

Emerging Contaminants: Thoughts and Perspectives

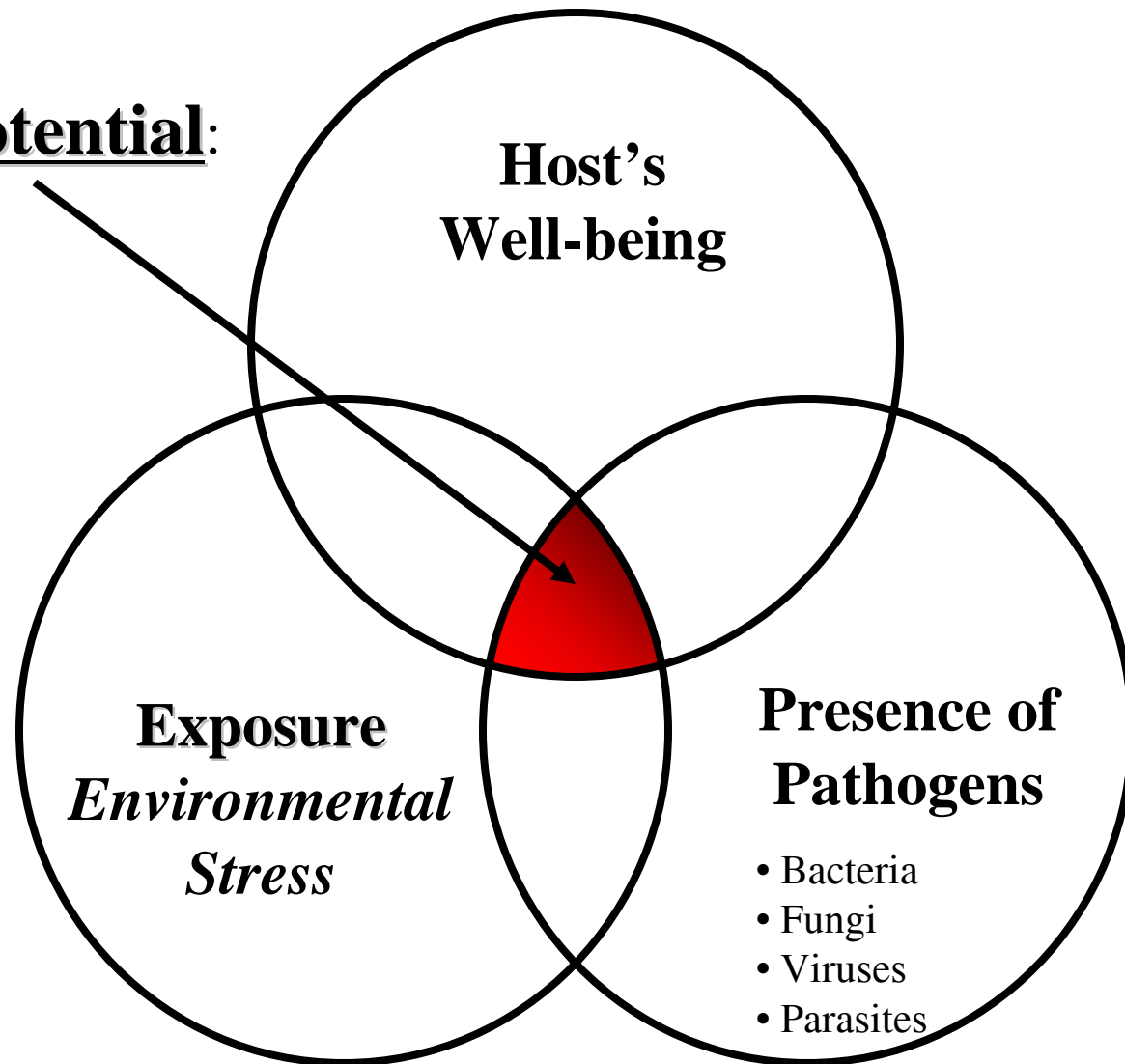
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Center for Environmental and Human Toxicology
Emerging Pathogens Institute

"Emerging Contaminants"

- **New contaminants**
- **Detectable contaminants**
- **Contaminants of concern**
- **Environmentally persistent**
- **Novel environmental outcomes**
- **Novel environments**

“Dis-ease” potential:



Stressors:

Physical (trauma, suboptimal habitat, irritants)

Chemical (contaminants, toxins, suboptimal water quality)

Biological (pathogens, parasites, suboptimal food, environmental unease)



The great expectations held for DDT have been realized. During 1946, exhaustive scientific tests have shown that, when properly used, DDT kills a host of destructive insect pests, and is a benefactor of all humanity.

Pennsalt produces DDT and its products in all standard forms and is now

one of the country's largest producers of this amazing insecticide. Today, everyone can enjoy added comfort, health and safety through the insect-killing powers of Pennsalt DDT products . . . and DDT is only one of Pennsalt's many chemical products which benefit industry, farm and home.



GOOD FOR FRUITS—Bigger apples, juicier fruits that are free from unsightly worms . . . all benefits resulting from DDT dusts and sprays.



GOOD FOR STEERS—Beef grows meatier nowadays . . . for it's a scientific fact that—compared to untreated cattle—beef steers gain up to 50 pounds extra when protected from horn flies and many other pests with DDT insecticides.



KNOX FOR THE HOME—helps you to make healthier, more comfortable homes . . . protects your family from dangerous insect pests. Use Knox-Out DDT Powders and Sprays as directed . . . then watch the bugs "bite the dust"!



KNOX FOR DAIRIES—Up to 20% more milk . . . more butter . . . more cheese . . . tests prove greater milk production when dairy cows are protected from the annoyance of many insects with DDT insecticides like Knox-Out Stock and Barn Spray.



87 Years' Service to Industry • Farm • Home

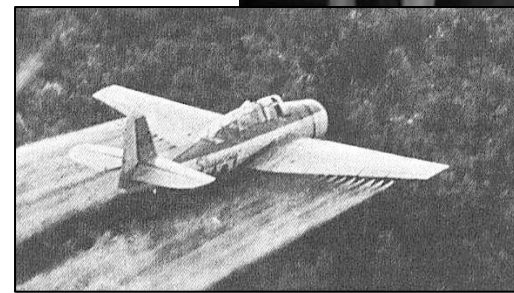
She longed for a Star Trek-type doctor with a state-of-the-art diagnostic tool. The doctor, with a few computer bleeps, would locate the exact cause of her newly discovered and doctor-baffling skin lesions and assign a painless treatment with no side effects.



GOOD FOR ROW CROPS—25 more barrels of potatoes per acre . . . actual DDT tests have shown crop increases like this! DDT dusts and sprays help truck farmers pass these gains along to you.

