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INTRODUCTION

Advent has arrived. Streets, stores and the first apartments sparkle from christmas lights, but the festive glow can be quite deceptive. Are those omnipresent christmas light free of hazardous chemicals and safe for humans and the environment?

This winters' product test carried out as part of the EU project "[LIFE AskREACH](#)" shows that many christmas lights still contain harmful chemicals such as phthalates or chlorinated paraffins.

The Austrian environmental protection agency GLOBAL 2000 has bought eleven light chains from seven different stores and has sent them to an independent and accredited laboratory, where they were analyzed for substances of very high concern, for short SVHCs. These substances are classified in the European Union chemicals regulation REACH and are proven to be

- carcinogenic,
- toxic to reproduction,
- mutagenic,
- endocrine disruptive,
- persistent, bioaccumulative and toxic,
- very persistent and very bioaccumulative, or
- of similar concern

SVHCs can be present in all kinds of consumer products, such as toys, kitchen utensils, furniture, clothing and also christmas lighting.

LEGAL BACKGROUND

REACH

The EU [REACH Regulation](#) on the Registration, Evaluation, Authorisation and restriction of Chemicals (1907/2006/EU) came into effect in 2007. Its aim is to ensure a high level of protection for human health and the environment, as well as the free circulation of chemical substances on the internal market and the enhancement of competitiveness and innovation.

Candidate list

Certain chemical substances are defined in the REACH Regulation as SVHCs (Substances of Very High Concern). The SVHCs are listed in the "[Candidate List](#)", which is updated twice a year and in June 2022 contained 224 substances. These substances are candidates for the authorisation process under REACH, i.e. their use might be limited to certain applications. In addition, REACH stipulates that these chemicals should progressively be replaced by suitable alternative substances or technologies where economically and technically viable.

Article 33

[Article 33](#) of REACH states that a manufacturer or seller is obliged, on request, to inform a consumer if a given article contains SVHCs. This obligation applies as soon as at least one SVHC is present at a concentration of more than 0.1% by weight in that article. The information must be made available within 45 days and must include at least the name of the SVHC substance.

Article 33 applies to most solid objects such as clothing, furniture, toys or electronics offered for consumer use. In the case of food, medicines and "non-solid" articles such as cosmetics, cleaning agents, paints, or powders, the obligation to provide information applies only to the packaging.

HOW WE TESTED

A total of eleven christmas lights were purchased in seven different shops. These were then sent to an independent, accredited laboratory to be tested for specific SVHCs. The focus here was on the soft plastic of the cable sheathing and on metal components, as previous product tests showed that they have high risk of containing SVHCs. Cable sheathing is often made of PVC, a plastic that requires many additives such as plasticisers to be suitable for its many applications.

A risk-based approach was chosen for the selection of SVHCs to be analysed. This means that only certain substances with a high probability of being present in the materials that were tested. Thus, it does not mean that if no substances could be detected in a product, this product is also completely harmless and safe to use.

The cable sheathing of all products was tested for phthalates, chlorinated paraffins, polycyclic aromatic hydrocarbons, lead and cadmium. In some cases, other components made of soft plastic were analysed for the same substances and in three products, metal components were tested for lead, cadmium and mercury.

ANALYZED SUBSTANCES

Phthalates

Phthalates are plasticisers used in plastics such as PVC to make them soft and flexible. Phthalates can affect our biological system like hormones. Some have shown to be harmful to reproduction, such as diethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), benzyl butyl phthalate (BBP), and diisobutyl phthalate (DIBP). In children, for example, they can interfere with sexual maturation. The exposure to hormone-like substances is also suspected to contribute to the declining fertility of men, which has been observed in Europe over decades. For example, the plasticisers mentioned above show anti-androgenic effects such as reduced testosterone production and can have a damaging effect on testicular function. A [study by the German Environment Agency](#) between 2003 and 2006 examined 1,790 children aged between 3 and 14 years and revealed alarming results, particularly for plasticisers. Metabolites of selected plasticisers were found in the urine of almost all children, in some cases at considerable concentrations.

