### Introduction
Recent reports suggest that many drugs commonly administered for medical or agricultural applications are found in measurable concentrations in sewage streams and as contaminants of surface waters throughout the world (Quinn et al. 2008). One survey indicated the presence of numerous common pharmaceuticals, including Gemfibrozil, Ibuprofen and Carbamazepine in surface waters throughout the United States (Kolpin et al. 2004). The presence of these drugs in the environment is of concern as they may have far reaching effects on animals, plants, and microorganisms (Hernando et al. 2006). Concern arose when estrogen mimics in detergents and soaps were found in 30% of streams tested in 30 states of the U.S. (Palace et al. 2005). The concentrations typically found downstream of waste water treatment plants (5-6ng/L) have been shown to reduce the Flat Headed Minnow population at study sites causing severe kidney damage and death (Kidd et al. 2006). The purpose of this study was to investigate the effects of several household drugs on common bacteria.

### Methods and Materials
**Bacterial growth and maintenance.** Salmonella typhimurium, *P. aeruginosa, S. aureus* and *E. coli*, were each grown in LB broth. *Bacillus cereus*, was grown on Tripticase Soy Broth. All strains were incubated at 37°C in an orbital shaking incubator.

**Growth Studies.** To determine the effects of each drug on bacterial growth, overnight cultures were used to inoculate (1% inoculum) sterile cultures medium containing Gemfibrozil, Ibuprofen or Carbamazepine at the maximum aqueous solubility of each respective drug. Cultures were incubated for 16 hours and optical densities (600 nm) recorded and compared with controls consisting of cultures grown in the absence of any drug.

**Cell Morphology.** Gram staining was used to determine any morphological changes induced by exposure to each drug (Gram 1884) and compared with controls consisting of cultures grown in the absence of any drug.

**Motility assays.** Motility assays were performed on *S. typhimurium, P. aeruginosa, E.coli,* and *B. cereus* (Garg and Kanitkar, 2006).

### Results
Gemfibrozil significantly affected the growth of *S. typhimurium, S. aureus, and B. cereus* (P< 0.05). *Pseudomonas aeruginosa* and *E. coli,* were not significantly affected (P> 0.05) by Gemfibrozil (Figure 1).

Ibuprofen significantly affected the growth of *S. typhimurium* (P< 0.05), but not *P. aeruginosa, S. aureus, E. coli* or *B. cereus* (Figure 2).

### Conclusions
Gemfibrozil, Ibuprofen, and Carbamazepine were shown to be detrimental to the growth of bacterial strains tested. These drugs tested make their way into drinking water throughout the world. With constant exposure to Gemfibrozil, Ibuprofen, and Carbamazepine, the bacterial flora that can participate in maintaining health may be adversely affected. The increased exposure of these pharmaceuticals could increase side affects to those already taking the drug. These drugs are in minute concentration, however, with so many different types of drugs present, studies have yet to be performed to determine what types of synergistic effects there may be.

### References


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**Figure 1:** The effects of Gemfibrozil on bacterial growth.

**Figure 2:** The effects of Ibuprofen on bacterial growth.

**Figure 3:** The effects of Carbamazepine on bacterial growth.