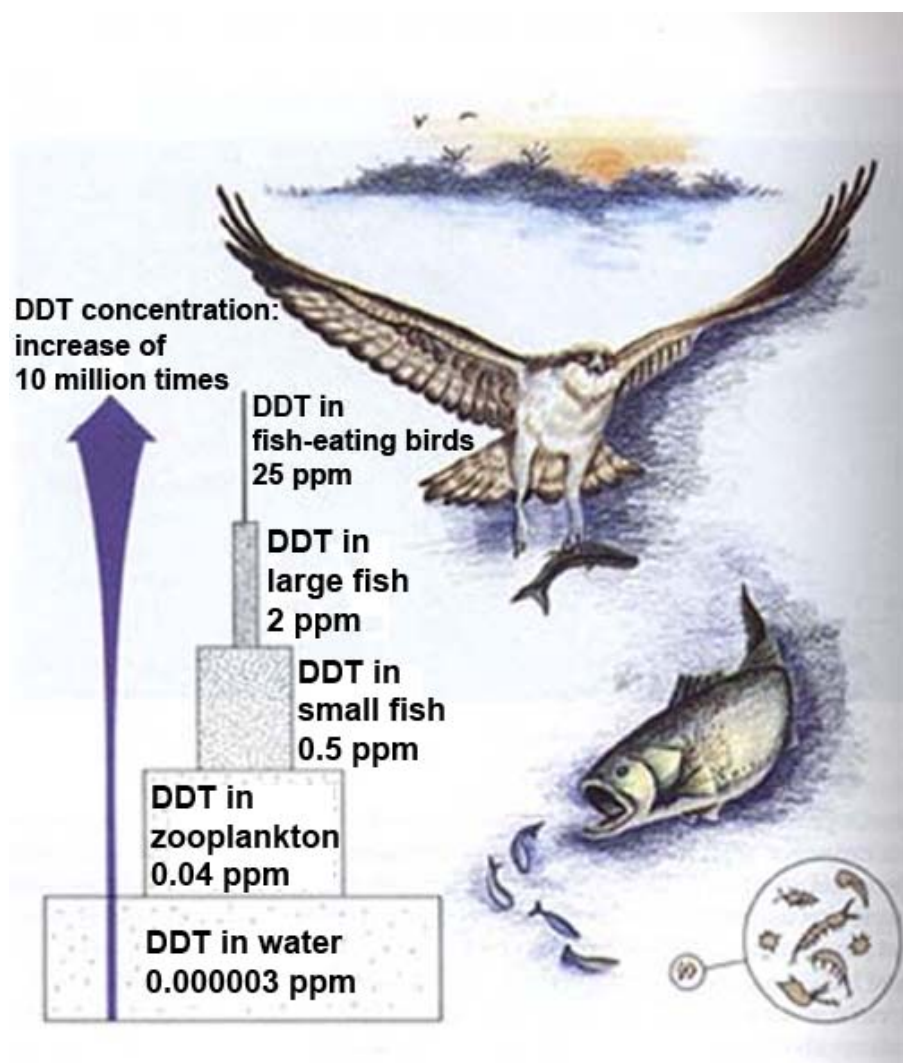


KNOX FOR INDUSTRY—Food processing plants, laundries, dry cleaning plants, hotels . . . dozens of industries gain effective bug control, more pleasant work conditions with Pennsalt DDT products.

