UI Environmental Engineering Lab
Erik R. Coats, P.E., Ph.D. – Associate Professor
ecoats@uidaho.edu **208.885.7559**

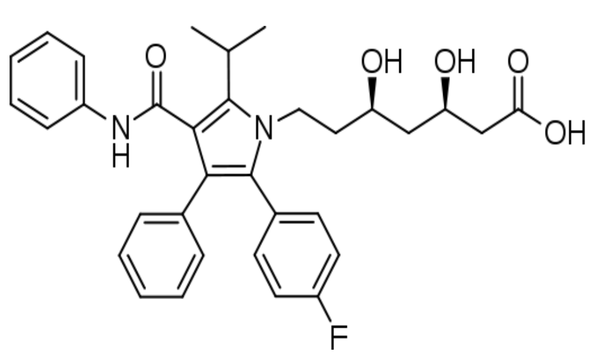
Elimination of Pharmaceuticals During Water Reclamation: A Practical Approach

Pharmacology is an integral part of modern life. Hundreds of tons of pharmaceuticals are produced each year and are prescribed with the intention of inducing a biological effect. Many of these enter the sewer system through bodily excretion. Some persist through the water reclamation process as unchanged compounds while a few transform to metabolites with even higher activity or toxicity.

The University of Idaho in cooperation with the Idaho National Lab have begun a study with the following goals:

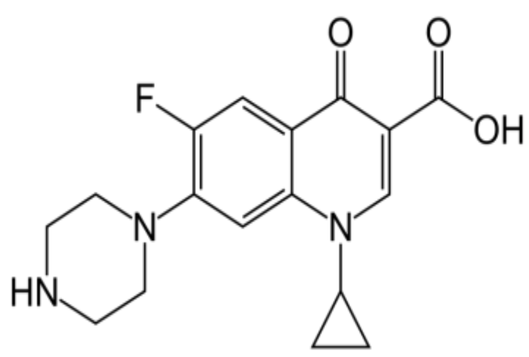
- Develop operating criteria to minimize pharmaceuticals in reclaimed water
- Develop real-time indicators of process stability with respect to pharmaceutical removal
- Eliminate solid-bound compounds through specialized digestion or composting
- WWRF processes to be tested: activated sludge, dispersed IFAS, anaerobic digestion
- Develop quantification methods for trace contaminants

Target Pharmaceuticals For This Study



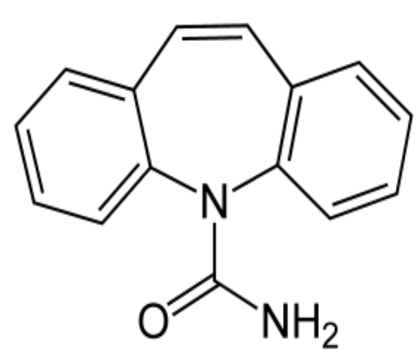
Atorvastatin (Lipitor)
(cholesterol)

#2 most prescribed pharmaceutical



Ciprofloxacin
(antibiotic)

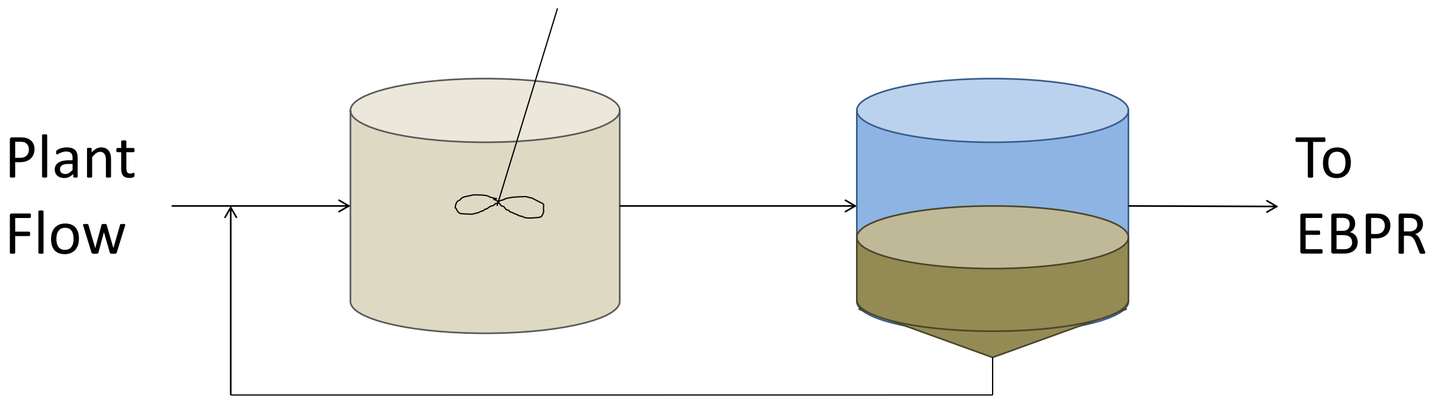
Evidence indicates high levels of bacterial resistance



Carbamazepine
(anti-epileptic)

Shown to be highly resistant to wastewater treatment

Novel Fermentation Process



Similar to activated primary system with the exception of the large fermentation reactor before the primary clarifier

- Lab-scale SBRs currently in operation
  - Short cycle length: semi-continuous flow
  - Real wastewater (post screening)
  - Not side-stream
- Initial data indicates up to 77% increase in VFAs
- Future operations
  - Optimize VFA production
  - Evaluate for pharmaceutical removal

Analytics

Analysis of target compounds will be conducted through a partnership between UI, INL, and Agilent Technologies Inc., Wakefield, MA

Current limit of quantification (LOQ): <31 nM (≈ 20 µg/l)

Zymark RapidTrace™ SPE Automation

Solid phase extraction (SPE) will be used to concentrate and "clean up" samples prior to analysis with LC-MS/MS

LOQ with SPE: ≈ 200 pg/L