

# What do you know about endocrine disruptors?

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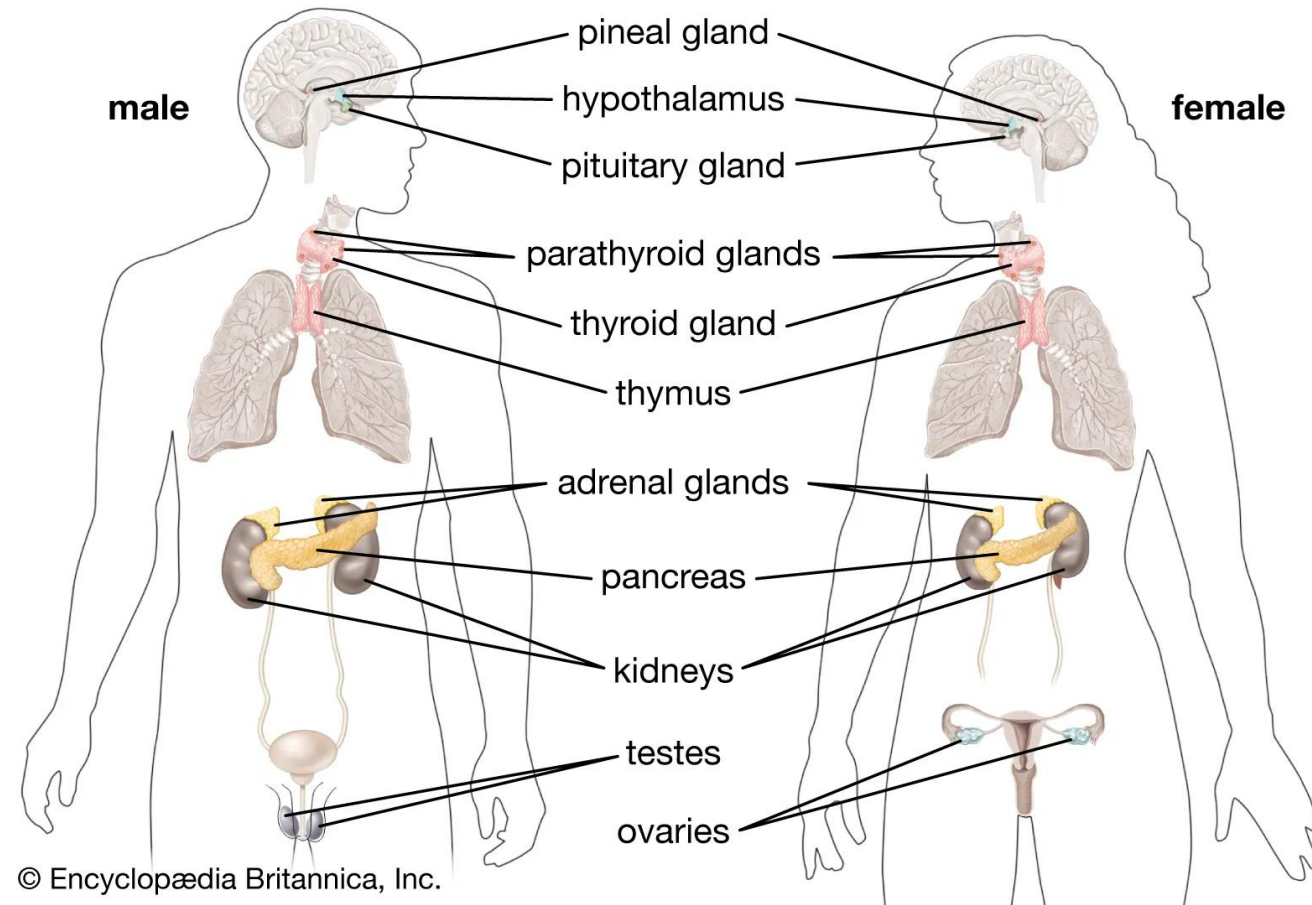
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- What are endocrine disruptors
- EATS disruption
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# Endocrine System



# Function of hormones

- Thyroxin - controls metabolism
- Adrenaline – «Fight or flight»
- Noradrenaline - controls the heart and blood pressure
- Dopamine – controls the heart rate and also assists in perception
- Antidiuretic Hormone – responsible for retaining water within the kidneys.
- Cholecystokinin – Aids in the release of digestive enzymes for the pancreas
- Erythropoietin – Stimulates the production of erythrocytes
- Follicle-Stimulating Hormone – Stimulates the follicles within the sex organs of both males and females
- Growth Hormone – Helps to stimulate growth and the reproduction of cells.
- Insulin – Responsible for several anabolic effects, primarily glucose intake.
- Etc, etc, ...

