

## Research Round Up

**Title of the project:** Use of effects based bioassays to assess the endocrine disruption potential of advanced tertiary treated sewage effluent.

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**Collaborating organisations:** Veolia Water Australia, Landcare Research NZ, Sydney Water, National Institute for Environmental Studies, Japan

### Key issue/s addressed:

- To determine the efficacy of removal of endocrine disrupting chemicals using advanced tertiary treatment technologies..

### Objectives:

- To determine changes in endocrine disruption potential during the treatment train of domestic effluent by:
  - a. characterising the ED potential of effluent after each stage of treatment using *in vitro* bioassays
  - b. identifying changes in steroidal estrogens and alkylphenols profiles during treatment and whether this correlates with bioassay responses, and
  - c. determining whether the final effluent causes any *in vivo* estrogenic ED in mosquito fish and to what extent the advanced treatment stages improve upon any ED potential that could be present after conventional stages of treatment

### Planned Outputs/Outcome (by when):

- Presentation at IWA conference: Micropol and Ecohazard (June 2007) by Lisa Hamilton (PhD student)
- Publication of peer reviewed journal papers (2007-09)
- Presentation at SETAC World Congress (August 2008)
- Submission of PhD thesis (March 2009)

### Methodological approach:

- Screen effluent extracts from each stage for endocrine disruption potential using the estrogen receptor binding assay (ERBA) (total interference with the estrogen receptor), E-screen (agonistic interaction with the estrogen receptor) and two hybrid yeast assay (differential responses for fish and human estrogen receptors).
- Chemical analysis of effluent from after each treatment stage after solid phase extraction using Oasis HLB cartridges and GC-MS analysis
- On-site flow through tanks for exposure of mosquitofish, *Gambusia holbrooki* to final effluent and partially treated effluent from earlier stages in the treatment train. Assessment of morphological end-points after development from juvenile to adult and vitellogenin analysis of adults.

### Key findings so far:

- Estrogenic endocrine disruption potential is reduced by treatment to a level that is undetectable by *in vitro* bioassays after ozonation/biological activated carbon filtration (and remains undetectable through to final effluent)
- Similarly, steroidal estrogens are completely undetectable after ozonation/biological activated carbon filtration even when the ozone is offline.
- There is no difference in the capacity of the treatment plant to remove steroidal estrogens and estrogenic ED potential in *in vitro* bioassays during normal flow periods and peak summer holiday inflows
- Steroidal estrogens are not the sole estrogenic ED in the influent stream as they do not completely account for the bioassay responses.

### Please tick the relevant theme below:

Monitoring/ Analysis  Exposure assessment  Environmental Fate  Effects

Treatment Technology  Risk Assessment  Other