Endocrine Disruptors: What are they, and why should we care?

The Endocrine System

- Hormones secreted into bloodstream from glands or organs
- Conveys information throughout body
- Regulates metabolism, growth, reproduction, immune function, etc.

Examples of Human Hormones

- Testosterone
- Estrogen
- Growth hormone
- Insulin
- Thyroxine
- Adrenaline
Hormone Receptors

- Each hormone molecule fits a specific receptor protein
- Different cells, organs, have different receptors
- Hormones can target specific cells, organs via these receptors

Hormones target specific cells via their receptors
Different cells have different receptors

Endocrine disruptors:

- Molecules that interfere with endocrine system
- Naturally occurring or man-made
- Enter organisms via air, water, diet, skin
- Can cause problems with an organism’s development, reproduction, immune system, etc.
**Agonist:** molecule that binds hormone receptor and triggers the hormone’s effect (snake venom)

**Antagonist:** molecule that binds hormone receptor but does not trigger hormone’s effect (beta blockers)

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**Effects of Endocrine Disruptors**

- “Intersex” characteristics: both male and female characteristics are present in the same fish
- Feminization of males
- Abnormal breeding cycles
- Impaired immune systems

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- Cellular growth/tumors
- Abnormal development

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[Links]

http://pubs.usgs.gov/fs/fs-043-01/
http://snhs-plin.barry.edu/endocrine_disruptors.htm
Sources of Endocrine Disruptors:

- Drugs/medicines
- Pesticides
- Plasticizers
- Consumer products (plastic bottles, metal cans, detergents, cosmetics, toys, food)

Examples of Endocrine Disruptors

- DDT
- PCB’s (polychlorinated biphenyls)
- BPA (bisphenol A)
- Phthalates
- Triclosan

Dealing with Endocrine Disruptors

- Prevent exposure (laws, policy-making)
- Remove contaminants
- ???
Arsenic: An Unusual ED

- Disrupts many hormones, not just one
- Neither agonist or antagonist
- Doesn’t target hormone receptors at all
- Acts as a powerful immuno-suppressive agent

Endocrine Disruptors and Frogs

- Limb development

Sources of Arsenic

Naturally-Produced
- Geothermal vents
- Aquifers
- Microbes
- Runoff

Man-Made
- Coal combustion
- Arsenic – based pesticides
- Processing of pressure-treated wood