ANALYSIS OF EDC’S IN AQUATIC SYSTEMS

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Points to discuss

- My background and experience.
- Approach for study
Recent Analytical Experience.

- “Occurrence of antibiotics and hormones in a major agricultural watershed” Journal article, 2008.
- “Fate of triclosan in agricultural soils after biosolid application” – analyses in biosolids and field soils.” Journal article, 2010.
- Several publications on alkylphenol and alkylethoxylates in WWTPs, airports and waterways – Jorge Loyo-Rosales 1998 to 2005.
EDC/Fish–Related Research

- 1998 to 2010 - Alkylphenols and Alkylphenol-ethoxylates (APEs) as Potential Endocrine Disrupters in Fish.
Fig. 3. Effluent concentrations of nonylphenol (NP) and nonylphenol 1 to 2 ethoxylate (NP1–2 EO), and temperature in effluent versus days after 1st sample collection at the North Side Water Reclamation Plant inclusive of a fall 2006 collection interval (0 to 20 days) followed by a spring 2007 collection (140 to 200 days).
Fish Tissue Concentration Also vary seasonally

Fig. 2. Nonylphenol (NP) and nonylphenol 1 to 4 ethoxylate (NP(1–4)EO) concentrations found in fish collected in the Fall of 2006 and Spring of 2007. Concentrations represent mean ± standard error of the mean of all fish captured for each season.
Vitellogenin levels in males positively correlated with concentrations of NPEs in these same fish.

There were, however, no observable histological differences in fall versus spring fish samples.
Acknowledges

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  - Dr. Osman Arikin – Visiting Scientist - 2006
  - Dr. Seema Datta – Post. Doc -1999
EDC’s as proposed in UCMR3, e.g. 6 natural estrogens plus equiline and EE2 throughout.

Marker compounds for WWTP (nonylphenol, altenolol, TCS, TCEP (tris(2-chloroethyl) phosphate), Sucralose, etc.

Marker compounds for Urban sources (bisphenol A, PAH’s, …)

Marker compounds for Agricultural sources (sulfamethazine or sulfathiazole, ionophores and herbicides, etc.).
Chemistry is critical, but not central to the goal of this study. Central is its bioassay directed focus.

- Attempt to use common media for chemical and biotic impact assessments.
- Correlation across water parameters to emphasize:
  - Bioavailability
  - Exposure duration (may use POCIS samplers).
- Many unknown stressors besides obvious EDCs:
  - Metals
  - Man-made pollutants:
    - Pharmaceuticals
    - Pesticides
  - Interactive effects (mixtures).
- Utilize DOM measured using EEMs to combine and correlate with:
  - Biological effects (fish bioassays)
  - Chemical measurements (water and fish?)
Conclusions

- One needs a team approach to better understand problems of this complexity.

- We need to better manage this river system to protect the fisheries, but also to gain insight into potential effects on drinking water, as an early sentinel for possible human effects.

- Hopefully we should be able to apply knowledge to similar river systems in other impacted urban areas.