Phthalates enter the body mainly through food, but also through the air children breathe or through direct contact with the skin. Because children often play on the floor, they take in plasticisers via dust. Infants and young children also frequently put things in their mouth. Through the saliva, phthalates can be absorbed into the body. Countless everyday objects such as clothing, shoes, tools, swimming gear, kitchen and bathroom items or cables may contain phthalates. Since July 2020, products containing the phthalates DEHP, DIBP, BBP and DBP may no longer be placed on the market if the concentration exceeds the limit of 0.1 percent by weight (with very few exceptions). Other phthalates (DNOP, DINP and DIDP) have been banned for use in children's products.

Short- and medium-chain chlorinated paraffins (SCCPs & MCCPs)

Chlorinated paraffins are divided into long-, medium- and short-chain chlorinated paraffins depending on the chain length. They are used in many different ways, for example as plasticisers in plastics, as binding agents in paints, as flame retardants or as oiling agents for leather and furs.

Chlorinated paraffins are extremely persistent and very toxic to aquatic life. They pollute water and soil and can harm living organisms. SCCPs are classified as “possibly

carcinogenic to humans" by the International Agency for Research on Cancer. They can also cause kidney, liver and thyroid damage. They accumulate in human fat tissue and are passed on through breast milk. SCCPs are distributed all over the world and can be detected in soil, water, plants, humans and animals. They are regulated by the European regulation for persistent organic pollutants (POP regulation), which sets a limit concentration in articles of 0.15%.

Polycyclic aromatic hydrocarbons (PAHs)

PAHs are formed during the incomplete combustion of biomass (e.g. wood, coal or oil) and are often carcinogenic, mutagenic, toxic to reproduction, persistent in nature and toxic to aquatic organisms. Due to their longevity, they are found almost everywhere these days. In everyday objects, PAHs are often found in bicycle handlebar grips or tool handles, where they can also be absorbed through the skin. Plasticiser oils that make plastics more soft and flexible often contain PAHs. PAH contamination is found in particular among cheap plastic and rubber products.

Heavy metals

Heavy metals such as copper, lead, cadmium or mercury are usually only found at low concentrations in nature. While many of them are vital for plants, animals and humans, even slightly elevated concentrations can have a harmful impact on their health. Soil around the world is widely contaminated with heavy metal compounds, which in turn can transfer into groundwater. They subsequently accumulate in plants, but also in the skeleton, liver, kidneys and red blood cells of animals and humans.

Some heavy metals and/or their compounds are carcinogenic, harmful to reproduction or have negative effects on our nervous system and organs such as the kidneys and liver. These include, for example, lead and cadmium.

Heavy metals can be found in household items, jewellery and even toys.

RESULTS

SVHCs were found in six out of eleven, i.e. in more than half of the tested light chains. These six can be further subdivided, depending on the type and quantity of the detected substances:

- Two christmas lights should not have been sold because they contain DEHP, a plasticiser that has been restricted for over two years in almost all products above a concentration of 0.1% by weight. DEHP can disrupt the sexual maturation of children and is partly responsible for the decline in male fertility that has been observed for years. Nevertheless, DEHP was found in concentrations of up to 8.4 percent by weight, which is 84 times higher than the limit value. Especially with hormonally active substances like DEHP, such concentrations are shocking, as even very small amounts are sufficient to cause great harm. Moreover, plasticisers are only embedded in the plastic and can therefore also escape very easily. They constantly evaporate from the products and can be absorbed by us through mouth, skin and respiratory tract.

In one of those products, traces of DIBP, another banned plasticiser, and traces of MCCPs were found.

- Two other christmas lights contained MCCPs above the limit of 0.1 percent by weight. These are thus subject to disclosure, but still legal on the market. Nevertheless, they should rather be avoided, as MCCPs are toxic, long-lasting and accumulate in humans and the environment.
- The last two of the six contaminated christmas lights contained SVHCs below the limit value, once DEHP and once cadmium. They are therefore legal on the market and also not subject to disclosure. However, this does not mean that they are completely harmless. DEHP in particular, as already mentioned, can be harmful even in very low concentrations.

The results show that toxic chemicals are still widespread in everyday products and pose a serious risk to human health and the environment.

