The 32 to leave behind

The most well-founded list of EDCs relevant for REACH

EDCs are a threat to human health

Endocrine Disrupting Chemicals (EDCs) can be linked to many growing health disorders. Recent studies estimate the costs of having these chemicals circulating in society to be billions of euro every year. Nevertheless, decision makers have still not agreed on how to effectively regulate these chemicals.

Endocrine disrupting chemicals (EDCs) interfere with hormone signalling in the body. The hormone systems control important processes such as reproduction, growth and development. If these systems are disturbed it can lead to severe problems, including infertility, diabetes, obesity, cancer and learning disabilities.

What effect an endocrine disrupter will have on an individual depends very much on the timing of exposure. This means that even very low doses can have serious effects, especially during times of growth and development, in foetuses and children for example. What makes it even more complex is that the effects can be delayed, even for decades. Exposure during childhood may result in impaired reproduction as an adult.

EDCs are present in many everyday products, including soft plastics, electronics, textiles and cosmetic products.

Health disorders that have been linked to EDCs include:

- Sperm quality across European population has declined by 50% in 50 years.
- 1-2% more couples every year seek assisted pregnancies.
- Incidence rates for many types of cancer, including breast and prostate cancers, have more than doubled in recent decades.
- Neurological disorders, including autism and ADHD, are increasing.

Regulation of EDCs lags behind the science

Even though the problems associated with EDCs have been known and studied in the scientific community for more than twenty years, the process of transferring this knowledge into protective regulation has proven to be slow and partly controversial.

In the EU, under the chemicals regulation REACH, only a handful of EDC substances have been identified and listed on the Candidate List.

Under the EU pesticide and biocide regulations, substances having endocrine disrupting properties that may cause adverse effects will not be approved for use. However, the criteria needed to define endocrine disrupting properties are not yet in place. The process has been greatly delayed.

One probable scenario is that once established, these criteria will also be used for other EU regulations.

The SIN List identifies high concern chemicals

The SIN List consists of chemicals that have been identified by ChemSec as being Substances of Very High Concern (SVHCs), based on the criteria for SVHCs defined within REACH. The SIN List aims to speed up the REACH process as well as to offer a glimpse into the possible future of European chemicals regulation. By doing so, it provides a concrete tool for companies and others to identify chemicals that they should start moving away from.

The SIN List is short for "Substitute It Now!" and has been developed by ChemSec in close collaboration with scientists and technical experts, as well as NGOs in Europe and the US. The list is based on credible, publicly available information from existing databases and scientific studies.

Since 2008 the SIN List has provided valuable advice to both companies and legislators on the substances meeting SVHC criteria. In 2012 a report from the EU Commission stated that the SIN List is a main driver for innovation among EU chemicals industry. The SIN List has been updated regularly following new scientific data and political developments.

The listing of EDCs on the SIN List has been especially important, since it, as opposed to other available lists, identifies EDCs based on more than a potential concern, but on solid scientific data. A more specific description of how the EDCs were selected for the SIN List can be found after the list of substances.

"I believe very firmly that this initiative is really helping authorities as well as industries."

– Geert Dancet, Excecutive Director of the European Chemicals Agency, ECHA, at launch of the SIN List, October 2014

"Skanska welcomes this latest transparency move by ChemSec as it helps us to improve the future proofing of our construction projects."

– Noel Morrin, Senior Vice President Sustainability at Skanska, concerning the update of the SIN List in February 2013

SIN List EDCs were identified through scientific reviews

For the SIN List, 32 substances have been identified to qualify as Substances of Very High Concern solely due to their ED properties. An additional 25 substances have been included partly due to their ED properties. As for the Candidate List, they have been included on a case-by-case basis after scientific scrutiny. Endocrine disrupting chemicals have been added to the SIN List three times, in 2008, 2011 and in 2014.

The selection of the EDCs for the SIN List is based on scientific reviews performed by independent top scientists in the field. The reviews include all publically available, peer-reviewed scientific data, relating to ED properties. Based on these reviews and advice from various experts, ChemSec has selected the final substances for inclusion, using a conservative approach.

"The recently published second edition of the SIN list, which also includes substances with endocrine disrupting properties, should indicate to you the substances the European Commission will take into consideration for placement on the candidate list."

– Janez Potocnik, the European Commissioner for Environment, May 2011

For the first version of the SIN List, launched in 2008, a number of substances with endocrine disrupting properties were included as "equivalent level of concern" substances. Here, EDC properties were investigated as one of several endpoints and qualification for the SIN List was based on the combined substance properties.

In 2011, ChemSec launched an updated version of the SIN List, focusing exclusively on endocrine disrupting properties. The evaluated substances were all from the EU Commission database of Endocrine Disruptors. After careful evaluation by the research organisation TEDX, founded by professor Theo Colborn, 22 of the substances were selected for the SIN List. ChemSec based the selection on the amount of evidence, i.e. the number of high-quality studies showing ED properties for each substance.

"We were completely in the dark before the SIN List."

