The Endocrine Disruptors

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ENDOCRINE DISRUPTORS

- ✓ WHAT ARE
- ✓ THEIR CLASSIFICATION
- ✓ THEIR MECHANISMS OF ACTIONS
- ✓ SOME INDUCED PATHOLOGIES
- ✓ THE EFFECTS OF THE EXPOSURES
- ✓ THE WAY BY WHICH THEY REACH THE HUMANS
- ✓ THE LIMITS OF THE RESEARCH IN THIS FIELD
- ✓ THE PERSPECTIVES

✓ *What is an Endocrine Disruptor ?*

An endocrine disruptor is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an healthly organism , in its progeny or (sub)populations

Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), 1997

✓ EDCs Classification

- **Natural substances**:
  - Estrogens (Estradiol)
  - Androgens (Testosterone)
  - Phytoestrogens (Flavonoids)

- **Men made substances** :
  - Synthetic hormones
  - Polychlorinated biphenyls (PCB),
  - Dioxins
  - Alkylphenols: Octylphenol, Nonylphenol
  - Pesticides (o,p-DDT)
  - Erbicides (atrazine)
  - Fungicides;
  - Nematicides
  - Phthalates
  - Heavy Metals (Pb, Hg, Cd).

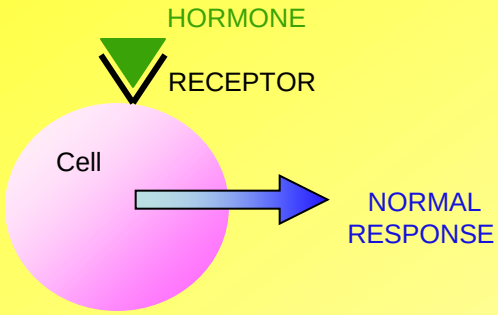
Mechanisms of action

- ✓ ***Receptor-mediated mechanism have received the most attention, but other mechanisms - such as hormone synthesis, transport and methabolism - have been shown to be equally important.***

- ✓ ***For this reason it is difficult to distingluish between direct and indirect effects and primary versus secundary effects of exponsure to EDCs.***

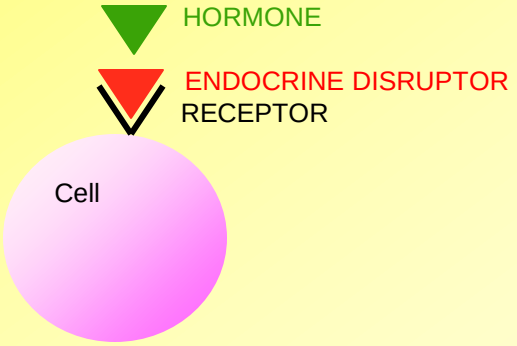
Mechanisms of action

NORMAL RESPONSE



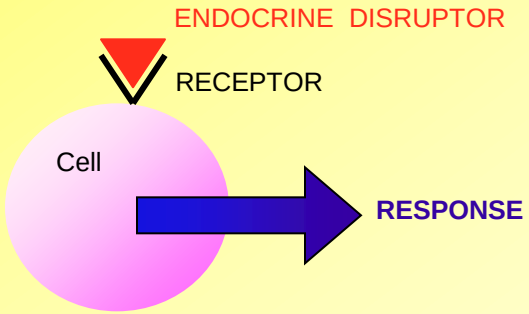
The hormone interacts with the receptor and induces the normal response

NO RESPONSE



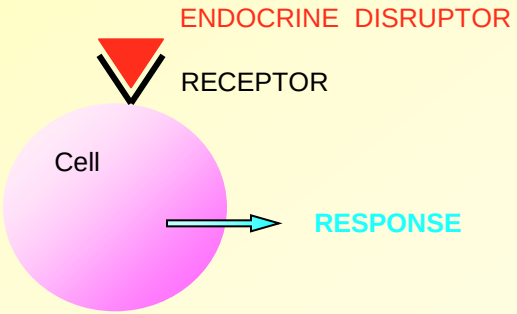
The endocrine disruptor blocks the hormone-receptor interaction by deleting the normal response

EXCESSIVE RESPONSE



The endocrine disruptor induces a greater response than that produced by the hormone

