

Abstract

Pharmaceuticals have been found in waste water treatment plant (WWTP) effluents and there are scientific studies that indicate at least some of these chemicals have adverse effects on fish health. Two groups of pharmaceuticals that currently cause concerns are natural and synthetic steroids and selective serotonin reuptake inhibitors (SSRIs). Fathead minnows (FHM) are a common species of fish used for research and ethynyl estradiol (EE2) is a synthetic estrogen known to cause decreased fertility in fish. FHMs were exposed to EE2 for time periods between 0.25 hours to 144 hours in order to study uptake and disposition in this species. These results demonstrated that EE2 is rapidly absorbed by FHMs and distributed to target tissues such as the liver and gonads. These findings support the use of short-term exposure studies of WWTP effluents to assess the potential physiological effects on fish. The use of relatively short exposure times (e.g. 72 hrs) requires fewer resources and permits more WWTP effluents to be tested.

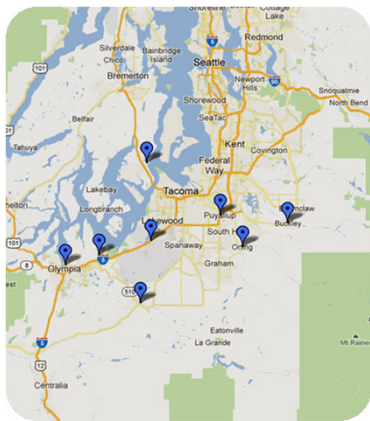
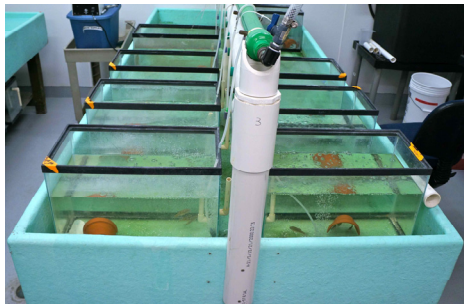


Figure 1. Research involved assaying WWTP effluent from nine treatment plants to determine what pharmaceuticals these effluents contained.



Results

- Small quantities of steroids, but fairly high amounts of SSRIs were found in the WWTP effluents.
- Concern about steroids is still relevant because they have been found in other studies and are potent physiologically (Desbrow).
- Plasma levels of EE2 quickly reached equilibrium with EE2 in the water, within 2 hours.
- Testes and liver tissue levels of EE2 also reached equilibrium quickly, taking approximately 8 hours.

References

C. Desbrow, E. J. Routledge, G. C. Brighty, J. P. Sumpter, and M. Waldock. "Identification of Estrogenic Chemicals in STW Effluent. 1. Chemical Fractionation and In Vitro Biological Screening." *Environ. Sci. Technol.*, 1998, 32 (11), pp 1549-1558.

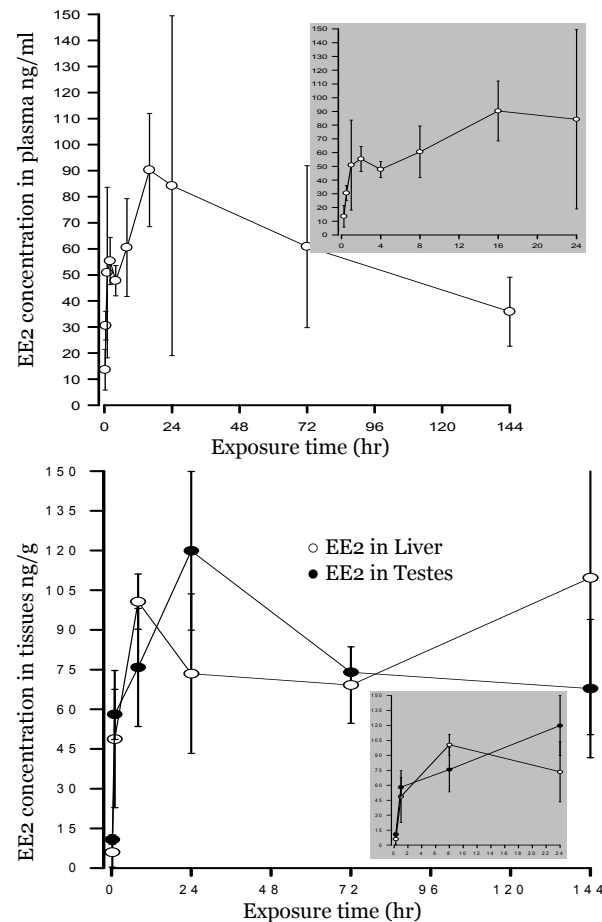


Figure 2. EE2 concentration-time profiles in male FHM blood plasma (top figure), liver and testes (bottom figure) after continuous exposure to 100 ng/l EE2. Fish were exposed using a single pass flow-through exposure system. Blood and tissue sampling was performed in fish serially euthanized at various times of exposure up to 144 hrs (7 d). Values are the mean \pm SD; $n = 3-6$ individuals per sampling time.