

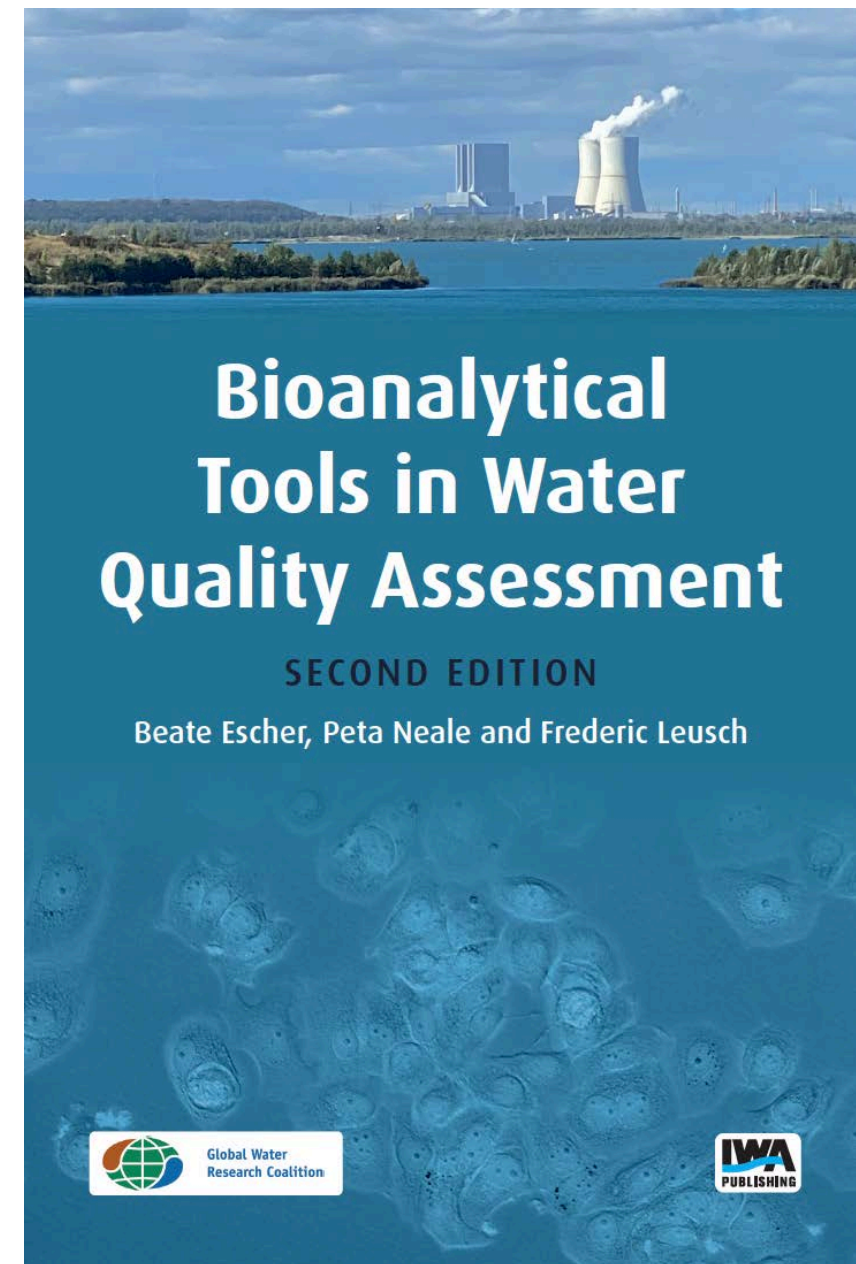
Chapter 6

Toxicity pathways of chemicals in aquatic organisms

This presentation accompanies Chapter 6 of
“Bioanalytical Tools in Water Quality Assessment”
<https://www.iwapublishing.com/books/9781789061970/bioanalytical-tools-water-quality-assessment-2nd-edition>

