Assessment of ovarian maturation in *Chasmichthys dolichognathus* after exposure to single polycyclic aromatic hydrocarbons, benzo[a]pyrene

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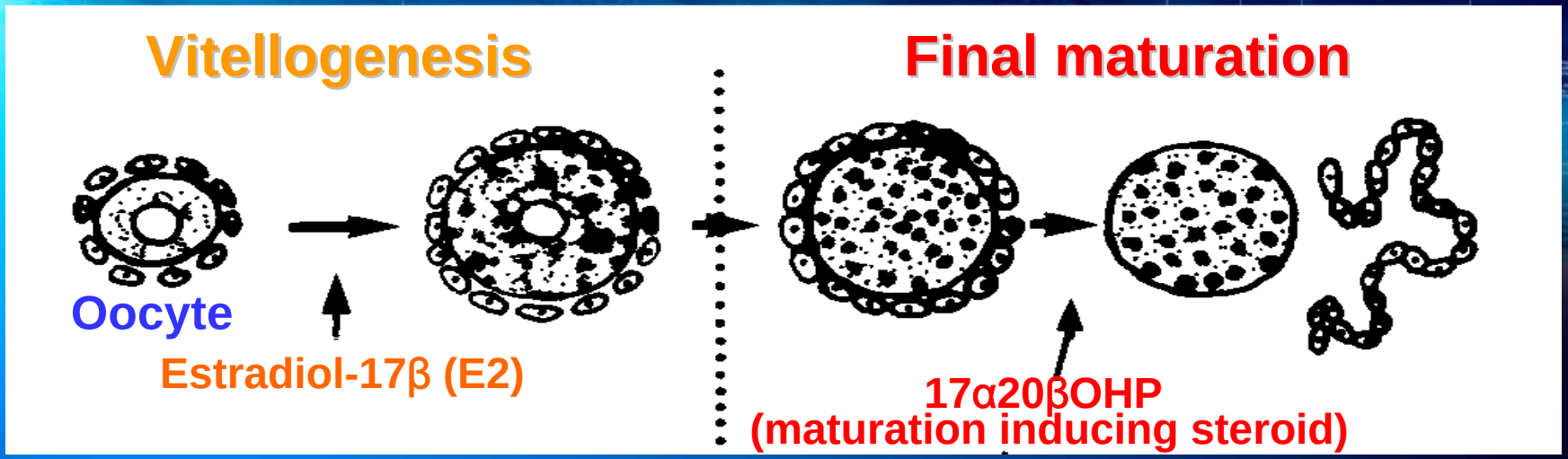
Background

