Particulate Phase Phosphorus Bioavailability in the METRO Effluent

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Introduction
- Section 303 of the Clean Water Act states that if a water body is not meeting water quality standards for the designated beneficial use, a Total Maximum Daily Load (TMDL) must be established.
- A phosphorus TMDL is presently being developed for Onondaga Lake.
- Phosphorus TMDLs traditionally focus on total phosphorus, despite the fact that it is well accepted that not all phosphorus is bioavailable (Effler et al. 2002).
- Given the contribution of the METRO effluent to the lake’s overall loading, it is important to understand the degree to which this source is bioavailable.
- Here, we report on the algal bioavailability of particulate phase phosphorus in the METRO effluent and compare that contribution to historical conditions.

Objectives and Approach
- Quantify the algal bioavailability of particulate phase phosphorus in the METRO effluent.
- Compare that result with those obtained for untreated wastewater, historical METRO effluent and effluents examined for other treatment facilities.
- The analytical approach will be to examine particulate phase concentrate from the METRO effluent using an algal assay in a Dual Culture Diffusion Apparatus (DCDA).
- This approach, developed by DePinto (1981) has been widely applied for this purpose, e.g. Young et al. 1982, Ekholm and Krogerus 1998 and Effler et al. 2002.

Methods
- In the assay, the cumulative algal uptake of phosphorus is measured and bioavailability expressed as a percentage of the particulate phase phosphorus originally present in the effluent sample.
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Results (influent)
- Sewage plant influent appears to be approaching 100% bioavailable phosphorus

Results (historical effluent)
- Tomasoski, 1997 found the METRO was 58% +/- 9 bioavailable

Results (contemporary effluent)
- The mean of four assays preformed in 2010 showed that METRO is now 1% +/- 0.3 bioavailable much less than it was in 1997

Conclusions
- The particulate phosphorus of the METRO effluent is strikingly less available to algae. The bioassay results show that it is only about 1% bioavailable much less than 58% from 13 years ago.

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