

How can chemicals influence your hormones?

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Abstract

Did you know that hormones not only influence your mood but also most of your body's functions? They are messengers involved in telling you when to feel hungry or when to get tired, for example. It is very important to have the right levels of hormones in your body to stay healthy. But there are a lot of man-made chemicals that find their way into our environment. They can then disrupt those important biological messengers in the animals and humans living

nearby. Hormones are particularly important in providing instructions for your development before you are born and when you are a baby.

We reviewed the scientific literature to find out how these chemicals get into our bodies and the environment. We found that a lot of them get used in industrial processes or are in pesticides. But some also turn up in food packaging materials, cleaning products, or cosmetics.

Introduction

You have probably heard of adrenaline – the **hormone** that prepares your body for “fight or flight”! But there are many more hormones that help regulate the functions of your organs. Where do they come from? Different **glands** in your body produce them and release them into your blood. Then the **hormones tell other organs what to do. So, they are basically chemical messengers throughout your entire body.** All together, we call this messaging system the **endocrine system**.

There are a lot of different chemicals that can disturb the endocrine system if they get into your body. We call them **endocrine-disrupting chemicals**, or EDCs. They can have negative effects on how we respond to stress and on our behavior, for example. If we are exposed before we are born, they can affect things like the development of our brain or whether we may become obese when we grow up. But how? To your body, some chemicals look very similar to a hormone (because they have similar chemical structure). So, an EDC can bind to the hormone receptor in a cell as if it were a hormone (Fig. 1).

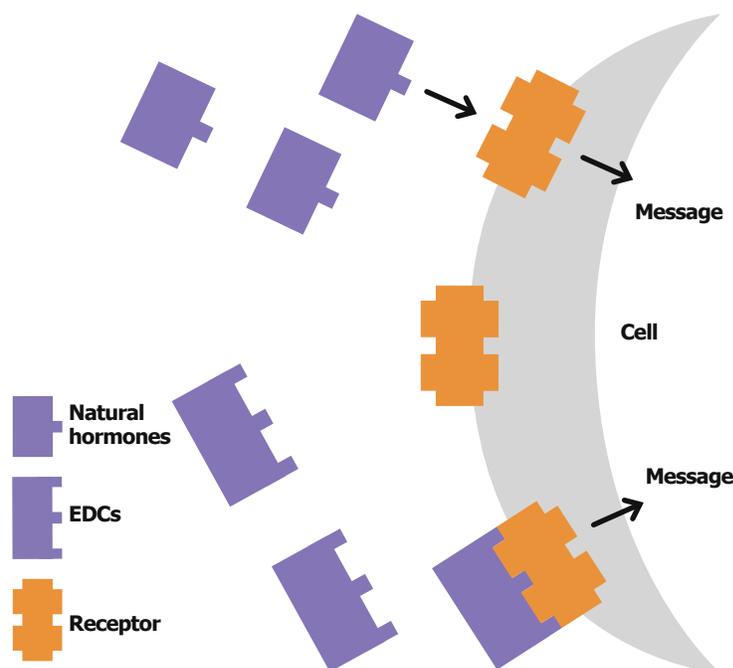


Figure 1: Endocrine-disrupting chemicals can fool our cell's hormone receptors. They may have a similar chemical structure to our natural hormones, so they can bind to our hormone receptors. Image adapted from a figure by [Iulian Gabriel Goidescu](#).

For example, an EDC might bind to receptors in your fat cells and react to an incorrect message to "Produce more fat cells". Then you might put on weight, which can eventually lead to obesity.

The endocrine system also controls our (and many animals') ability to reproduce! Unfortunately, if there are certain chemicals in the water, fish living there may lose their ability to produce offspring. This can endanger whole species and ecosystems.

Methods

We wanted to find out where these endocrine-disrupting chemicals come from. So, we looked at over 160 studies of other scientists from 1997 up until now. We compared their research and combined their knowledge to create a list of

the most important EDCs. We organized them into groups of similar chemicals. We then looked for information about where these chemicals come from and how they get into the environment.