Oocyte maturation of fishes



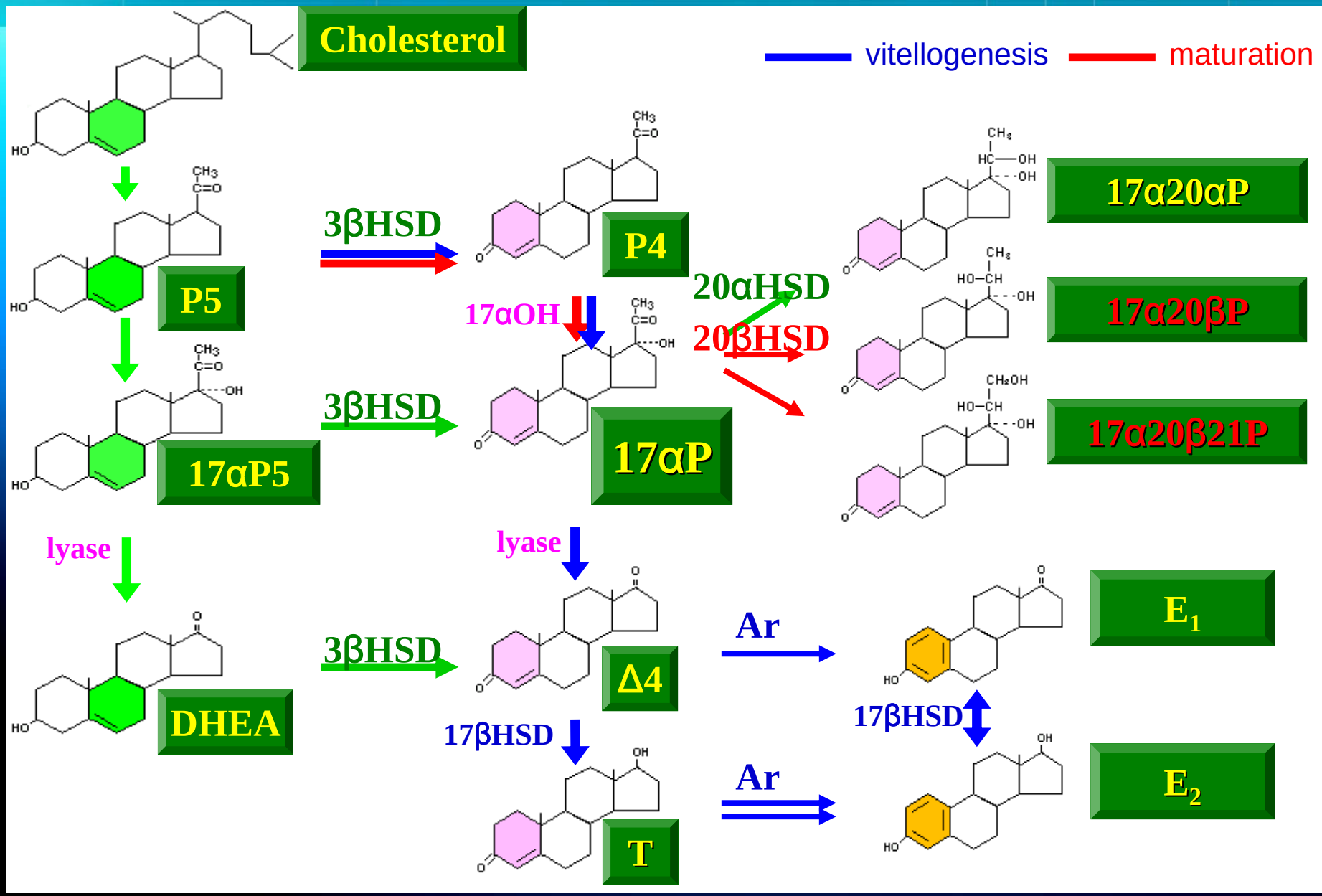
Long period → **Short period**

GSI increases gradually
Increase in oocyte diameter

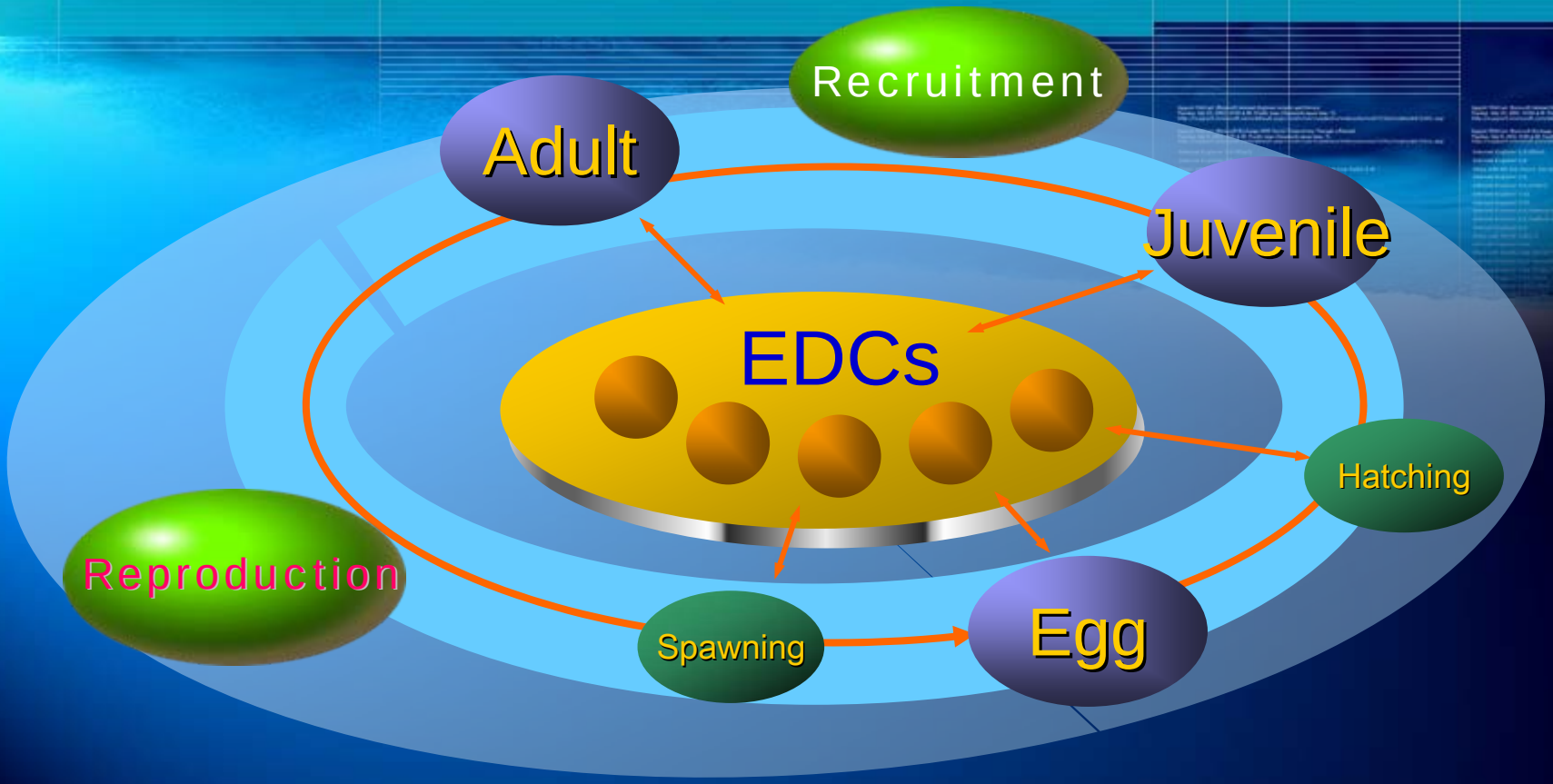
Maximum in GSI
Occurrence of GVBD and ovulation
Induction of final maturation
Ready to spawn