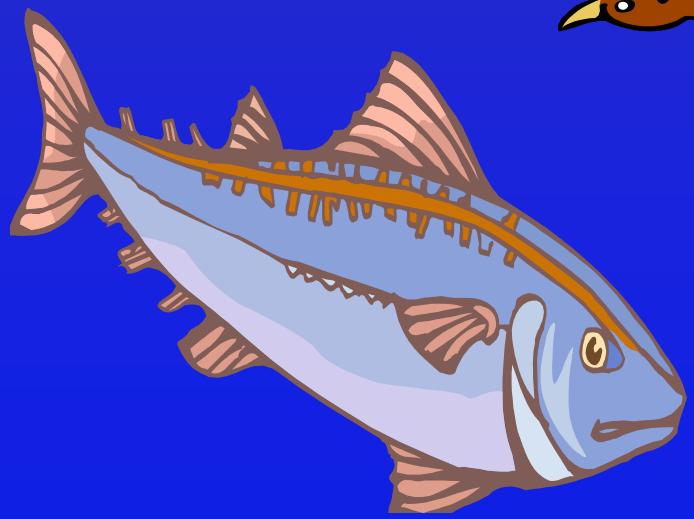
LOWER RESPONSE



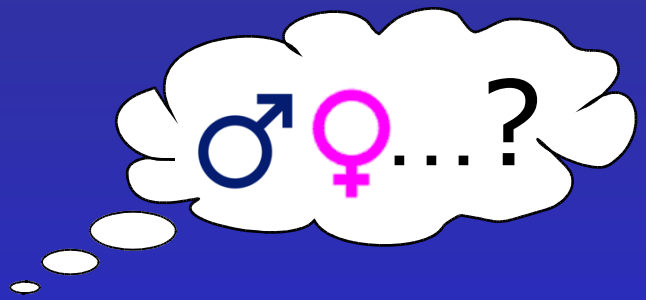
The endocrine disruptor induces a lower response than that produced by the hormone

✓ Some induced phatologies

- Feminization e defeminization
- Mascolinization and demascolinitation
- Fertility reduction
- IMPOSEX