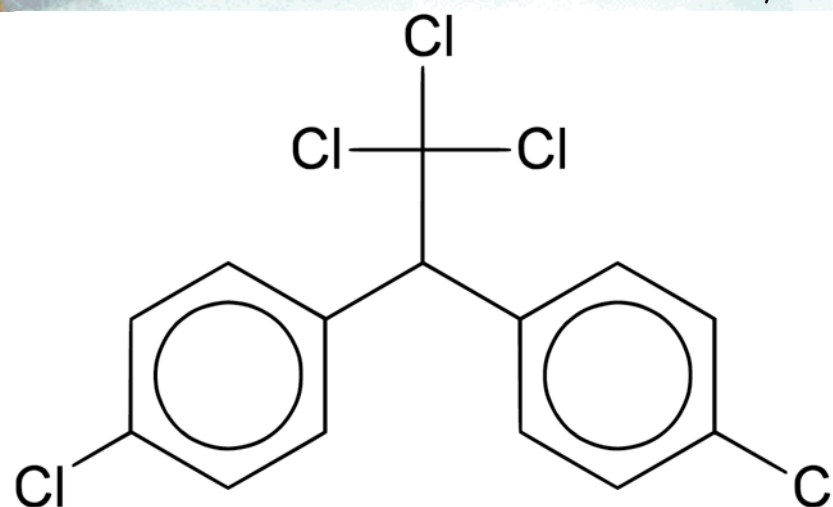


POPs

Persistent Organic Pollutants

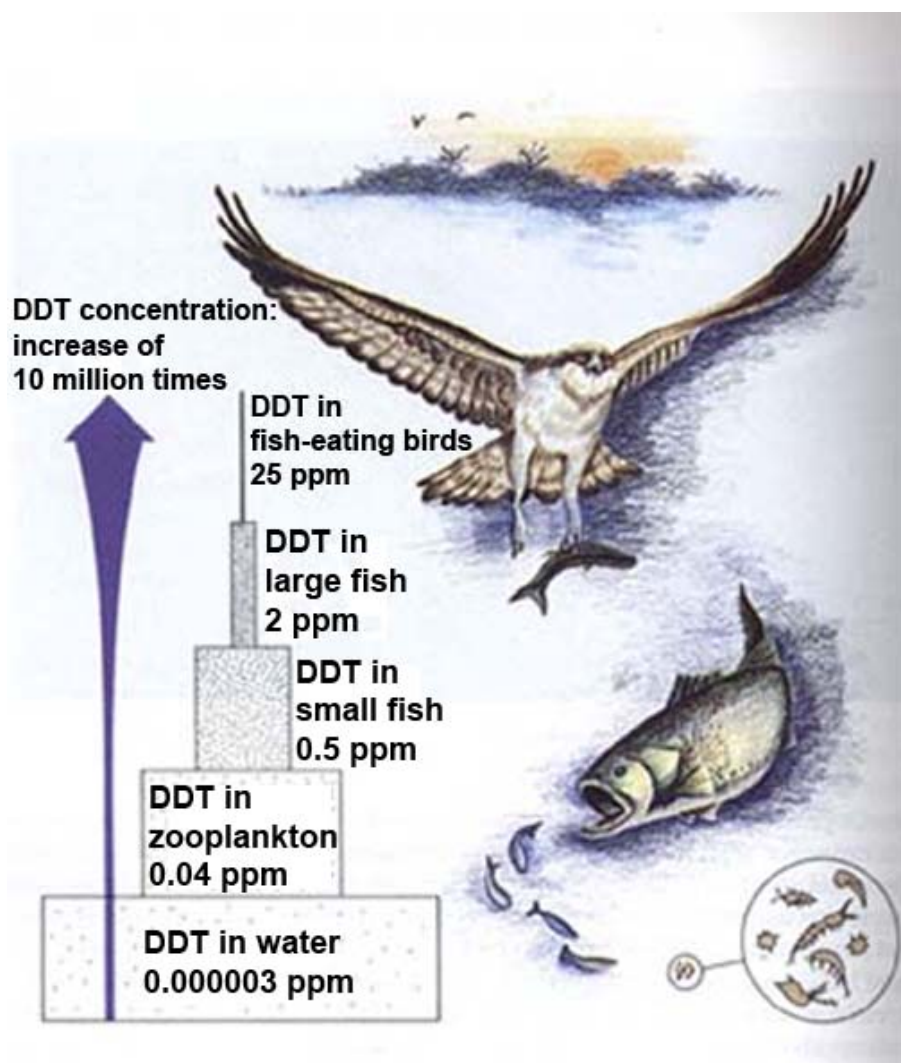


Bioconcentration → Biomagnification

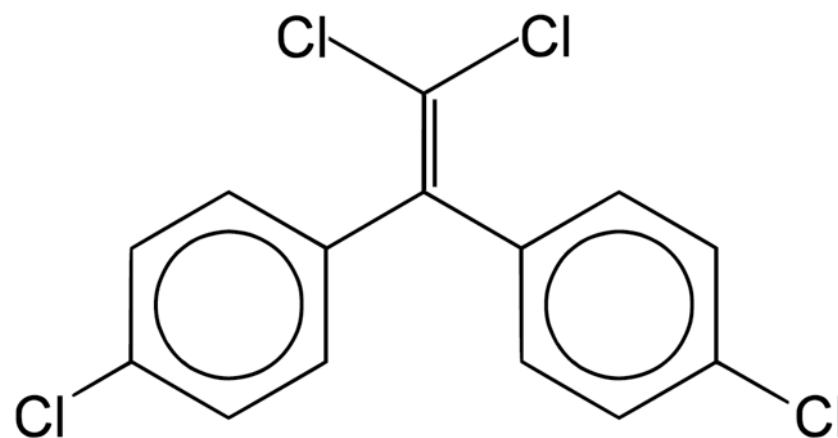


POPs

Persistent Organic Pollutants



Bioconcentration → Biomagnification



Polybrominated diphenyl ethers

Paints, resins, rubber

Household appliances

Stereo components

Computers & casings

Switches, fuses

Smoke detectors

Automotive seats

Television sets

Laminates

Carpeting

Upholstered furniture

Insulation materials

Wires and cables

Furniture coating

Office machines

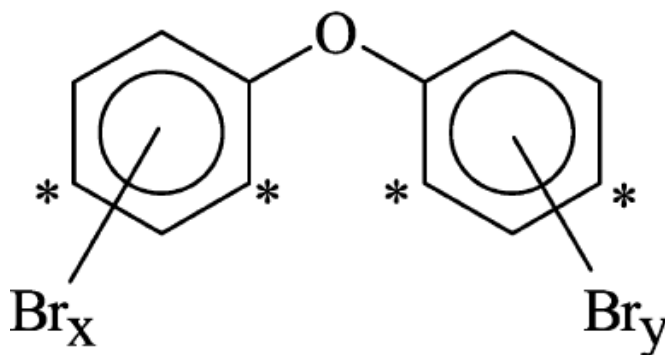
Military clothing

Vacuum cleaners