– Seb Beloe, Head of Sustainability Research at WHEB Listed Equities.
On how they use the SIN List for predicting regulation.
SIN List launch October 2014

In 2014, ChemSec selected further EDCs to add to the SIN List. Again, TEDX reviewed the endocrine disrupting properties of a number of suspected EDCs. Following recent developments, the selection this time related more clearly to the WHO/IPCCS definition. For the substances selected, there are high-quality studies showing an endocrine mode of action, a probable serious effect and a plausible link between the two. 10 EDCs were selected for the update in 2014.

- **All in all, there are 57 substances on the SIN List with scientifically proven EDC properties.**
- **All details on the methodology can be found on www.sinlist.org**

The following 32 substances have been identified as endocrine disrupting chemicals for the SIN List. This is currently the most well-founded list available of REACH relevant EDCs.

These 32 EDCS require immediate action.

In the SIN List database www.sinlist.chemsec.org you can find much more information on each chemical including links to substitution case stories.

NAME	CAS	CONCERN	USE
Di-n-octylphthalate, DnOP	117-84-0	These phthalates show antiandrogen, estrogen or thyroidogenic properties.	Phthalates are often used as plastic softeners but also have other uses such as dye and fragrance carriers and are present in a wide range of products.
Diisodecylphthalate, DiDP	68515-49-1, 26761-40-0		
Diundecyl phthalate, DuDP	3648-20-2		
Dicyclohexyl phthalate, DCHP	84-61-7		
Diethyl phthalate, DEP	84-66-2		
Dihexyl phthalate, DHP	84-75-3		
Bisphenol S	80-09-1	Bisphenols have mainly estrogenic properties.	Bisphenols, such as the more widely known Bisphenol A, have many uses, including the manufacture of plastics, as corrosion inhibitors and in thermal paper.
Bisphenol F	620-92-8		
4,4´-dihydroxybenzophenone,	611-99-4	Several different UV filters show ED properties. These are all estrogenic, but some also show other ED properties.	UV filters are used in cosmetic products but also in paint, printing inks and packages.
Benzophenone-1	131-56-6		
Benzophenone-2	131-55-5		
Benzophenone-3	131-57-7		
Ethylhexyl methoxycinnamate	5466-77-3		
4-methylbenzylidene camphor	36861-47-9		
3-Benzylidene camphor 3-BC	15087-24-8		
Propylparaben	94-13-3	Parabens show estrogenic but also antiandrogenic and thyroid effects.	Parabens are used as preservatives, mainly in cosmetic products.
Butylparaben	94-26-8		

NAME	CAS	CONCERN	USE
Ziram	137–30–4	All of these thioaminocarbonyls show a range of ED properties, resulting in developmental effects.	These substances function as biocides and are used in a range of products, including rubber and latex, wood preservative and paint.
Metam natrium	137–42–8		
Thiram	137–26–8		
Zineb	12122–67–7		
Tribromophenol	118–79–6	Tribromophenol affects estrogen and thyroid hormones and shows developmental effects.	This substance is used in plastic production.
Pentachlorophenol	87–86–5	Pentachlorophenol has been shown to disrupt thyroid function and to interfere with sex hormones, brain development and metabolism.	Pentachlorophenol is used mainly as a wood preservative but is also used in glues and starches.
Butylated hydroxytoluene	128–37–0	The substance affects the thyroid gland, testis and growth hormones. Reduced fertility, altered growth and development have been observed.	This substance is used in pulp and paper products, coatings, inks, cosmetics, lubricants and fuel.
Carbon disulphide	75–15–0	Human workers exposed to the chemical have shown dysfunctional sex behaviour, lowered sperm quality and alterations in testosterone levels.	Carbon disulphide is used to manufacture polymers and cellulose and as a laboratory chemical.
Triphenyl phosphate	115–86–6	Altered levels of estradiol, testosterone and affected reproductive parameters have been observed.	This substance is used in the formulation of plastics and rubber.
4-nitrophenol	100–02–7	The substance is estrogenic and an antiandrogen.	4-nitrophenol is used in dyes and to darken leather.
Methyl tertiary butyl ether (MTBE)	1634–04–4	MTBE affects the male and female reproductive systems in animals, and also impairs learning and memory.	MTBE is used as an extraction solvent and as a fuel component in gasoline to raise the octane number.
Perchloroethylene	127–18–4	Exposure shows effects on reproduction and development through a range of mechanisms.	The main use of perchloroethylene is in dry-cleaning.
Quadrosilan	33204–76–1	It has antiandrogenic effects, disrupting the formation of sperm and is also estrogenic.	Quadrosilan is used as bearing grease and in breast implants.
Resorcinol	108–46–3	Resorcinol affects the thyroid gland, thyroid hormones and glucose metabolism.	Resorcinol has numerous uses, including rubber and resins, in cosmetics, pharmaceuticals and hair dye.
Tert-butylhydroxyanisole (BHA)	25013–16–5	BHA has been reported to have both estrogenic as well as antiestrogenic effects.	The primary use for BHA is as an antioxidant and preservative in food packaging, cosmetics, rubber, and petroleum products.

The following substances are also EDCs and on the SIN List. They were however added to the SIN List not only because of their ED properties, but in combination with additional hazardous properties.