Prerequisite process for stock recruitment

General steroidogenic pathway of teleost

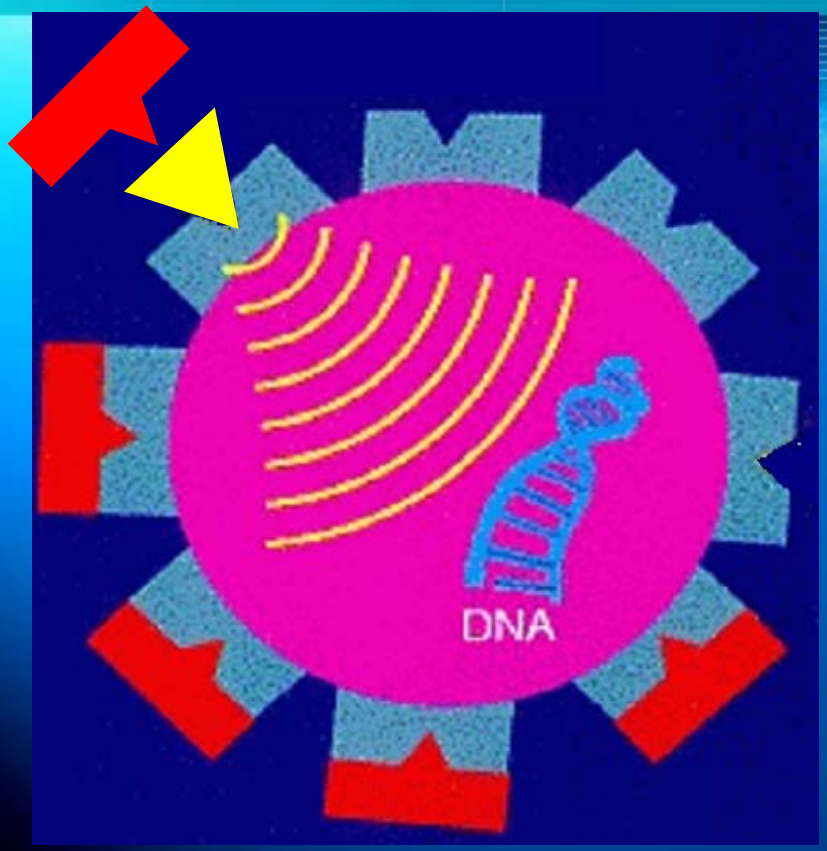


Endocirne Disrupting Chemicals and Fisheries



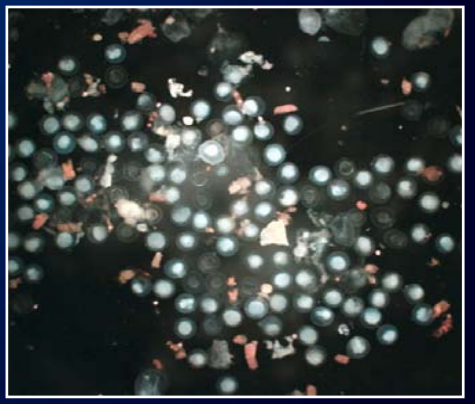
EDCs	**Natural or anthropogenic compounds that mimic endogenous hormones**
	Also known as hormone mimics, hormonally active agents, xenoestrogens

Mechanism of endocrine disrupting chemicals



Bind to hormone receptors; and/or interfere with normal hormone response

Inhibition of oocyte maturation
Alteration in reproduction

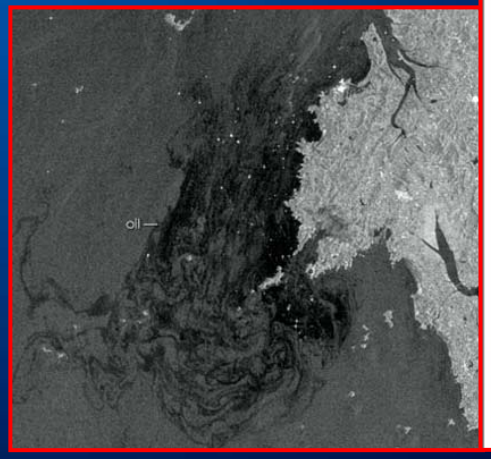


Reproductive success or not

Oil spills

Release of crude oil or refined petroleum products into the ocean and coastal waters

Spills take months or even years to clean up



Oil spills in Korea (2007)

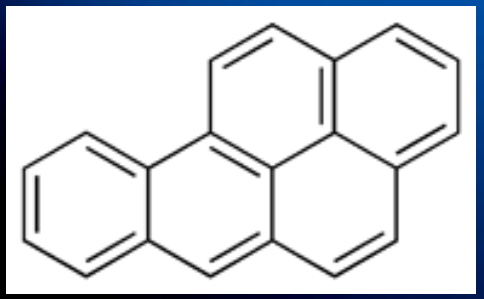
Polycyclic Aromatic Hydrocarbons (PAHs)