Sealants, foams

Tents, tarps

Floor mats



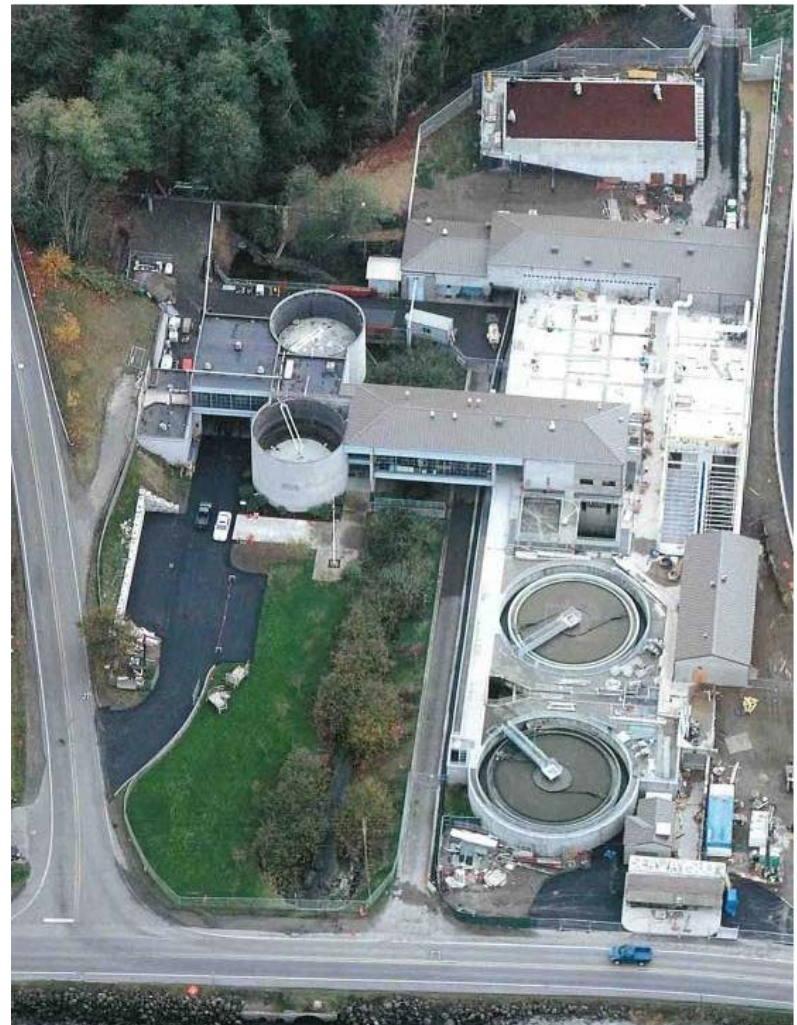
CAFOs



CAFOs



Exogenous enrichment



Effluent-dominated waterways



Point sources



STPE: A complex mixture of EDCs

- naturally occurring hormones
(e.g., progesterone, testosterone, estradiol)
- synthetic hormones (birth control estrogen - EE₂)
- neuroactive pharmaceuticals
(antidepressant,
-anxiety, ADHD meds)
- surfactants,
plasticizers, and
antimicrobials

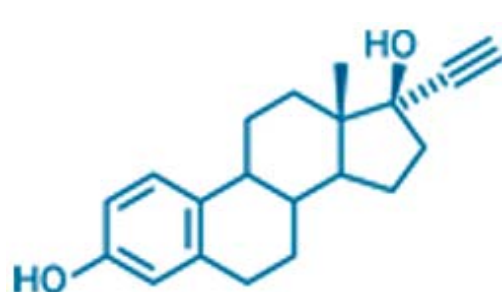


PPCPs

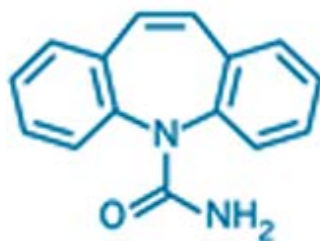


Ilene Ruhoy & Christian Doughton (2007) Sci Total Environ (338): 137-148
19.7 tons orphaned pharmaceuticals per year