Exercises can be found at www.ufz.de/bioanalytical-tools

Questions? please send an e-mail to bioanalytical-tools@ufz.de

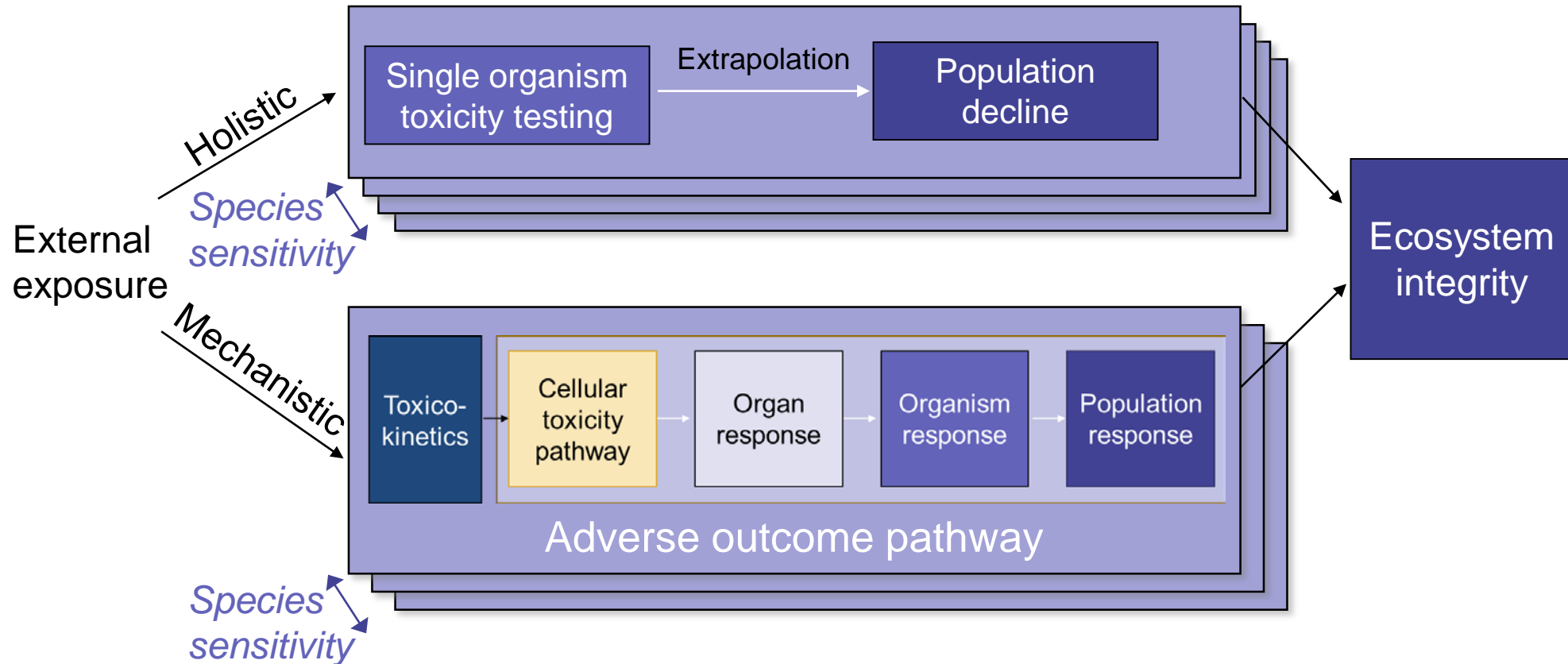


Learning goals

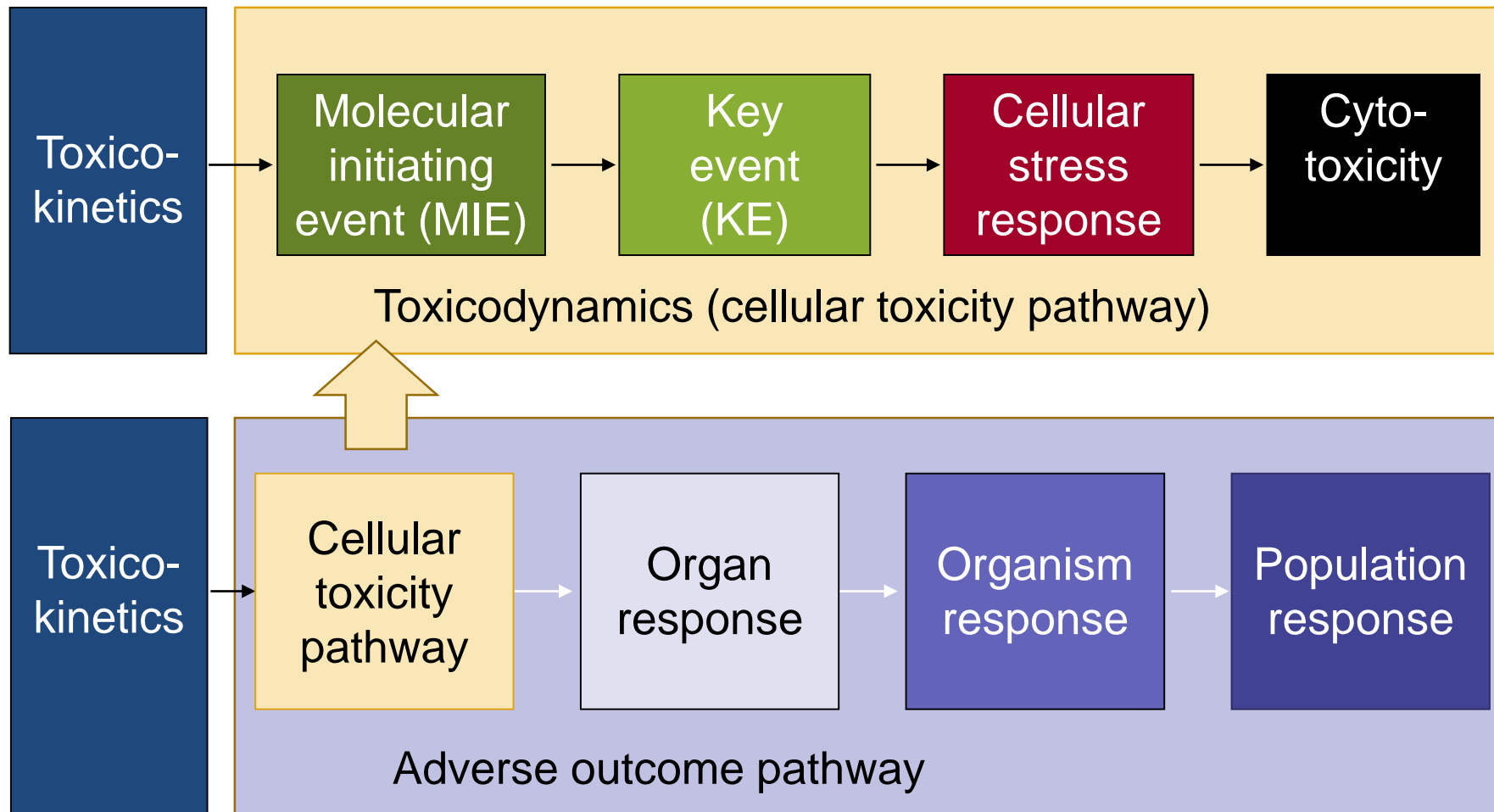
- XXX

Baseline toxicity

- XXX



Link between cellular toxicity pathways and adverse outcome pathways





Toxico-kinetics

- hydrophobicity dependent bioaccumulation

Adverse outcome pathway in algae: **baseline toxicity**

Molecular interaction

- changes in fluidity of cellular membranes
- changes in photosynthetic electron transport chain

Cellular response

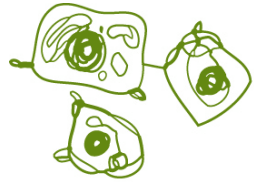
- reduced availability of energy

Organism response

- decrease of cell size
- no cell division (reproduction)

Population response

- biomass decline
- smaller growth rate of population



Toxicokinetics

- hydrophobicity dependent bioaccumulation
- metabolism

Adverse outcome pathway in algae: inhibition of photosynthesis

Molecular interaction

- binding to Photosystem II causing shut-down of photosynthesis
- production of reactive oxygen species