Component of crude oil

Byproducts of incomplete combustion

Bioaccumulation in lipid-rich tissues

Benzo[a]pyrene

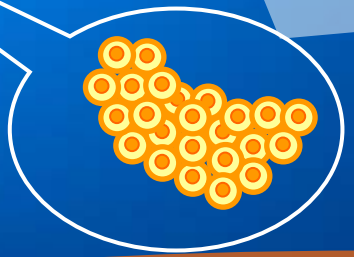


A representative PAHs that has strong toxicity

A five-ring PAH that is mutagenic and highly carcinogenic

The aim of this study

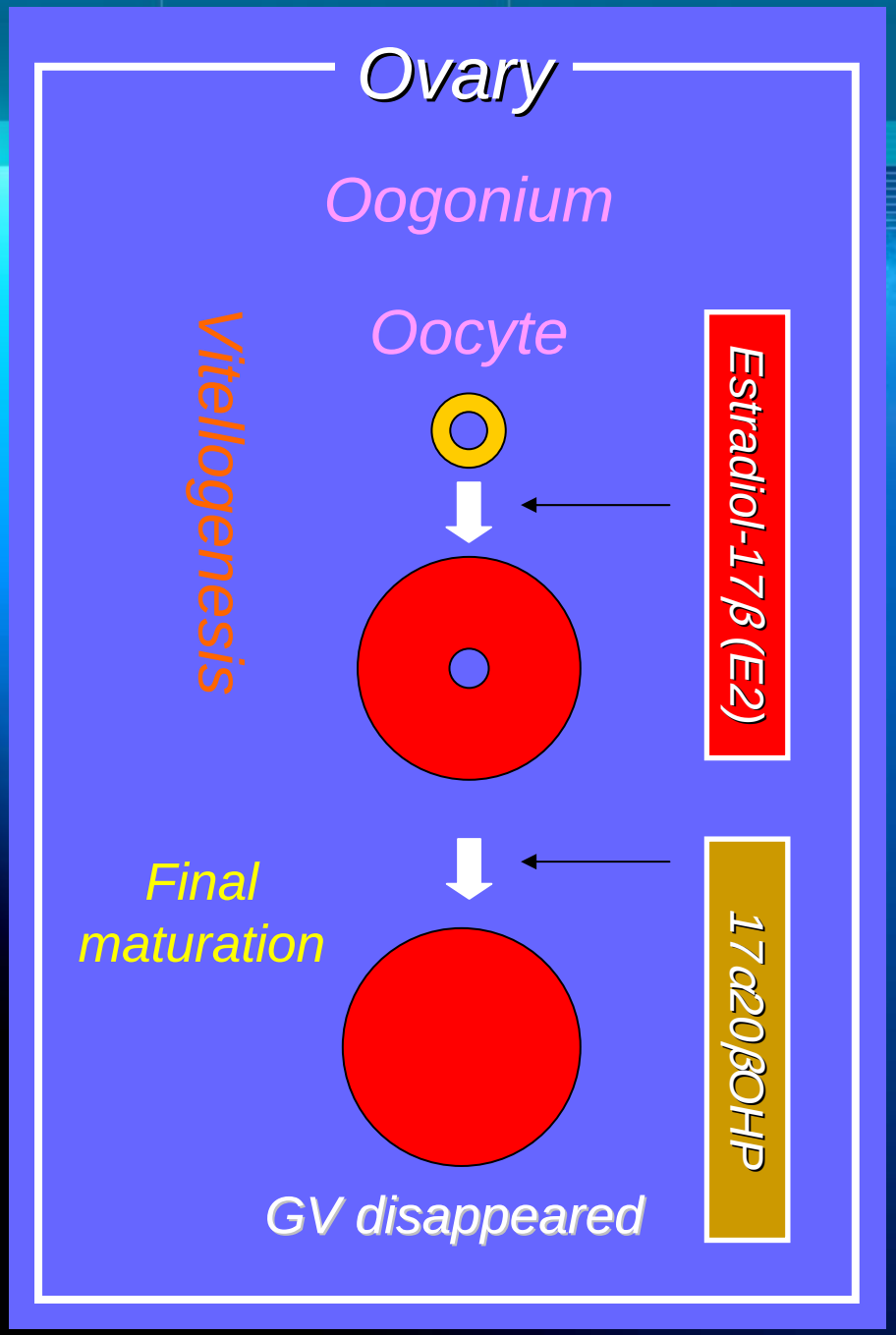
To evaluate the effects of benzo[a]pyrene on oocyte maturation *in vitro*



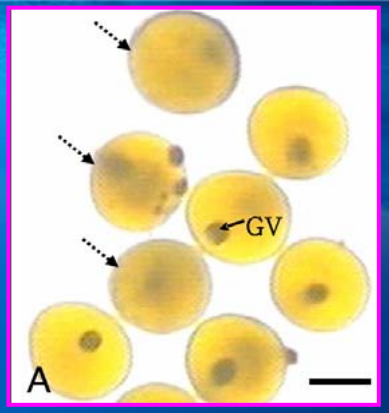
GVBD

Steroid production

Maturation



Germinal vesicle break down (GVBD)



Morphological index of maturation

Steroid hormone production

- Maturation inducing steroid (MIS, 17α20βOHP)
- Estrogen and testosterone
- Ratio of each steroid (E2/T or E2/17α20βOHP)

Gobiid fish : Ideal organism in EDCs study

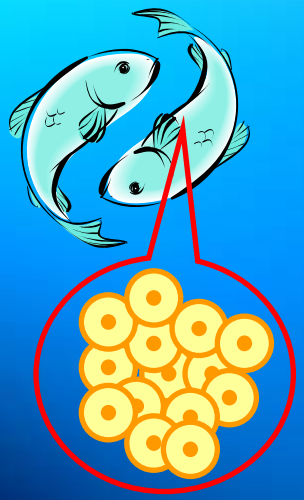
Longchin goby,
Chasmichthys dolichognathus

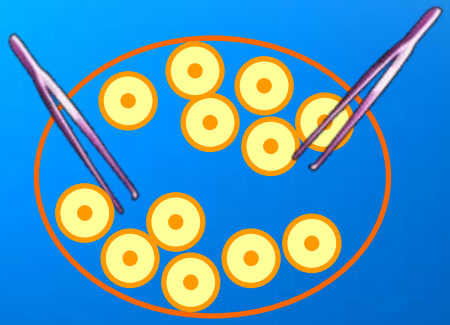
1. Short life cycle
2. Small size
3. Easy to handle
4. Strong tolerance
5. World wide distribution

Materials and methods

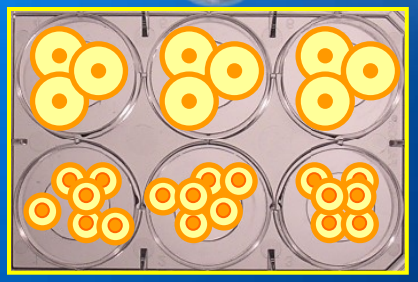
Experimental protocol

Dissection → Separation of oocytes → *In vitro* Incubation → Extraction of steroids in the media