Furthermore, the results indicate that products from cheaper shops with lower quality assortments have a higher risk of containing SVHCs. For example, both christmas lights that would not have been marketable were bought at different discounters.

Store	Product	Price [€]	Barcode/product code	Detected SVHCs
IKEA	Solvinden	13.49	405.139.89	-
DEPOT	Lichterkette Macramee	12.99	4,05128E+12	-
DEPOT	Lichterstrang Mini für Innen	5.99	4,05128E+12	-
BUTLERS	Lichterkette Fatima	14.99	4,03564E+12	Cadmium 0.00195 %
BUTLERS	Lichterkette Ceasar	19.99	4,03564E+12	MCCPs 0.26 %
Urban Outfitters	White Curtain Light	45.00	73232589	DEHP 0.012 %
Flying Tiger	Lyskaede	16.00	2,0003E+11	-
TEDi	LED Microdraht	3.00	DNP 267 27545003191000000300 222	-
TEDi	LED Lichterkette	2.00	DNP 30 52387003191000000200 222	DEHP 2.9 %
1€ Shop	Silver Wire Lights	22.99	8,71816E+12	DEHP 8.4 % DIBP 0.009 % MCCPs 0.061%
1€ Shop	Guirlande de Noel	9.99	3,6605E+12	MCCPs 0.17 %

red = DEHP above 0.1% → not marketable

orange = SVHCs above 0.1% → marketable, but subject to disclosure

yellow = SVHCs below 0.1% → marketable and not subject to disclosure

Substance group	Substances included
Phthalates	BBP; DBP; DEHP; DIBP; DIHP; DHNUP; DMEP; DPENP; DiPP; PiPP; DPP; DnHP; DCHP; DHxP; DIHxP; DPP; 1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters, mixed decyl and hexyl and octyl diesters
Chlorinated paraffins	Short-chain chlorinated paraffins (SCCPs); Medium-chain chlorinated paraffins (MCCPs)
PAH (Polycyclic aromatic hydrocarbons)	Benz[a]anthracene; Benzo[a]pyrene; Chrysene; Benzo[k]fluoranthene
Heavy metals	Lead; Cadmium; Mercury

LIFE AskREACH & Scan4Chem

LIFE AskREACH is a five-year project funded by the EU LIFE programme. Under the coordination of the German Environment Agency, 20 partner organisations in 13 EU member states are cooperating to make the REACH consumer rights more widely known.

As part of the project, a smartphone app (named "[Scan4Chem](#)" in most countries) allows consumers to scan the barcodes of articles to see if they contain SVHCs, or to send SVHC-requests directly to companies. The Scan4Chem app can be downloaded for free at the App Store and at Google Play.

We also work with companies to make it easier for them to respond to SVHC requests. The project offers a [database](#) where companies can upload their article information so that they will not have to answer individual consumer requests. The project also facilitates communications along the supply chain for companies.

RECOMMENDATIONS

What needs to be done?

- SVHCs in everyday products should be replaced by safe alternatives as soon as possible.
- Substances for which no safe limits can be derived, e.g. chemicals that interfere with the hormone system or non-threshold carcinogens, should be replaced as a matter of priority.
- All potential substances of very high concern should rapidly be identified and evaluated and, where appropriate, added to the candidate list.
- For companies at every stage of the supply chain, passing on SVHC information should become a matter of course in compliance with REACH Article 33. Information on SVHCs must be disseminated both along the supply chain and to the competent authorities and ultimately made available to the public and consumers.
- Companies should be made more aware of REACH obligations so that these are correctly implemented.
- The 45-day response period should be shortened, and replies given to every SVHC request, even if no SVHCs are present, in order to avoid misunderstandings.

What can consumers do?

- Avoid articles made of plastic, especially soft PVC or cheap articles made of dark hard plastic. Return strongly smelling plastic articles to the retailer. Preferably buy products made of natural materials like wood.
- Look out for eco-labels, such as the EU Ecolabel or the Blue Angel.
- Scan products you want to buy in advance with the “Scan4Chem” app and send an SVHC request to the seller or manufacturer of the item. Scan as many products as possible with the Scan4Chem app to show companies that consumers want safe products!



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