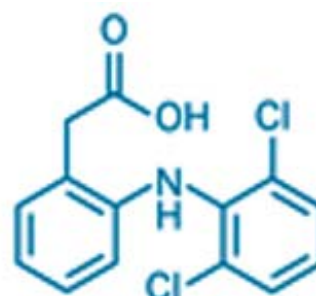
Fish as sentinels



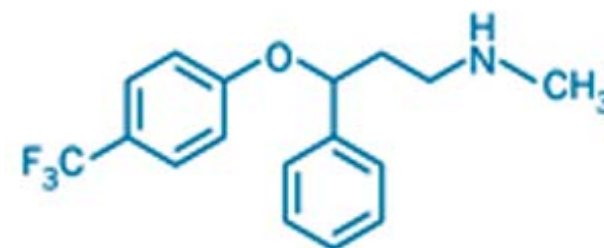
17 α -Ethinylestradiol



Carbamazepine

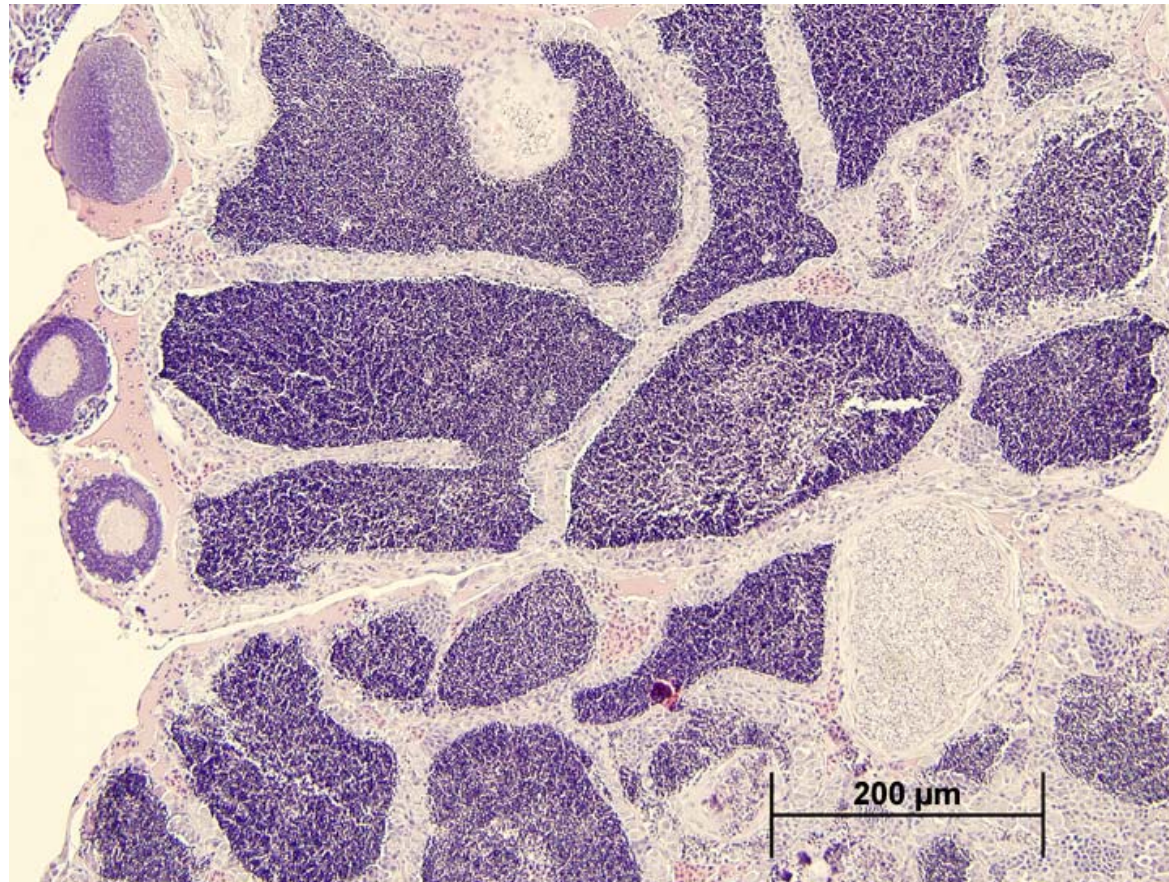


Diclofenac

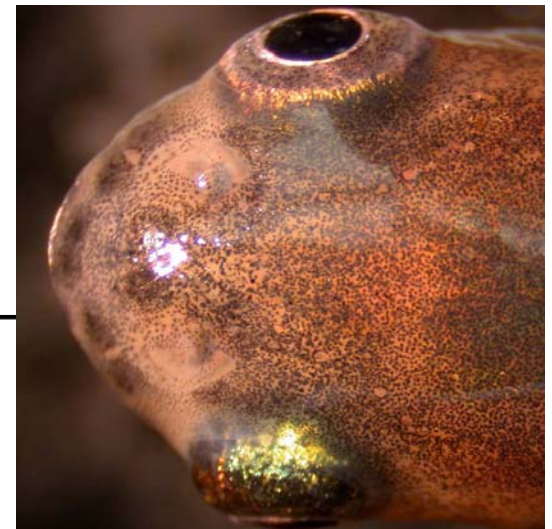
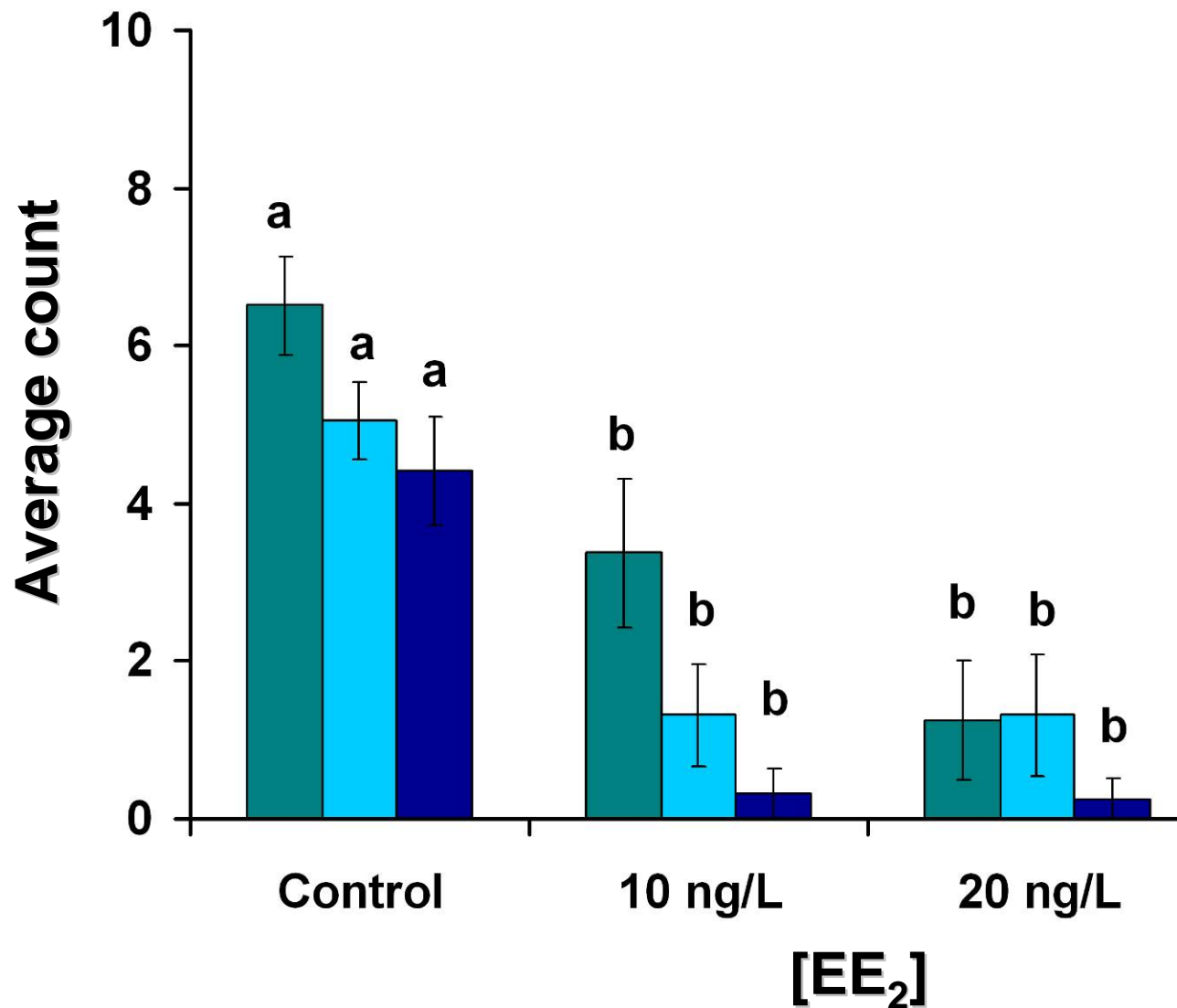