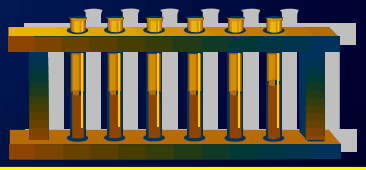
B[a]P



Incubated oocytes
-Observation of GVBD

Oocytes of ***0.9-1.0 mm*** *and* ***0.8-0.9 mm*** in diameters

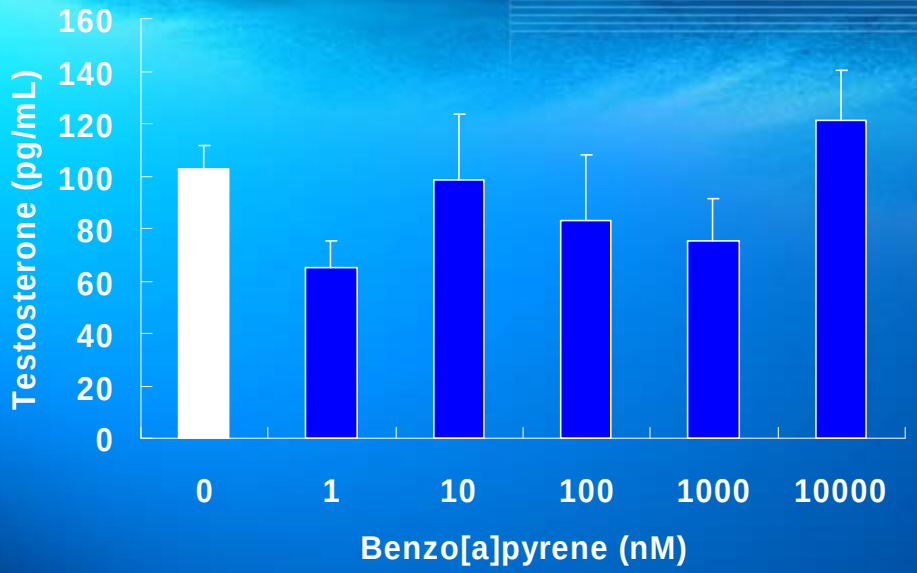
Exposure to 1, 10, 100, 1,000 and 10,000 nM of *B[a]P*

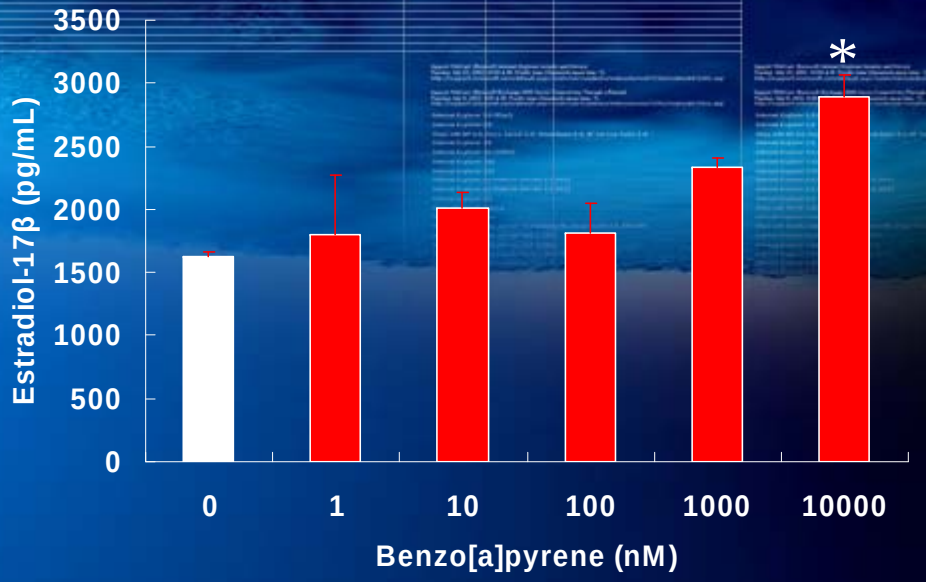


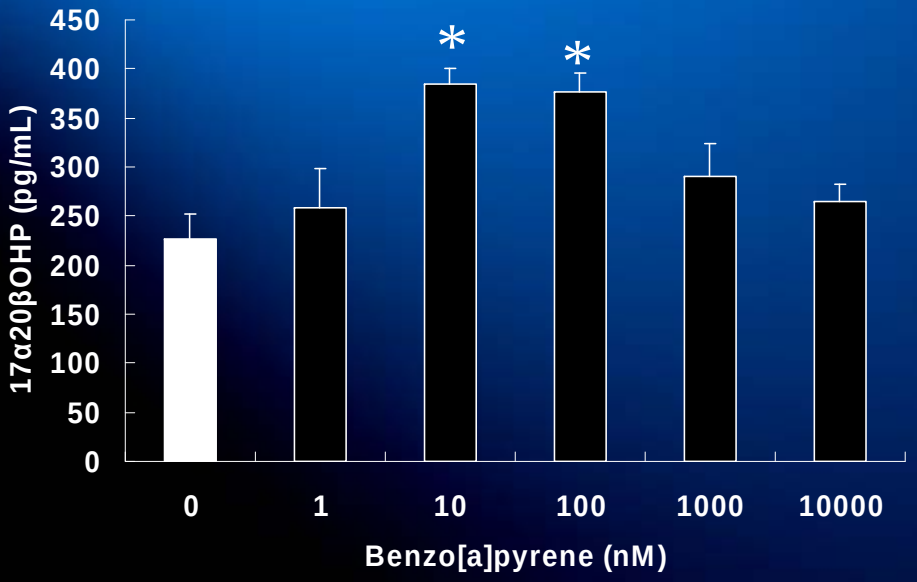
Steroids levels - RIA

Results and discussion

Effects of B[a]P on *in vitro* steroid production (Φ=0.8-0.9 mm)