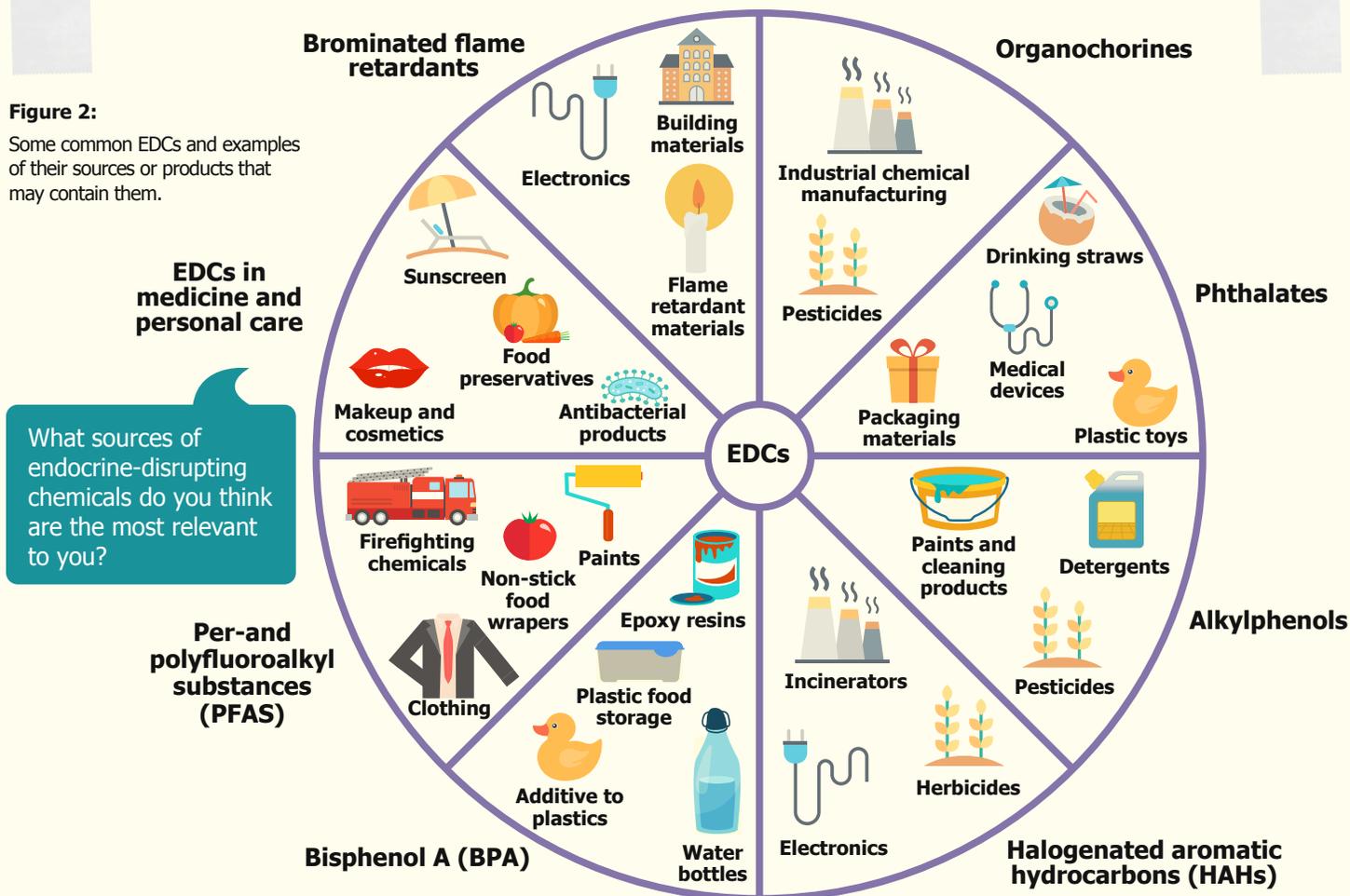
Results

We identified many sources of EDCs (Fig. 2). Some come from agricultural or industrial uses. They get into the environment first and then can get into your body because

you eat food or drink water containing them. But some other chemicals can get into your body through contact with the material, like some plastics or cosmetics.