# Hormones disruption

Mood swings

Diabetes

Addison disease

Low sex drive

Graves Disease

Muscles loss

Cushing syndrome

Reproductive problems

Slow metabolism

Hypothyroidism

Weight gain

Polycystic Ovarian syndrom

Acne

Changed sleep parterns

Menstrual irregularity

Fatigue

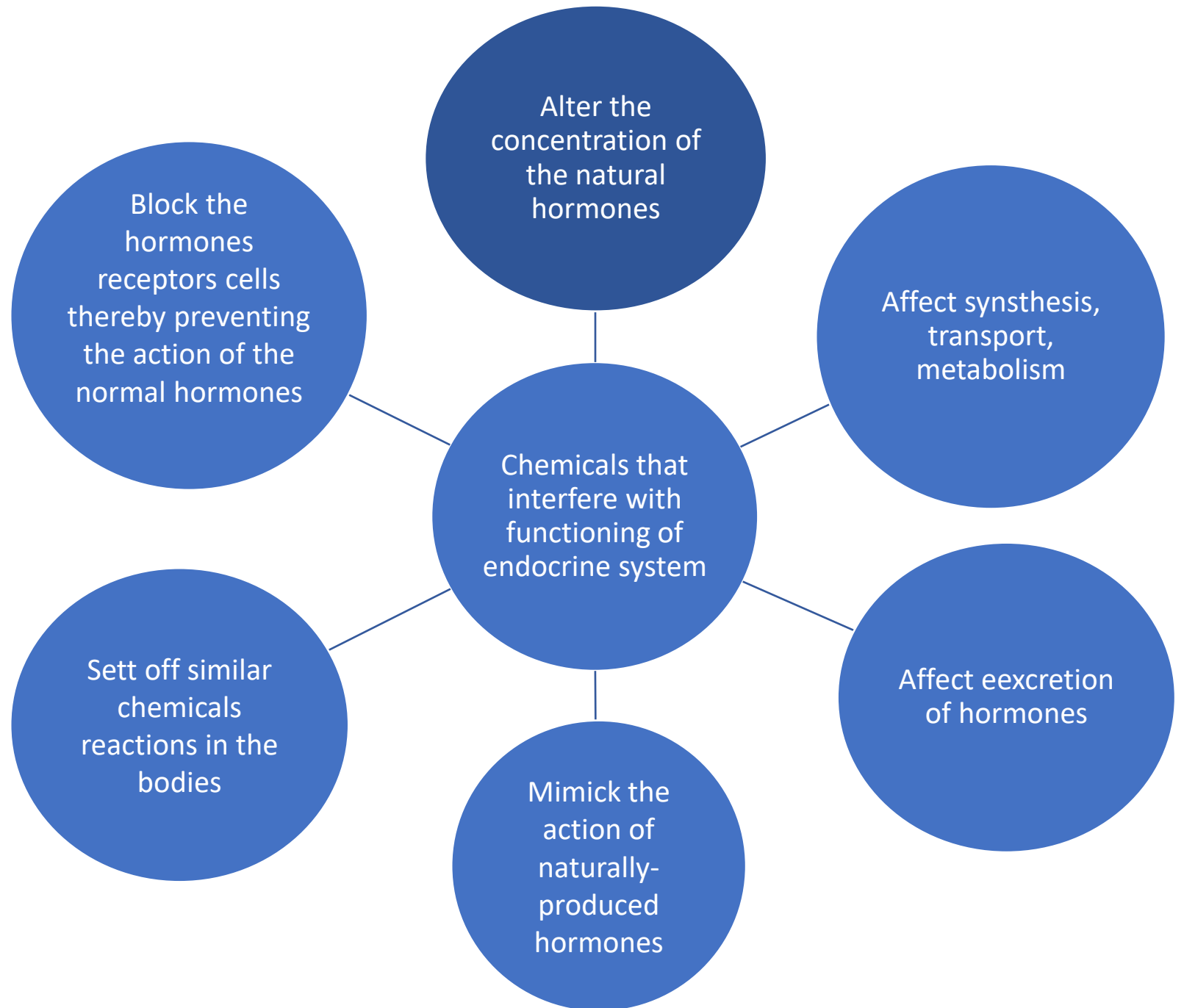
Higher percieved stress

Abnormal hair growth

Erectile dysfunction

...