Fluoxetine

Intersex

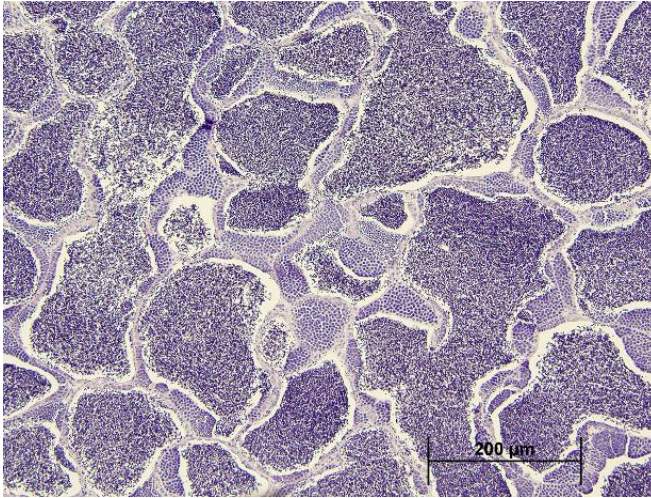


Fish as sentinels: Laboratory Studies

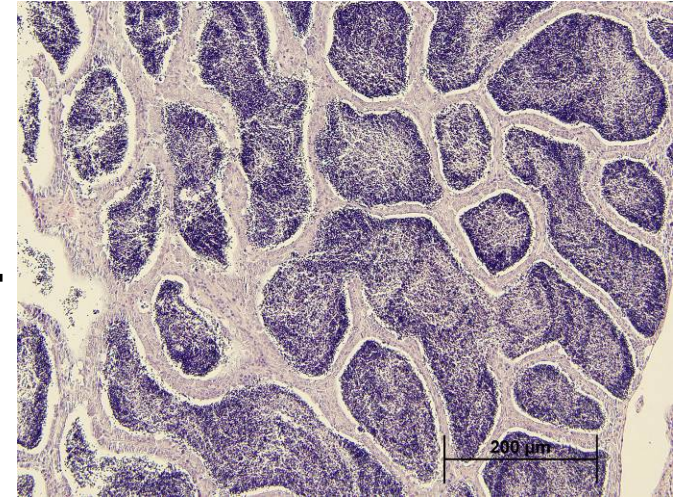


Fish as sentinels: Laboratory Studies

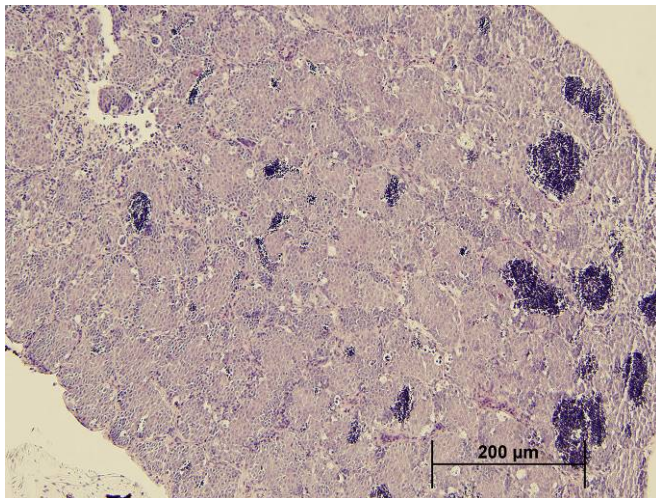
Control



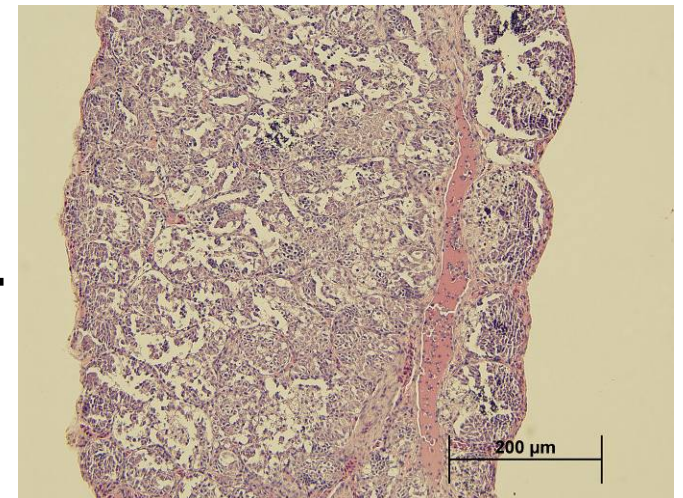
10 ng/L



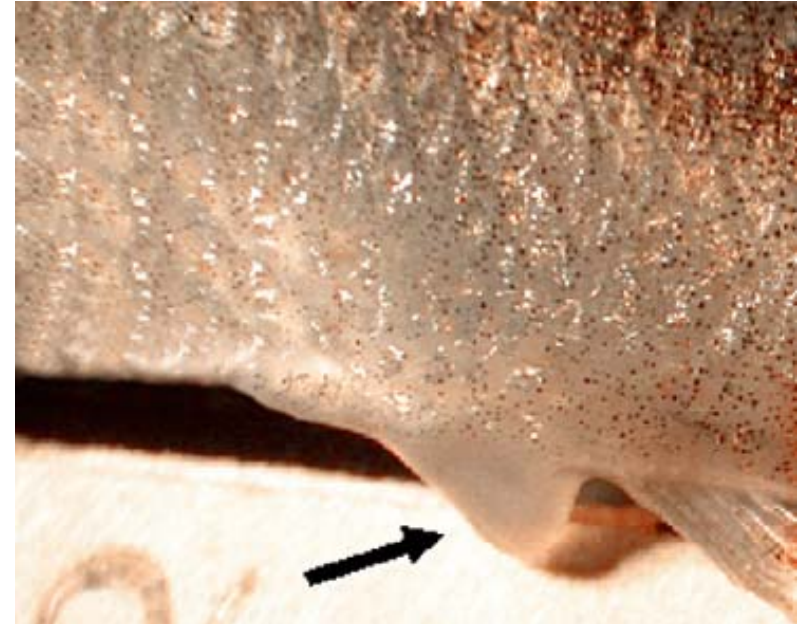
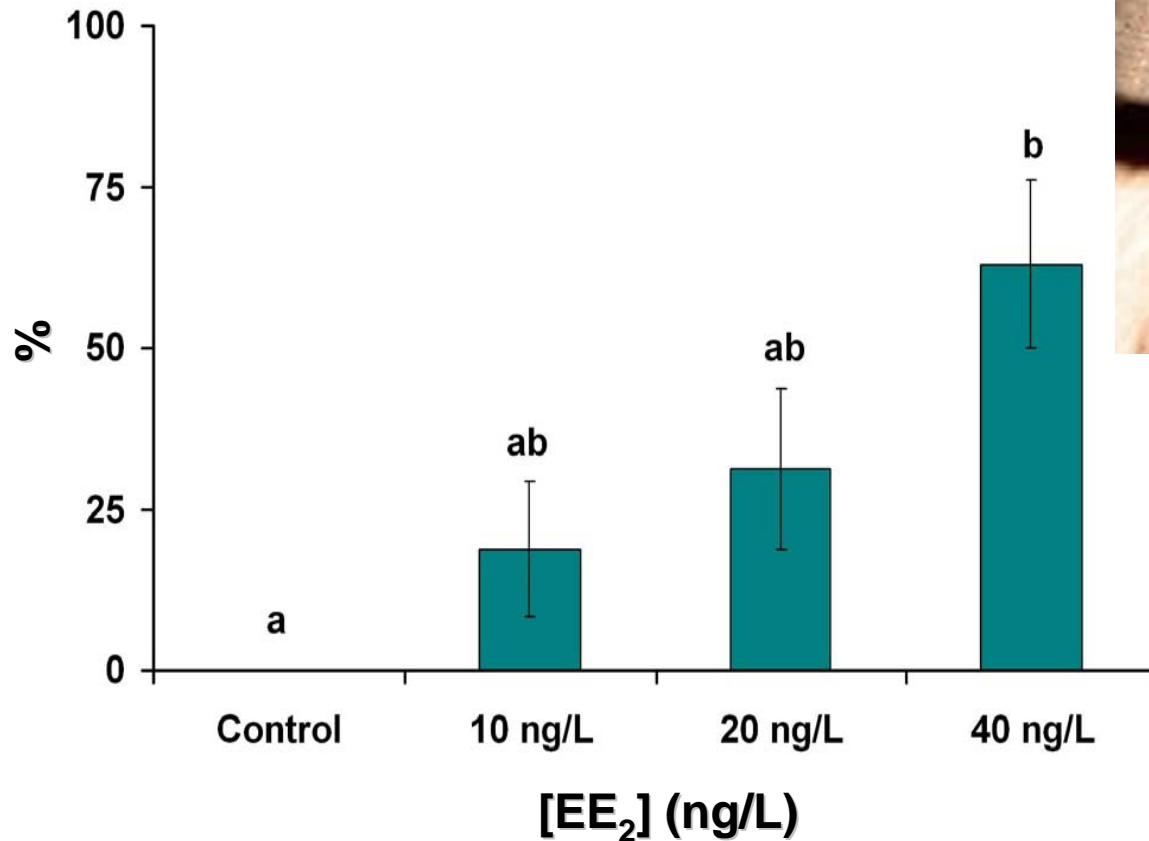
20 ng/L