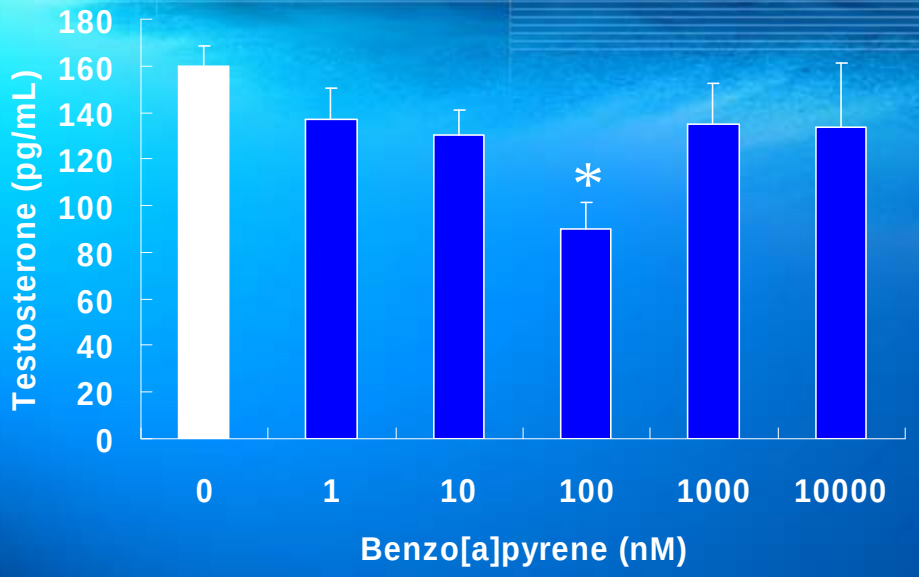


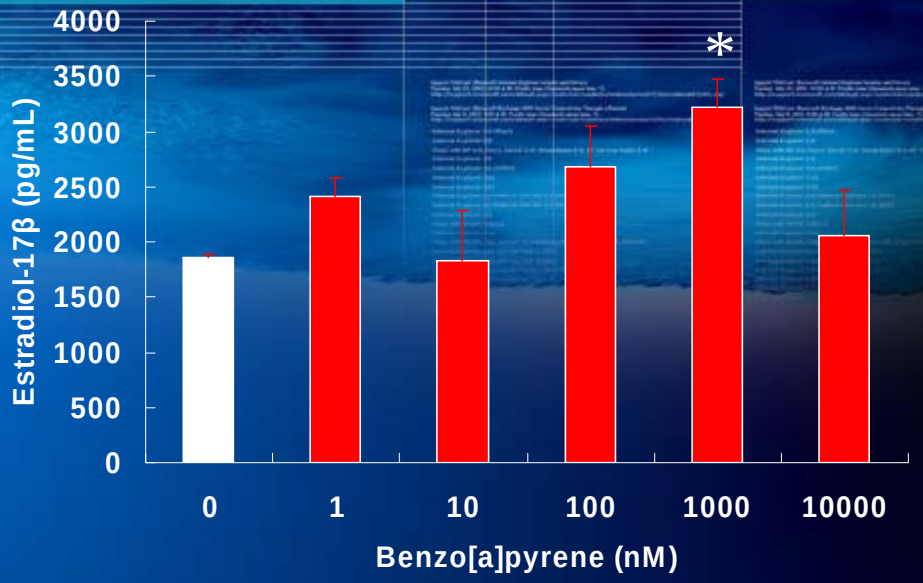


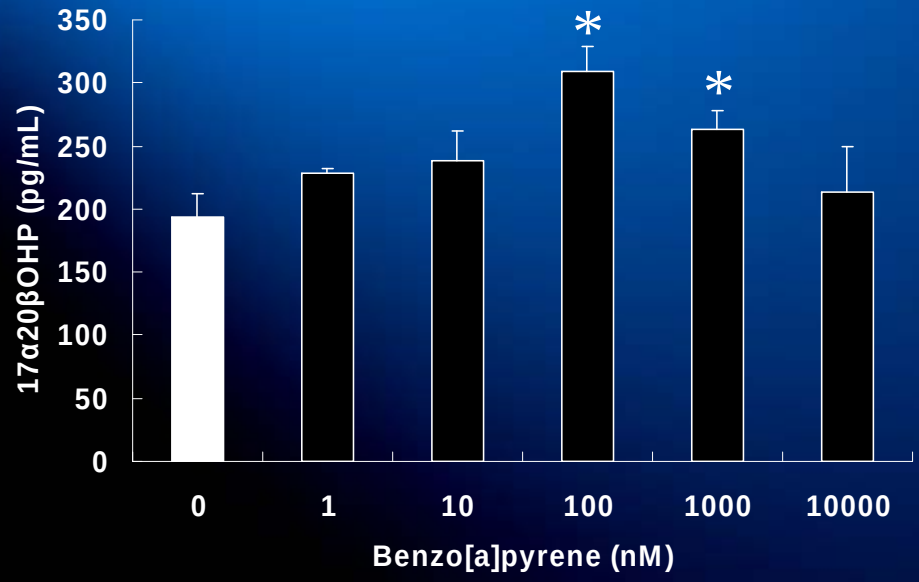
Bars represent the mean and SEM (n=3). Asterisks indicate significant differences from controls ($P<0.05$).