Figure 2:

Some common EDCs and examples of their sources or products that may contain them.



We found that many of these chemicals are very resistant to breaking down. Other EDCs are continuously released in large quantities, such as from sewage treatment plants, and so are always present in the environment. In many cases, they can travel long distances in water and air and can affect the environment.

Discussion

A lot of the chemicals that we know can disrupt the endocrine system are tightly regulated by law. This is good because those EDCs have harmful effects. **They can be bad not only for humans, but also endanger species living in a contaminated area, or even in remote areas like the Arctic.**

Unfortunately, some EDCs are essential for industrial uses, and so they still find their way into water, soil, and also food. So just saying "Hey, you are not allowed to use this anymore!" is sometimes not the best option. We need to:

1. first identify the dangerous chemicals,
2. then find a substitute for them that is similar enough to let us use it for the necessary processes,

An example of a chemical that can easily get into the human body is BPA (Bisphenol A). It is often added to hard plastic containers, such as food containers or drink bottles. Especially when you heat the materials (for example, during microwaving), BPA can detach from the rest of the packaging material and get into your food. Among other effects, BPA can alter brain development in humans.

3. but which is also different enough to not have the same bad effects on the environment.

It can be very hard sometimes to find better replacements for EDCs. Although the levels of some EDCs are declining in the environment thanks to bans, most of them are still detectable in humans and wildlife. **Scientists have to be vigilant in identifying EDCs and providing the information to government departments so that they can control their release into the environment or can ban them outright.** The **Stockholm Convention** is an international agreement that is constantly being updated and includes the ban of many EDCs.

Conclusion

Want to keep your hormones working well? You can try to avoid using or consuming products with high levels of endocrine-disrupting chemicals. It's not always easy to identify them, but you can check the ingredients and look out for the EDCs you know about. But be careful! For example, not all packaging

labeled "BPA free" is better by default. Some substitutes for BPA are considered even more dangerous than BPA itself. Keep this in mind when you are buying plastic containers or cosmetics.

Glossary of Key Terms

Endocrine-disrupting chemicals (EDCs) – natural and man-made chemicals found in many household and industrial products that can interfere with the endocrine system. They may have similar chemical structure to hormones.

Endocrine system – a messaging system consisting of glands producing hormones and the hormones themselves. Hormones act as messengers to tell other organs in the body what to do. The endocrine system coordinates many different essential functions in the body, including growth, development, reproduction, sleep, and blood pressure.

Glands – special organs in your body that make different substances. Endocrine glands produce hormones, while other glands can make sweat, tears, or juices that help your stomach digest the food you have eaten.

Hormones – chemicals that work as messengers. They move through the body in our blood and tell our organs, tissues and cells how to work. The cells have special receptors for the hormones. Each different hormone has a specific function.

Stockholm Convention – An international agreement to ban chemicals that are a hazard to humans and the environment. Many of these chemicals, such as PCBs and brominated flame retardants, are known EDCs. The convention is constantly being updated to ban new classes of chemicals as scientists provide information on their harmful effects.

Check your understanding

- 1 What function do hormones have?
- 2 Why are endocrine-disrupting chemicals not only dangerous for humans but also for other species of animals, like fish?
- 3 Can you find a few other examples of hormones that exist in humans besides adrenaline?
- 4 Do you think all chemicals which are known to disrupt the endocrine system should be banned immediately?
- 5 Find an example of a product that might be affecting your hormones. Do you have an idea how you could avoid it?

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