40 ng/L



Fish as sentinels: Laboratory Studies



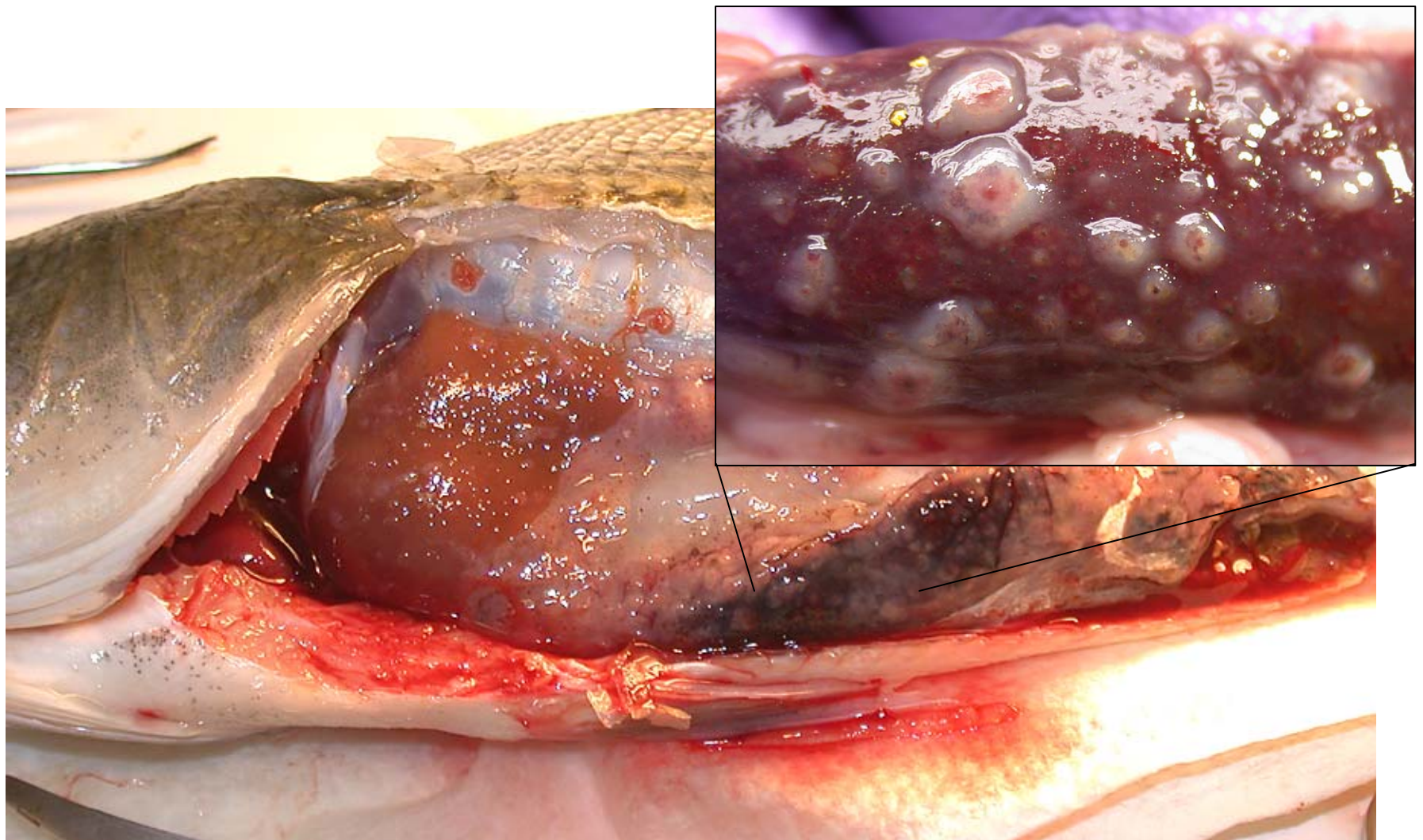
Mycobacteriosis



Mycobacteriosis



Mycobacteriosis



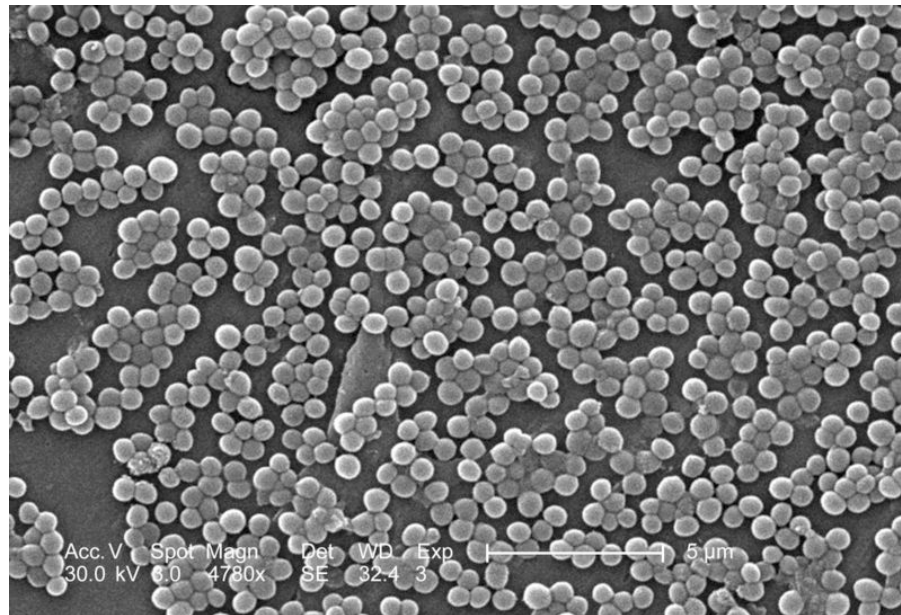
Mycobacteriosis

- **Changes in flow dynamics**
- **Shoreline development**
- **Agricultural runoff**
- **Over-harvesting**
- **Changes in filtration rate**
- **Altered water quality**
(pH, temperature, suspended solids)

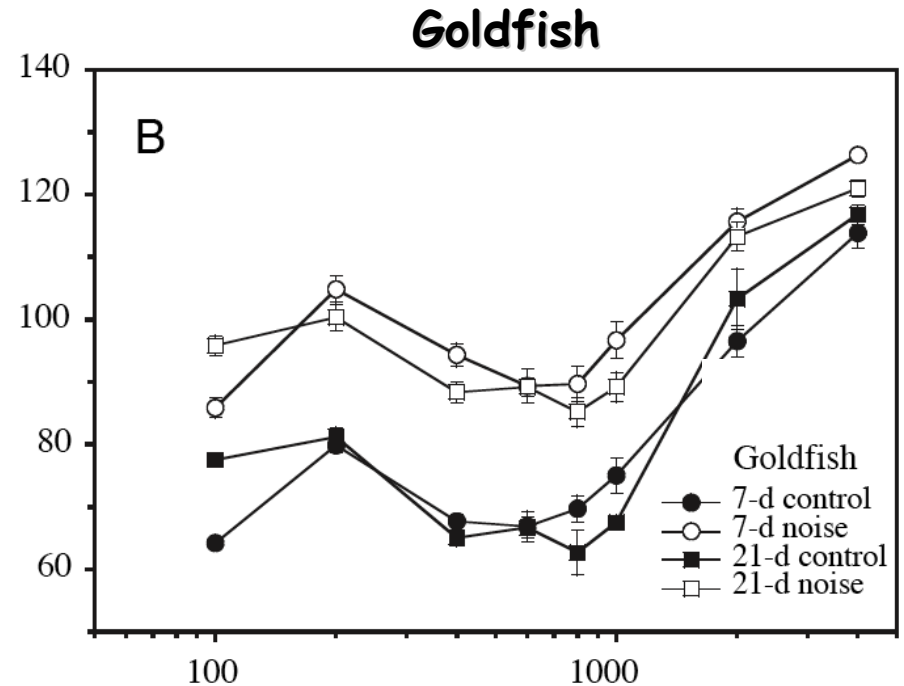
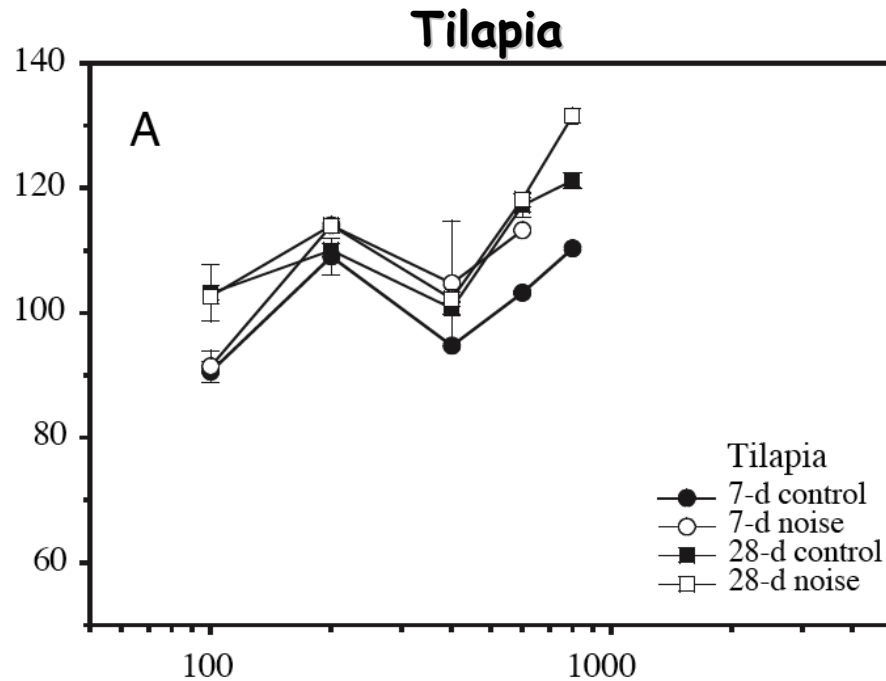
Antibiotic resistance