Lower concentrations of B[a]P
-Increase in 17α20βOHP production
-related to final maturation

Effects of B[a]P on *in vitro* steroid production (Φ=0.9-1.0 mm)





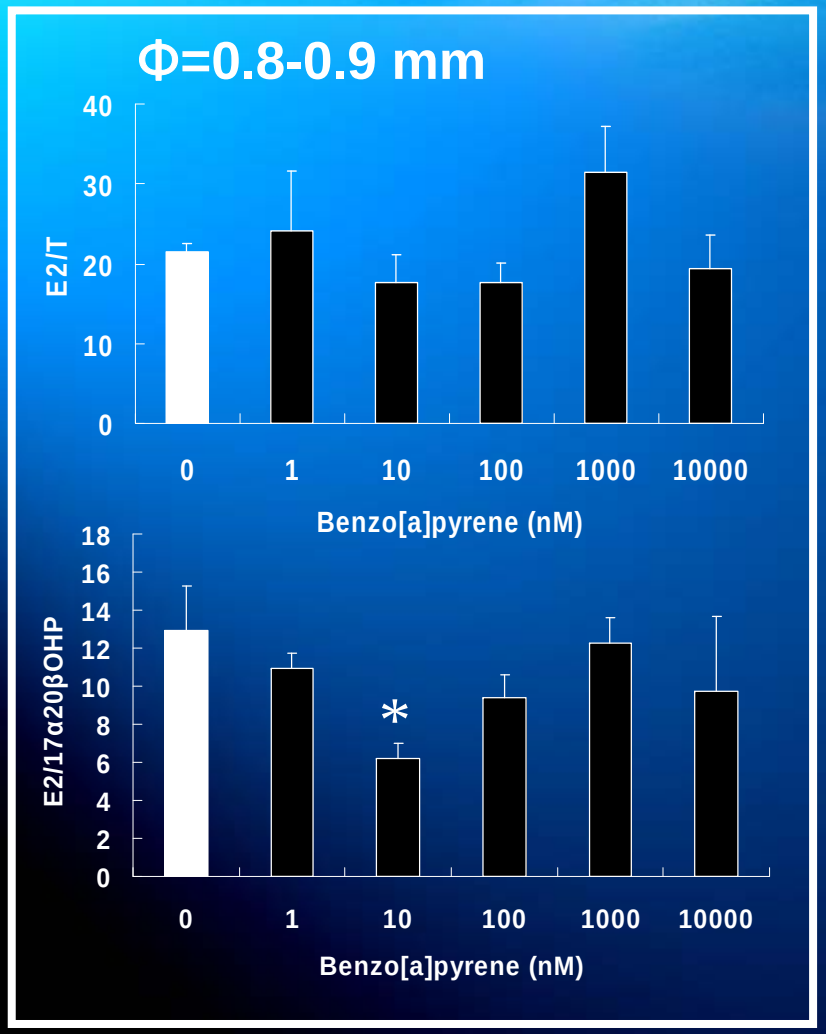


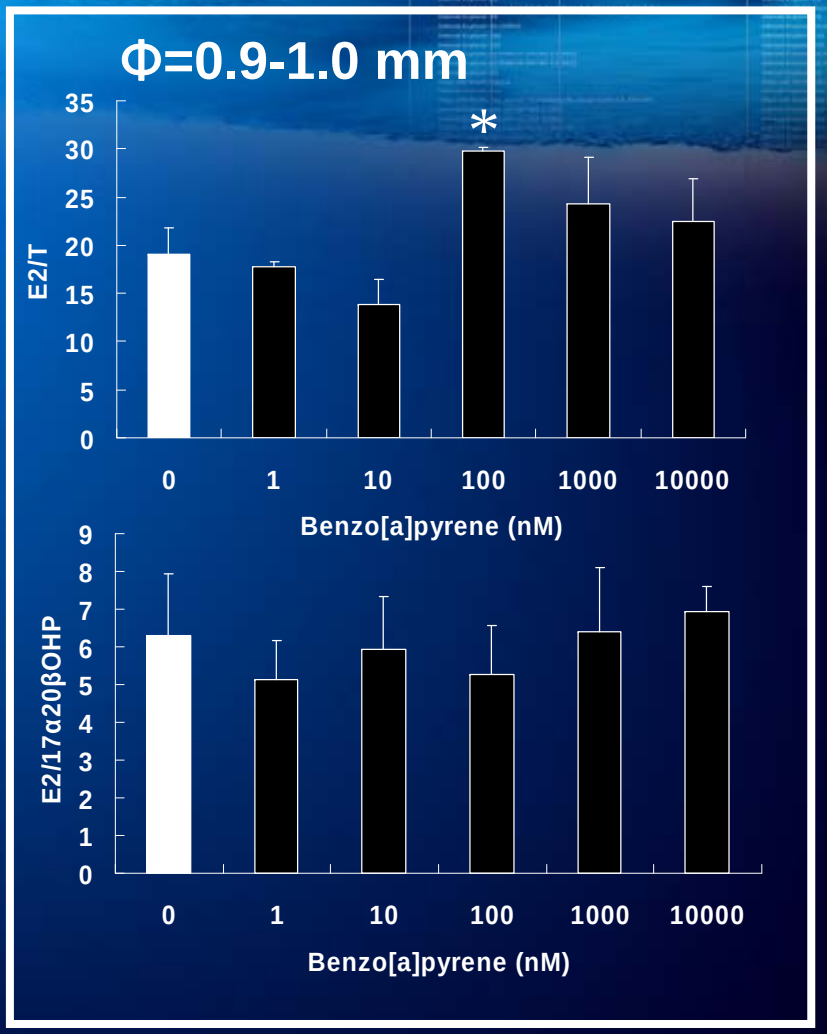
Bars represent the mean and SEM (n=3). Asterisks indicate significant differences from controls ($P<0.05$).