Cellular response

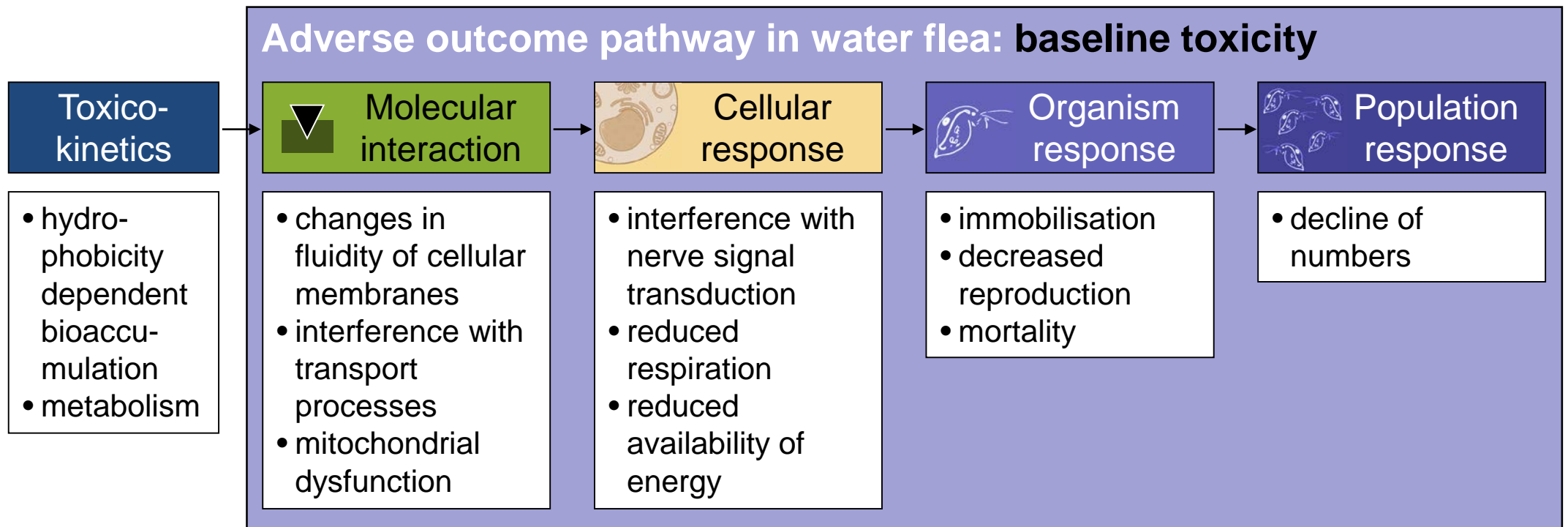
- reduced availability of energy
- oxidative stress

Organism response

- “bleaching” of cells (loss of chlorophyll)
- decrease of cell size
- cell death

Population response

- biomass decline
- smaller growth rate of population





Toxico-kinetics

- metabolic activation necessary for organo-phosphates

Adverse outcome pathway in water flea: insecticides

Molecular interaction

- inhibition of acetylcholine-esterase

Cellular response

- accumulation of acetylcholine
- interference with nerve signal transduction

Organism response

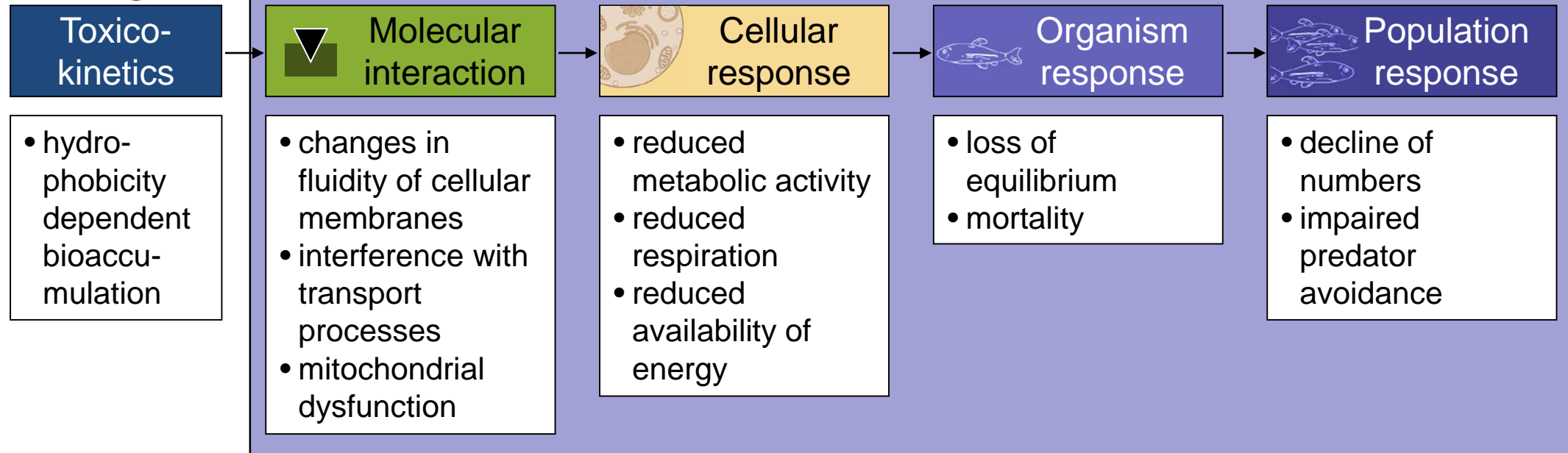
- over-excitation
- immobilisation
- mortality