Methicillian-resistant *Staphylococcus aureus*

Vancomycin-resistant *Staphylococcus aureus*



Acoustic contamination



Smith, Kane & Popper (2004). *J Exp Biology* (207):3591-3602

Analytical Methodology

**Detection does not
infer health risk and
non-detection does not
ensure safety.**

Our Changing Environment

Anthropogenically- Accelerated Eutrophication

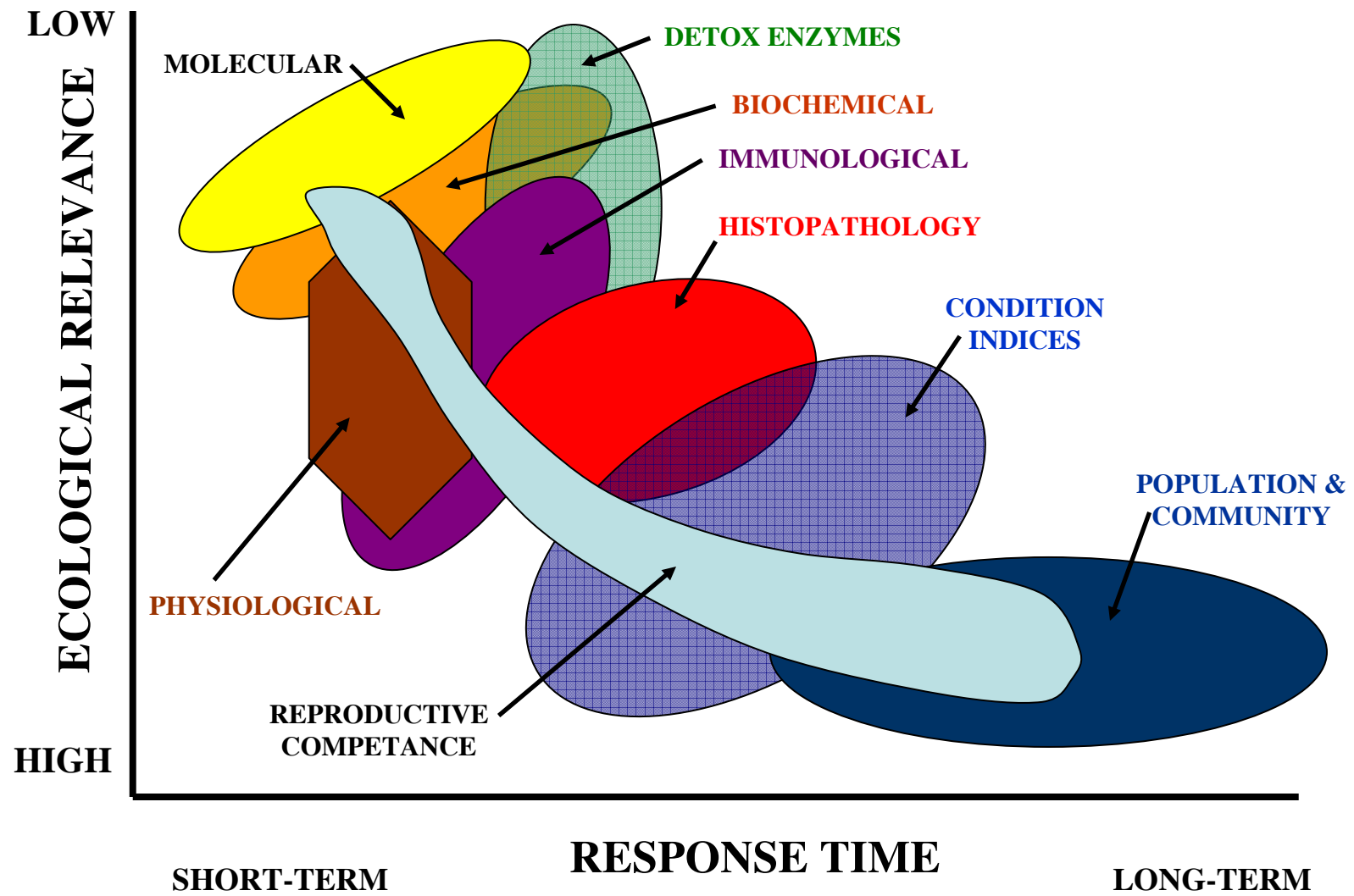
Harmful algal blooms



Fish Kills



Continuum of Biological Responses



Management Implications



Integrated Approach

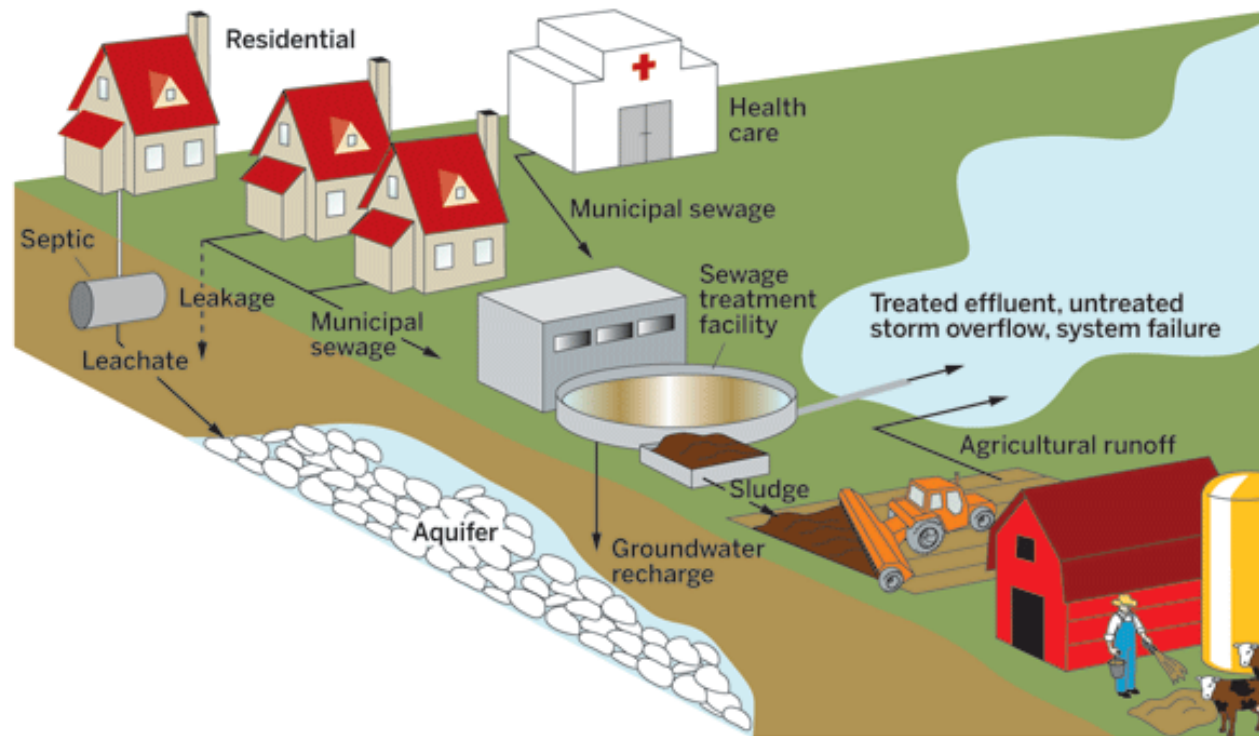
Environmental consumers:

- Users
- Advocates

↓
Stewardship



QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.



Striped bass (*Morone saxatilis*)