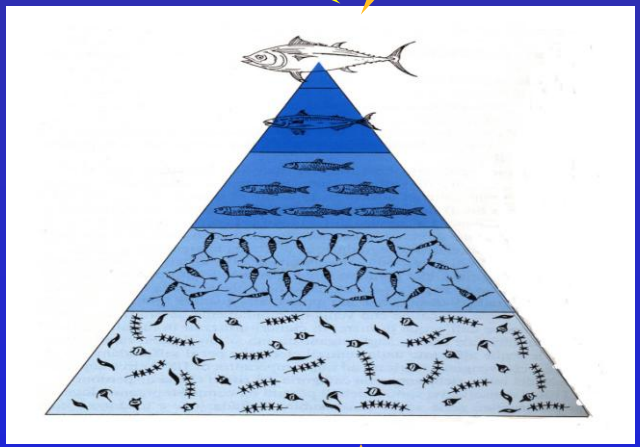
Endocrine disruptors



✓ THE WAY BY WHICH THEY REACH THE HUMANS

Human gender

Bioconcentration **Biomagnification**



Top predators

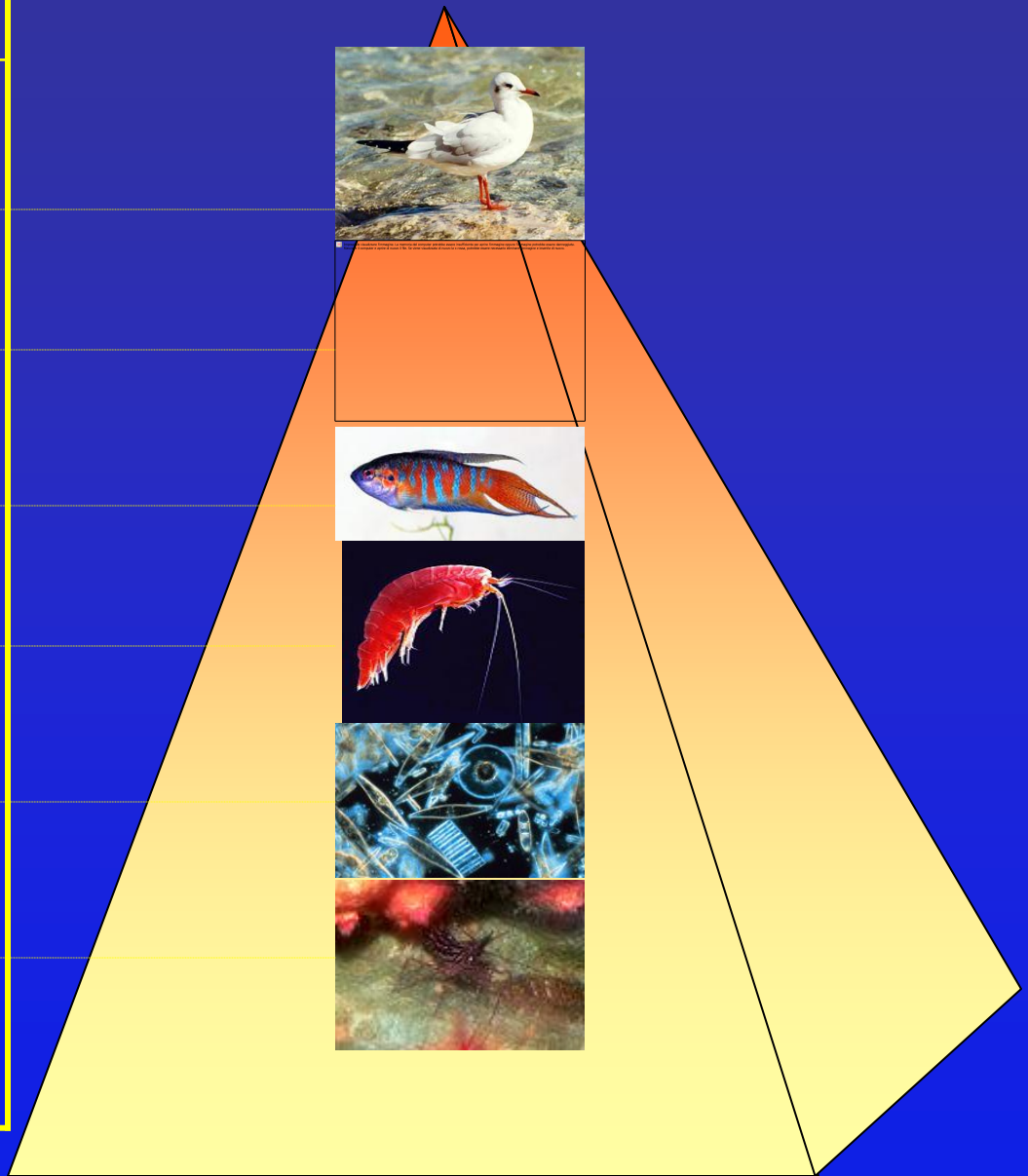
zooplankton

phytoplankton

Endocrine disruptors from natural sources or produced by human activities enter into the trophic and food chain

An example of Bioaccumulation

Concentration (a.u.)	System
25.000.000	Seagull
2.800.000	Trout
835.000	Minnow
45.000	Shrimp
500	Zooplankton
250	Phytoplankton
1	Sea bed



EDCs and human health

➢ *Female disorders*

- **Endometriosis**
- **Infertility**
- **Early age of menarch**
- **Late onset of menopause**
- **Breast cancer**
- **Structural anomalies of the uterus and oviducta**
- **Reproductive disfunction**

EDCs and human health

➢ *Male disorders*

- **Decreased sperm count/quality**
- **Increased incidence of testicular cancer**
- **Testicular maldescent (Cryptorchidism)**
- **Reproductive tract malformation (Hypostadias)**

➢ *Exposure effects*

- **Prenatal exposure to EDCs may result in permanent changes of function or sensitivity to stimulatory or inhibitory signals.**

- **Exposure in adulthood may be compensate for by normal homeostatic mechanisms and therefore may not result in any significant or detactable effect.**

- **Exposure to the same level of an endocrine signal during different life stage or different seasons may produce different effects.**

People most at risk

- **Human bodies in development (Embryo and fetus)**
- **Children**

➢ *Caution*

- **Considerable caution is necessary in:**

  1) extrapolating from *in vitro* to *in vivo* effects;

  2) predicting effects from limited *in vivo* data;

  3) extrapolating from experimental data to human situation.

➢ *Perspectives*

- **Individuation of new chemicals endowed with endocrine activity.**
- **Study of the effects induced by EDCs mixtures.**
- **Studies on the substitution of EDCs in materials of commune use, for example BPA in plastic bottles.**

Many thanks

for your attention