NAME	CAS	ADDITIONAL CONCERN
Bisphenol A	80–05–7	Reprotoxic
TBBPA	79–94–7	Persistence and aquatic toxicity
D4, Octamethylcyclotetrasiloxane	556–67–2	Reprotoxic, persistence, bioaccumulation
Clorinated paraffins (CPs)	63449–39–8	Carcinogenic, persistence, bioaccumulation
Butylphenol	98–54–4	Reprotoxic
Galaxolide	1222–05–5	Persistence, bioaccumulation
Hexane	110–54–3	Reprotoxic, neurotoxic
Tonalide	1506–02–1, 21145–77–7	Persistence, bioaccumulation
Styrene	100–42–5	Aquatic toxicity and CMR properties
Triclosan	3380–34–5	Aquatic toxicity, persistence, bioaccumulation
Diisononyl phthalate, DINP	68515–48–0, 28553–12–0	Reprotoxic
Organic tin compounds	56573–85–4, 1002–53–5, 1461–22–9, 688–73–3, 668–34–8, 639–58–7, 900–95–8, 77–58–7, 76–87–9, 683–18–1, 761–44–4, 1067–29–4, 2279–76–7	Persistence, bioaccumulation
Octylphenol and ethoxylates	68987–90–6, 9036–19–5, 9002–93–1, 27193–28–8, 140–66–9	Persistence
Nonylphenol and ethoxylates	68412–54–4, 25154–52–3, 9016–45–9, 127087–87–0, 26027–38–3 104–40–5, 90481–04–2, 37205–87–1	Reprotoxic, bioaccumulation, persistence

”For our clients there are two ways to look at chemical regulation: There are the risks of continuous use of SVHCs, and there are the advantages of finding safer alternatives. For us the SIN List is currently the most comprehensive way to work with this issue.”

– Amandine Marqués, MSCI ESG Research, May 2011

"Amidst the current buzzwords of economic growth, competition and efficiency, we must remember that a productive, competitive workforce requires a mentally and physically healthy population."

– Dr Carol Kwiatkowski, executive director of the Endocrine Disruption Exchange (TEDX), October 2014

EDCs are costly for society

It is difficult to measure the negative effects of EDCs caused by human suffering from various health conditions and negative environmental effects. However, several recent studies point to the fact that the health impacts caused by EDCs cost society billons of euro annually.

According to a series of studies released by the Endocrine Society in 2015, current exposure to EDCs costs the EU €157 billion annually. The studies have assessed the economic impact related to exposure by accounting for healthcare expenses and lost earnings. The figure is conservative, since the study has limited the analysis to disorders with the strongest scientific evidence. Such disorders include infertility and male reproductive dysfunctions, birth defects, obesity, diabetes, cardiovascular disease, as well as neurobehavioural and learning disorders.

"According to a series of studies released by the Endocrine Society in 2015, current exposure to EDCs costs the EU €157 billion annually."

A study by the Nordic Council (2014) estimated the costs of effects of EDCs on male reproductive health as being up to €1,184 million per year for the EU as a whole.

While economic arguments are often used against chemicals regulation, these reports demonstrate that the phasing out of hazardous chemicals can be economically beneficial when you include also the costs for civil society, as well as those for the private sector, in the analysis.

References / further reading:

- Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union. Journal of Clinical Endocrinology and Metabolism (2015)
- The Cost of Inaction: A Socioeconomic analysis of costs linked to effects of endocrine-disrupting substances on male reproductive health. Nordic Council of Ministers, Nordic Council of Ministers Secretariat (2014)
- Health costs in the European union. How much is related to EDCs? Health and Environmental Alliance (2014)
- Key scientific issues relevant to the identification and characterisation of endocrine-disrupting substances – Report of the Endocrine Disrupters Expert Advisory Group. JRC (2013)
- State of the Science of Endocrine-Disrupting Chemicals. United Nations Environment Programme and World Health Organization (UNEP/WHO) report (2012)
- The impacts of endocrine disrupters on wildlife, people and their environments. European Environment Agency (2012)
- State of the art assessment of endocrine disrupters, Final report. European Commission (2011)
- Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement. The Endocrine Society (2009)

Endocrine Disrupting Chemicals (EDCs) can be linked to many growing health disorders, including infertility, certain cancers, neurological disorders and obesity. Recent studies estimate the costs of having these chemicals circulating in society to be billions of euro every year. Nevertheless, decision makers have still not agreed on how to effectively regulate these chemicals. As a consequence, many responsible companies have developed their own EDC strategies in the absence of regulation.

The SIN (Substitute It Now!) List, developed by ChemSec, identifies 32 EDCs of which each has been identified as a chemical of high concern after thorough scientific assessments. **This is currently the most well-founded list available of REACH relevant EDCs.**

In this folder you will find more information about Endocrine-Disrupting Chemicals and the SIN List, but most important, you will know which chemicals to start taking action on!

- **We urge decision makers to ensure that these chemicals are regulated sooner rather than later.**
- **We ask companies to investigate whether any of these chemicals are used in your processes and products and if so, search for safer alternatives to replace them.**

www.chemsec.sinlist.org

chemsec
SIN LIST