# What are endocrine disruptors?



# EATS Disruption

- EATS-Estrogen, Androgen, Thyroid and Steroidogenic (EATS)-hormones involved in many aspects of development, reproduction
- Effects of disruption:
  - Reproductive systems: Genital malformation, puberty disorders, testicular/prostate cancer, benign breast cysts, fertility problems
  - Immune system: Disturbance of the immune system
  - Brain development: Reduced IQ, cognitive problems, autism, ADHD
  - Thyroid disorders
  - Neurodegenerative diseases: Alzheimer, Parkinson

# Metabolism Disruption

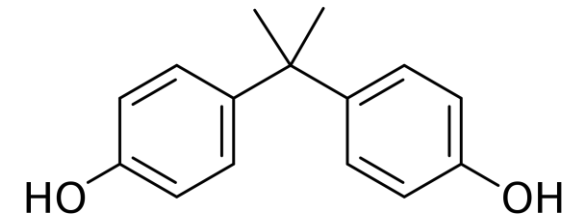
- Alter microbiomes
- Increase food intake – obesity
- Larger effect with High Fat Diet (HFD)
- Development of insulin resistance
- Disfunctional adipose
- Inflammation of the digestive system

**NB: Not known how many metabolism disruptors are out there**



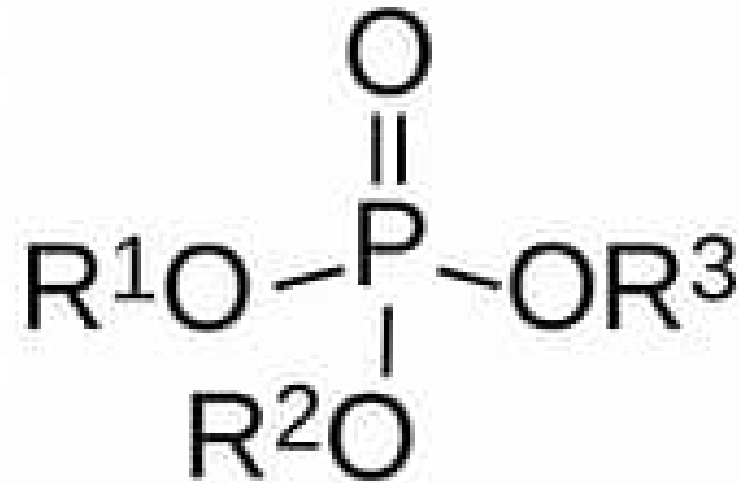
# Bisphenol A and its derivatives

- 64 known derivatives of BPA
- Used to make polycarbonate plastics
- Used in the manufacture of epoxy resins and vinyl ester resins
- Used in thermal paper
- Antioxidant in brake fluids
- Etc...



# Organophosphates

- Fertilizers
- Pesticides
- Herbicides

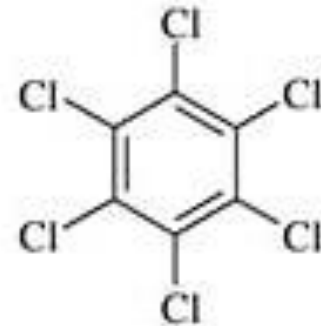


# Perfluorinated chemicals: Per- and polyfluoroalkyl substances (PFASs)

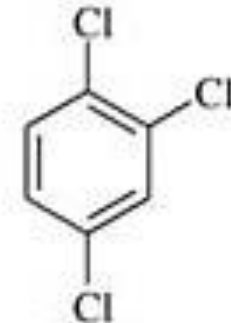
INDUSTRY BRANCH		NON-POLYMER	
1. Aviation, aerospace & defense	additives in aviation hydraulic fluid		
2. Biocides		active ingredient in plant growth regulators or ant baits; enhancer in pesticides formulations	
3. Construction products		additives in paints and coatings	additives in paints and coatings
4. Electronics	flame retardants		
5. Fire-fighting		film formers in AFFF	film formers in AFFF and in FFFP
6. Household products	wetting agent in floor polishes	wetting agent or surfactant in products such as floor polishes and cleaning agents	wetting agent or surfactant in products such as floor polishes and cleaning agents
7. Metal plating	wetting agent, mist suppressing agent	wetting agent, mist suppressing agent	wetting agent, mist suppressing agent
8. Oil and mining production	surfactants in oil well stimulation	surfactants in oil well stimulation	surfactants in oil well stimulation
9. Polymerisation	(emulsion) polymerisation processing aids	(co)monomer of side-chain fluorinated polymers	(co)monomer of fluoropolymers & side-chain fluorinated polymers

# Chlorinated compound

- Polychlorinated biphenyls (PCBs) – Mostly banned in many countries
- In low concentration - Increase production of progesterone
- In high concentration – Block progesterone production
- Cause reproductive abnormalities