Population response

- smaller growth rate of population

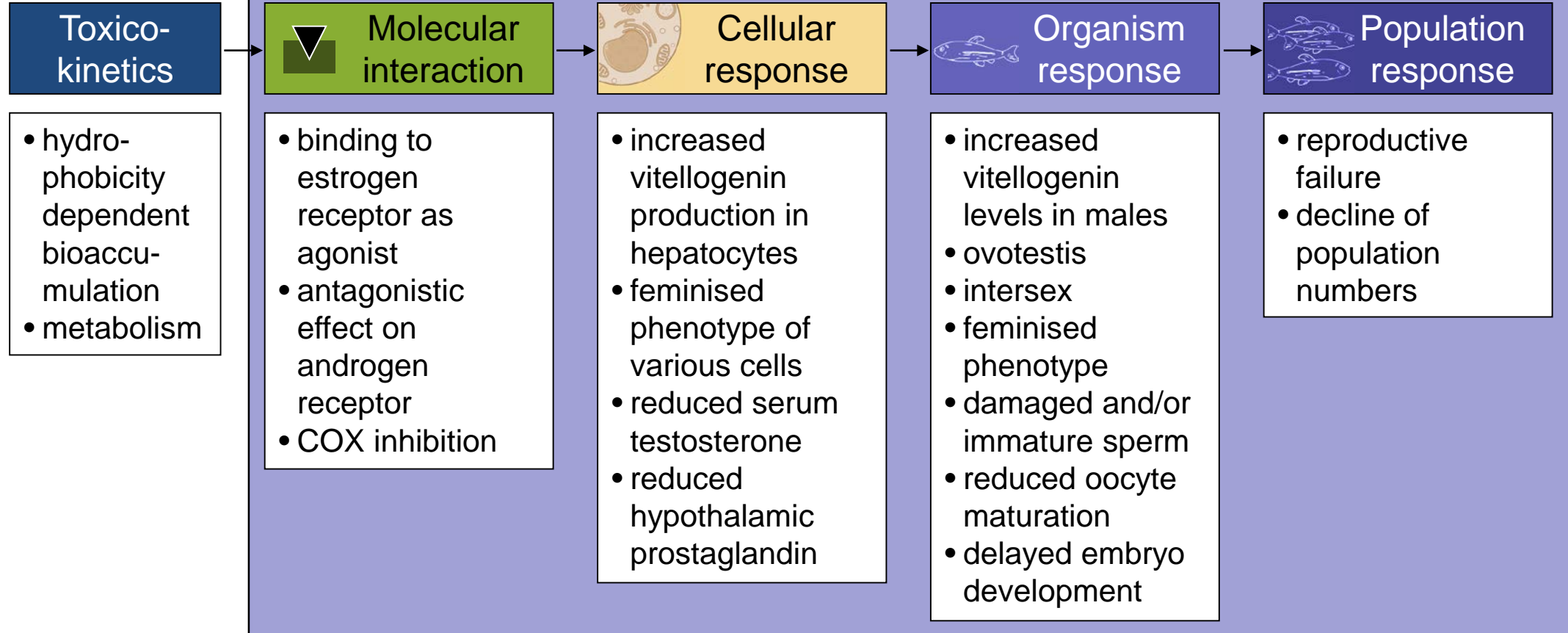


Adverse outcome pathway in fish: **baseline toxicity**





Adverse outcome pathway in fish: reproductive toxicity



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