- Huberman Lab, "The effects of Microplastics on Your Health & How to Reduce Them" (link)

This fact sheet is based on contributions from Dr. Hervé Raps (Centre Scientifique de Monaco), Mathieu Ben Braham (Générations Futures), Patrick Navard (Mines Paris/CNRS), Valérie Guillard (Université de Montpellier), Henri Bourgeois-Costa (Fondation Tara Océan), Ismahane Remonnay (Veolia) and Valérie Ingrand (Veolia).

This document was synthesized by ©Beyond Plastic Med ©ConsultantSeas

Contacts

Lucile COURTIAL
lcourtial@beyondplasticmed.org
+337 98 98 95 24

Céline RENOUARD
crenouard@beyondplasticmed.org
+337 98 98 44 56