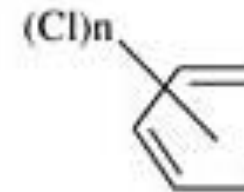
Hexachlorobenzene



Trichlorobenzene



DDT



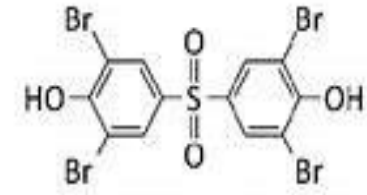
# Brominated flame retardants (BFR)

- Used widely for their fire resistance (plastics, electronics, etc)
- Affect androgen and oestrogen receptors



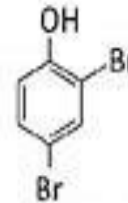
Tetrabromobisphenol A

## BROMOBISPHENOLS

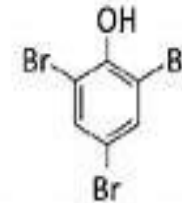


Tetrabromobisphenol S

## BROMOPHENOLS



2,4-dibromophenol



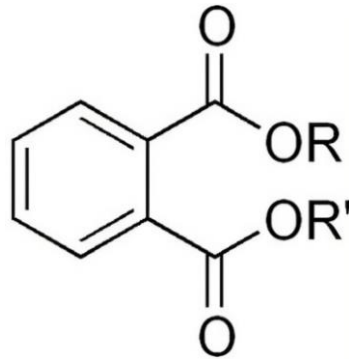
2,4,6-tribromophenol



2,3,4,5,6-pentabromophenol

# Phthalates

- Plasticisers



## Products that Contain **PHTHALATES**

### PACKAGING

- Children's toys
- Paint
- Printing inks & coatings
- Clay
- Pharmaceuticals
- Food products
- Textiles



### COSMETICS

- Perfumes
- Eye shadow
- Moisturizer
- Deodorant
- Nail polish
- Liquid soap
- Shampoo
- Conditioner
- Hairspray



### HOUSEHOLD ITEMS

- Detergent
- Shower curtains
- Vinyl upholstery
- Carpeting
- Wire coatings
- Adhesives
- Floor tiles
- Food containers
- Wrappers



### MEDICAL/PERSONAL-CARE PRODUCTS

- Coatings of pills & supplements
- Gelling agents
- Film formers
- Stabilizers
- Dispersants
- Lubricants
- Binders
- Emulsifying agents
- Suspending agents
- Adhesives
- Agricultural adjuvants
- Building materials
- Electronics
- Catheters
- Blood transfusion devices



# Classification of EDC (EU-CLP)

31.3.2023

EN

Official Journal of the European Union

L 93/7

COMMISSION DELEGATED REGULATION (EU) 2023/707

of 19 December 2022

amending Regulation (EC) No 1272/2008 as regards hazard classes and criteria for the classification, labelling and packaging of substances and mixtures

(Text with EEA relevance)

## Generic concentration limits of components of a mixture classified as endocrine disruptor for human health that trigger classification of the mixture

Component classified as:	Generic concentration limits triggering classification of a mixture as:	
	Category 1 endocrine disruptor for human health	Category 2 endocrine disruptor for human health
Category 1 endocrine disruptor for human health	$\geq 0,1 \%$	
Category 2 endocrine disruptor for human health		$\geq 1 \%$ [Note 1]

Categories	Criteria
CATEGORY 1	<p>Known or presumed endocrine disruptors for human health</p> <p>The classification in Category 1 shall be largely based on evidence from at least one of the following:</p> <ul style="list-style-type: none"> <li>a) human data;</li> <li>b) animal data;</li> <li>c) non-animal data providing an equivalent predictive capacity as data in points a or b.</li> </ul> <p>Such data shall provide evidence that the substance meets all the following criteria:</p> <ul style="list-style-type: none"> <li>(a) endocrine activity;</li> <li>(b) an adverse effect in an intact organism or its offspring or future generations;</li> <li>(c) a biologically plausible link between the endocrine activity and the adverse effect.</li> </ul> <p>However, where there is information that raises serious doubt about the relevance of the adverse effects to humans, classification in Category 2 may be more appropriate.</p>



CATEGORY 2

Suspected endocrine disruptors for human health

A substance shall be classified in Category 2 where all the following criteria are fulfilled:

- (a) there is evidence of:
  - i. an endocrine activity; and
  - ii. an adverse effect in an intact organism or its offspring or future generations;
- (b) the evidence referred to in point (a) is not sufficiently convincing to classify the substance in Category 1;
- (c) there is evidence of a biologically plausible link between the endocrine activity and the adverse effect.

# Summary

- There are several groups of endocrines disrupting chemicals
- Affects EATS and metabolic systems
- The chemicals are widely used
- Classified according to EU chemicals regulation as category 1, i.e., Known or presumed ED in humans, and as category 2, i.e., Suspected to be ED in humans