Increase in E2 production
Increase in 17α20βOHP production

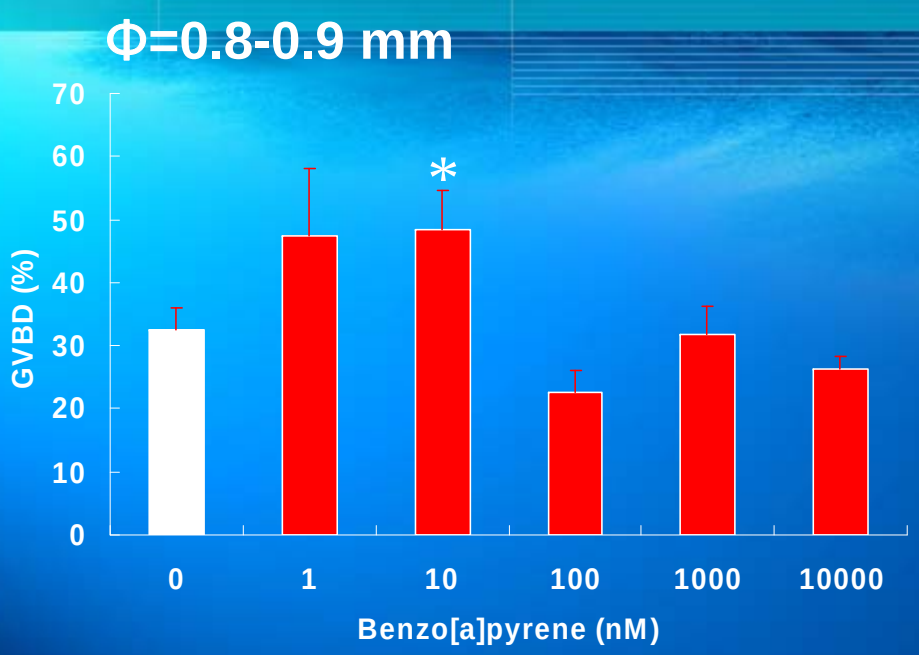
Effects of B[a]P on *in vitro* steroid production (E2/T and E2/17α20βOHP)

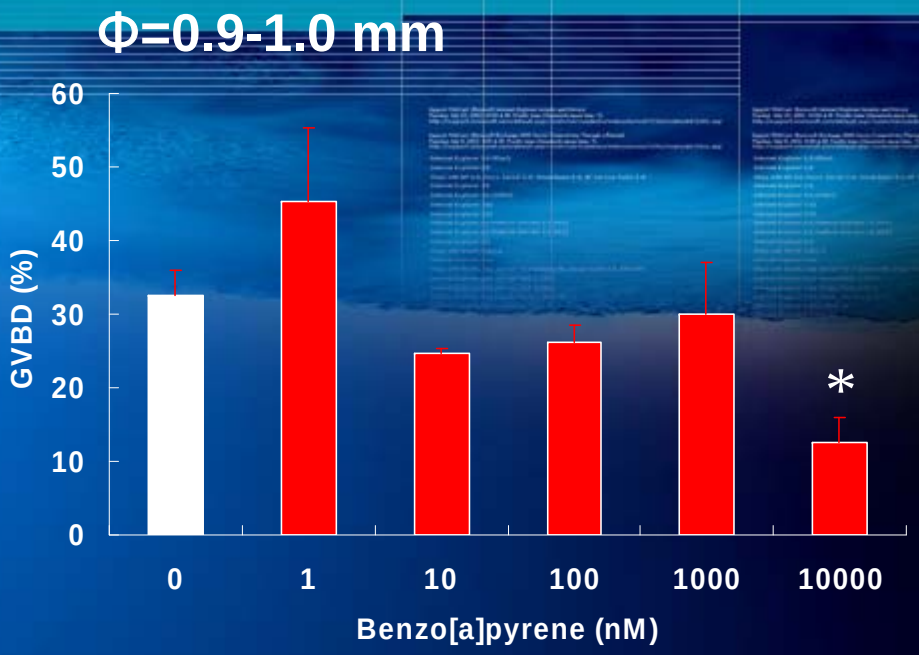
High E2/T and E2/17α20βOHP – Estrogenic activity or inhibition of maturation





Effects of B[a]P on *in vitro* GVBD





Bars represent the mean and SEM (n=3). Asterisks indicate significant differences from controls ($P<0.05$).

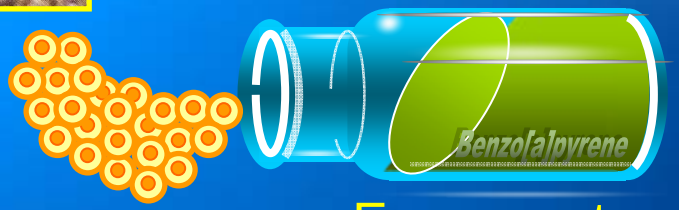
Higher concentrations of B[a]P – Inhibition in GVBD
Lower concentrations of B[a]P – Stimulation in GVBD

Conclusion and future study

But, I'm not sure.
Study more
in detail!

Exposure to
lower concentrations

→ Stimulation
in maturation



Exposure to
higher concentrations

→ Estrogenic effects
Inhibition in maturation

Investigation
of long-term effects

In vivo experiment

Molecular biological methods

→

Mechanism of
endocrine disruption
on oocyte maturation
by PAHs, B[a]P

Thank you.
Don’t spill your oil.